REDISCOVERING THE BOOK OF MORMON REMNANT THROUGH DNA

ROD L. MELDRUM

DIGITAL LEGEND
Mendon, NY

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Honeoye Falls, NY 14472
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For a listing of all Digital Legend Products, visit www.Digitalegend.com.
Printed in the United States of America

ISBN: 978-1-934537-29-9

PREFACE

This work is the sum of over four years of nearly continuous research into possible DNA connections between the Native American peoples, and the prophesied "remnant" of the house of Israel as contained in the Book of Mormon. You will find scriptural, historical and scientific material combined in a synergistic way that may offer support to some of the physical claims of the Book of Mormon. Many tens of thousands of Latter-day Saints have now seen portions of this information, either through a four hour DVD or at live presentations around the country. Many scholars and historians support this research and its findings, with many more anticipated as this information continues to gain momentum and change "accepted" paradigms. It is also acknowledged that there are many scholars that do not support this research.

It is a rather technical book because it addresses a subject with a high level of scientific contribution. A substantial number of direct quotes from peer reviewed scientific journals are incorporated and an attempt has been made to explain them to well-educated non-scientists. It is written in a way that maintains scientific accuracy but is readable and understandable.

The subject of DNA and the Book of Mormon, while a currently popular topic, is still rather poorly understood among Latter-day Saints and non-members alike. It is hoped that this exciting new information leads to insights that provide support for the historic reality of the Book of Mormon. Certain portions of this research may be considered by some to be of a controversial nature. In the author's view this work is not controversial, but rather scriptural, historical and scientific. The desire is to present this new research in a non-confrontational, Christ-like manner, while offering significant evidence that may challenge some long held, yet unsanctioned, beliefs about the geography of the Book of Mormon.

While the information must address questions and possible objections to this research, the intent is to do so in a Christ-like, respectful manner, yet as authoritatively and factually as possible. This information will be a powerful tool in helping to establish a new paradigm in the LDS community regarding the geography of the Book of Mormon.

Though the author's professional research activities have not been specifically focused in the area of genetics, this paper does not rely on an appeal to personal authority, but provides detailed documentation in peer reviewed scientific journals that readers can examine for themselves.

The quotes and scriptures in this article are sometimes rather lengthy. This was done so that the reader could understand the quote in context without overstepping the boundaries of copyright. The majority of the journal articles are in journals that are difficult or expensive for normal readers to access, making it difficult to verify the quotes for most people. I encourage readers to check up and verify the validity of the quotes and if there is something found to have been taken out of context, it will be taken under advisement and corrections made as needed.

Note: Unless otherwise indicated, *emphasis* within any quotation is added by the author.

ENDORSEMENTS

This book is very well written and thoroughly documented. It contains revolutionary concepts that all Latter-day Saints would find of great interest and significance. I believe that anyone (member or non-member) who would study this evidence with an open mind would have a difficult time refuting it scripturally or scientifically. I am convinced, after reading this book, that its conclusions are, in fact, validated. I whole-heartedly agree that the information that has been so clearly documented and convincingly presented make it very probable that it happened as it has been proposed. Dr. Walter L. Ogden, MS MD

This book is a must read to understand Book of Mormon remnant genetics as it is very well researched and accurate. Adrian L. Arp, Ph.D., Plant Geneticist

I am amazed at all of the research put into this paper. I don't think any rock was left unturned! This research was done very methodically and the paper is very convincing. People that care about this topic will take what has been presented and compare it to the other "ideas," check citations, and make up their own minds. This current research shows that its hypothesis is very possible and, at this point, I have a strong feeling that it is correct. Janelle G. Millhouse, Plant Pathology, University of Nebraska-Lincoln

What the discovery of the Dead Sea Scrolls has done to spark re-examination of basic Christianity, Meldrum's analysis of DNA research promises to do for the re-examination---and probable replacement---of Mesoamerica as the accepted locus of Book of Mormon chronology. Not since the long-lost Joseph Smith papyri burst upon the scene in 1967 has there been news of this magnitude and import regarding physical corroboration of Latter-day Saint doctrine and scripture.

Having now thoroughly demolished the DNA arguments of the opponents of the Church---namely, that there is no current DNA evidence linking contemporary Middle Easterners with Book of Mormon peoples---Meldrum has gone on to assemble an impressive and virtually-unassailable mountain of scriptural and archaeological data in support of the Heartland Model, a compelling approach to Book of Mormon geography which centers upon the ancient mound-builders of North America, primarily the highly advanced Hopewell civilization whose remains are concentrated in the Great Lakes and Midwest regions of the United States.

Meldrum's elegant linking of the latest DNA findings with contemporary archaeological and geographical evidence---all the while remaining impeccably true to ancient and modern scripture---yields an approach to Book of Mormon geography (and Book of Mormon veracity) that is nothing less than a sea change in scholarly thinking. How welcome or unwelcome this paradigm shift will prove to be, especially among LDS scholars of the Meso-American persuasion, remains to be seen. Regardless, Meldrum has clearly done his homework, and those that would challenge him had better be sure they've done theirs. Ed Lauritsen, Ph.D.

ABOUT THE AUTHOR

Rod Meldrum served as senior scientific researcher for 7 years on a natural sciences book to be published in the near future. That 1200 page university-level text will be the culmination of over 12 years of research. He was President and CEO of High Country Gourmet in Orem, Utah. More recently he was Director of Business Development for Interact Medical, a leading developer of online LMS (Learning Management System) -based training systems for surgeons and patients in the medical device industry.

Brother Meldrum served a mission in Milan, Italy and has served in many church ward and stake level leadership callings, most recently Young Men's President of his Provo, Utah ward. He and his wife, Tonya, have four children.

He began his study of issues surrounding the controversy over DNA and the Book of Mormon in 2003. His studies lead to questioning the origins of proposed geographical settings of the Book of Mormon. In addition he completed intensive study of the Book of Mormon itself and historical documents associated with Joseph Smith and Smith's knowledge of this subject. In 2007 he began sharing his research in free presentations done at his own expense in the Intermountain Region of the United States.

Interest in the research reached a point that it was no longer possible to accommodate all those who wanted to learn more; it was requested by many attendee's that the presentation be recorded. This resulted in creation of a comprehensive 4-hour DVD titled *DNA Evidence for Book of Mormon Geography*. Brother Meldrum has since given presentations across the United States and his research has been seen by tens of thousands of members of the Church. The research is given in support of the truthfulness of Book of Mormon and the gospel of Jesus Christ. Viewers across the globe have overwhelmingly expressed gratitude and excitement about the information, many stating that it "just makes sense" intellectually as well as spiritually. It is hoped that this information will cause a renewed desire in those who see it to study and ponder the truths of the Book of Mormon, the words of The Prophet, Joseph Smith, and the gospel of Jesus Christ as established by him in The Church of Jesus Christ of Latter-day Saints.

ACKNOWLEDGEMENTS

This book is dedicated to all those who have had an impact in helping me realize the power of learning by faith in the pursuit of truth. I have been blessed with associations with incredible individuals that have inspired and instructed me in marvelous ways. This book has challenged me in ways previously unimaginable, but the overwhelming amount of encouragement I've received from tens of thousands of truth-seeking, honest and sincere "friends" has borne me up and strengthened my faith in the power of the Lord's truths to change lives. It is my hope to assist in this quest.

First and foremost I give thanks to Him from whom all truth springs.

I express my eternal gratitude to my patient, loving and supportive wife, children and parents; without their love, help and continuous support this book would not have been possible.

I would like to express my deep and sincere gratitude to all those who have given of their time, talents and expertise in helping with so many aspects of research, review, editing, printing and publishing.

My gratitude to the many reviewers of this work cannot be overstated, especially Les Austin who has been instrumental in the technical writing and editing aspects of the book.

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INTRODUCTION

From the earliest days of the restoration of the Church of Jesus Christ of Latter-day Saints there has been tremendous interest in where the events described in the Book of Mormon actually took place. On what land did this epic saga transpire, and who are the actual descendents of the peoples identified in the Book of Mormon?

There have been books, papers, news statements and internet sites claiming that DNA findings refute the historicity of the Book of Mormon, negating it as an actual historical record. What is the background of these statements? Can the evidence support the claim that DNA proves the Book of Mormon false?

Over the past ten years much has been speculated about these questions, especially in light of scientific findings involving human DNA testing. Recent research has been conducted on Native American DNA, studies potentially related to the Book of Mormon that may lend support to its claims. The research herein refutes the claim that DNA analysis proves the Book of Mormon false, and it explores genetic (DNA) evidence that may actually support the claims of the Book of Mormon.

My position as the author of this work is that when there is an inferred conflict between scientific theories and scriptural truths, the scriptures will always be demonstrated true, and the theories of men, put forward through science, will eventually conform to the truths of the gospel, not the other way around. Of course error can be made in the interpretation of scripture; however when they (the Scriptures) are clear and supported by prophetic or revelatory understanding, and if they cannot be reconciled with the current theories of science, then it should be understood that eventually the scientific theories will be altered to comply with God's truth, even if that means waiting until the next life. The theories (beliefs) of men that *don't* harmonize with the truths (facts) of God are in error and are subject to alteration. Theories should be altered by facts, which should also be a foundational understanding of science. God's facts are not subject to alteration by the theories of men in order to reconcile them.

As Latter-day Saints, we believe in all truth from whatever source it springs. Therefore, it is important not to simply brush aside scientific findings of truth. Empirical, experiment-based scientific findings of truth are occasionally at odds with proposed theories that attempt to explain them. It is important to differentiate between scientific observation, which is data derived by experiment or empirical work, and theories which are philosophies and beliefs that attempt to explain the observations. Theories that have reached a certain level of consensus have too often resulted in scientific paradigms and dogma that obscure and eclipse the empirical facts.

Truth is truth in whatever sphere it is found, whether in science, religion, politics, or life in general. So if something is true in one sphere, it MUST be true in all others. If pure gold does not tarnish naturally in geology, then it will not be found to tarnish in archaeology either. If the Old Testament is true, then archaeological findings will eventually bear it out, which to a large extent it has, and therefore if the Book of Mormon is true, then genetic truths and evidence will eventually bear out those truths as well. One must simply have the faith, and the patience, to wait until the Lord's time for the truth to be made known. Sometimes that will happen rather quickly, but most times there is a waiting period, possibly to try our faith, and possibly to fit into the Lord's time-frame. In

this case, it may often be longer than one's lifespan. Nevertheless, should we be vigilant and ready at all times for new truths, in the event that the Lord's time frame matches our lifetime? Absolutely.

This gives confidence that no matter what is being researched, it will always bear out the fact that the scriptures are true; if not, then that research is not based on truth. So what have we to fear? Nothing. There is never a reason or a time to fear finding the truth! One must only be absolutely sure to adhere to the truths established by God as the foundation, and glean more truth through building on that base. We should do our best to be truth-seekers in everything we do and in every aspect of our lives.

Having a testimony of the gospel of Jesus Christ, and knowing it is true, leaves little doubt that the Book of Mormon is an historical record. Its words are a foundational pillar upon which much of the gospel rests. Its truths are fundamental to our belief in the prophet Joseph Smith and the commencement of the restoration of the gospel. *It is not possible that the Book of Mormon could be spiritually true and historically false*.

Knowing the book to be spiritually true, its historical account must also be true. Since it is an historical record, then naturally there should be evidences that support it. How are such evidences found? There must be a starting point: a method that begins from a solid foundation of truth upon which to build further understanding that will withstand the tempests and storms of challenge. This DNA section is only one of the many areas of exploration and research that is beginning to unfold the strength of the claims of the Book of Mormon as an historical text.

The Roles of Faith, Evidence, Scholarship and Revelation

Elder Dallin H. Oaks in a speech before the organization formerly known as the Foundation for Ancient Research and Mormon Studies (FARMS; now the Neil A. Maxwell Institute for Religious Scholarship), given in Provo, Utah, October 29th, 1993, confirmed the fact that secular or scientific evidence cannot "prove" the Book of Mormon either false or true. There will always remain a need for faith. Its truths will always depend on the witness of the Holy Spirit to form the basis of testimony. No one should ever base their testimony on scientific or other types of external evidence, but must always seek first the whisperings of the spirit to the heart and soul.

> In fact, it is our position that secular *evidence can neither prove nor disprove the authenticity of the Book of Mormon. Its authenticity depends, as it says, on a witness of the Holy Spirit.* Ref 1

Such is the case with this work. While it may appear after review of this material to some readers that this research "proves" the truthfulness of the Book of Mormon, it must always be remembered that there are a host of "assumptions" that have been made along the way. This research is still in its infancy and will grow and develop as additional great minds with superior expertise in specific arenas apply their skills and knowledge to the subject. No matter how far these ideas progress, they will always remain in the realm of theory until the Lord makes the truth known, if He ever does while we are in this life.

Elder Oaks explains that God wants us to reason *with* Him. To me, this supports a similar teaching found in the scriptures that encourages learning by study and also by faith (D&C 88:118, D&C 109:7). Secular study alone will only produce limited results, but secular study combined with revealed knowledge from God through his scriptures and prophets is infinitely more powerful. Such study is not dependant on having certain credentials or appealing to scholarly authority. Anyone can exercise this learning and discovery process; it is not limited except in the degree to which we leave the Lord's teachings and begin to trust more in the teachings of men.

> *God invites us to reason with Him*, but I find it significant that the reasoning to which God invites us is *tied to spiritual realities and maturity rather than to scholarly findings or credentials*. Three times in modern revelation the Lord has spoken of reasoning with his people. (D&C 45:10, 15; 50:10—12; 61:13; also see Isaiah 1:18.) Ref 1

Elder Oaks then provides extraordinarily profound advice and counsel on the role and use of rational argument that I echo in wholehearted agreement.

> In these remarks *I will seek to use rational argument, but I will not rely on any proofs. I will approach the question of the historicity of the Book of Mormon from the standpoint of faith and revelation*. I maintain that the issue of the historicity of the Book of Mormon is basically a *difference between those who rely exclusively on scholarship* and those who *rely on a combination of scholarship, faith, and revelation. Those who rely exclusively on scholarship reject revelation and fulfill Nephi's prophecy that in the last days men "shall teach with their learning, and deny the Holy Ghost*, which giveth utterance." (2 Ne. 28:4). Ref 1

With these inspired words I absolutely agree. Attempt at rational argument has been used throughout this research. However, scholarship has not been used exclusively but rather in a combination of scholarship, faith and revelation. Lest an attempt be made to make of this statement more than it is, the faith and revelation referred to herein are those gained by a testimony of the Lord Jesus Christ, his prophets, and the Book of Mormon. In these I unreservedly claim to have a firm witness by revelation from the spirit of God to be true. I do not claim to know that this proposed theory is true, nor is any claim made that it has been received by revelation. I do not, however, deny that I pray daily for guidance in my research and ask the Lord to help in my understanding. I have felt, on occasion, His guiding influence in my life which I cannot, and will not deny. This is not contrary to the restored gospel of Jesus Christ. This method is consistent with the teachings of the Church.

I have attempted to do just as Elder Oaks taught: to use rational argument combined with faith that the Book of Mormon is true and an historical record of real people, accompanied by personal revelation that has powerfully and undeniably testified that it is true.

Based on this testimony of and faith in the gospel, there are certain theories of men that appear incompatible to me. I have made a conscientious decision to hold to the truths of the gospel, as found in the scriptures and words of the prophets, and question the theories of men when they appear to be in disagreement.

As a statement on the importance of standing for truth, Dr. Robert Millet, professor of ancient scripture at Brigham Young University clarifies several foundational truths for which all "must stand." As noted in the following quote, one is the truthfulness of the Book of Mormon, and another is the divine call of the prophet, Joseph Smith. The importance of these truths is summed up in the final words of this quote.

> [T]here are a myriad of doctrinal issues over which *discussion and debate may lead to diverse conclusions*, particularly in matters which have not been fully clarified in scripture or by prophets. At the same time, *there are certain well-defined truths*—matters pertaining to the *divine Sonship of Christ*, the reality of *the atonement*, the *appearance of the Father and the Son* in 1820, and *the truthfulness of the Book of Mormon*—which, in the uncompromising language of President J. Reuben Clark, "*must stand, unchanged, unmodified, without dilution, excuse, apology, or avoidance; they may not be explained away or submerged*." Without these two great beliefs [the reality of the *resurrection and atonement* and the *divine call of Joseph Smith] the Church would cease to be the Church*. Ref 2

How did all this get started?

Native American remains have been used to study the peopling of the Americas for a greater understanding in many fields of endeavor. Often these studies resulted in

sacred ancestral remains of native peoples being exhumed and studied, then locked away in storage facilities. A law was passed November 16th, 1990, titled the "Native American Graves Protection and Repatriation Act" that requires the remains of Native American people be returned to their rightful owners. While this law was seen as a significant step in repatriating these sacred remains back to their rightful descendants, the process of returning these remains also created confusion over which group held those rights when it was found that in several instances there were multiple Native American tribal groups claiming a particular set of remains.

Initial findings of Native American DNA Studies

Mitochondrial DNA (mtDNA) is passed maternally from mothers to their children and is not recombined every generation as is nuclear DNA, making it more diagnostic for human population studies. This article becomes more technical in certain areas which may be more difficult for non-scientists to fully understand; therefore, I have attempted to simplify the concepts and explain the quotes in terms that most well educated readers will be able to grasp. This will make it worthwhile for the reader to wade through the scientific nomenclature to glean a deeper understanding of the material being discussed.

> The *human mitochondrion* is an extra nuclear organelle having DNA that exists as a circular molecule 16,569 base pairs in length, in which *all nucleotide positions and coding loci are known*. Because *this DNA is uniquely maternally inherited* and, unlike nuclear DNA, does not recombine, *all changes in mtDNA sequence are the result of accumulated mutations inherited from mother to daughter*. In addition, mtDNA mutates an order of magnitude faster than does nuclear DNA, with the control region mutating at an even greater rate, making it particularly *useful for analyses at shallow time depths*. Finally, mtDNA exists in high copy number in haploid condition. Consequently, it is easily assayed in the laboratory and *can be recovered from prehistoric biological material* in sufficient quantities for amplification and analysis using the polymerase chain reaction. Ref 3

Before the polymerase chain reaction method was adopted, large quantity samples were required for analysis. This technological advance in human genetic testing has resulted in resounding progress in the ability to "map" genetic "signatures" of modern as well as prehistoric samples.

Geneticists determined to put this new technology to work on one of its first major challenges: matching Native American remains to existing populations for compliance with the Native American Graves Protection and Repatriation Act (NAGPRA). This launched a massive research project to categorize the DNA of all Native Americans into related groups, called Haplogroups. Systematic DNA sequencing of Native American populations began in earnest, engaging dozens of universities, laboratories and geneticists. Preliminary DNA studies, performed on thousands of individual Native Americans from the Aleuts in Alaska, through North, Central and South America, were completed over several years. Their DNA was sequenced, studied and ultimately classified into one of four primary genetic groups called haplogroups. Four founding groups were discovered, designated Haplogroups A, B, C and D.

> While widespread, the geographic distribution of the four haplogroups is markedly nonrandom (Lorenz and Smith, 1996). For example, *haplogroup A* is extremely common among Eskimo/Aleut and Northern Athapaskan tribes, but extremely rare in non-Athapaskan speakers of the Southwest United States. *Haplogroup B* is extremely common in the American Southwest but absent, or rare, in the Arctic, Subarctic, and Northwest Coastal regions. *Haplogroup D*, while present throughout the New World, is the least common of the four haplogroups everywhere except in certain Western tribal groups. Ref 4

The preliminary results indicated that Native American populations were very closely related to Asian-based genetic groups, whose ancestral lineages are believed to be

found today in modern populations of Siberia and Asia. These findings support the dominant theory of the peopling of the New World (the Americas) by an overland migration of Asiatic peoples across the Bering Strait (sometimes called a "land-bridge") during an ice age. This theory originated in 1589 with a Spanish Jesuit missionary Jose de Acosta, who wrote one of the earliest books on the history of the New World called *Historia natural y moral*. In this book he hypothesized that Native America's indigenous peoples had migrated from Asia into the Americas.

These initial studies indicated that there were no African or European genetic DNA lineages, implying that the Native peoples of the Americas were of Asian descent exclusively.

Why would these findings be thought to challenge the historicity of the Book of Mormon? First, the Book of Mormon does not describe an overland migration into the Americas from Asia, but rather a transoceanic voyage from the Mediterranean area. Second, Lehi's lineage stems from the descendants of Noah's son Shem, and not Japheth, the father of the Asiatic peoples. Further explanation pertaining to these lineages and their specific genetic signatures will be discussed in detailed in this work.

The primary races of the earth, Asian (Oriental), African (Negroid) and European (Caucasian) are easily distinguished from each other through specific DNA markers or "signatures" that delineate their ancestry. Through DNA sequencing, these three primary genetic groups, called supergroups, can be differentiated one from another due to the presence or lack of certain DNA markers which makes them identifiable for genetic study. This makes it possible to identify peoples' genetic lineage(s).

The Book of Mormon tells us that the descendants of Lehi, (including his wife Sariah, Ishmael and his wife, and Zoram) came out of the Mediterranean area, then migrated to and multiplied to a great extent somewhere in the Americas. (See BoM Helaman 11:20 and 3:8 and also 3 Nephi 1:17). They were a Semitic people and as such would be classified by today's genetic terminology as "European," rather than "Asian." They would not have been considered to be of African or Asian descent.

Since Asian lineages and European can be differentiated, and the initial DNA studies on Native Americans identified them as having come from Asian stock, this would naturally appear to contradict the Book of Mormon claims of Mediterranean (European) migrations into the Americas. Yet this is exactly what the initial DNA studies found, lending support to the dominant theory of the peopling of the Americas over the Bering Strait. It is under these auspices that a chain of events occurred that spawned the controversy involving DNA and the Book of Mormon.

The preliminary results from DNA research on Native American populations throughout the Americas indicated that all were "Asian" lineages, and that no "European" lineages were present. Since the Book of Mormon history is an account of three migrations from the Mediterranean area, which in genetic terms would be "European," rather than Asian, this posed a potential challenge to the historical authenticity of the book itself.

The initial lack of "European" DNA caused some to conclude that no ancient European or "Israelite" migration as recorded in the Book of Mormon had occurred anywhere in the Americas. This led a small number of LDS and non-LDS scholars to write articles and books that claim that DNA studies refute the historicity of the Book of Mormon, alleging it to be a non-historical record upon which the Church was founded, as well as declaring Joseph Smith to be a false prophet.

These claims were trumpeted to the world by several sources. One particularly persuasive work was accomplished by a small Christian ministry. They capitalized on this

group of LDS scholars and scientists who left the Church by conducting interviews with them about the issue and presenting their case in a video documentary. Their DVD has sold hundreds of thousands of copies and the revenue produced by it has funded several other videos highly critical of the Church.

While the producers of these videos have offered free streaming video on their websites, thousands of the "hard" DVD copies are still selling. Who are buying these, and why? The answer is that other Christian denominations have been buying them for distribution into neighborhood after neighborhood, especially those having high concentrations of members of the Church. Entire cities have been blanketed by different Christian groups in Utah, Idaho, Arizona, California and other states.

Why is this being done? Because other Christian denominations believe they have DNA evidence "proving" the Book of Mormon to be false. Since the Book is a founding document acknowledged by the Church through official and scriptural statements to be historical in nature, they claim that DNA evidence proves the Church of Jesus Christ of Latter-day Saints to be based on a false premise, making it a false church.

Unfortunately for those who prematurely jumped to conclusions based on the *preliminary* DNA research, genetic research continued and new findings began to unfold, findings that even today are fundamentally challenging the assumptions of the peopling of the Americas.

ESTABLISHING
BOOK OF MORMON LINEAGES

The Book of Mormon's internal claims indicate it to be a literal historical record of three ancient migrations from the old world to the Promised Land in the Americas. These consisted of a people who left the old world at the time of the biblical Tower of Babel (Genesis 11:1-9), and became known as the Jaredites. A second group left Jerusalem at 600 BC lead by a prophet named Lehi, and a third group left Jerusalem (circa 589 BC) headed by the son of King Zedekiah named Mulek whose descendants later became known as Mulekites in the Book of Mormon.

The principle group, which included the prophet Lehi and his wife Sariah and their family along with another family headed by Ishmael and his unnamed wife, and one servant named Zoram, left Jerusalem about 600 BC They traveled to the Americas by boat where, according to the record, their posterity developed into a mighty civilization. Their group separated into two primary factions. One group was called the Nephites, named after the fourth son of Lehi who headed this group; the other was called "Lamanites," headed by Laman, the eldest son of Lehi. Over many generations the distinctions between these two groups became somewhat obscured because of intermixing between themselves and possibly others. Their history ended with the extermination of the Nephite faction of the group, approximately 400 AD, leaving the remaining majority of their descendants being called Lamanites to live on.

The Book of Mormon text provides the understanding that Lehi descended from Joseph that was sold into Egypt. It states that a record had been kept of the Jews which included a genealogy of Lehi's forefathers (BoM 1 Nephi 3:3, 12) and the Law of the Lord (BoM 1 Nephi 4:16) which were engraved upon plates of brass. Lehi sent his sons to procure this record, which was accomplished by Nephi, and the record was brought to Lehi. Upon receiving the brass plates, Lehi learned that he was a descendant of Joseph through his eldest son, Manasseh.

> 14 And it came to pass that my father, *Lehi*, *also found upon the plates of brass a genealogy of his fathers; wherefore he knew that he was a descendant of Joseph; yea, even that Joseph who was the son of Jacob, who was sold into Egypt*, and who was preserved by the hand of the Lord, that he might preserve his father, Jacob, and all his household from perishing with famine.
> 1 Nephi 5:14

> 51 And *Joseph called the name of the firstborn Manasseh*:…
> Genesis 41:51

Later in the Book of Mormon this is confirmed again to have been true.

> 3 And Aminadi was a descendant of *Nephi, who was the son of Lehi, who came out of the land of Jerusalem, who was a descendant of Manasseh, who was the son of Joseph who was sold into Egypt* by the hands of his brethren.
> BoM Alma 10:3

What do we know of the lineages of Lehi's Group?

We do not know the exact makeup of Lehi's DNA, but that does not preclude us from knowing something about his genetic heritage. Actually, once it has been established that he descended from Manasseh, the remainder of his lineage is quite well defined and we can use that knowledge to make logical predictions pertaining to it and that of others of his group that left Jerusalem with him, based on this knowledge.

Lehi's lineage traces back to Noah's son Shem

The following series of scriptures from the Holy Bible (King James Version) give the genealogies from Adam through Abraham and Jacob's lineage to Joseph and Manasseh. It was from this lineage that Lehi found he was a descendant.

1 *ADAM, Sheth, Enosh,*
2 *Kenan, Mahalaleel, Jered,*
3 *Henoch, Methuselah, Lamech,*
4 *Noah, Shem,* Ham, and Japheth.
1 Chronicles 1:1 – 4

10 ¶ *These are the generations of Shem*: Shem *was* an hundred years old, and *begat Arphaxad* two years after the flood:
12 And *Arphaxad* lived five and thirty years, and begat Salah:
14 And *Salah* lived thirty years, and begat Eber:
16 And *Eber* lived four and thirty years, and begat Peleg:
18 And *Peleg* lived thirty years, and begat Reu:
20 And *Reu* lived two and thirty years, and begat Serug:
22 And *Serug* lived thirty years, and begat Nahor:
24 And *Nahor* lived nine and twenty years, and begat Terah:
26 And *Terah* lived seventy years, and begat Abram, Nahor, and Haran.
Genesis 11:10, 12, 14, 16, 18, 20, 22, 24, 26

This genealogy is repeated and extended by this passage in First Chronicles to include the descendants of Abraham down to the sons of Joseph of Egypt.

24 *Shem, Arphaxad, Shelah* [Salah],
25 *Eber, Peleg, Reu,*
26 *Serug, Nahor, Terah*,
27 *Abram; the same* is *Abraham*.
28 *The sons of Abraham; Isaac, and Ishmael*.
34 *And Abraham begat Isaac. The sons of Isaac; Esau and Israel*.
1 Chronicles 1:24-28, 34

1 *THESE are the sons of Israel*; Reuben, Simeon, Levi, and Judah, Issachar, and Zebulun,
2 Dan, *Joseph*, and Benjamin, Naphtali, Gad, and Asher.
1 Chronicles 2:1 - 2

20 ¶ And unto *Joseph in the land of Egypt were born Manasseh and Ephraim*, which Asenath the daughter of Poti-pherah priest of On bare unto him.
Genesis 46:20

The biblical genealogical source above is corroborated by the following quote from the works of Josephus. Shem had five sons who established the lineages of the Persians, Assyrians, Chaldeans, Syrians, and Lydians in the Mediterranean region. Shem's great-grandson, Heber is from whom the name "Hebrews" originated.

Shem, the third son of Noah, had five sons, who inhabited the land that began at Euphrates, and reached to the Indian Ocean. They [the sons] were the founders of the lineages of the Persians (Elam), Assyrians (Ashur), Chaldeans (*Arphaxad*), Syrians (Aram), Lydians (Laud) according to Josephus. *Sala was the son of Arphaxad; and his son was Heber, from whom they originally called the Jews Hebrews*. Heber begat Joctan and Phaled... I will now treat of the Hebrews. The son of Phalg, whose father was Heber, was Ragau; whose son was Serug, to whom was born Nahor; his son was Terah, who was the father of *Abram* (Abraham), who accordingly was the tenth from Noah, ... Ref 5

There exists an unbroken genealogical lineage from Adam to Joseph's sons Manasseh and Ephraim as outlined in the Bible and this additional ancient text. Thus, Lehi's lineage through Jacob, Joseph and Manasseh indicates that he was of the lineage that descended from Noah's son Shem. Noah had three sons, Ham, Shem, and Japheth from whom all the world's peoples descended after the great flood according to scripture. From these three brothers and their wives sprang the world's three primary lineages or "supergroups" which in genetic terms are African, European, and Asian. Following is a brief synopsis of what is known of each of these three primary lineages from Noah's sons.

Shem's Lineage

From the Bible Dictionary we learn of Shem's descendants.

> *Shem. Name.* Son of Noah (Gen. 5:29–32; 6:10; 7:13; 8:16; 9:26; Moses 8:12); his descendants (Gen. 10:21–31; 11:10–32; 1 Chr. 1:17; Luke 3:36). Shem was the traditional ancestor of the Shemitic or *Semitic races*, i.e., a group of kindred nations, which *includes the Arabs, the Hebrews and Phoenicians, the Aramaeans or Syrians, the Babylonians and Assyrians*. The languages spoken by these various nations were closely related, and were known as the Semitic languages. In latter-day revelation Shem is referred to as "*the great high priest*" (D&C 138:41).
>
> LDS Bible Dictionary: Shem

Shem was the "patriarch" of the priestly lineage through which came Abraham, Isaac, Jacob, Joseph and Manasseh, which was Lehi's ancestral lineage. This is the reason Shem is referred to as "the great high priest" (D&C 138:41). These are the ancestors of the European lineages.

Genesis 9:26 states: "blessed be the Lord God of Shem." It is through Shem's priestly lineage that the Lord God would bless his children. Through Shem's lineage came Judaism, Early Christianity, the Patriarchs, and Jesus Christ.

Thus Lehi descended from Shem, which was a lineage that in today's genetic terms is "European." This is about all we can deduce about Lehi's genetic heritage, the genealogical record of which was paternal in nature.

Ham's Lineage

Ham was married to Egyptus and was cursed by his father, Noah. It is through this lineage that the curse of Cain was preserved through the flood. After the flood, Ham and his descendents inherited the land of Egypt.

> 22 And *Ham, the father of Canaan*, saw the nakedness of his father, and told his two brethren without.
>
> ...
>
> 25 And he said, *Cursed be Canaan*; a servant of servants shall he be unto his brethren.
> 26 And he said, *Blessed be the LORD God of Shem*; and Canaan shall be his servant.
> 27 God shall *enlarge Japheth, and he shall dwell in the tents of Shem; and Canaan shall be his servant.*
>
> Genesis 9:22, 25 - 27

> 21 Now this king of Egypt was a *descendant from the loins of Ham, and was a partaker of the blood of the Canaanites by birth*.
> 22 *From this descent sprang all the Egyptians, and thus the blood of the Canaanites was preserved in the land.*
> 23 The land of Egypt being first discovered by a woman, who was the daughter of Ham, and the daughter of Egyptus, which in the Chaldean signifies Egypt, which signifies that which is forbidden;
> 24 When this woman discovered the land it was under water, who afterward settled her sons in it; and *thus, from Ham, sprang that race which preserved the curse in the land.*
> 25 Now the first government of Egypt was established by *Pharaoh, the eldest son of Egyptus, the daughter of Ham*, and it was after the manner of the government of Ham, which was patriarchal.
>
> PoGP Abraham 1:21 - 25

The children of Ham possessed the land from Syria and Amanus, and the mountains of Libanus; seizing upon all that was on its sea-coasts, and as far as the ocean, and keeping it as their own. Some indeed of its names are utterly vanished away; others of them being changed, and another sound given them, are hardly to be discovered; yet a few there are which have kept their denominations entire: for of the *four sons of Ham, time has not at all hurt the name of Chus; for the Ethiopians, over whom he reigned,* are seven at this day, both by themselves and by all men in Asia, called Chusites. The memory also of the *Mesraites* is preserved in their name; for all we *who inhabit the country [of Judea,] call Egypt* Mestre, and *the Egyptians Mestreans. ...But the name it has now, has been by change given it from one of the sons of Mestraim*, who was called Lybyos. We will inform you presently what has been the occasion *why it has been called Africa also. Canaan, the fourth son of Ham*, inhabited the country now called *Judea*, and called it from his own name Canaan. ...*Nimrod, the son of Chus, stayed* and tyrannized *at Babylon*, as we have already informed you. Now all the

> children of *Mesraim*, being eight in number, *possessed the country from Gaza to Egypt*, though it possessed the name of one only the Philistim, for the Greeks call part of that country *Palestine*. Ref 5

The Book of Mormon refers to Lehi's group as being a "white" and "delightsome" people (1 Nephi 13:15, 2 Nephi 5:21, 3 Nephi 2:15), indicating their lineage did not carry the Canaanite bloodlines and therefore are most certainly not of the genetically referred to African or Negroid descent. Neither Lehi's ancestors nor descendants are considered to be among this lineage.

Japheth's Lineage

From the Bible Dictionary we find the following.

> *Japheth.* Eldest son of Noah (Moses 8:12; cf. Gen. 5:32; 6:10; 7:13; 9:18, 23); his blessing (Gen. 9:27). His descendants were dispersed over the European coasts of the Mediterranean and the districts adjoining the Black and Caspian seas (Gen. 10:1–5, 21; 1 Chr. 1:4–5), forming what is now called the Indo-European family of nations.
>
> Bible Dictionary: Japheth

The Black Sea separates Eastern Europe from western Asia and the Caspian Sea lies further east. These two seas are a part of what is considered as Asia, the largest and most populous continent on earth.

> *Japhet the son of Noah*, had seven sons. They inhabited so, that beginning at the mountains Taurus and Amanus, they *proceeded along Asia*, as far as the river Tanais, and along Europe to Cadiz. Ref 5

Japheth's lineage was prophesied to be "enlarged" by Genesis 9:27.

> 27 God shall *enlarge Japheth*, and he shall dwell in the tents of Shem; and Canaan shall be his servant.
>
> Genesis 9:27

According to Josephus, lineages springing from Japheth's seven sons included the Galatians (Gomer), Magogites (Magog), Grecians (Javan), Medes (Madai), Iberes (Thobel), Cappadocians (Mosoch), and Thracians (Thiras).

> Many are the countries that had the children of Japhet for their inhabitants. Ref 5

One of the three sons of Gomer, named Thrugramma began a lineage that was called "Thrugrammeans, who, as the Greeks resolved, were named Phrygians." Ref 5

To recap, the Hebrew lineages stem from Noah's son Shem, who is thought to have been the carrier for the Caucasian lineages after the Flood. Ham and his wife, Egyptus, were the founding couple of the African or Egyptian peoples, and Japheth's family headed the Asian lineages.

Ishmael's lineage

Lehi sent his sons back to Jerusalem to the head of another family, named Ishmael. He was the father of five daughters that Lehi wanted for his sons so that they could marry according to their covenants. Ishmael also had married sons, (1 Nephi 7:6) as apparently two of his sons already had families of their own.

> 6 And it came to pass that as we journeyed in the wilderness, behold Laman and Lemuel, and *two of the daughters of Ishmael*, and the *two sons of Ishmael and their families*, did rebel against us; yea, against me, Nephi, and Sam, and their father, Ishmael, and his wife, and his *three other daughters*.
>
> BoM 1 Nephi 7:6

Ishmael is thought to have been of the lineage of Shem through Ephraim, according to Brigham Young.

> *The prophet Joseph informed us* that the record of Lehi was contained on the 116 pages that were first translated and subsequently stolen and of which an abridgement is given us in the first Book of Nephi, which is the record of Nephi individually. *He [Lehi] himself being of the lineage of Manasseh; but that Ishmael was of the lineage of Ephraim*, and that his sons married into Lehi's family, and Lehi's sons

married Ishmael's daughters, thus fulfilling the words of Jacob upon Ephraim and Manasseh in the 48th Chapter of Genesis, which says: "and let my name be named on them, and the name of my fathers Abraham and Isaac; and let them grow into a multitude in the midst of the land." *Thus these descendants of Manasseh and Ephraim grew together upon this American continent, with a sprinkling from the house of Judah, from Mulek descended*, who left Jerusalem eleven years after Lehi, and found the colony afterwards known as Zarahemla and found by Mosiah, -- thus making a combination, an intermixture of Ephraim and Manasseh with the remnants of Judah, and for aught we know, the remnants of some other tribes that might have accompanied Mulek. Ref 6

That Ishmael was also a worthy priesthood holder, and thus of the patriarchal order of the lineage of Shem, is evident by the ritual ordinance performed as his family united with Lehi's.

22 ...And after I and my brethren and all the *house of Ishmael* had come down unto the tent of *my father [Lehi]*, *they* did give thanks unto the Lord their God; and *they did offer sacrifice and burnt offerings* unto him.
BoM 1 Nephi 7:22

This establishes that the two patriarchs of the group leaving Jerusalem with Lehi (with the exception of Zoram) were a combination of both Manasseh and Ephraim, thus sharing a similar lineage back through Joseph of Egypt to Shem.

THE INITIAL GENETICS CONTROVERSY OVER DNA AND THE BOOK OF MORMON

What genetic evidence for the Book of Mormon would be expected and what was initially found? From the early days of the Church there have been many ideas and assumptions that prevailed upon its membership. Some believed that Book of Mormon peoples migrated into a pristine land devoid of any other populations and many thought that every Native American anywhere in the Americas was a literal descendant of one of the Book of Mormon groups, in other words, from the Lamanites.

An understanding of the lineages from Noah's sons down through Joseph, Manasseh and Ephraim then becomes critical to our understanding of what types of genetic markers might be expected from the Book of Mormon account.

The following sequential study of events leading up to one of the most exciting discoveries of human genetics regarding the Book of Mormon is about to be unfolded to your view, and the results are nothing short of amazing. The field of genetics is in a state of flux as they go about interpreting the current DNA data and continue to gain additional insights from larger sampling groups. One of the most exciting things for members of the Church of Jesus Christ of Latter-day Saints is that these findings may provide additional validation for the historical claims of the Book of Mormon. They also could lend supporting evidence in favor of Joseph Smith's understanding and revelations about the geography that is outlined within the prophecies and promises of the Book of Mormon.

Researchers working with Native American mtDNA among populations in North America found a new genetic strain that didn't match any of the established Asiatic lineages, so it was relegated to the "other" category until further sampling could be done. As early as 1998 these new findings were beginning to surface in the literature. Genetic research in Europe was by this time in full stride and journals were flowing with information on their findings. Scientific investigators were beginning to unravel some of the mysteries behind the migrations of the ancient peoples of Europe. Populations were being sampled and linkages and groupings of European peoples were being procured from the data. Investigators on both sides of the Atlantic began to share their findings with each other in unprecedented cooperation, and unexpected links from the old world to the new world began to be forged.

The predominant theory of the peopling of the Americas, known as the Bering Strait theory or hypothesis, claimed that ancient Asian people crossed a "land bridge" sometime during the last ice age and crossed over into what is now Alaska. They then worked their way down through Canada into the United States, Mexico, Central America and finally pushed into South America. This theory predicted no European lineages until more recent admixture with Vikings and other European incursions into the Americas. This, however, was about to change!

The LDS Scholarly Response to the DNA Controversy

As introduced earlier, the initial lack of "European" DNA caused some to conclude that no ancient European or "Israelite" migration as recorded in the Book of Mormon had occurred anywhere in the Americas. This led a small number of LDS and non-LDS scholars to write articles and books claiming that DNA studies refute the historicity of the Book of Mormon

The LDS scholarly community was quick to respond with articles and papers debunking the uninformed false claims that DNA evidence "proves" the Book of Mormon false. Organizations such as FARMS, or Foundation for Ancient Research and Mormon Studies were among the first to counter these arguments. A series of highly informative and well-researched articles appeared that dispelled the claims brought forward by the critics of the Church.

It became clear that the claims of those who had attempted to use DNA against the Book of Mormon were based on several untenable assumptions. LDS scholars demonstrated that using the current understanding of genetics and DNA research, a claim that portends to "prove" the Book of Mormon false had fundamental flaws. Their contributions to the understanding of DNA research for the membership of the Church are unquestionable and undeniable. Through these articles it became clear that DNA research could not disprove the truthfulness of the Book of Mormon.

The DNA controversy relating to Latter-day Saint members stems from several assumptions made by members of the Church, LDS scholars, and those who are boldly claiming that DNA "proves" the Book of Mormon false. Those seeking to put forth evidence against the Church used many of these assumptions to form the basis of their arguments. This is why addressing these assumptions is important to an understanding of the nature of the controversy.

The Arguments of the Critics Based on the Assumptions of Church Members

One of the first assumptions made by critics who believed that DNA disproves the Book of Mormon is that it is the belief of the Church that all Native American populations, anywhere in North or South America, were descended from the Lamanites who were the remaining population after the final battles of extermination described in the Book of Mormon. While this belief has been pervasive among church members, the Church has had no official position … until recently.

Are all Native Americans "Lamanites"?

Although it has been widely held by some early and modern members of the Church that all indigenous peoples of the Americas descended from the original "Lamanite" population, the first presidency of the Church has recently made a change to the introduction page of the Book of Mormon that corrects that false assumption. A more detailed work by this author on the beliefs and understandings of some of the early brethren regarding this assumption has been compiled and reviewed by competent historians and will be released upon completion.

Historical accounts witness to the fact that some of these early brethren espoused a hemispheric model that embraced all of North and South America as the scope of the Book of Mormon lands. Such has also been the opinion of many modern apostles and prophets; however clarification was received by the First Presidency of the Church under the prophet Gordon B. Hinckley and reported in the Deseret Morning News on November 8, 2007. An article titled "Debate renewed with change in Book of Mormon introduction" by religion writer Carrie A. Moore appeared in the newspaper outlining a one-word change to be made to the introduction page of all future printings of the Book of Mormon. The introduction was not a part of the original book as translated by Joseph Smith Jr., but was written by Bruce R. McConkie in 1981.

The original introduction page reads:

> After thousands of years, all were destroyed except the Lamanites, and they are the *principal* ancestors of the American Indians.
> Book of Mormon - Preface Introduction: 1

Following the revision by the First Presidency, the Preface Introduction now reads:

> After thousands of years, all were destroyed except the Lamanites, and they are *among* the ancestors of the American Indians.
>
> Book of Mormon - Preface Introduction: 2

The phrase "the *principle* ancestors" was officially corrected by the presidency of the Church to read "*among* the ancestors" of present day American Indians, which clarifies the position of the brethren and answers the question of whether *all* Native Americans are descendants of the Lamanites. Clearly they are not.

The incorrect assumption that all Native Americans descended from the "remnant" Lamanite population has also been challenged based on population demographics and geographical indications from the text.

Alone on the Promised Land?

It has been postulated that beginning with Lehi's small group, if it grew at normal (but assumed) rates for approximately 1500-1600 years and reached a maximum population expansion as described near the end of the Book of Mormon that speaks of potentially millions of people of the Nephites and Lamanites, this massive population could not have been derived from such a small beginning group in this amount of time.

Even before being ravaged by diseases brought by European explorers, wars continuously reduced the overall population as the Book of Mormon records. That would tend to exacerbate this demographic problem. It is also curious that throughout the Book of Mormon the unrighteous Lamanites always seemed to outnumber their righteous counterparts, although historically righteous parents tend to have more children than unrighteous ones.

Of course extrapolating demographic population figures is fraught with potential problems and assumptions, nevertheless such large populations from small beginnings is thought to be outside of the realm of possibility. Certainly many of these problems could be easily explained if there were in fact other populations already established on the Promised Land. More on this population intermixing through Lamanite covenant breaking and its resulting consequences will follow.

Some assumed that the Book of Mormon precludes any other people from being on the "Promised Land." These assumptions have been thoroughly addressed by the LDS scholarly community and will not be covered in detail in this work. Those assumptions have been found to be without merit as the Book of Mormon does not demand a "no others" view and in fact may indicate in several passages the presence of other groups. As Matthew Roper writes in his article "Swimming in the Gene Pool: Israelite Kinship Relations, Genes, and Genealogy," there are some potential indications that there were others.

> While some Latter-day Saints may have assumed that everyone inhabiting the New World prior to the arrival of European explorers was a descendant of Lehi's party, the Book of Mormon makes no such claim. Indeed, on a number of occasions the Nephite text indicates that others were in the land. Ref 7

There is no credible reason to assume that the Book of Mormon people were the only ones on the land of promise. In fact, the Nephites gave no indication of being surprised in finding records of others or even of finding a survivor of another people.

> 19 And it came to pass that *the people of Zarahemla, and of Mosiah, did unite together*; and Mosiah was appointed to be their king.
> 20 And it came to pass in the days of Mosiah, there was a large stone brought unto him with engravings on it; and he did interpret the engravings by the gift and power of God.
> 21 And they gave an account of one Coriantumr, and the slain of his people. And *Coriantumr was discovered by the people of Zarahemla*; and he dwelt with them for the space of nine moons."
>
> BoM Omni 1:19 – 21

Mosiah learned of two other civilizations that had previously existed upon the land, one with a robust surviving group and the other having had only one known surviving member. Certainly there could have been other groups that remained unknown.

The Heartland Model geography, as proposed and outlined in other works by the author and discussed later in this work, posits that the Land of Zarahemla is where the Lord revealed to Joseph Smith a city by that name should be built in D&C 125:3 wherein the Lord commands,

> 3. Let them build up a city unto my name upon the land opposite the city of Nauvoo, and let the name of Zarahemla be named upon it."
> D&C 125:3

This model further proposes that the Land of Nephi is located near the southern foothills of the Appalachian Mountains in eastern Tennessee in accordance with scriptural indications and archaeological findings.

According to the Heartland Model, if Mosiah's people were unaware of the Mulekites in Zarahemla (Nauvoo, IL area) prior to their arrival there, and the land of Nephi was in the Appalachian Mountains only a few hundred miles distant, then it is certainly plausible that the Nephites would have been unaware of other civilizations in the American Southwest, west coast, or in Canada. It would seem that they may have been more or less content at this time to remain in the fertile valleys of the Mississippi river drainage system. This leaves open the possibility of other, even very large populations that went unknown and unspoken by the Book of Mormon authors. The Book of Mormon does not preclude other groups.

> 5 But, said he, notwithstanding our afflictions, *we have obtained a land of promise*, a land which is choice above all other lands; a land which the Lord God hath covenanted with me should be a land for the inheritance of my seed. Yea, the Lord hath covenanted this land unto me, and to my children forever, *and also all those who should be led out of other countries* by the hand of the Lord.
> BoM 2 Nephi 1:5

It is clear from this scripture that the land of promise is prophesied to be inhabited by people from other nations. Of course this could be speaking of the Jaredite group, but more likely it was given for an understanding that there will in fact be others, possibly many other groups who will be guided to the Promised Land by the Lord.

The false notion that the Book of Mormon peoples were alone on the Promised Land has been addressed by numerous LDS leaders and scholars. One of the more informative articles on this subject is Matthew Ropers excellent article Nephi's Neighbors: Book of Mormon Peoples and Pre-Columbian Populations which was published in *FARMS Review*. He concluded:

> It is true that *the assumption that Native Americans are of exclusively Israelite heritage has been around for a number of years*. Unfortunately for those who would like to use it to denounce the Book of Mormon, it is neither revelatory nor canonical. Regardless of who may have believed or propounded it in the past or under what circumstances they may have done so, *it has never been anything more than an uncanonized, unscriptural assumption*.
> On the other hand, *many Latter-day Saints over the years, including a number of church leaders, have acknowledged the likelihood that* before, during, and following the events recounted in the Book of Mormon, the *American hemisphere has been visited and inhabited by nations, kindreds, tongues, and peoples not mentioned in the text*. They also concede that *these groups may have significantly impacted the populations of the Americas genetically*, culturally, linguistically, and in many other ways.
> Finally, *neither in the Book of Mormon itself nor in the scriptural revelations concerning it is there anything to contradict the view that Nephi had neighbors in his New World land of promise. There is, on the other hand, much within these sources that seems to support this idea.* Ref 8

There are one or two verses that do, however give the general impression that there

were not "many nations" of people within the confines of the area wherein they first settled, nor where they expanded.

> 8 And behold, it is wisdom *that this land should be kept as yet from the knowledge of other nations;* for behold, *many nations would overrun the land, that there would be no place for an inheritance*.
> 9 Wherefore, I, Lehi, have *obtained a promise*, that inasmuch as those whom the Lord God shall bring out of the land of Jerusalem shall *keep his commandments*, they shall prosper upon the face of this land; and *they shall be kept from all other nations, that they may possess this land unto themselves*. And if it so be that they shall keep his commandments they shall be blessed upon the face of this land, and *there shall be none to molest them, nor to take away the land of their inheritance*; and they shall dwell safely forever.
> BoM 2 Nephi 1:8-9

This does not preclude a smaller group or two, but clearly the Lord intended Lehi's group to have primary access to these lands for their inheritance. Nowhere does the Book of Mormon give any account of having to fight other peoples as they moved into the "wilderness" areas and established their lands. Again this does not necessarily mean that there were no others, but if there were, they must have been either relatively small groups that posed no threat and were not organized, or they immediately forged alliances with the Lehite group. It seems doubtful that the Nephites would have been excessively accepting of an influx into their society of those whom did not share in their culture and religion. Nevertheless, the possibility is acknowledged.

In 2 Nephi 1:5 quoted previously, Lehi claims that the Lord made a covenant with him that the land would be an inheritance for his children and interestingly he adds, "and also all those who should be led out of other countries." The fact that the word "should" is used gives the impression that this is something that might occur sometime in the future, not necessarily something that has already occurred. The Lord did not indicate such was already the case, or it seems more likely that the wording would have been more similar to "have been" rather than "may," "will" or "should." While there very well may have been others on the lands promised Lehi and his family, there is also no direct evidence that there were in fact any others not of their group besides the Mulekites.

Additional suggested reading is Matthew Roper's informative article, "Nephi's Neighbors." Ref 8 Roper acknowledges that these verses could mean Lehi's group "inherited an empty promised land" but also explores other possible interpretations.

A Limited Geographic Setting?

It has also been well argued that the internal indications from the text of the Book of Mormon itself dealing with travel distances, placement of cities from the beginning to ending of its history, and other evidences. These combine to show that a hemispheric model for its geography is equally difficult to explain, and is more easily explained by a somewhat more limited geography, upwards of several hundred miles in extent, and not thousands of miles as would be required for a hemispheric setting. There are many volumes of work on this subject by competent LDS scholars for which all should be grateful.

Of course if all Native American people were derived from Book of Mormon peoples, then it would make sense that they would be found throughout both North and South America and the Book of Mormon would also have occurred on both these continents. However, if it is established that not all Native Americans came from Book of Mormon people, then it must be accepted that there were other people in the Americas who were also building civilizations and expanding their lineages. Thus, the Book of Mormon lands may not have encompassed the entire hemisphere, but were more likely in a somewhat limited geography within this hemisphere. Such a clarification would have the effect of potentially limiting both the population and the extent of the geography of the

Book of Mormon. Such appears to be the case by the change in the wording of the introduction page of the Book of Mormon. Church leadership solidified this understanding by correcting the wording of the original Introduction page of the Book of Mormon, as mentioned previously.

Much has been said about the wording change, but it certainly reflects a view more conducive to other migrations into the New World beyond those of the Book of Mormon and a more limited scope of its geography than hemispherical notions. It must also be considered that if the remnants of the Lamanites are only "among" the Native Americans, then there are Native American groups which are in fact not descendants of Book of Mormon peoples. Who are the remnants, and who are not? Is it possible that DNA analysis may unlock the answer to this question?

A Hemispheric or Mesoamerican Setting?

Ever since Joseph Smith's translation of the Book of Mormon, speculation about where the ancient history took place has occurred. Many of the early brethren made comments, wrote articles, and discussed where they thought the Book of Mormon to have taken place. It is clear that while several of the early brethren embraced a hemispheric setting that included all of North and South America for its history, every one of them understood that whatever the geographical extent, North America had to be a part of its realm. This has been verified through historical sources and documents.

The assumption of a hemispheric setting continued to be held for many years by many leaders of the Church and members. In more recent times research into the travel times and distances within the text seemed to offer a different picture of its extent. From the text itself it would seem that the territory making up the Book of Mormon landscape was one of significantly smaller dimensions than the entire hemisphere, and well reasoned suggestions that the geography was more limited in scope began to persuade scholars and members alike of the likelihood that such was the case.

By this time, those who were investtigating the potential evidences for the Book of Mormon in Central America had developed a strong organization and powerful following in their research efforts. They argued persuasively for a limited geography model that encompassed a much smaller region of the Americas and backed it up with thoughtful commentary from the text itself. Several articles and books have explored travel disances and time frames within the book that clearly indicate a more restricted geography than the entire western hemisphere, generally thought to be in the range of 200 – 400 miles in extent.

This has lead to an interesting conundrum. If the geography was limited, to which region was it limited to, North America, Central America, or South America? It could no longer be all of the Americas for the geography was shown to be limited. A decision had to be made. Based on the evidences of a high civilization with its grand structures, mighty ruins, and chiseled writings, along with speculations *thought* to have come from Joseph Smith in several *Times and Seasons* documents, it was determined that Central or Mesoamerica would be the most likely candidate.

Intensive research ensued in the effort to validate the claims of the Book of Mormon in this limited geographical area and dozens of proposed geographies were offered. The more engaged the researchers became, the more elaborate were the theories offered and the more the idea of a Mesoamerican setting grew. The more elaborate it became, the more attention it received which instilled greater confidence until it was generally accepted and embraced, gaining significant cohesion among the LDS scholarly community.

Not that all agreed to one particular proposed setting, but most agreed that it took place somewhere in Mesoamerica. Even today there are many factions offering proposed geographies which are roundly debated and reviewed, yet a kind of "general" consensus for a limited geography in Mesoamerica finally emerged.

A consensus had finally been achieved and additional research, along with books, tapes, disks, and movies, magazines, and TV programs began to more and more boldly proclaim that Mesoamerica was "in fact" the ancient setting for the Book of Mormon. Such a position was not, however, without challenges.

To solidify a Mesoamerican setting, the long accepted view of North America had to be dealt with because a geography limited to Central America precluded any acceptance of a North American setting. There were several difficult "sticking points" that had to be resolved such as the location and number of "Cumorahs" in the book, and the statements and writings of Joseph Smith indicating a North American setting. They set out to explain why these North American views could have been incorrect and could thereby be dismissed in favor of the grand evidences thought to be found in Mesoamerica which would bolster support for the theories being offered there.

Their efforts have been widely and heavily promoted resulting in them being generally accepted by the membership of the Church, yet even they openly acknowledge that they are only theories, and that the Church has no official position pertaining to the geography of the Book of Mormon. This then has become one of the grandest assumptions upon which critics of the Church have relied, yet it is a completely unsubstantiated assumption. A phrase used by Matthew Roper, but meant for a different assumption is certainly applicable to this one.

> Unfortunately for those who would like to use it to denounce the Book of Mormon, it is neither revelatory nor canonical. Regardless of who may have believed or propounded it in the past or under what circumstances they may have done so, *it has never been anything more than an uncanonized, unscriptural assumption*. Ref 8

There is no official position by the Church in support of, nor against the Mesoamerica theories, nor is there any canonized support for its validity. It is an assumption based on years of dedicated research and also much speculation. While it must be admitted that there has been tremendous work accomplished by competent researchers to support this idea, it is not a fact, but an assumption, and must be treated as such.

Yet, the words of President Thomas S. Monson in an *Ensign* article of May 2004 titled "The Call for Courage" provide encouragement for those who may find themselves having new information that challenges the consensus of others.

> Of course, we will face fear, experience ridicule, and meet opposition. Let us *have the courage to defy the consensus, the courage to stand for principle*. Courage, not compromise, brings the smile of God's approval. *A moral coward is one who is afraid to do what he thinks is right because others will disapprove or laugh*. Ref 104

It is understandable that this new research and information may indeed challenge long held beliefs that have achieved the status of consensus. As President Monson stated above, however, it would be cowardly to be afraid of presenting this new information solely because others who have an interest in propagating the old ideas may mock, disapprove, or laugh at it. Nothing is hurt by reasonable discussion and thoughtful consideration so long as a spirit of mutual respect is maintained.

President John Taylor, speaking on the importance of eternal truth proclaimed the following.

> *A man in search of truth has no peculiar system to sustain, no peculiar dogma to defend or theory to uphold*. He embraces all

> truth, and that truth, like the sun in the firmament, shines forth and spreads its effulgent rays over all creation. *If men will divest themselves of bias and prejudice, and prayerfully and conscientiously search after truth, they will find it* wherever they turn their attention.
> One great reason why *men have stumbled so frequently in many of their researches after philosophical truth is that they have sought them with their own wisdom*, and gloried in their own intelligence, and *have not sought unto God for that wisdom* that fills and governs the universe and regulates all things. Ref 105

Primary Assumptions of the Critics

Critics of the Church relied upon many of the unsubstantiated assumptions of church members to attempt to discredit the Book of Mormon as a historical record. Their assumptions mirror the incorrect assumptions of many members of the Church to a large extent, which is why they were addressed in the previous section. Critics have argued that:

- The Book of Mormon is the only historical record of the Americas
- The Book of Mormon precludes any other people in the Americas
- All Native American populations are direct descendants of the "Lamanites"
- All DNA testing is definitive and unambiguous
- There are "Israelite" DNA markers that clearly define this lineage
- Ancient "Israelite/Jewish" DNA and modern "Israelite/Jewish" DNA should be identical
- The supposed "Israelite" DNA must match Native American DNA
- DNA proves that there are no "European" or "Israelite" DNA lineages in the Americas
- Finding no European DNA in the Americas proves the Book of Mormon is false

One of the original assumptions made by critics is that the Book of Mormon requires that its history be the only one in the Americas, and that all Native Americans anywhere in the Americas are descendents of the Lamanites. These assumptions have been shown to be untenable as the Book of Mormon makes no such claim.

Another assumption was that DNA testing done for forensic purposes is comparetive in accuracy with DNA research on ancient human populations and their movements. Such a notion has been clearly addressed by LDS forensics expert John M. Butler in his article, *Addressing Questions surrounding the Book of Mormon and DNA Research*, wherein he states:

> In the case of *forensic DNA testing* that is widely accepted in courts of law, *DNA from a suspected criminal is compared with DNA collected from the scene of a crime*...In forensic DNA testing there is a one-to-one correlation of DNA results—the individual's DNA either matches or does not match the evidence. Ref 9

In forensics, a direct comparison can be made between samples; however, this is not the case with ancestry studies wherein no ancient sample is available. In this case scientists are left to speculate or hypothesize about possible correlations.

> *In ancestry studies, DNA information from multiple modern population groups is projected over many generations* between populations tested. Even though the same genetic markers may be used as in forensic DNA testing, in ancestry testing there is usually not a one-to-one unique match being made. *Instead, scientists are often guessing at what genetic signatures existed in the past based on various assumptions—with a bit of educated "storytelling" to fill in gaps.* Ref 9

He then goes on to reference a 2002 article in the *Annual Review of Genomics and Human Genetics* that gives additional insight into this difference.

> Given that it is necessary to incorporate information from other disciplines, and that it is not currently possible to develop fully realistic and general inferential models, *there remains an important place for*

> *storytelling in the study of human genetic history. By storytelling we mean, essentially, the construction of a reasonable historical scenario that might explain currently observed patterns of variation. But it is very clear that some stories are considerably more fanciful than others.* Ref 10

LDS geneticist Michael F. Whiting warns of the dangers of placing too much confidence in the science of DNA analysis and results that are too often thought to be clear-cut and uncomplicated by assumptions by the general public.

> However, these claims err scientifically in that they are based on the *naïve notion that DNA provides infallible evidence for ancestry and descent* in sexually reproducing populations *and that the results from such analyses are straightforward, objective, and not laden with assumptions*. Moreover, proponents of this naive view blindly ignore decades of theory associated with DNA sequence evolution and data analysis and rarely speak to the extremely tentative nature of their conclusions. Ref 11

These statements reiterate the fact that while DNA testing can be a very powerful tool, like all other tools it must be used in the correct application or it may not be as effective, or may even be detrimental to our understanding. DNA testing established the occurrence of markers which can then be directly compared to other samples, but when no other sample is available to test, such as is generally the case with ancient human population and migration studies, the geneticists are left to do their best, based on other disciplines like archaeology or anthropology, to piece together the "story." This is vitally important to understand as it relates directly to certain aspects of DNA analysis, such as the dating of ancient genetic events and movements of populations.

Further assumptions were made that there is "Israelite" DNA that unambiguously defines that lineage and that this "Israelite" lineage would be the same anciently as what is found today. It was thought that this "Israelite" lineage must match that of modern Native Americans to give credence to the Book of Mormon. The fact that such lineage traces were lacking in the Native America populations was viewed as definitive evidence that it is false. All of these arguments have been thoroughly addressed by LDS scholars. Several excellent articles clarify and largely refute these assumptions.

Is there such a thing as "Israelite" DNA?

An article addressing the plausibility of identifying "Israelite" DNA describes the challenge of the relative speed with which nuclear DNA changes with every generation. Brian D. Stubbs in an article called "Elusive Israel and the Numerical Dynamics of Population Mixing," points out what on the surface does not seem obvious.

> *No one is a "pure Israelite," nor ever has been, except Israel (Jacob) himself*. Jacob's twelve sons—who were only half Israelite—presumably did not marry sisters, so Jacob's grandchildren, who made the trek into Egypt to meet their uncle Joseph, were already only one-quarter Israelite, *Israel (Jacob) being only one of the four grandparents of each of his son's children.* Ref 12

As you read Stubbs words it is easy to see the complexity of coming to definitive conclusions about following genetic lines. It must be remembered that he is speaking of nuclear and not mitochondrial DNA. Nuclear DNA is recombined with every generation, whereas mtDNA is simply passed along maternally, and only through daughters will it continue.

D. Jeffrey Meldrum (a distant relative of this author) and Trent D. Stephens in their article "Who are the Children of Lehi" reiterated this difficulty by stating:

> *The gene pool of the house of Israel was, from its earliest history, a melting pot of ethnicities and nationalities.* Ref 13

In their concluding remarks, Meldrum and Stephens provide their belief regarding the possibility of identifying DNA markers for the Book of Mormon.

> *We probably will never find a genetic marker for the children of Lehi, for the children of Abraham, or even for the "Children of God."* Ref 13

These two LDS scholars clearly believe that there will probably never be any evidence to support either the Book of Mormon, or the Bible, or even God's creation of mankind, provided by mtDNA analysis. What could be the underlying cause of this disbelief? Why would we as LDS people think that no evidence will be forthcoming? Are our beliefs true or are they not? If they are true, why wouldn't there be any evidence to support this truth?

Ancient "Israelite" DNA and modern "Jewish" DNA

Dr. David Stewart discusses modern Jewish vs. Ancient Israelite DNA in his excellent article "DNA and the Book of Mormon." He describes how ancient Jewish populations were dispersed and may not reflect their modern descendants accurately. He writes:

> If we are to use modern Jewish genetics as the "control" against which Native American DNA is to be evaluated for possible ancient Israelite origins, *we must first determine whether modern Jewish DNA data adequately represents ancient Israelite DNA*. If the collective DNA of modern Jewish groups does not reflect all or at least a large majority of the DNA sequences and haplotypes present in ancient Israel, *modern Jewish DNA data cannot be considered a valid control against which claims of Israelite ancestry of other groups can be accurately evaluated*. He then goes on to quote Dr. Robert Pollack who notes, "*...there are no DNA sequences common to all Jews and absent from all non-Jews.*" Ref 106 See: http://newsroom.lds.org/ldsnewsroom/eng/commentary/dna-and-the-book-of-mormon

The LDS scholarly community has done a wonderful service in providing credible answers to the DNA questions posed by critics of the Book of Mormon and the Church. From a genetics standpoint, the critics have been found to be lacking in scientific rigor and appear to have serious bias in their ill-fated conclusions, while the LDS scholars have demonstrated a high level of understanding of the genetic and scientific principles and fields.

As is typically the case, the worst detractors are typically those whom have become disenfranchised from the Church due to other issues and feel the need to strike back as a result. Such has been the case with the DNA controversy. The majority of those proclaiming to the world that "DNA proves the Book of Mormon false" are former members of the Church, not the scientific community.

"Israelite" DNA and Native American DNA

Those taking issue with the Book of Mormon lineage claims did so based on the assumptions above and others. For example, it was assumed that the Book of Mormon descendants would have "Israelite" or at least "European" type DNA markers and be found in the Americas, or more specifically Mesoamerica because a consensus among LDS scholars had been achieved to a great extent by this time. Since no such lineages were found in the initial studies and all were found to be Asian-based bloodlines, it was believed that this "proves" that such Book of Mormon claims have no basis, and is therefore false.

Because the Book of Mormon is accepted as the "founding document" of the Church, this means that the lack of any "Lamanite" (Israeli/European) DNA evidence proves that no such migration did in fact occur. Therefore, the Book of Mormon is not what Joseph Smith claimed it to be, making both him a false prophet and the Book of Mormon itself a fictional deception. If Joseph Smith is a false prophet and the Book of Mormon is a fraud, then the entire basis for the Mormon religion is false, therefore the Church of Jesus Christ of Latter-day Saints is a false church.

Such were the assumptions of those who were a little too eager to attempt to discredit the Book of Mormon and the Church. These groups relied on the incomplete preliminary findings of DNA research to

assume that DNA would spell the demise of the Book of Mormon. They were wrong.

Premature Speculation

There are several issues that have clouded the path to finding potential answers to the DNA questions. One critical factor is that the producers of the anti-Mormon material were unfortunately premature in their conclusion that DNA had "proved" the Book of Mormon false by relying on the preliminary studies regarding DNA in the Americas rather than waiting for more robust research which was still being completed at the time of the release of their information.

LDS Scholarly Explanations for the Lack of European DNA in the Americas

The principal explanations forwarded by the LDS scholarly community for the initial lack of any European-based DNA evidence in the Americas fall into three fundamental arguments:

1. We don't and can't know exactly what we are looking for because there are no representative DNA samples from which to make comparisons. What kind of DNA did Book of Mormon groups or ancient "Israelites" have and how would we know if we found it? What specifically constitutes "Israelite", "Jewish" or "Lamanite" DNA? We have no DNA samples from Lehi, Ishmael, or their families, therefore it is impossible to know even what type of DNA markers to look for or what we would even expect to find.
2. Lehi's group was a "genetic drop in the bucket," a very small population that arrived amidst a much larger Asiatic population with whom they began almost immediately to intermarry. This resulted in their genetic signatures becoming diluted to the point of being undetectable using current DNA sequencing techniques. In other words, the DNA of Lehi's group was simply diluted out of existence, or at least below the threshold of current DNA sequencing techniques to be able to detect it.
3. Book of Mormon related DNA may have been eliminated through population "bottlenecks" that are known to have occurred in other populations as well as parts of the Book of Mormon history, such as the Jaredite and Nephite annihilations.

Each of these arguments has been addressed by well-qualified LDS scholars who are experts in their related fields and each explanation is valid within the realm of genetic research. Each of these arguments provide a legitimate explanation of why no "European" or Mediterranean DNA was found, which provides a framework from which to declare that while no DNA evidence in favor of the Book of Mormon had been found, it would also not be expected to ever be found based upon these explanations. Therefore DNA cannot be used to "disprove" the Book of Mormon.

However, the unfortunate corollary to this position is that one must then also concede that DNA findings cannot be used as potentially supportive evidence, even if it supports the historicity of the Book of Mormon, making it, at best, a neutral argument. This approach asserts that DNA cannot be used either to disprove, nor "prove" or lend support to, the Book of Mormon. Such a position then also creates a potential predicament wherein evidence that could lend support to the claims of the Book of Mormon, while not "proving it," may be looked upon as at odds with these scholarly conclusions. This may lead to valid supportive evidence being overlooked, ignored, disregarded or even aggressively and unfairly criticized by some who may feel that their established conclusions are being challenged or discredited.

Each of the three explanations of why no DNA evidence in favor of the Book of

Mormon is expected by the LDS scholarly community will be reviewed in their order.

No Representative Samples and Unknown Genetic Backgrounds

As mentioned earlier, one of the tenets of forensic DNA testing is having a "control" (DNA found at a crime scene) DNA sample and a "source" (DNA from the suspect) sample. In his article "Addressing Questions Surrounding the Book of Mormon and DNA Research," John M. Butler, a leading LDS DNA forensic expert who has written articles and contributed to textbooks in the field of genetics, gives an example of this explanation.

> *In forensic science, a documented "chain of custody" is crucial to verifying a link between the DNA profile produced in the lab with the original crime scene evidence. No such "chain of custody" exists with DNA* or genealogical records *connecting people from Book of Mormon times to people living today. ...*
> Again, *without reliable reference samples from the past, we cannot proclaim the Book of Mormon true or false based on DNA data*. Ref 9

These statements by Butler are absolutely correct. In order to "prove" the Book of Mormon is a historical record beyond question through DNA, we would need the same level of DNA evidence required in a court of law, forensic type evidence. As we learned earlier, this type of accuracy requires both a source and a control sample for comparison. There is no realistic hope of obtaining an actual sample from any of the founders of the Book of Mormon populations. Without a "control" sample, we can never be certain of an exact connection or link to modern day populations. Even if we did have such a sample, do we know enough about the history between the modern day descendants to positively identify such a connection? The answer is, probably not.

> *...we do not have enough information from the Book of Mormon to confidently determine a source population* for the Lehites or Mulekites, and *so we cannot compare this population with modern-day Native American results.* Ref 9

David A. McClellan "is an assistant professor of integrative biology at Brigham Young University where he researches the theoretical aspects of protein and DNA molecular evolution," according to the "About the Contributors" page in the book from the Maxwell Institute for Religious Scholarship called *The Book of Mormon and DNA Research* which was published in 2008. In closing his article, McClellan reaffirms:

> The general conclusion of this essay, therefore, is that *although it may be possible to recover the genetic signature of a small migrating family from 2,600 years ago, it is not probable*. Ref 14

There is no "control" sample for direct comparison from Lehi, Sariah, Ishmael, nor any other of this party. No positively identifiable remains, or "swab" from one of their initial group is available for comparison.

Does this mean that we know absolutely nothing of their genetics? Not necessarily.

Many articles have been written by LDS scholars on the subject of identifying a sample population that could be used as a baseline for comparison with populations in the Americas. We now have a pretty good idea about what we *don't* know about the genetic lineages of Book of Mormon founders, but what *do* we know about them?

1. We know that Lehi descended from Manasseh, through Joseph, Abraham and back to Shem
2. We know that Lehi was married to Sariah
3. We know that Ishmael descended from Ephraim then following back to Shem
4. We know that Lehi wanted his sons to marry Ishmael's daughters
5. We know that Ishmael was married

6. We know something of Jewish marriage practices
7. We know that Ishmael had sons and daughters-in-law
8. We know that Zoram was with their group and that he was keeper of the ancient records (plates of brass)
9. We know that their lineage attained and multiplied on the "Promised Land"
10. We know that they remained primarily on the Promised Land throughout the Book of Mormon history

A Genetic "Drop in the Bucket?"

If a small group enters an area and immediately begins mixing with a much larger population, will modern DNA testing techniques detect the signatures of the smaller group? Is it possible for a small group to completely disappear from the genetic record of its descendants over sufficient time?

These are good questions that have, to a large degree, been addressed by others in the LDS scholarly community. In his article "Addressing Questions Surrounding the Book of Mormon and DNA Research," John M. Butler gives an example from the literature that addresses this question. In the June 2004 issue of the *American Journal of Human Genetics* a study was reported that used the genealogies from Icelandic peoples. They traced the ancestry of 131,060 Icelanders and found that "the majority of the people living today in Iceland *had ancestors living only 150 years ago that could not be detected* based on the Y-chromosome and mitochondrial DNA tests being performed …" [Ref 9] even though their genealogical records show that in fact they existed and were real ancestors.

This article demonstrates that in fact such a situation can occur. A small group of individuals with distinctive DNA profiles could intermix with a much larger population over a relatively small number of generations and have their distinctive markers become a smaller and smaller component of the overall gene pool until they become diluted out of the range of detection using modern DNA testing methods. The question is, how well does this apply to the Book of Mormon peoples?

Upon their arrival on the Promised Land, Lehi's group settled in together until threats against Nephi caused him to accept the Lord's counsel to leave with those who would follow and separate from his wicked brothers.

> And it came to pass that the Lord did warn me, that I, Nephi, should depart from them and flee into the wilderness, *and all those who would go with me.* Wherefore, it came to pass that I, Nephi, did take *my family*, and also *Zoram* and his family, and *Sam*, mine elder brother and his family, and *Jacob and Joseph*, my younger brethren, and also *my sisters*, *and all those who would go with me. And all those who would go with me were those who believed in the warnings and the revelations of God;* wherefore, they did hearken unto my words.
>
> 2 Nephi 5:5–6

In this passage Nephi takes the families of Zoram, Sam, Jacob, Joseph, his sisters, as well as his own and departs from his wicked brothers along with all others who were believers in the "warnings and revelations of God." Some scholars have taken these "others" to indicate that Nephi took people who were not part of their original group, suggesting that by this point, in as little as three and up to thirty years (arrived 591-589 BC, 1 Nephi 18: heading and 588-559 BC, 2 Nephi 5: heading), that other non-mentioned peoples had already joined their group.

> Who were these others who "believed in the warnings and the revelations of God"? The most likely answer seems to be other people living in the land, not of Lehi's family. [Ref 8]

Could it not also be possible that the "others" Nephi takes with him are simply those of his brothers' families who are righteous and desire to come along with Nephi's more righteous group? Why would we assume that none of the remaining families had any among them that would want to leave with the

righteous "Nephites," rather than stay and be ruled over, possibly brutally, by Laman and Lemuel. Surely they were aware of the many times father Lehi counseled these sons to turn from their wicked ways as well as how they had mistreated Nephi on the voyage previously.

Certainly this would have been a difficult decision because of the obvious fact that there is safety in numbers and, if there were other potentially hostile people besides their group in the area, it would be the most prudent to stay together. When the threats came from within their own group, and there was a lesser perceived threat from outside of the group, then it would be normal for them to make the move away from the security of the combined group. That they chose to leave the security of the combined group can be best understood under the conditions that there was either a lack of others who may be hostile or there were others, and they were "friendly."

It seems, however that if there were other people who were "friendly" why would Nephi feel such a need to leave? Why not join forces with the other friendly group and cause the wicked brothers to leave. There is no specific mention of any other groups of people at this point in their history; however the account does not specifically exclude such a possibility either. Given that no explicit mention is made of any non-Lehite people joining either Nephi or the remaining group, who were then called "Lamanites," there is no compelling reason to assume that any others were in fact present.

The same could be said about the remaining people who did not leave with Nephi, now collectively called "Lamanites."

> 14 And I, Nephi, did take the sword of Laban, and after the manner of it did make many swords, lest by any means *the people who were now called Lamanites* should come upon us and destroy us; for *I knew their hatred towards me* and my children *and those who were called my people.*
>
> 2 Nephi 5:14

Demography expert James E. Smith postulates:

> One reading of the latter phrase is that *"Lamanites" is a new name for the family and followers of Laman*, the brother-enemy from whom Nephi fled. *Another possible reading is that some people not previously called "Lamanites" were now so called*, presumably because of Laman's affiliation with them. Ref 15

To assume that the phrase "now called Lamanites" may indicate that other people not originally associated with Lehi's group had only recently joined Laman's group, while possible, seems unlikely. Why would other people who presumably greatly outnumber Laman's group determine to take upon themselves the name of the oldest brother of this small, rather insignificant group of most likely less than 100 souls?

Remember that the scholarly explanation for no surviving European type DNA in the Americas is that Lehi's group landed amidst a large population of Asians within which the Book of Mormon peoples' DNA was diluted out of existence. It would seem more likely that Lemuel and Ishmael's sons and their families decided to submit to the oldest brother's desire to rule, rather than venture out on their own.

The phrase "the people who were now called Lamanites" is most easily explained by a simple understanding that previously they may have distinguished themselves by family, as Lemuelites, Ishmaelites, etc., now, for protection in numbers, they determine to be grouped together under Laman's rule. There is no compelling reason to invoke outside populations to comprehend this phrase.

The homogenous people of Nephi in the land of Nephi

Once separated from their wicked relatives the more righteous of their group journeyed "many days" into the wilderness (2 Nephi 5:7-8) and established an area they

called the "land of Nephi" after their leader and were thereafter called "Nephites."

> 7 And we did take our tents and whatsoever things were possible for us, and did *journey in the wilderness for the space of many days*. And after we had journeyed for the space of many days we did pitch our tents.
> 8 And my people would that we should call the *name of the place Nephi*; wherefore, we did call it Nephi.
> 9 And all those who were with me did take upon them to *call themselves the people of Nephi*.
> 10 And *we did observe* to keep *the judgments*, and *the statutes*, and *the commandments of the Lord* in all things, according to the law of Moses.
> BoM 2 Nephi 5:7-10

Verse 10 is interesting in that Nephi attests that they were living according to the commandments of the Lord and the Law of Moses. They were keeping their covenants, one of which was not to intermarry with their unrighteous relatives. This however did not seem to impede their growth either economically or as a people.

> 13 And it came to pass that *we began to* prosper exceedingly, and to *multiply in the land*.
> BoM 2 Nephi 5:13

Those who gathered with Laman and his group had a curse placed upon them "because of their iniquity" which was grievous enough to cause the Lord to make it so that the Nephites could distinguish themselves from their brethren by sight. What was the iniquity spoken of? This was not the first time Nephi's older brothers had rebelled against him and the Lord, even seeking to take Nephi's life while on the voyage to the Promised Land, yet previously they were not cursed.

It would seem that they had crossed a line of iniquity more severe than ever before. The Book of Mormon records that again Nephi's brothers sought to kill him, but this time they received a curse and Nephi received a commandment not to intermarry or "mix" with his brothers wicked families. Why would such a stringent curse and commandment be placed on the people of Laman and Nephi?

> 21 And he had caused the *cursing to come upon them*, yea, even a sore cursing, *because of their iniquity*. For behold, they had hardened their hearts against him, that they had become like unto a flint; wherefore, as *they were white*, and exceedingly fair and delightsome, that they might not be enticing unto my people *the Lord God did cause a skin of blackness to come upon them.*
> BoM 2 Nephi 5:21

> 23 And *cursed shall be the seed of him that mixeth with their seed*; for they shall be cursed even with the same cursing. And *the Lord spake it, and it was done*.
> BoM 2 Nephi 5:23, 588-559 BC

It has been speculated that because the phrase "the Lord spake it, and it was done" is used that this may indicate that Lamanites were already mixing their "seed" with others. However, another interpretation could be simply that from that time forward, those who broke their covenants with the Lord and sinned by mixing their seed would be partakers in the curse. For some reason, the Lord did not want Nephi's group to intermarry with Laman's group. Why didn't the Lord want intermarrying to occur? A potential answer to this may lie in an understanding of ancient and modern Israelite marriage traditions.

The sin that seems to have caused the cursing is one of a procreative nature, and while speculative, could it have to do with Laman's group intermingling their bloodlines with other peoples that were already living on the Promised Land, of "mixing their seed" with outsiders? Certainly there was a spiritual and social motive for Lehi sending his sons back to retrieve Ishmael and his daughters. It was so that his sons could have wives who were of their same kindred and beliefs. However, once they arrived on the Promised Land and subsequently separated, the two groups were not to intermix any longer, to the point that wars began to be fought between them.

> 24 And I saw *wars between the Nephites and Lamanites* in the course of my days.
>
> BoM Enos 1:24, about 420 BC

The people of Nephi in the land of Nephi kept their covenants and did not appear to be mixing with the Lamanites up to this time, about 420 BC Again, no other people besides these two factions were explicitly mentioned in the text. How long did the Nephites in the land of Nephi continue to observe the commandment of not mixing with the Lamanites?

> 5 And now, behold, *two hundred years had passed away, and the people of Nephi had waxed strong in the land. They observed to keep the law* of Moses and the sabbath day holy unto the Lord. And they profaned not; neither did they blaspheme. And *the laws of the land were exceedingly strict*.
>
> BoM Jarom 1:5, about *399–361 BC*

The Nephites were keeping their covenants made to the Lord in all facets of their lives, which included the covenant not to inter-marry their Lamanite counterparts. To this they had been faithful for more than 200 years to this point. The fact that wars were mentioned between only these two groups testifies to the strength of that commitment and also reiterates that the Nephite group at least was still generally homogenous and the Lamanites may have been as well. One passage that may indicate otherwise for the Lamanites is given in the following verse.

> 6 And they were scattered upon much of the face of the land, and the *Lamanites* also. And they *were exceedingly more numerous than were they of the Nephites*; and they loved murder and would drink the blood of beasts.
> 7 And it came to pass that *they came many times against us, the Nephites, to battle*. But our kings and our leaders were mighty men in the faith of the Lord; and they taught the people the ways of the Lord; wherefore, we withstood the Lamanites and *swept them away out of our lands*, and began to fortify our cities, or whatsoever place of our inheritance.
> 8 And *we multiplied exceedingly, and spread upon the face of the land*,...
>
> BoM Jarom 1:6 – 8, about *399–361 BC*

Is it possible that upon arrival to the Promised Land the Lamanite group found others with whom they wanted to have relations with, both socially and through marriage? Could this not have been the grievous sin against their marriage traditions and covenants that warranted the curse from the Lord? Yet, such a union would be very advantageous should the "outside" group be numerous, providing additional strength and security to this fledgling group, would it not?

In verse 6 a significant statement appears pertaining to demographics. In the course of about 200 years, the Lamanites were now "exceedingly more numerous" than the Nephites. No mention of such a demographic discrepancy was given in the text at the time of their initial separation, so it must be assumed that the outnumbering by the Lamanites was due to being either more prolific in child bearing, or that their numbers were being bolstered through an influx of other peoples who joined them, either by force or by agreement.

Since righteous people tend to place higher priority on families and children, rather than personal pursuits, it is highly unlikely that the Lamanites would have achieved superior numbers over the righteous Nephites so quickly solely from child bearing. A more likely scenario would be the assimilation of other people from populations previously unknown by either group. Again, no specific mention of any other peoples occur, but given the beginning allocation of family groups and the resultant discrepancy between the two groups after 200 years, the simplest explanation is that this took place through external population influx into the Lamanite group.

Once a substantial imbalance of population and thus power had occurred, and knowing the hatred of the now overpowering Lamanite forces, the believing Nephites move out of the land of Nephi to the land of Zarahemla.

> 12 Behold, I am Amaleki, the son of Abinadom. Behold, I will speak unto you somewhat concerning *Mosiah*, who was made king over the land of Zarahemla; for behold, he being warned of the Lord that he should *flee out of the land of Nephi, and as many as would hearken unto the voice of the Lord should also depart out of the land with him*, into the wilderness—
>
> BoM Omni 1:12, *323–130 BC*

The people of Nephi remained in the land of Nephi until Mosiah was inspired to leave. Between 277 and 470 years of continuous inhabitation by the Nephites had taken place in the land of Nephi. The Nephites, who were under strict command not to mix their seed with the Lamanites and who had "exceedingly strict" laws that they were righteously observing must have maintained the relative genetic integrity of the group during all this period of time. For as many as 458 (588 BC to 130 BC) years this group seems to have honored their societal, social, and spiritual commandments not to mix themselves with others, thereby maintaining a very homogeneous population.

The prophet Alma, over 500 years after their arrival on the Promised Land, records that the curse upon the Lamanites had indeed been effective in limiting intermixing between the only two mentioned parties at the time, the Lamanites and Nephites. If a Nephite transgressed the will of the Lord and did intermix with their now distant relatives, they were "cursed" with the same cursing so that other Nephites knew to remain apart from them. They knew that intermixing with the Lamanites, and likely any other people, was in direct violation of their traditional marriage covenant as members of the House of Israel, as well as the Lord's express command.

> 6 And *the skins of the Lamanites were dark, according to the mark which was set upon their fathers*, which was a curse upon them because of their *transgression* and their *rebellion* against their brethren, who consisted of Nephi, Jacob, and Joseph, and Sam, who were just and holy men.
> 7 And their brethren sought to destroy them, therefore they were cursed; and the Lord God set a mark upon them, yea, upon Laman and Lemuel, and also the sons of Ishmael, and Ishmaelitish women.
> 8 And *this was done that their seed might be distinguished from the seed of their brethren, that thereby the Lord God might preserve his people, that they might not mix* and believe in incorrect traditions which would prove their destruction.
> 9 And it came to pass that *whosoever did mingle his seed with that of the Lamanites did bring the same curse upon his seed*."
>
> ...
>
> 14 Thus *the word of God is fulfilled*, for these are the words which he said to Nephi: Behold, *the Lamanites have I cursed, and I will set a mark on them that they and their seed may be separated from thee and thy seed*, from this time henceforth and forever, except they repent of their wickedness and turn to me that I may have mercy upon them.
> 15 And again: I will set a *mark upon him that mingleth his seed with thy brethren*, that they may be cursed also.
> 16 And again: I will set a mark upon him that fighteth against thee and thy seed.
> 17 And again, I say he that departeth from thee shall no more be called thy seed; and I will bless thee, and whomsoever shall be called thy seed, henceforth and forever; and *these were the promises of the Lord unto Nephi and to his seed*.
>
> BoM Alma 3:6-9, 14 – 17 (87–86 BC from BoM Alma 3: Heading)

Thus, for between 277-470 years the Nephite population in the land of Nephi had grown and "multiplied exceedingly" without any significant intermixing with the Lamanites, nor any mention of any intermixing with any other peoples. Such population dynamics would suggest that the Nephite genetic group would have remained relatively intact and would have retained to a large extent its genetic signatures within that population.

This implies that at least the Nephite group had time enough for their population to become a substantial genetic force that would be very difficult to simply dilute out of existence through interspersion even with a larger population. The same cannot be said with confidence about the Lamanite group. Nevertheless, there is no unambiguous claim by the Book of Mormon for any other people outside of descendants of the original groups joining either the Lamanite or Nephite cultures.

It is hard to conceive how such a tremendous time frame could pass with its resultant population expansion, verified by scriptural record, and still have its genetic signatures diluted out of existence by a larger population in the remaining 500 years of their history. The number of cities mentioned in the destructions at the time of Christ would certainly indicate a very large and genetically significant population whose lineages hail from the Mediterranean, somewhere in the America's where the Book of Mormon saga took place. The Nephites in the land of Nephi must have been much more than a mere "drop in the bucket" genetically, so it becomes much more difficult to explain how they could have been "diluted" out DNA existence.

As stated by Matthew Roper in his excellent article "Nephi's Neighbors" (see quotation following), there does not even appear to be much dissent among the Nephite population for between 300 and 450 years. This allows ample time for the creation of a very large "Nephite" population that is of relatively isolated genetic stock.

> Although wars and contentions are mentioned by nearly every chronicler who wrote on Nephi's small plates, most of these *conflicts are specified as being between Lamanites and Nephites*. It is *not until Amaleki, the last of these chroniclers, begins his account that dissent among the Nephites themselves is implied*. He records in Omni 1:12–13 that Mosiah, "being warned of the Lord that he should flee out of the land of Nephi," departed into the wilderness with "as many as would hearken unto the voice of the Lord" and eventually encountered the people of Zarahemla. *This exodus*, reminiscent of Nephi's departure from the land of first inheritance generations earlier due to family contention, *is estimated to have occurred sometime between 279 and 130 b.c.* Ref 8

A remnant of the House of Israel at the time of Christ and after

Christ himself proclaimed that those still alive at the time of his coming were literal descendants of Jacob or the House of Israel. From this scripture there should be no doubt that there was a genetic remnant left at this point in Book of Mormon history.

> 4 *O ye people of these great cities which have fallen, who are descendants of Jacob, yea, who are of the house of Israel*, how oft have I gathered you as a hen gathereth her chickens under her wings, and have nourished you.
>
> BoM 3 Nephi 10:4

Mormon, the ancient prophet, nearly 400 years after the time of Christ makes clear declarations in the Book of Mormon relating to his genetic background or lineage (Mormon 1:5; 8:13). He unabashedly exclaims "I am Mormon, and a pure descendant of Lehi." (BoM 3 Nephi 5:20). Somehow he knows that he is a "pure descendant of Lehi" which can confidently be said to mean that he could trace his genealogy back to father Lehi, which carries with it an unbroken lineage all the way back to Shem.

How would he have known and been able to make such a bold statement nearly 1,000 years after their forefathers arrival if they weren't keeping a written genealogy? Such a record must have existed upon the plates of their history, because of the evidence of a natural (pure) lineage stemming from Lehi up past the time of Christ to the time of Mormon, at the close of the Book of Mormon record.

> 3 And *my father also was killed by them*, and I even remain alone to write the sad tale of the destruction of my people. But behold, they are gone, and I fulfill the commandment of my father. And whether they will slay me, I know not.
>
> BoM Mormon 8:3 AD 385-400

This passage was written by Moroni, the last author to inscribe his words into the thin gold leaves of the sacred record. He was the son of Mormon who had declared himself to be a "pure descendant of Lehi" which means that Moroni was also paternally so. There were pure descendants of Lehi from the moment they arrived on the Promised Land until the day the record was placed into the stone box where it was preserved. The record, over 1,000 years in the making, proclaims that

throughout their entire millennial history, there remained those who were pure descendants.

This is somewhat astonishing, yet it must also be possible that Mormon may have mentioned that fact because by that time it had become rare to be a literal descendant. This could possibly indicate that extensive admixture of the majority of the population of the Nephites had made them "non-pure" descendants or a mixed group. The Book of Mormon does not specifically state why Mormon wrote what he did about his ancestry, so it is speculation to some degree about his motives. Reading the following passage, we gain additional insights.

> 19 And now I make an end of my saying, which is of myself, and *proceed to give my account of the things which have been before me*.
> 20 *I am Mormon, and a pure descendant of Lehi*. I have reason to *bless my God and my Savior Jesus Christ*, that he *brought our fathers out of the land of Jerusalem*, (and no one knew it save it were himself and those whom he brought out of that land) and that *he hath given me and my people so much knowledge* unto the salvation of our souls.
> 21 Surely he *hath blessed the house of Jacob, and hath been merciful unto the seed of Joseph*.
>
> BoM 3 Nephi 5:19 - 21

Mormon may not have been proclaiming his pure lineage for the purpose of distinguishing himself from all the other "non-pure" descendants, as some have proposed. Such a proposal was offered to imply that extensive admixture with other peoples had occurred. It appears more likely from the passages before and after the statement that he was merely establishing their lineage back to Jacob and Joseph of Egypt.

Such an individual has a right to certain authority or status as a pure descendant. This would establish that the leader of the Nephites was of the priestly lineage stemming from Shem through Jacob, Joseph and Lehi. He is expressing gratitude for the bounteous blessings of being a part of this rich heritage. He is not holding himself up as the *only* pure descendant, but simply stating that he *is* one. There is no need to assume that he was in some way proclaiming that he was somehow "special" because he is the only pure descendant from these verses, as there very well could have been hundreds, if not tens of thousands who could have been pure descendants of Lehi and could make such a claim. The fact is that we simply are not given such detailed information in the text. It is highly speculative to assume that there were not many others of pure descent.

The Lamanites, on the other hand, appear to have begun mixing with another population early in their history and may have become more diversified genetically than the Nephites. The extent of any admixture is, of course, unknown. It is reasonable to assume that the cause of their continual outnumbering of the Nephites was because of alliances or admixture with other groups not native to theirs. Such admixture would most certainly alter the genetic "pool" as relating to the Lamanites, and cause their genetic signatures to begin the process of dilution early on. There is no question that such mixing would forever alter the genetics of their population as a whole, and make it far more difficult to ascertain their unique heritage upon the land of promise.

At nearly the same time as the Nephites joined with the Mulekites, which were of similar genetic or house of Israel stock, and were together living in Zarahemla, the Lamanites came to war with what is described as an "innumerable army of men."

> 2 Now *there were not so many of the children of Nephi, or so many of those who were descendants of Nephi, as there were of the people of Zarahemla, who was a descendant of Mulek*, and those who came with him into the wilderness.
> 3 *And there were not so many of the people of Nephi and of the people of Zarahemla as there were of the Lamanites; yea, they were not half so numerous*.
>
> BoM Mosiah 25:2-3, 120 BC

If the Nephites numbers were more than doubled by their new alliance with and assimilation of the Mulekites, where did the Lamanites gain all of their new population so that they were more than twice as numerous? The simplest answer would be that they too had joined with other populations, but likely of the Asiatic groups that are known to have been in the Americas during this period through archaeological and DNA evidence. Over 50 years earlier the Lamanite army had already reached the point of being called by the Nephites "innumerable."

> 14 And it came to pass in the forty and first year of the reign of the judges, that the *Lamanites had gathered together an innumerable army of men*, and armed them with swords, and with cimeters and with bows, and with arrows, and with head-plates, and with breastplates, and with all manner of shields of every kind.
>
> BoM Helaman 1:14, 52-50 BC

While this army of the Lamanites from just 50 years before Christ was understood to have been innumerable, the army the Lamanites assembled for the final battle of extermination must have been absolutely overwhelmingly huge. When one considers that the Nephite army consisted of 23 Nephite commanders with 10,000 men each, not including their women and children, this was a standing army of over 230,000 men. With women and children who would have at least doubled that number, this means that in excess of half a million Nephites were involved in this final battle and extermination.

With a group of this magnitude, what size must the Lamanite armies have been to inflict "terror" upon the Nephites? The Nephites had faced battles with overwhelming odds previously and emerged victorious even boasting about their strength in doing so (BoM Mosiah 11:19), yet in this battle they were dumbstruck in awe of the sheer numbers of Lamanite warriors.

> 7 And it came to pass that my people, with their wives and their children, did now behold the *armies of the Lamanites marching towards them*; and with that awful fear of death which fills the breasts of all the wicked, did they await to receive them.
>
> 8 And it came to pass that they came to battle against us, and *every soul was filled with terror because of the greatness of their numbers*.
>
> BoM Mormon 6:7 – 8, AD 385

At a ratio of two-to-one of Lamanites to Nephites, this would have meant an army of over a million Lamanite men. Yet they were still being lead by those who called themselves Lamanites, not an assembly of Lamanites under the command of another larger population for which they were fighting. If the Lamanites were the small group that joined with a much larger Asiatic group, why weren't the Lamanites simply assimilated into the larger group, taking upon themselves the name of that group?

The Nephites maintained their name when they joined the larger Mulekite group in Zarahemla, but the impression is that they did so because of their having the records and a strong leader in Mosiah who may also have had the proper authority to become their king. It could very well be that Mosiah was allowed to be the ruler even though his group was smaller, out of respect for his patriarchal authority through his lineage, although if there were "pure" descendants of Mulek, they might also have had claim to the kingship due to Mulek's father being King Zedekiah in Jerusalem. That this "spiritual" lineage was possibly more authoritative than the "kingly" lineage is borne out in the following verse.

> 13 And now *all the people of Zarahemla were numbered with the Nephites, and this because the kingdom had been conferred upon none but those who were descendants of Nephi*.
>
> BoM Mosiah 25:13

From the record, there is an unknown but clear influence on the people of Mulek pertaining to the rights of ruling. Who had the rite or authority to rule over both the Mulekites and the Nephites? No wars or vying for leadership seems to have occurred, but rather a simple acknowledgement of Mosiah's

right to be king. Such an acknowledgement indicates a special place for those of Nephi's "prophetic" lineage.

It must be acknowledged that by the time of the final battles, the terms "Lamanite" and "Nephite" had little if anything to do with genetics or lineages, but had primarily to do with believers and unbelievers.

> 36 And it came to pass that in this year *there arose a people who were called the Nephites, and they were true believers in Christ; and among them there were* those who were called by the Lamanites—*Jacobites, and Josephites, and Zoramites*;
> 37 Therefore the *true believers in Christ*, and the true worshipers of Christ, (among whom were the three disciples of Jesus who should tarry) *were called Nephites*, and Jacobites, and Josephites, and Zoramites.
> 38 And it came to pass *that they who rejected the gospel were called Lamanites, and Lemuelites, and Ishmaelites*; and they did not dwindle in unbelief, but they did wilfully rebel against the gospel of Christ; and they did teach their children that they should not believe, even as their fathers, from the beginning, did dwindle.
> BoM 4 Nephi 1:36 - 38

While it is true that these groups may have had others "among" them, it is still probable that the majority of those claiming to be "Nephites" were in fact descendants of the earlier "Nephites" and similarly, those with the "Lamanites" had a high probability of a majority of their population being descended from the earlier "Lamanites." For additional information on this subject, Matthew Ropers article Ref 7 "Swimming in the Gene Pool: Israelite Kinship Relations, Genes and Genealogy," is an excellent reference.

The Book of Mormon text does not support the hypothesis that Lehi's group would have played only a very limited part in the genetic history of the Promised Land. In fact, quite the opposite seems to have been the case, with the Nephite group remaining genetically isolated over a large period of time in which, by their own history, they grew to a large population. They were not a genetic "drop in the bucket" of a much larger gene pool, but a significant and indeed potentially dominant genetic force that would be perpetuated throughout the culture even after extensive mixing with the Lamanites and others had occurred. It must also be remembered that the Mulekites were an even larger group that would share "Israelite" lineages, but it is unknown to what extent they may also have intermixed with the Asian population that preceded them in North America.

However, because of the religious marriage practices of Israelite populations, it is highly doubtful that any of the righteous Book of Mormon populations practiced significant admixture with outside groups. As both the Nephites and Mulekites would have grown in relative genetic isolation over a period of some 500 years it is highly doubtful that their combined genetic signatures would have been completely erased due to later mixing with the Lamanites and other groups.

While it is probable that they were intermixing with other populations early on in their history, the Lamanites would still have been passing their genetic lineages on to their descendants, so it is not a case that their unique Israelite genetic signatures would have simply disappeared. We know that all these "Israelite" groups divided and grew into mighty peoples whose descendants would most certainly have carried their genetic signatures forward into later Native American groups. They were not simply a "drop in the bucket" but were a major and substantial contributor to the genetic lineages that were passed forward, making it doubtful that at least some of their unique genetic markers would not have survived into the Native American populations of today, even after the effects of genetic bottlenecks and dilution that may have occurred.

The following are important genetic points that are known about Lehi's group.

1. We know that the Nephites remained in relative genetic isolation over

several hundreds of years, while the Lamanites may have intermixed with others early on in their history.

2. We know that there were still "pure descendants of Lehi" to the end of their record in the Book of Mormon, about AD 400-421. (Moroni was the son of Mormon who was a "pure descendant" of Lehi.)
3. We know that the Nephites and Lamanites may have later intermixed to an unknown extent.
4. We know that the Lamanite population grew faster and became larger than the Nephites.
5. We know that the terms Nephite and Lamanite became analogous to *believers* vs. *non-believers*, rather than genetic affiliations.
6. We know that a very large population of Lamanites survived past the history of the Book of Mormon because of the prophecies and promises made to them throughout the Book of Mormon and the Doctrine and Covenants.

GENETIC BOTTLENECKS

A genetic bottleneck occurs when a significant portion of a population is killed or does not reproduce, causing a temporary reduction in the overall population which results in a decrease in the genetic variation of the remaining group. Thus only the genetic signatures of the surviving group are passed on to future generations, limiting how closely those future generations may share genetic traits common to the larger population prior to the bottleneck. Those traits not passed through the bottleneck become extinct and will not be found in future generations.

The Book of Mormon gives at least two excellent examples of genetic (or population) bottlenecks, one extreme case with the Jaredite near-extinction event, the other with the Lamanite extermination of the Nephites. Later, Native American populations suffered a catastrophic bottleneck at the time of the early explorations of the Americas by European diseases for which the Native American peoples had no natural immunity.

The Jaredite Extinction Genetic Bottleneck

The Jaredite near-extinction event is chronicled in the Book of Ether of the Book of Mormon when their entire civilization became so wicked and engrossed in their hatred towards one another that they waged battle down to the last man, named Coriantumr. While the Book of Mormon record does not give any evidence that any more than this one man survived, it could have been that a few stragglers remained undetected upon their lands. Even if there were "stragglers" or those who hid away from the war, they would not have contributed much genetically to the overall remaining peoples on the Promised Land because of their small numbers. Coriantumr was eventually discovered by the people of Zarahemla (the Mulekites) and he stayed with them for nine moons or lunar cycles.

Such an extreme genetic event is very rare, yet it provides a clear example of how this event drastically altered the genetic landscape of a future generation. No mention is made of a wife of Coriantumr, but had he determined to marry and have a child with a woman from the Mulekite group, it is easy to see that his genetic descendants would not at all be representative of the entire Jaredite civilization that previously existed. In fact all of the female mtDNA markers would have been forever lost as only his nuclear and Y-Chromosomal DNA would be passed on to his offspring, if he fathered any. This exercise in understanding is important to grasp because similar, but less extreme, genetic events can result in significant changes in the overall population, or loss of portions of the original population's genetic diversity.

The Nephite Extermination Genetic Bottleneck

A more "standard" genetic bottleneck event can be seen within the context of the final battle between the Lamanites and Nephites. By the time of this final battle the genetic landscape may have changed considerably from the initial group.

One of the most likely time frames of possible intermixing of the Nephites and Lamanites would have been the 200 year period of peace following the visit of Christ. As recorded in the Book of Mormon text, this time of peace was a time of tremendous growth and prosperity upon the land. Without wars, and with their physical needs being abundantly met, these remaining groups saw a time of great population expansion following the visit of Christ.

> 2 And it came to pass in the thirty and sixth year, *the people were all converted unto the Lord, upon all the face of the land, both Nephites and Lamanites*, and there were no contentions and disputations among them, and every man did deal justly one with another.
> 3 And *they had all things common* among them; therefore there were not rich and poor, bond and free, but they were all made free, and partakers of the heavenly gift.
> ... 6 And thus did the *thirty and eighth year pass away*, and also the thirty and ninth, and forty and first, and the forty and second, yea, even until forty and nine years had passed away, and also the fifty and first, and the fifty and second; yea, and even until fifty *and nine years had passed away*.
> 10 And now, behold, it came to pass that the *people of Nephi did wax strong, and did multiply exceedingly fast, and became an exceedingly fair and delightsome people*.
> 11 And *they were married, and given in marriage*, and were blessed according to the multitude of the promises which the Lord had made unto them.
> 17 There were *no robbers, nor murderers, neither were there Lamanites, nor any manner of -ites; but they were in one, the children of Christ*, and heirs to the kingdom of God.
> 18 And how blessed were they! For the Lord did bless them in all their doings; yea, even *they were blessed and prospered until an hundred and ten years had passed away*, and the first generation from Christ had passed away, *and there was no contention in all the land.*
> 22 And it came to pass *that two hundred years had passed away*, and the second generation had all passed away save it were a few.
>
> BoM 4 Nephi 1:2-3, 6, 10-11, 17 – 18, 22

At this time significant admixture could have taken place between these two groups; however for almost 60 years the distinction of "the people of Nephi" or "Nephites" and the now converted "Lamanites" continued to be drawn. Fifty-nine years after Christ, there was still a cohesive group called the Nephites, but after that all were righteous and had all things in common and there were no "manner of –ites" or, in other words, they dissolved their distinctions between themselves and considered themselves one people.

It is not clear if this also included intermarriage between groups or not, but it does not specifically forbid such arrangements unless the previous commandment was still in force. It is also possible that the commandment not to mix their seed was still in force, and yet they shared of their substance and worked together in peace, but that is not as likely a scenario. Nowhere does the Book of Mormon specifically indicate that the commandment to the Nephites of not intermixing with the Lamanites had been removed, but again the book is not clear therefore it will be assumed that some limited intermixing did occur; however wholesale mixing is thought to have still been unlikely.

For approximately 150 more years this peaceful arrangement continued until pride and greed again caused them to splinter into "classes" (4 Nephi 1:26) and some groups began their own religions. After that time, war again raged throughout their remaining history and the previous divisions of Nephite and Lamanite were reestablished once more (4 Nephi 1:36 – 38). At this point, as discussed previously, the terms "Nephite" and "Lamanite" had more to do with their beliefs, but could very well have included a recombining of former familial groups.

While there is no reason to assume that there had been wholesale mixing of these two earlier groups, even during the time of peace, there is also no reason to assume that the majority of those calling themselves "Nephites" were not, in large measure, those who had previously shared that association. Is there any compelling reason to believe that the majority of those calling themselves "Nephites" were now made up primarily of former "Lamanites?" It is very doubtful that such would have been the case, or vice versa for the Lamanites to be made up primarily of former "Nephites."

The most reasonable assumption is that each took upon themselves the name that was most closely associated with their family heritage, and naturally that would again

separate them to a certain extent by their specific genetic lineages, although they shared a common ancestry. The primary difference being whatever changes had occurred from possible intermixing with others, mutations within their lineages that became "fixed" within those lineages, and wars that may have caused the end of certain lineages.

The final battles at the Hill Cumorah then involved to a larger degree the extermination of a higher percentage of the "Nephite" genetic markers than the "Lamanite" ones. This extermination event absolutely and permanently altered the genetic lineages that would carry forward their unique genetic signatures. Those, such as Mormon, who were literal descendants of Lehi and Nephi were killed, ending this unbroken genealogical line, and many similar lines that may have been common among the Nephite population. Such an event was devastatingly significant in terms of loss of life and was equally so in terms of loss of genetic information these lineages would have contributed into the future.

Still, because of the potential mixing of a least some of their number into the Lamanite population, at least some of their blood lines would have continued forward, albeit an acknowledged potentially small contribution to the overall Lamanite population. This would then also create a low percentage of potentially recognizable "Nephite" DNA markers that continued into the future populations making up the Native American Indian populations. The Lamanites would be the primary carriers of their ancestors DNA heritage into the future, and they had probably incurred significant intermixing with other populations, making their genetic contributions more diluted, but most likely not diluted out of existence.

The Native American / European Contact Population Bottleneck after 1492

Another catastrophic genetic bottleneck event known to have taken place among Native American populations occurred at the time of the exploration of the New World by Europeans. In the book *Through Indian Eyes: the Untold Story of Native American Peoples*, we begin to see the tremendous significance of the devastating impact this contact had on Native American populations.

> Recent estimates place the *native population of the Southeast before European contact as high as two million [2,000,000]; by 1700 it had fallen to perhaps 130,000*. Ref 16

This is but one example of the incredible devastation brought on Native Americans by contact with European diseases. According to the journal *Western Historical Quarterly*, Russell Thornton is a leading scholar in the field of American Indian demography. He accomplished one of the most detailed analyses of the impact on Native American populations from these disease epidemics. In his book, *American Indian Holocaust & Survival* he relates the following sad saga accompanying the discovery of America by Christopher Columbus 1492.

> Another demographic history exists, however. It is the history of the people Columbus meets here: the descendants of the first humans to arrive on the land, the first to populate it, the first to prosper on it. *To them 1492 also marked a turning point in population history*. The date, however, is not one to be celebrated. Far from it! *In the centuries after Columbus these "Indians" suffered a demographic collapse*. Numbers declined sharply; entire tribes, often quickly, were "wiped from the face of the earth."
> *This is certainly true of the American Indians on the land that was to become the United States of America. For them the arrival of the Europeans marked the beginning of a long holocaust*, although it came not in ovens, as it did for the Jews. The fires that consumed North American Indians were the fevers brought on by newly encountered diseases, the flashes of settlers' and soldiers' guns, the ravages of "firewater," the flames

> of villages and fields burned by the scorched-earth policy of vengeful Euro-Americans. The effect of this holocaust on North American Indians, like that of the Jews, was millions of deaths. In fact, *the holocaust of the North American tribes was, in a way, even more destructive than that of the Jews, since many American Indian peoples became extinct.* Ref 17

As discussed previously, such extinction of ancestral lines shifts the genetic influence towards only those that survived, which is called genetic drift. The most devastating cause of this dramatic population decline were the many infectious diseases that Europeans brought with them -- diseases for which the Native peoples had no immunity. It is also of interest to note the comparison between the Jewish holocaust and the Native American decimation by European diseases. Both of these "House of Israel" populations have suffered the calamities promised for unrighteousness.

> Other really deadly *diseases undisputedly came only after 1492*, such as *smallpox, cholera, measles, diphtheria*, some *influenzas, typhoid fever*, and *the plague*. These were definitely brought from Europe and Africa. Ref 17

The estimated population of the American Hemisphere prior to 1492 has been widely discussed and thoroughly debated, however, there is simply too little information to be able to make more than an educated guess. Thornton is his book accomplishes one of the finest assemblies of information on the subject to the date of publication of his book in 1990. Hundreds of others have referenced his work and it is still considered by many to be the definitive work on the subject. In it he uses multiple sources to derive the best estimates possible. He writes of the beginning population prior to 1492.

> My figures of *72 + million aboriginal American Indians in the Western Hemisphere* and 7 + million north of the Rio Grande may be compared with non-Indian populations circa 1492 to 1500. ...we see that *the population of the rest of the world circa 1500 may have totaled around 500 million*. If so, *there were perhaps seven times as many non-Indians as American Indians in the world*. Ref 17

The hemispheric population of the Americas by best estimates was about 72 million souls. The North American population was only a small proportion of this figure. Central America had a much larger population that did North America at this time according to this demographer. Their populations suffered tremendous loss of life from these European diseases to a similar extent as did those in North America, but with overall greater numbers of the dead.

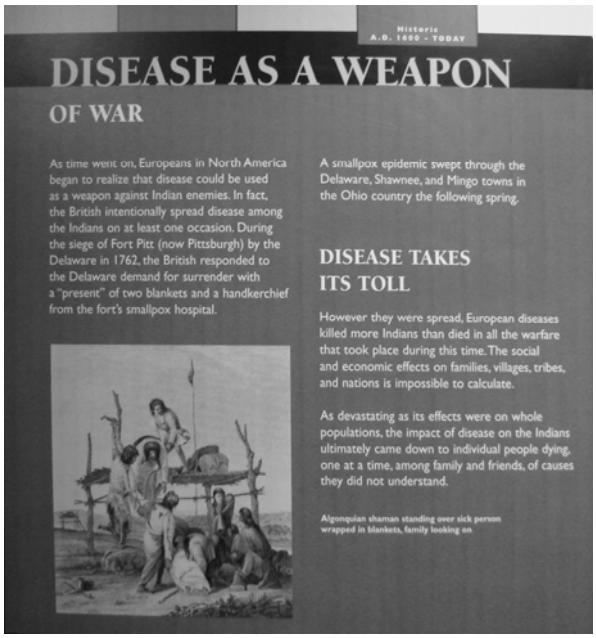
> *The aboriginal population of the conterminous United States area was probably 5 + million when Columbus arrived* in the Western Hemisphere in 1492. Dobyns's methodology applied to the *Canadian area yields a population estimate of 2 + million*. When smaller aboriginal populations for present-day Alaska and Greenland are added to these, *we have a conservative total of 7+ million for the area north of Mexico*. Ref 17

The following figures are difficult to comprehend because of their severity. They are conservative in nature and over the period between 1492 and the early 1700's represent a massive genetic bottleneck event rivaling or surpassing any in human history.

> *...the native peoples of the Western Hemisphere underwent centuries of demographic collapse and geographic concentration. Their total numbers were reduced to but a few million* before a population recovery began. *They still are far fewer today than in 1492*. In marked contrast, *the Europeans, Africans, and others who came to the American Indian world subsequently had unprecedented population growth and geographical redistribution*. Ref 17

Certainly the prophecies of the Lord in the Book of Mormon have been fulfilled in the Native American populations wherein they have suffered "afflictions" they could not even have dreamed of. The prophecies pertaining to the Promised Land being a blessed land are also seen in the above quote. The civilizations for which we have record show tremendous population growth after establishing them-

selves upon it. This is also in fulfillment of prophecy, as the Gentiles were promised that they would be blessed, prosper and become a mighty nation upon the Promised Land (BoM 1 Nephi 22:7).



1 On display at the Fort Ancient museum, courtesy of the Ohio Historical Society.

> I estimated in Chapter 2 a total population of 72 + million American Indians in the Western Hemisphere in 1492. *This 72+ million declined in a few centuries to perhaps only about 4 to 4.5 million. This was a population about 6 percent its former size. It represents a tremendous population decline* over the centuries. Ref 17

It is hard to imagine the severity of the trials endured by these peoples. According to the best demographic information we have at this time, the entire population of the Americas was reduced nearly 94%! Think of the implications of such an occurrence in any population. Think of the devastation to families and loved ones, heart-sick parents and orphaned children. Such are the consequences of turning away from the God of Heaven which brings upon them His judgments.

The following quote is on display in the Fort Ancient Museum of Ancient History in Ohio, describing the harrowing ravages and effects of these diseases.

> However they were spread, *European diseases killed more Indians than died in all the warfare that took place during this time. The social and economic effect on families, villages, tribes, and nations is impossible to calculate*.
> As devastating as its effects were on whole populations, *the impact of disease on the Indian ultimately came down to individual people dying, one at a time, among family and friends, of causes they did not understand*. Ref 18

Some accounts speak of entire villages so stricken by the smallpox plague that there was no one left to prepare food or care for those who initially survived because so many had died. Even those who survived the plagues often died in their beds from starvation. The number of epidemics is unknown, but those that are known number well into the 70s between 1492 and the early 1900's. These are catastrophic declines of epoch proportions among the native peoples.

Each of these genetic bottleneck events had the cumulative effect of erasing more and more of their ancestry through Lehi's group, and reflected more and more the ancestry of those with whom they were intermixing. The significance of this problem is addressed by LDS scholar John M. Butler in his article *Addressing Questions Surrounding the Book of Mormon and DNA Research*. He states

> Another point to consider is *that present-day Native Americans represent only a fraction of previous genetic lineages in the Americas because of large-scale death by diseases brought to the New World by European conquerors.* Ref 9

He then goes on to quote from Michael Crawford's book *The Origins of Native Americans: Evidence from Anthropological Genetics*:

> *This population reduction has forever altered the genetics of the surviving groups, thus complicating any attempts at reconstructing the pre-Columbian genetic structure of most New World groups.* Ref 19

Of course he is exactly correct. Such alteration forever ends particular lineages, and

complicates any attempt to ascertain the entire genetic picture previous to these events. However, the fact that many lineages remained and made it through these bottlenecks still gives us at least a portion of the previous picture, though not all. Certainly those that did survive are still representative of the previous population, just not a "representative sample" of it, meaning that the surviving lineages do not reflect the entire genetic diversity it once had.

That is the reason it is critical to look for even small traces of different lineages in the DNA information of today's modern Native populations. While they may be in low frequency or percentage, they may still be there, shedding light on their ancestral backgrounds. Then again, they may have been completely erased by these three very significant genetic bottleneck events, and no genetic traces may now be discernable through modern DNA testing techniques.

Butler provides a clear answer to how he views the current DNA situation. Given the background of three tremendous genetic bottlenecks in the source population from which we are presently deriving DNA studies and sampling, it is not hard to imagine that no genetic signatures may still be discernable.

> *... it certainly seems possible that the people who are reported in the Book of Mormon to have migrated to the Americas over 2,600 years ago might not have left genetic signatures that are detectable today.* Ref 9

Is there any hope of ever finding evidence in the DNA record of these ancient lineages in Native American populations? Certainly these three explanations put forward by LDS scholars demonstrate that each has merit in the field of genetics, but how do these explanations fit with the prophecies and promises in the Book of Mormon about the "House of Israel," the "House of Jacob," the "Jews," the "Abrahamic" covenant and all others of this priestly lineage stemming from Shem?

> 20 But behold, it shall come to pass that they shall be driven and scattered by the Gentiles; and after they have been driven and scattered by the Gentiles, behold, then will the Lord remember the *covenant which he made unto Abraham and unto all the house of Israel*.
>
> BoM Mormon 5:20

What is the Abrahamic Covenant?

> 1 AND when Abram was ninety years old and nine, the LORD appeared to Abram, and said unto him, I *am* the Almighty God; walk before me, and be thou perfect.
> 2 And *I will make my covenant between me and thee*, and will multiply thee exceedingly.
> 3 And Abram fell on his face: and God talked with him, saying,
> 4 As for me, behold, my covenant *is* with thee, and *thou shalt be a father of many nations*.
> 7 And *I will establish my covenant between me and thee and thy seed after thee in their generations for an everlasting covenant*, to be a God unto thee, and to thy seed after thee.
> 9 ¶ And God said unto Abraham, *Thou shalt keep my covenant therefore, thou, and thy seed after thee in their generations.*
> 10 *This is my covenant, which ye shall keep, between me and you and thy seed after thee; Every man child among you shall be circumcised*.
> 11 And ye shall circumcise the flesh of your foreskin; and *it shall be a token of the covenant* betwixt me and you.
> 12 And he that is eight days old shall be circumcised among you, *every man child in your generations, he that is born in the house, or bought with money of any stranger, which is not of thy seed*.
> 13 He that is born in thy house, and he that is bought with thy money, must needs be circumcised: and *my covenant shall be in your flesh for an everlasting covenant*.
> 14 *And the uncircumcised man child whose flesh of his foreskin is not circumcised, that soul shall be cut off from his people; he hath broken my covenant*.
>
> Genesis 17:1 – 14

The covenant provided that because of Abraham's willingness to sacrifice his only son to be obedient to the Lord, the Lord covenanted with Abraham that through his seed or posterity, all the world would be blessed. He did not limit the blessings of the covenant to only Abraham's literal (genetic) descendants, but extended it to all those who would believe in the gospel and obey it (PoGP

Abraham 2:9-10). From the scriptural passages it is clear that one did not necessarily have to be a direct descendant of Abraham to join in the blessings of the covenant, but one did have to submit to the belief and become circumcised to do so. Only those willing to do so were allowed, and this would have been a limiting factor for many other cultures to accept this religious practice.

The token of the covenant was that every male would be circumcised. In this way each male would have "evidence" that they were partakers in or adherents to the covenant and this would of course become evident to any woman who would know whether her potential husband was under the covenant. The men of the family group would most likely know such a thing long before she would, and would surely alert her to the situation because of the strong family relations common among these covenant peoples.

This appears to have been done to discourage marriage with those outside of their religion and their lineage both stemming from Abraham. Those who were not circumcised were considered outsiders or covenant breakers. Surely this would be a deterrent for the daughters of these lineages to take an uncircumcised man as their husband, and this provided strong incentive for the men to demonstrate their willingness to submit to the commandments of the Lord by being circumcised.

Of course such a ritualistic practice would have been looked upon as abhorrent to other cultures that had not received it as a commandment from the Lord, and would have been most unwilling to participate unless they embraced the religion of Abraham's lineage. This would have the effect of discouraging intermarriage between Abrahamic groups and non-Abrahamic groups. Such is the case still today.

Is it possible that this was a part of the reason for the "curse" put upon the Lamanites? Could they have broken their covenant to marry within their own people and instead intermarried with another population that did not share their religious and kinship views?

One of the most significant blessings pronounced on Abraham was that his literal descendants would "be multiplied" as "the stars of heaven" and "the sand which is upon the sea shore."

> 15 ¶ And the angel of the LORD called unto Abraham out of heaven the second time,
> 16 And said, By *myself have I sworn, saith the LORD*, for because thou hast done this thing, and *hast not withheld thy son*, thine only *son:*
> 17 That in blessing I will bless thee, and in multiplying *I will multiply thy seed as the stars of the heaven, and as the sand which is upon the sea shore*; and thy seed shall possess the gate of his enemies;
> 18 *And in thy seed shall all the nations of the earth be blessed*; because thou hast obeyed my voice.
>
> Gen. 22:18

The Bible Dictionary clarifies the relationship between those that are literal descendants and those that are "adopted" into the covenant through belief in the Savior and his gospel.

> *Seed of Abraham*. The heirs of the promises and covenants made to Abraham, and obtained only by obedience to the laws and ordinances of the gospel of Jesus Christ. Men and women become heirs by faithfulness to covenant obligations whether they are literally of Abraham's lineage or by adoption.
>
> Bible Dictionary, *Seed of Abraham*

Thus anyone can become a partaker of the Abrahamic Covenant either through lineage or by adoption. There is a distinction made between the two because obviously not everyone is a direct descendant nor could be. This does not diminish the fact that Abraham was blessed that his posterity would be tremendous and would never end.

Accordingly, through Abraham's posterity are all the nations of the earth to be blessed, through the covenant. (Gen. 26:4; 28:14; Acts 3:25; 1 Ne. 15:18; 22:9; D&C 124:58). The Book of Mormon people were partakers of

both this lineage and this covenant. Christ himself reiterates this fact in third Nephi.

> 25 And behold, *ye are the children of the prophets; and ye are of the house of Israel; and ye are of the covenant which the Father made with your fathers, saying unto Abraham: And in thy seed shall all the kindreds of the earth be blessed*.
> 26 The Father having raised me up unto you first, and sent me to bless you in turning away every one of you from his iniquities; and this because *ye are the children of the covenant*—
> 27 And after that ye were blessed then *fulfilleth the Father the covenant which he made with Abraham*, saying: In thy seed shall all the kindreds of the earth be blessed—unto the *pouring out of the Holy Ghost through me upon the Gentiles, which blessing upon the Gentiles shall make them mighty above all, unto the scattering of my people, O house of Israel.*
> 28 *And they shall be a scourge unto the people of this land*. Nevertheless, when *they shall have received the fulness of my gospel*, then if they shall harden their hearts against me I will return their iniquities upon their own heads, saith the Father.
>
> BoM 3 Nephi 20:25 - 28

These very interesting verses clearly state that the Book of Mormon people were of the House of Israel and they are the children of the Abrahamic covenant. Christ then goes on to say that sometime later the Lord was going to pour out the blessing of the Holy Ghost upon the Gentiles, who would then become "mighty above all," would scatter the House of Israel, and be a "scourge unto the people of this land." Yet it will be a portion of these same Gentiles that will "receive the fulness of my gospel" according to this prophesy by Christ.

From this scripture and others it becomes clear that those who are descendants of Abraham will be among those who are to be "scattered" and "afflicted" by these same Gentiles on the land where Christ was speaking from … *this land*.

AREN'T THE LDS SCHOLARLY EXPLANATIONS SUFFICIENT?

Aren't the explanations by LDS scholars regarding Book of Mormon genetics (offered above) sufficient to refute the false claim that DNA proves the Book of Mormon false? Absolutely they are, and the explanations have given Latter-day Saints as well as critics of the Church the genetic facts to counter and rebut further genetic argument making such claims.

One observation that becomes absolutely clear is that through these explanations the critics of the Church cannot make the claim that DNA does now, or ever will, definitively "prove" that the Book of Mormon is false. It is an untenable assumption that has been thoroughly debunked. However, as stated previously, the unfortunate corollary is that DNA research, even if it supports the historicity of the Book of Mormon, also cannot be used as evidence, making it a neutral argument. The claim is made that DNA evidence cannot be used neither to disprove, nor to "prove" the Book of Mormon. This is true.

The only way to "prove" the Book of Mormon's historicity would be to obtain actual DNA samples from founding members of Lehi's group and compare their DNA with modern day DNA from Native Americans to verify any matches. Even then, such genetic influences such a genetic drift, mutation, bottlenecks and dilution may still make it impossible to absolutely ascertain any genetic connectedness or disconnectedness. It is commonly held in science that nothing is ever "proven" because there may be forces or factors involved that are at present unknown that could affect the outcome of any scientific experiment or theory. Thus, nothing is ever really "known" in that sense.

As Latter-day Saints, however, we can rest assured there is nothing even at the most microscopic of scales that is not known to God. Therefore, it is only through God that anything can be absolutely "known." The author of this work acknowledges that the only way that DNA evidence could ever proclaim "proof" of the validity of the Book of Mormon is if God were to reveal it, and God has not revealed it at this point. No level of DNA evidence will ever "prove" the truthfulness of the Book of Mormon. An absolute knowledge of its truths can come only through a witness of the spirit of God, and this is exactly how it has been and will remain until it is the Lord's will to reveal it, if He ever does.

This position, however, should not be construed to think that there is no evidence that *could* support the claims of the Book of Mormon. Just as a case in a court of law may not find absolute evidence of the guilt or innocence of an accused person, a case can be made that may point in one direction or another. This is the approach being taking in this research. It is fully accepted that DNA evidence cannot make the claim that absolutely establishes the truthfulness of its historicity, but can a case be made that supports the foundational premise of its claims?

A position that does not allow a case to be made that may demonstrate at least potential evidence supporting the Book of Mormon then also creates a potential predicament wherein evidence that could lend support to the claims of the Book of Mormon may be looked upon as going against previous scholarly conclusions. Again it should be understood that this may lead to valid evidence in support of the Book of Mormon being disregarded or even aggressively criticized be some who may feel that their established conclusions have been discredited. This is not the aim or desire of the author of this work.

The goal is to review the DNA information, formulate and present a case that demonstrates the possibility or even plausibility of the truthfulness of the claims of the Book of Mormon.

Again, it must be clear that the author of this work holds a definite bias in that he believes from a spiritual standpoint that the Book of Mormon is true and that it is a literal history of real people, places, and things upon the Promised Land of the Lord in the Americas. All scientists, researchers and indeed all people bring with them their personal views and beliefs into everything they do, even though they may do all in their power to maintain neutrality in their work.

By admitting this bias up front, it is hoped to demonstrate honesty in this research and not hide this fact from its readers. Some may take issue with this fact, claiming that such bias taints the research. To this allegation he respectfully disagrees as all research is fraught with human bias in one form or another and there is no such thing as absolute neutrality on the part of people who conduct it. Such a claim would demonstrate naivete of the scientific world and of research in general. Those that are honest admit their bias to make it clear to others how this may affect their work.

However well reasoned the explanations from the field of genetics are as assembled by the LDS scholarly community, they have failed to address one critical aspect of the Book of Mormon in this regard. Its prophecies and promises clearly and irrevocably state that *there will be a remnant of the House of Israel left upon the Promised Land in the latter days*. This irrefutable fact seems not to have been considered or addressed while presenting the multiple explanations of why no evidence of "European" type DNA has been found in Mesoamerica, the location thought to have been that of the Book of Mormon by a consensus of LDS scholars. This is why an understanding of the prophecies and promises are so incredibly important, and indeed vital to our understanding of what types of evidence we might expect to find in the field of genetics that might lend support to the claims of the Book of Mormon.

A Remaining Remnant of the House of Israel?

There are at least 17 verses in the Book of Mormon that specifically and undeniably state that there will be a remaining "remnant" of the House of Israel in the latter days. This section will discuss what such a remnant may be, relevant to DNA studies.

> 53 And behold how great *the covenants of the Lord*, and how great his condescensions unto the children of men; and because of his greatness, and his grace and mercy, *he has promised unto us that our seed shall not utterly be destroyed, according to the flesh, but that he would preserve them; and in future generations they shall become a righteous branch unto the house of Israel*.
>
> BoM 2 Nephi 9:53

> 4 *And then shall the remnant of our seed know concerning us, how that we came out from Jerusalem, and that they are descendants of the Jews.*
>
> BoM 2 Nephi 30: 4

Some questions to ponder in relation to these scriptures.

1. Is it possible for the "remnant" of the "House of Israel" to be a group that is not in any way genetically related to the lineage of the house of Israel?
2. In other words, is it possible for a group that has no genetic link to Lehi, Joseph, Abraham or Shem to also be considered to be a "seed" or "remnant" of the House of Israel?
3. When the scriptures state that this remnant will not be completely destroyed, "according to the flesh" how can that mean anything other than a literal remnant that has in their bodies (their flesh) the actual blood lineage of the house of Israel?

4. How are the prophecies regarding the remnants coming to a knowledge that they are "descendants of the Jews" possibly going to be fulfilled if they have absolutely no genetic indication of having come from these lineages?
5. Of course the Book of Mormon could be how they would know, but the Book of Mormon has been in print for many years now, so is there a population that knows with complete surety that they are, in fact, of the Jews?

These scriptures seem to indicate that there must be at least enough of a genetic signature remaining within the remnant or seed of Jacob to positively identify them as being of the house of Israel.

These honest questions must be addressed if we believe in the truthfulness of prophecy and the Book of Mormon. Once it is stated that DNA evidence will not, or cannot be used to provide supporting evidence in favor of the Book of Mormon, what other method is available to substantiate the claims of the Book of Mormon? Could archaeology do it? Even if archaeologists found direct evidence for Hebrew language in the Americas or something similar, it is likely that such information would be pronounced fakes or forgeries as has occurred in every instance of such finds thus far in North America. It would so challenge the dogma of the peopling of the Americas as to cause a meltdown of the *a priori* assumptions of this field. Such a find would create unimaginable chaos and toss years of speculation and research into the junk-heap of history.

If not from archaeology, then what? Linguistics? Could linguistics demonstrate beyond any doubt that a modern day people are the literal descendants of Jews? Again, not likely. Language changes very rapidly. So much so that in only a few generations languages previously spoken or written can be altered significantly enough to lose understanding. Parents often find that in a single generation it is hard to communicate with their children due to changing linguistic uses of words and patterns of speech. Unlike DNA, linguistics is in a continuous state of change in every generation and is therefore unreliable to be able to definitely establish that today's Native Americans are "descendants of the Jews." As an example:

> *The Americas are home to approximately half of the world's language stocks.* This *extraordinary linguistic diversity among the indigenous groups of Native America* suggests to many comparative linguists that there was *either a single colonization several tens of thousands of years ago or that there were multiple colonizations by speakers of different unrelated language phyla*. There is dispute, however, about whether or not linguistic evidence supports an early or later first occupation of the Americas. Ref 3

Specific work was done comparing languages and genetics to find if they follow along the same paths by Keith Hunley and Jeffrey C. Long of the Department of Human Genetics, University of Michigan Medical School in Ann Arbor. Their informative article, "Gene Flow Across Linguistic Boundaries in Native North American Populations," published in *PNAS* in 2005 provides a very direct answer. No.

> *Cultural and linguistic groups are often expected to represent genetic populations*. In this article, we *tested the hypothesis* that the hierarchical classification of languages proposed by J. Greenberg [(1987) *Language in the Americas* (Stanford Univ. Press, Stanford, CA)] also represents the genetic structure of Native North American populations. The genetic data are mtDNA sequences for 17 populations gleaned from literature sources and public databases. *The hypothesis was rejected*. Ref 20

They go on to say that their resulting study showed that the genetic structure did not correlate with even the best-fitting linguistics models available.

> Further analysis showed that *departure of the genetic structure from the linguistic classification was pervasive* and not due to an outlier population or a problematic language group. Moreover, we show that the *genetic structure among these Native North*

> *American populations departs significantly from the best-fitting hierarchical models*. Analysis of median joining networks for mtDNA haplotypes provides strong evidence for *gene flow across linguistic boundaries*. Ref 20

The explanation given for the divergence between gene flow and linguistics is straight forward: language changes very quickly, much more so than genetics. This point should be fairly obvious, yet many fail to grasp the significance. Those who are parents can attest that significant language alterations can and do occur, even within a single generation.

> In principle, *the language of a population can be replaced more rapidly than its genes because language can be transmitted both vertically from parents to children and horizontally between unrelated people*. Ref 20

If linguistics cannot shed additional light on DNA studies to find answers to such questions as whether there was one or a number of migration events, it does not lend credibility to this particular field of science to be able to clearly identify the modern day descendants of the Book of Mormon peoples. It is also worthy of note here that several Book of Mormon geography theories have been based or considered highly supported by linguistic evidences. While these evidences may certainly lend support to an existing theory, it is not at all likely that one could use linguistic evidence as a foundational basis for any particular geography.

There have been some who have speculated that because a word pronounced in a modern day native language "sounds like" a word spoken in modern English or Latin-based language, that there must be some kind of connection. This is rather absurd when considering the ease of which language changes, the factors that control language such as change in populations in a given area, change of governance, change of cultural traditions, movements of cultures and any number of other possible scenarios that are known to cause place name changes over very short time scales.

A simple example of this are the number of streets in cities across the United States that have been renamed "Martin Luther King" Street/ Blvd/ Road/ Avenue out of respect for this honored American. Place names change rapidly and easily, and basing a geography on such changes seems foolhardy.

Such examples could go on, but the simple fact is that the most likely method for "the Gentiles" to come to a knowledge that Native Americans somewhere in the Americas are literal descendants of the house of Israel is by demonstrating possible connections between their DNA lineages in a coherent way. Note that the word "proven," is not being used here, only that there may be a "good case" for the claims of the Book of Mormon. To this end is this work presented.

What does the word "Seed" mean? What Constitutes Someone's "Seed"?

What does the term "seed" mean in conjunction with passages from the Book of Mormon indicating that "the seed" of the Lamanites would be found in the latter days?

> 6 And that a *New Jerusalem should be built up upon this land, unto the remnant of the seed of Joseph*, for which things there has been a type.
> 7 For as Joseph brought his father down into the land of Egypt, even so he died there; wherefore, *the Lord brought a remnant of the seed of Joseph out of the land of Jerusalem*, that he might be merciful unto the seed of Joseph that they should perish not, even as he was merciful unto the father of Joseph that he should perish not.
> BoM Ether 13:6 – 7

> 14 And it came to pass that my father, *Lehi, also found upon the plates of brass a genealogy of his fathers; wherefore he knew that he was a descendant of Joseph*;
> BoM 1 Nephi 5:14

From these passages it is clear that the remnant of the seed of Joseph was Lehi's

group, and Lehi was a literal descendant of Joseph. There should be no question that "seed" in this case meant a literal genetic remnant based on genealogical records, namely the Brass Plates of Laban.

For most it should be easily understood that someone's "seed" means one's children or posterity. After all, what is a literal "seed" except a genetic replica, capable of producing a living organism like unto its parent organism? The seed of a plant is by definition:

> the fertilized ovule of a plant and its covering. The seed contains a miniature plant capable of independent development into a plant similar to the one which produced it ... (rheet.) semen, and ... (bible) descendants. Ref 21

Some LDS scholars have argued that "seed" is not necessarily a genetic remnant. In his informative article "Swimming the Gene Pool: Israelite Kinship Relations, Genes, and Genealogy," Matthew Roper writes:

> One might assume that the term *seed* refers to literal descendants of Israel or Lehi. While some passages seem to refer to literal descendants, that usage is not exclusive and can include other groups as well. Ref 7

Roper uses two scriptures to support his idea that the word "seed" does not mean "literal descendant." He quotes Mosiah 15:10-13 wherein it states:

> 10 And now I say unto you, who shall declare his generation? Behold, I say unto you, that *when his soul has been made an offering for sin he shall see his seed*. And now what say ye? And *who shall be his seed*?
> 11 Behold I say unto you, that whosoever has heard the words of the prophets, yea, all the holy prophets who have prophesied concerning the coming of the Lord—I say unto you, that *all those who have hearkened unto their words, and believed that the Lord would redeem his people, and have looked forward to that day for a remission of their sins*, I say unto you, *that these are his seed*, or they are the heirs of the kingdom of God.
> 12 For these are they whose sins he has borne; these are they for whom he has died, to redeem them from their transgressions. And now, *are they not his seed*?
> 13 Yea, and *are not the prophets*, every one that has opened his mouth to prophesy, that has not fallen into transgression, I mean *all the holy prophets ever since the world began*? I say unto you that *they are his seed*.
>
> BoM Mosiah 15:10 - 13

Commenting on this passage Roper writes:

> Abinadi, then, *defines the seed of Christ as the prophets and everyone else who hears their words*...in this passage, *seed refers to a covenantal relationship rather than a genetic one*. The Abrahamic Covenant is based upon this same concept. The Lord promised Abraham: Ref 7

> 9 And I will make of thee a great nation, and I will bless thee above measure, and make thy name great among all nations, and *thou shalt be a blessing unto thy seed after thee*, that in their hands they shall bear this ministry and Priesthood unto all nations;
> 10 And I will bless them through thy name; for *as many as receive this Gospel shall be called after thy name, and shall be accounted thy seed*, and shall rise up and bless thee, as their father;
>
> PoGP Abraham 2:9 – 10

He continues:

> *Abraham's "seed," then, includes not only his literal descendants, but also all those who enter the covenant* or receive the gospel. In terms of blessings, there appears to be no difference between the two. Through the covenant all may become Abraham's seed, and he becomes their father. Ref 7

He then quotes 2 Nephi 10:19 which states:

> 19 Wherefore, *I will consecrate this land unto thy seed, and them who shall be numbered among thy seed*, forever,...
>
> BoM 2 Nephi 10:19

It is true that on the surface in these instances the use of the word "seed" appears not to be a purely genetic or genealogical relationship. However, are we not all literally related to Christ as spirits? Is there no such thing

as "adoption" into a family, such as Abraham's wherein one could become a family member or "seed" and still not be a literal descendant?

These passages could be simply stating that those who obey the Lord and have repented will be a part of his (and Abraham's) eternal family either by being a literal descendant or by adoption. It does not negate the use of the word "seed" as also meaning in certain circumstances "literal descendant." As we are all relatives of Christ, and can be adopted into Abraham's family, each of us can become a part of their combined family, or in other words, his seed.

There is nothing in this scripture that precludes the use of the word seed from indicating a purely genetic relationship in appropriate circumstances. In fact, these scriptures make clear distinctions between those who are literal descendants and those that are adopted. Verse 9 of Abraham 2 talks about Abraham's literal seed, while verse 10 discusses those who may be adopted into his family. In 2 Nephi verse 19 Jacob clearly distinguished between the two groups comprised of "thy seed" and those "numbered among" thy seed. Again, "thy seed" being genetic descendants, and those "numbered among" are adopted into the family. Why would such a distinction be made, if there were no genetic relationships as pertaining to the literal seed?

What purpose does it serve to attempt to diminish the significance of the word "seed" in these and other scriptural passages? It could create a way out of addressing the prophecies that there will be a literal remnant of the house of Israel remaining in the last days upon the land of promise. If none were in fact found, there is a legitimate excuse as to why none have been found because "seed" may not mean actual descendant, but only a covenant relationship. Is this really all that the term "seed" signifies?

No, it is highly doubtful that this is what is meant by these passages. There is a literal and an adoptive method for obtaining the promised blessings of Abraham or the Lord. Let us not diminish the importance of the words "descendants," "children," and "seed," all of which indicate genetic and genealogical relationships, in an effort to justify the idea that no such relationship is expected to be found, especially when the scriptures indicate otherwise.

Roper makes a good point in that there are some passages that are deliberately inclusive of the idea that some are literal descendants and some are adoptive, and the scriptures make it clear when this is the case. Yet it appears that some passages are exclusive, as indicated by distinctions made between a literal genetic lineage and those adopted into it. The fact that inclusionary language has been utilized in some passages does not negate the obvious genealogical or genetic linkages made in other passages that are clearly exclusionary through their noted distinctions.

Use of the Word "descendant" for Distinction within Scripture

Matthew Roper again in his article, "Swimming in the Gene Pool: Israelite Kinship Relationships, Genes, and Genealogy," gives a similar explanation for the term "descendant" in the Book of Mormon:

> While *it seems that something genetic was often implied by the use of the term descendant*, such references usually occur in a context in which this is thought to be noteworthy or exceptional. Such distinctions would be meaningless if all or a large part of the total population could claim the same genetic heritage. Ref 7

While it may have been the case that the use of the term descendant would be meaningless if most of the Book of Mormon population shared a common heritage, it could also be true that the term was noteworthy or exceptional simply by the writers knowledge of his genealogy, which was likely known only to those keeping the records, and not to the population at large. Without the records from

which to refer, the majority of the population would have lost their ancestral lines in a few short generations. Such is the nature of record keeping, and the Book of Mormon indicates that this is a part of the purpose of sacred writings as demonstrated by Lehi's returning to Jerusalem to retrieve the brass plates.

It should be noted that both the Nephites and Lamanites were keeping genealogical records as there are several passages indicating there being descendants from Lamanite (Alma 24:29; 17:21; 55:4; 56:3; Helaman 11:24), Ishmaelite (Alma 17:21), Lemuelite (Alma 24:29), Mulekite (Mosiah 7:3; 25:2), and even Zoramite (Alma 54:23) as well as those descending from Joseph (1 Nephi 5:14; 6:2; 2 Nephi 3:4), Nephi (Mosiah 17:2; 25:13; Alma 10:2-3; Mormon 1:5; 8:13), and Lehi (3 Nephi 5:20).

One of the significant factors is that at least some of these lineages were known right up to the final destruction of the Nephites, despite the many incursions of both the Lamanite and Nephite groups into each other's civilizations. Such is the case with Mormon who declares that he is *a pure* [literal] *descendant of Lehi* at about the time of the final destruction of the Nephites, 401-421 AD. 3 Nephi 5:20. It seems that it would be hard to misconstrue this statement as meaning that he was "adopted" into Lehi's family. It is unquestionable that Mormon was making an official declaration of his knowledge of his own personal lineage.

Use of the Word "Seed" or "Remnant" for Distinction within Scripture

The majority of the passages describeing the "remnant" are exclusionary rather than inclusionary in that they differentiate between at least two separate groups, such as *the Gentiles*, or *the children of men*, from *the Jews, the seed* or *the remnant*.

> 38 And it came to pass that *I beheld the remnant of the seed of my brethren*, and also the book of the Lamb of God, which had proceeded forth from the mouth of the Jew, that *it came forth from the Gentiles unto the remnant of the seed of my brethren*.
>
> BoM 1 Nephi 13:38

> 13 And now, the thing which our father meaneth concerning the grafting in of the natural branches through the fulness of the Gentiles, is, that *in the latter days, when our seed shall have dwindled in unbelief*, yea, for the space of many years, and many generations after the Messiah shall be manifested in body unto the children of men, *then shall the fulness of the gospel of the Messiah come unto the Gentiles, and from the Gentiles unto the remnant of our seed*—
> 14 *And at that day shall the remnant of our seed know that they are of the house of Israel*, and that they are the covenant people of the Lord; *and then shall they know and come to the knowledge of their forefather*s, and also to the knowledge of the gospel of their Redeemer, which was ministered unto their fathers by him; wherefore, they shall come to the knowledge of their Redeemer and the very points of his doctrine, that they may know how to come unto him and be saved.
>
> BoM 1 Nephi 15:13 – 14

The emphatic statement contained in the passage above that the remnant "seed" shall … know that they are of the house of Israel is, by its very nature, exclusionary in that they will come to an understanding that sets their heritage apart from what had been previously assumed. This is meant to be a distinguishing or defining moment for the remnant, and must indicate a genetic link to this lineage. As discussed earlier, how will the Gentiles find out and then let the remnant know that they are "of the house of Israel" without genetic evidence?

> 2 And the things which shall be written out of the book shall be of great worth unto the *children of men*, and *especially unto our seed, which is a remnant of the house of Israel*.
>
> BoM 2 Nephi 28:2

The passage above differentiates between the "children of men" meaning the remaining population of the earth, and the "seed" which is defined as those of the house of Israel, which is exclusionary and must be

indicative of their "seed" sharing a genetic connection with that lineage.

> 3 And now, *I would prophesy somewhat* more concerning the *Jews and the Gentiles*. For after the book of which I have spoken shall come forth, and be written unto the Gentiles, and sealed up again unto the Lord, there shall be many which shall believe the words which are written; and *they shall carry them forth unto the remnant of our seed.*
> 4 *And then shall the remnant of our seed know concerning us, how that we came out from Jerusalem, and that they are descendants of the Jews*.
> BoM 2 Nephi 30:3 – 4

In the case of this passage, it is clear that they are making a specific genetic connection between the remnant descendants of "the Jews" as opposed to "the Gentiles." This is clearly not inclusionary of both the descendants and the Gentiles, but is meant to differentiate between them. This is important because there are those who have alluded that such statements are not to be understood literally as meaning a literal genetic remnant but more of a figurative or covenantal one. The author of this work disagrees with this premise and supports the interpretation that the remnant spoken of in these scriptural passages does in fact indicate a literal genetic remnant.

In the following account at the time of Christ's visitation, the Book of Mormon clearly denotes that a genealogical or genetic descendancy is meant as the author asks the rhetorical question, *are not we a remnant of the seed of Joseph?* … to which the obvious answer is that their lineage or genetic heritage was known because of their having possession of the brass plates for genealogical reference.

> 16 Yea, *the prophet Zenos did testify of these things, and also Zenock spake concerning these things, because they testified particularly concerning us, who are the remnant of their seed*.
> 17 Behold, our father Jacob also testified concerning a remnant of the seed of Joseph. And behold, *are not we a remnant of the seed of Joseph*? And *these things which testify of us, are they not written upon the plates of brass* which our father Lehi brought out of Jerusalem?
> BoM 3 Nephi 10:16 – 17

That the word "seed" denotes direct genetic associations in the following passages are unquestionable within the standard interpretation.

> 9 And it came to pass that *whosoever did mingle his seed with that of the Lamanites did bring the same curse upon his seed*.
> BoM Alma 3:9

> 14 Thus the word of God is fulfilled, for these are the words which he said to Nephi: Behold, the Lamanites have I cursed, and *I will set a mark on them that they and their seed may be separated from thee and thy seed, from this time henceforth and forever*, except they repent of their wickedness and turn to me that I may have mercy upon them.
> BoM Alma 3:14

> 3 And now, Joseph, my last-born, whom I have brought out of the wilderness of mine afflictions, may the Lord bless thee forever, *for thy seed shall not utterly be destroyed*.
> 4 For behold, thou art the *fruit of my loins*; and *I am a descendant of Joseph* who was carried captive into Egypt. And *great were the covenants of the Lord which he made unto Joseph*.
> 5 Wherefore, Joseph truly saw our day. And *he obtained a promise of the Lord, that out of the fruit of his loins the Lord God would raise up a righteous branch unto the house of Israel*; not the Messiah, but a branch which was to be broken off, nevertheless, to be remembered in the covenants of the Lord that the Messiah should be made manifest unto them in the latter days,…
> 16 Yea, thus prophesied Joseph: *I am sure of this thing*, even as I am sure of the promise of Moses; for the Lord hath said unto me, *I will preserve thy seed forever*.
> 23 Wherefore, because of this covenant thou art blessed; for *thy seed shall not be destroyed*, for they shall hearken unto the words of the book.
> BoM 2 Nephi 3:3-5, 16, 23

Certainly the term "fruit of my loins" indicates a direct genetic heritage harkening back genealogically from Joseph, son of Lehi, to Joseph son of Jacob or Israel. Then it clearly states that this was a direct result of a promise made by the Lord that "out of the fruit of his loins" a righteous branch of the house of Israel

would be raised up, and that his "seed" would never be destroyed. Could there be any question that this passage is specifying a literal genetic remnant?

These verses are surely speaking of an actual unbroken ancestral line of descendants of which Lehi's son Joseph is a part. Thus when Lehi makes the prophetic promise that his son's "seed" shall not be destroyed, it is a near certainty that he is speaking of Joseph's literal offspring and descendants that will not be destroyed, but will continue carrying forth the lineage of the house of Joseph and Israel. This being the case, then there should be some sort of genetic evidence for this remnant to be found. It has been prophesied not to have been destroyed.

It is also highly doubtful that a genetic lineage that has been diluted out of existence would qualify as not having been "destroyed." Since all humankind descended from Adam, Adam's lineage can be said not to have been destroyed. But when a later lineage has been sufficiently diluted so that there remains no genetic indication linking them back to a particular ancestor, is not this lineage then for all intents and purposes genetically "destroyed?"

At what point can it be determined that a descendant's DNA has been sufficiently diluted to consider them to no longer be linked with a particular ancestry? A potential answer is that this lineage is "destroyed" genetically when it is no longer discernable through DNA sequencing and analysis, which the Lord certainly knew would occur in connection to the prophesies and promises given to the "remnant Lamanites."

The most reasonable interpretation of these prophesies is that somewhere a genetic lineage will be found that can be traced back to the lineages of this prophetic line from Shem. If no such lineage is found, how could this prophecy and promise then be fulfilled? The only other method would be through direct revelation on the matter from the Lord.

The Prophecies and Promises of the Remnant, Outlined and Defined

What are the prophecies and promises of the remnant of the house of Israel/Jacob of the latter days? There were several given to Lehi's group. One that has already been discussed is that his group would be partakers of the blessings of Abraham, Isaac, Jacob, and Joseph through his and Ishmael's literal lineage. Another is that Lehi's lineage will survive and not be destroyed. It was prophesied that Nephi's group would be exterminated (1 Nephi 12:20; 13:35; Alma 45:12-14), and this prophecy already came to pass. In Nephi's vision he saw that the Lamanites would continue on after the destruction of his people, the Nephites (1 Nephi 12:20-21). He also saw in vision, as did others, that the Lamanites would "dwindle in unbelief" (1 Nephi 12:22; 13:35, Helaman 15:11; 3 Nephi 21:5).

The Lamanite Remnant and the Gentiles

According to the prophecies in the Book of Mormon the Lamanite remnant was to be smitten, afflicted and scattered by the Gentiles who come "out of captivity" upon the "many waters" and arrive on the land of promise. (1 Nephi 13:13-14, 34; 22:7; 2 Nephi 26:15, 19; 3 Nephi 16:9) These same Gentiles have many more prophecies and promises concerning them, but those will not be addressed here. For more detailed information about the 36 prophecies and promises, please see the book *Prophecies and Promises* by Bruce Porter and this author.

> 13 And it came to pass that I beheld the Spirit of God, that it wrought upon other *Gentiles; and they went forth out of captivity, upon the many waters*.
> 14 And it came to pass that I beheld many *multitudes of the Gentiles upon the land of promise*; and I beheld the wrath of God, that it was upon the *seed of my brethren; and they were scattered before the Gentiles and were smitten*.
>
> BoM 1 Nephi 13:13 - 14

> 7 And it meaneth that *the time cometh that after all the house of Israel have been scattered* and confounded, that *the Lord God will raise up a mighty nation among the Gentiles, yea, even upon the face of this land; and by them shall our seed be scattered*.
>
> BoM 1 Nephi 22:7

> 19 And it shall come to pass, that *those who have dwindled in unbelief shall be smitten by the hand of the Gentiles*.
>
> BoM 2 Nephi 26:19

The Gentiles who come "out of captivity" establish a new nation and prosper. These same Gentiles are also prophesied to bring to the remnant the "stick of Judah" or the Bible. (1 Nephi 13:19-23)

> 19 And I, Nephi, beheld that *the Gentiles that had gone out of captivity* were *delivered by the power of God out of the hands of all other nations*.
> 20 And it came to pass that I, Nephi, beheld that *they did prosper in the land*; and I beheld *a book, and it was carried forth among them.*
> 21 And the angel said unto me: Knowest thou the meaning of the book?
> 22 And I said unto him: I know not.
> 23 And he said: Behold *it proceedeth out of the mouth of a Jew*. And I, Nephi, beheld it; and he said unto me: *The book that thou beholdest is a record of the Jews*, which contains the *covenants of the Lord*, which he hath made unto the house of Israel; and it also containeth many of the prophecies of the holy prophets; and it is a record like unto the engravings which are upon the plates of brass, save there are not so many; nevertheless, they contain the covenants of the Lord, which he hath made unto the house of Israel; wherefore, they are of great worth unto the Gentiles.
>
> BoM 1 Nephi 13:19 – 23

All of these prophecies have today been fulfilled. The primary Gentile groups that came to the Americas out of captivity were the Pilgrims and Puritans who literally came out of the jail cells of Europe to have the freedom to practice their religion and worship God according to their own consciences. These two groups were essential in establishing the new Gentile nation known as the United States of America, and were among those that created its Constitution.

They did also bring with them the Bible and brought it in their evangelical effort to convert the Native peoples, many of whom were converted and became "Christian." These Gentiles did in fact "prosper in the land" and rose up to become a "mighty people" and established a nation that by all accounts qualifies as a "nation above all other nations." They were also among those that displaced and "scattered" the Native Americans. No other groups can be said to have more directly fulfilled these Book of Mormon prophecies than the Pilgrims and Puritans.

President Heber J. Grant had this to say about these people:

> It was *not by chance that the Puritans left their native land and sailed away to the shores of New England,* and that others followed later. They were the advance guard of the army of the Lord, *predestined to establish the God-given system of government* under which we live, and to make of America, *which is the land of Joseph,* the gathering place of Ephraim,*...and prepare the way for the restoration of the Gospel of Christ and the reestablishment of his Church* upon the earth. Ref 22

President Grant also clarified another important prophecy that has now been fulfilled. These same Gentiles will be those that establish the Lord's church in the latter days. The following verses clearly identify who these Gentiles are, as well as describe their relationship to the "remnant of Jacob" and the "house of Israel" (3 Nephi 21:22-23, D&C 10:53).

> 2 But if they [Gentiles] will repent and hearken unto my words, and harden not their hearts, *I will establish my church among them*, and *they shall come in unto the covenant and be numbered among this the remnant of Jacob*, unto whom I have given this land for their inheritance;
> 23 And *they shall assist my people, the remnant of Jacob, and also as many of the house of Israel as shall come*, that they may build a city, which shall be called the New Jerusalem.

BoM 3 Nephi 21:22 – 23

The Book of Mormon uses the same phrase as the Lord gives Joseph Smith in the Doctrine and Covenants as he clarifies those through whom he will establish His church.

> 53 And for this cause have I said: If this generation harden not their hearts, *I will establish my church among them*.
>
> D&C 10:53

It should be abundantly clear that the Gentiles that were prophesied to accomplish these things were, in fact, the descendants of the Pilgrims and Puritans. The church was indeed established in the United States of America by Joseph Smith and other followers who can trace their ancestry back to these two groups. That Joseph Smith literally fulfilled this prophecy should not come as a surprise, but many people do not realize the significance of this fulfillment.

> 35 For, behold, saith the Lamb: I *will manifest myself unto thy seed, that they shall write* many things which I shall minister unto them, which shall be plain and precious; and *after thy seed shall be destroyed, and dwindle in unbelief, and also the seed of thy brethren, behold, these things shall be hid up, to come forth unto the Gentiles*, by the gift and power of the Lamb.
>
> 1 Nephi 13:35

The Lord showed Nephi the future and again prophesied that Nephi's posterity will be destroyed and that the posterity of his brethren would dwindle in unbelief, but that a record would be kept and hidden to come forth unto a righteous portion of these same Gentiles. Who brought forth the record? Joseph Smith. Does Joseph Smith qualify as a "Gentile"?

Joseph Smith's great-great-great Grand-father, Robert Smith, was an indentured servant from Lincolnshire, England who came to America in 1638 and was sold to John Tuttle of Ipswich, MA for 15-16 pounds. This information came from the Arthur Neale family pages: George Towne book, 1661. On his mother, Lucy Mack Smith's side, his ancestry can be traced back seven generations to two passengers aboard the Mayflower, John and Elizabeth Tilley Howland who came to America together in 1620. [Source: Personal correspondence with Mary Harris, genealogical researcher on the Fuller family ancestry, which is associated with the Howland/Crocker lines, 05.05.09]

Others of Joseph's lineages include Solomon Mack, his maternal grandfather who fought in the Revolutionary War and still others were American colonists. Joseph Smith did indeed fulfill the ancient prophecies of himself: a) that it would be through Gentiles that came out of captivity (Joseph was a descendant of an indentured servant); b) brought forth the ancient record (The Book of Mormon); c) and reestablished the latter-day Church of Christ. Indeed, these prophecies about the Gentiles were fulfilled through him. He further identified himself as a "Gentile" in the dedicatory prayer of the Kirtland Temple on March 27th, 1836 in which he states the following:

> 60 Now these words, O Lord, we have spoken before thee, concerning the revelations and commandments which thou hast given unto *us, who are identified with the Gentiles*.
>
> D&C 109:60

Joseph Smith himself claims that he is a part of those who are identified with the Gentiles. This prayer, according to the Prophet's written statement, was given to him by revelation (D&C 109: Heading). That Joseph Smith knew of the importance of the next group of prophecies is clearly evident from this same dedicatory prayer at Kirtland. He continued:

> 61 But thou knowest that *thou hast a great love for the children of Jacob, who have been scattered* upon the mountains for a long time, in a cloudy and dark day.
> 62 We therefore ask thee to *have mercy upon the children of Jacob, that Jerusalem, from this hour, may begin to be redeemed*;
> 65 And cause that *the remnants of Jacob, who have been cursed and smitten because*

of their transgression, be converted from their wild and savage condition to the fulness of the everlasting gospel;
67 And *may all the scattered remnants of Israel, who have been driven to the ends of the earth, come to a knowledge of the truth, believe in the Messiah*, and be redeemed from oppression, and rejoice before thee.
D&C 109:61-62, 65, 67

The Prophet Joseph understood that the day of the fulfillment of the prophecies concerning the gathering of Israel was to begin from that very hour and that this included the "children" and "remnant" of Jacob or Israel who were in a "wild" and "savage" condition. The term "savage" is interesting in that the Native American people were often referred to as "Savages" by their European counterparts of that day. That Joseph Smith believed these Native American Indian tribes were associated with the Book of Mormon is irrefutable but will be covered in another section of this work in detail.

One of the important prophecies regarding the Lamanite remnant is that they will lose the knowledge of their ancestry, and not know their true lineage and heritage.

1 AND verily I say unto you, *I give unto you a sign*, that ye may know the time when these things shall be about to take place—that *I shall gather in, from their long dispersion, my people, O house of Israel*, and shall establish again among them my Zion;
2 And behold, this is the thing which I will give unto you for a sign—for verily I say unto you that when these things which I declare unto you, and which I shall declare unto you hereafter of myself, and by the power of the Holy Ghost which shall be given unto you of the Father, *shall be made known unto the Gentiles that they may know concerning this people who are a remnant of the house of Jacob*, and concerning this my people who shall be scattered by them;
3 Verily, verily, I say unto you, when *these things shall be made known unto them [the Gentiles] of the Father, and shall come forth of the Father, from them unto you;*
4 For it is wisdom in the Father that they should be established in this land, and be set up as a free people by the power of the Father, that *these things might come forth from them [the Gentiles] unto a remnant of your seed, that the covenant of the Father may be fulfilled* which he hath covenanted with his people, O house of Israel;
5 Therefore, when these works and the works which shall be wrought among you hereafter *shall come forth from the Gentiles, unto your seed* which shall dwindle in unbelief because of iniquity;
6 For thus *it behooveth the Father that it should come forth from the Gentiles*, that he may show forth his power unto the Gentiles, for this cause that the Gentiles, if they will not harden their hearts, that they may repent and come unto me and be baptized in my name and know of the true points of my doctrine, *that they [the Gentiles] may be numbered among my people, O house of Israel;*
7 And when these things come to pass that *thy seed shall begin to know these things*—it shall be a sign unto them, that they may know that *the work of the Father hath already commenced* unto the fulfilling of the covenant which he hath made unto the people who are of the house of Israel.
BoM 3 Nephi 21:1 – 7

From this passage we learn some very important prophetic aspects about a special event. Verse one states that a special sign is going to be given that will usher in the beginning of the gathering of the house of Israel. The sign is described as a new knowledge that the Gentiles will receive concerning the remnant of the Book of Mormon or Lamanite people who are of the house of Jacob and who have been scattered by the Gentiles.

What is this new knowledge? It could be the coming forth of the Book of Mormon, the record of this people. Christ repeats again the prophecy that the Gentiles, who we know refer to the Pilgrims and Puritans, are going to be established in "this land" and "set up as a free people." "This land" being on the same land upon which Christ was speaking, and "set up," signifying the beginning or setting up of a new nation that supports the cause of freedom. This new, free nation was allowed by the Lord so that "these things might come forth" to the Gentiles and ultimately to the remnant, so that the covenant might be fulfilled.

What covenant is Christ speaking of here? The covenant is that the house of Israel would be gathered in from their long dispersion. This new information is going to go forth from the Gentiles to the remnant and, when it does, it appears that the remnant are going to suddenly understand that the work of the father has "already commenced" unto the fulfilling of this covenant.

What work is Christ speaking of here? It seems most logical that he is prophesying of the establishment of the Church, and specifically of the dedicatory prayer written and offered by the Prophet, Joseph Smith in the Kirtland Temple, when Joseph proclaimed that from that hour the gathering had begun.

One aspect needing further discussion is the timing mentioned here. This passage states that the information that the Gentiles are going to give to the remnant won't occur until after the work (the restoration and the beginning of the gathering) has been accomplished, which happened at the time of the gathering at the Kirtland Temple for the dedicatory services. What specifically is this new knowledge?

By this time the Book of Mormon had already been published and missionaries had already taken it to the Lamanites according to D&C 28, 30, and 32. They were having only minor success among the Indian tribes at the time. The third section of the Doctrine and Covenants offers additional insight.

> 16 Nevertheless, my work shall go forth, for inasmuch as the *knowledge of a Savior has come unto the world*, through the testimony of the Jews, even so shall *the knowledge of a Savior come unto my people*—
> 17 *And to the Nephites, and the Jacobites, and the Josephites, and the Zoramites, through the testimony of their fathers*—
> 18 And *this testimony shall come to the knowledge of the Lamanites, and the Lemuelites, and the Ishmaelites*, who dwindled in unbelief because of the iniquity of their fathers, whom the Lord has suffered to destroy their brethren the Nephites, because of their iniquities and their abominations.
> 19 And *for this very purpose are these plates preserved*, which contain these records—that the *promises of the Lord might be fulfilled*, which he made to his people;
> 20 And *that the Lamanites might come to the knowledge of their fathers, and that they might know the promises of the Lord, and that they may believe the gospel* and rely upon the merits of Jesus Christ, and be glorified through faith in his name, and *that through their repentance they might be saved*. Amen.
>
> D&C 3:16 - 20

This new knowledge appears to be related to their history, or the Book of Mormon. The Lord states that the "testimony of their fathers" or the Book of Mormon, will come unto the knowledge of the "Lamanites" and their associated families for the purpose of helping them to understand the promises contained within its pages that are directly concerned with their history. In this way the Lamanite remnant will come to a knowledge of their forefathers and gain an understanding of the fact that they are partakers of the promises of the Lord contained therein. Then they will believe the gospel and, along with repentance, be saved and "blossom as the rose" as foretold (D&C 49:24).

> 9 For behold, *this* [the Book of Mormon] *is written for the intent that ye may believe* that [the Bible]; and if ye believe that ye will believe this also; *and if ye believe this ye will know concerning your fathers*, and also the marvelous works which were wrought by the power of God among them.
> 10 And *ye will also know that ye are a remnant of the seed of Jacob*; therefore ye are *numbered among the people of the first covenant*; and if it so be that ye believe in Christ, and are baptized, first with water, then with fire and with the Holy Ghost, following the example of our Savior, according to that which he hath commanded us, it shall be well with you in the day of judgment. Amen.
>
> BoM Mormon 7:9 – 10

Thus it can be said that the Book of Mormon is the new knowledge that will help the remnant understand their heritage and know who they are, after which they will accept the truth of the Book of Mormon and join his gospel.

To more effectively teach what was meant by a "remnant," Alma includes the words of Moroni and likens them to a fragment of the famous coat of many colors of Joseph of Egypt. The symbolic parallelisms can hardly be mistaken.

> 23 Moroni said unto them: Behold, *we are a remnant of the seed of Jacob; yea, we are a remnant of the seed of Joseph*, whose coat was rent by his brethren into many pieces; yea, and now behold, let us remember to keep the commandments of God, or our garments shall be rent by our brethren, and we be cast into prison, or be sold, or be slain.
> 24 Yea, let us preserve our liberty as a remnant of Joseph; yea, let us remember the words of Jacob, before his death, for behold, he saw that *a part of the remnant of the coat of Joseph was preserved and had not decayed. And he said—Even as this remnant of garment of my son hath been preserved, so shall a remnant of the seed of my son be preserved by the hand of God*, and be taken unto himself, while the remainder of the seed of Joseph shall perish, even as the remnant of his garment.
> BoM Alma 46:23 – 24

The use of the highly symbolic "remnant" of Joseph's coat of many colors was a brilliant use of metaphoric teaching. First, the cloth was woven by his father, Israel, the patriarch of this lineage, where it began. Then the coat was used to testify that Joseph was no more, that he had been removed from the company of his family, which is symbolic of Lehi's leaving the land of their inheritance for the Promised Land. A remnant of the coat was kept by his father and held sacred and kept so that it would not be destroyed. So shall the father preserve this remnant lineage that has been removed from their homeland.

The allegory of the Olive Tree is another example of the understanding that those included as the remnant seed are also those who share a common heritage or genetic relationship harkening back to the original stock.

> 12 Behold, I say unto you, that *the house of Israel was compared unto an olive-tree*, by the Spirit of the Lord which was in our father; and behold *are we not broken off from the house of Israel, and are we not a branch of the house of Israel?*
> 13 And now, the thing which our father meaneth concerning the *grafting in of the natural branches* through the fulness of the Gentiles, is, that *in the latter days*, when our seed shall have dwindled in unbelief, yea, for the space of many years, and many generations after the Messiah shall be manifested in body unto the children of men, then shall the fulness of the gospel of the Messiah come unto the Gentiles, and *from the Gentiles unto the remnant of our seed—*
> 14 And *at that day shall the remnant of our seed know that they are of the house of Israel, and that they are the covenant people of the Lord*; and then shall they know and come to the knowledge of their forefathers, and also to the knowledge of the gospel of their Redeemer,...
> 16 Behold, I say unto you, Yea; *they shall be remembered again among the house of Israel; they shall be grafted in, being a natural branch of the olive-tree, into the true olive-tree*.
> BoM 1 Nephi 15:12-14, 16

> 53 *...he has promised unto us that our seed shall not utterly be destroyed*, according to the flesh, but that he would preserve them; and *in future generations they shall become a righteous branch unto the house of Israel.*
> BoM 2 Nephi 9:53

Lehi's group was separated from the "natural olive tree" or broken off from the lands of their father's inheritance in the old world in coming to the Promised Land. In the latter days, long after the coming of Christ, this "broken" branch would again be grafted into the true olive tree, signifying that they will again be restored to their former status within the house of Israel, and be partakers of the promises made to their fathers.

When this happens they will simultaneously embrace the restored gospel of Jesus Christ according to the prophecies contained in the Book of Mormon and Doctrine and Covenants. Surely this will be a glorious time in the lives of all those who are true descendants of this righteous lineage. For the rest, we may also be partakers of the special blessing available through this lineage by living up to the covenants we have made in the gospel.

> 22 ...I will establish my church among them, and *they [the Gentiles] shall come in unto the covenant and be numbered among this the remnant of Jacob*, unto whom I have given this land for their inheritance;
> 23 And *they shall assist my people, the remnant of Jacob*, and also as many of the house of Israel as shall come, that they may build a city, which shall be called the New Jerusalem.
> BoM 3 Nephi 21:22-23

This scripture offers a clear differentiation between those that are the literal genetic descendants or the remnant, and those that are adopted in, or "numbered among" the house of Israel. Christ is indicating that there will be two distinct groups within the house of Israel, those that are the literal genetic remnants, and those that are "numbered among" them.

A final prophecy from the previous passage regarding the remnant people is that they will build the temple in the New Jerusalem, the land of their inheritance. They will be assisted by the Gentiles in this undertaking.

To give a quick overview of the prophecies and promises made to the Book of Mormon peoples, and their relationship with the Gentiles, the following condensed list is offered.

1. Lehi's group will be partakers of the blessings of Abraham, Isaac, Jacob, and Joseph
2. Lehi's posterity will not be destroyed but will survive
3. Nephi's group will be exterminated
4. The Lamanite group will continue on after the destruction of the Nephites
5. The Lamanites will "dwindle in unbelief"
6. The remnant Lamanites will be smitten and afflicted by the Gentiles
7. The remnant Lamanites will be scattered by the Gentiles
8. The Gentiles will bring the remnant the "stick of Judah" or the Bible
9. The Lamanites will lose the knowledge of their lineage
10. The Gentiles will discover the lineage of the remnant Lamanites
11. The Gentiles will bring the remnant Lamanites to a knowledge of their heritage
12. The remnant Lamanites will realize their ancestral heritage and lineage
13. The remnant Lamanites will come to the knowledge of the gospel
14. The remnant Lamanites will "blossom as the rose" and become again a mighty people
15. The remnant Lamanites will be "gathered in" to the lands of their inheritance
16. The remnant Lamanites will build the temple in the New Jerusalem, the land of their inheritance

ESTABLISHING WHAT WE MAY BE LOOKING FOR GENETICALLY THROUGH DNA RESEARCH

Before potential evidence can be found, an understanding of what might be expected must first be reached. If there were genetic indications from DNA studies supporting the Book of Mormon, what would they be? How would we know what they were, if we were to find them? What kind of DNA evidence would be necessary to demonstrate a plausible or possible connection between the claims of the Book of Mormon and DNA research? We must begin by stating what we might expect to find, defined as accurately as possible, based on the best information we have available.

Joseph Smith declared that the "the Indians" were literal [genetic] descendants from Shem's priestly lineage. Upon the occasion of a visit of an angel to him he writes:

> He [the angel] told me of a sacred record which was written on plates of gold. *I saw in the vision the place where they were deposited. He* [the angel] *said the Indians were the literal descendants of Abraham.* Ref 23

This claim by Joseph was made in 1835. Joseph consistently referred to the Native Americans in the North American areas wherein he was acquainted as "Indians" or "Lamanites," even interchangeably. He wrote that he received in vision knowledge of the location where the plates were deposited, then immediately relates that visionary location in New York with the Indians with which he would have been acquainted, making no distinction otherwise.

When understood in the light of his other revelatory statements from the Wentworth Letter and American Revivalist accounts, it is hard to imagine that Joseph thought the Indians he was referring to were not those of North America. He emphatically stated that "*the remnant are the Indians that now inhabit this country*" and "*the Book of Mormon is a record of the forefathers of our western tribes of Indians*" and "*by it, we learn that our western tribes of Indians, are descendants from that Joseph that was sold into Egypt…*"

Had the Prophet thought his use of the term "Indians" meant the descendants of the Mayan culture in Mesoamerica, it seems odd that he would not have distinguished them from the Indians with whom he was intimately familiar. If the North American Indians were in fact not the descendants of which he spoke, wouldn't Joseph have indicated so, directing his words to Central American peoples rather than simply stating "*Indians that now inhabit this country*," clearly indicating those with whom he had familiarity? Remember that he testified that he had learned these things by an angel of God. He was not stating his opinion. Joseph knew.

If the Native American people that Joseph was acquainted with were in fact the very descendants of Book of Mormon people, it would seem that this would be a good place to begin looking for possible genetic connections. We should be keeping a sharp eye out for any genetic evidence within the North American Indian populations that could lend support to Joseph's revelatory and prophetic statements. Of course we should also be looking for any genetic evidence anywhere in the Americas as well.

BoM mtDNA Lineage Sources

All of the Book of Mormon Mitochondrial DNA lineages stem from Lehi's wife Sariah and Ishmael's wife and daughters-in-

law, based upon what we know from the Book of Mormon.

Now that Lehi's lineage has been clearly established it would seem logical to simply look for "Hebrew" or "Semitic" DNA markers and make connections. However, several other factors are involved, complicating ways of distinguishing genetic lineages related to the Book of Mormon, and a drastic turn is about to take place.

The type of DNA used in the majority of articles about deducing population relationships and movements is mitochondrial DNA, which is passed maternally from mothers to their children. This being the case, Lehi's ancestry is of no practical importance to mtDNA based testing, rendering a knowledge of Lehi, Ishmael or Zoram's lineages irrelevant for direct mtDNA studies! Why would we have gone through so much trouble detailing Lehi's lineage if his DNA is irrelevant to these studies? Does this mean that this knowledge is of no use? Not necessarily, as these men's lineages may offer critical clues about the lineages of their wives.

The principle genetic contributors of consequence to the Lehite group would actually be Sariah and Ishmael's (unnamed) wife and their daughters and the wives of their two sons. These seven women's lineages are critical to forming mtDNA connections between them and Native Americans, and yet their genetic backgrounds are admittedly utterly unknown.

Is it then impossible to know anything about what DNA types or markers we could expect to find in the populations remaining from the Book of Mormon peoples? At the surface it would seem to be so, but can we know anything about their lineages at all? Actually, with further knowledge of the Jewish practices of marriage, we can know a substantial amount about their possible background lineages.

Could these women be expected to have derived from lineages similar to Lehi and Ishmael because of their marriage traditions and covenants?

Some have wondered about the genetic influence of the wife of Joseph of Egypt, Asenath, who was an Egyptian and also the daughter of Potipherah, priest of On. Egyptus, wife of Ham, through which the blood of Cain passed through the great flood, was the maternal source from whence Egyptians sprang. Many years before the time of Abraham, Egypt was invaded and conquered by a Semitic people known as the Hyksos. The Hyksos were in possession of the land of Egypt long before Joseph's era and his wife Asenath was of their priestly ruling class. Joseph Fielding Smith in *Answers to Gospel Questions* in 1966 provided important back-ground on this history.

> For many years proceeding the time of Abraham the descendants of Egyptus occupied and governed in Egypt. They extended their dominion into the land of Canaan and oppressed the people, but the time came when the people of Asia, who were of the Semitic race, rebelled and made war on the Egyptians and conquered the country, driving the original inhabitants farther south and up the Nile. These Semitic people known as Hyksos, or shepherds, for they had many flocks and herds, were in possession of the land of Egypt for many years before the time of Abraham. Their rule lasted for some five hundred years, and they were in possession of the land when Joseph was taken into Egypt. It was a Hyksos king who befriended Joseph and who was friendly with Abraham and Isaac. While these people occupied the land of Egypt, they were called Egyptians, although they were relatives of Abraham and Joseph, being descendants of Shem, the condition being similar to the early settlers in the United States. Ref 106

Asenath's Semitic mtDNA would have been passed down only through female children, not her sons Ephraim and Manasseh from whom Lehi descended. Therefore, Asenath's mtDNA wouldn't play a role in the mtDNA of Book of Mormon people. Both Ephraim and Manasseh would be endowed with Joseph's Y-chromosomal DNA, which is paternal in

nature and passed father to son, making both Lehi (from Manasseh) and Ishmael (from Ephraim) recipients of this paternal lineage.

An overview of Hebrew and Jewish marriage traditions is essential to a better understanding of the possibility of making a connection between their lineages and Native American lineages based on mtDNA.

Ancient Hebrew and Jewish Marriage Traditions

> 6 Therefore, *O Lord, thou hast forsaken thy people, the house of Jacob, because they be replenished from the east, and hearken unto* soothsayers like *the Philistines*, and they *please themselves in the children of strangers*.
>
> BoM 2 Nephi 12:6, quoting OT Isaiah 2:6

In this verse from both the Book of Mormon and the Bible, the Lord is displeased with the house of Jacob because, as it appears, they were replenishing, or having children with strangers from the east, such as the Philistines. This was looked upon as breaking their covenants of marrying within their kinship group.

Ancient Hebrew and Jewish marriage traditions are important in understanding the potential genetic relationship between Lehi and Sariah, and Ishmael and his wife and their families. Could either of their wives have been of a completely different genetic stock than their husbands? This does not seem to be justified when an understanding of these sacred rites is fully understood.

In ancient Jewish tradition, the bond between husband and wife in marriage was equated to that bond between Jehovah and his people. Prior to the time of Christ all marriages were "arranged" or "assigned" by the parents of both bride and groom in an agreement or "ketuba" which is a marital contract binding the groom to his future wife. These pre-arranged marriages were done with careful consideration to ensure that the couple would share common origins, especially a strong belief in the God of Israel. In her book *Beloved Bridegroom*, Donna B. Nielson describes the seriousness of this covenant.

> Besides the desired physical appearance, it was also *most important that a bride under consideration share common origins with her future husband and have a strong belief in the God of Israel. To marry outside of the covenant was to invite marital and spiritual disaster.* Ref 24

An example of the importance of finding a suitable mate is shown in the account of Abraham's quest to find a wife for his son Isaac. He sent his trusted servant, Eliezar, a very long distance to find Rebekah among his known kindred. Nielson then provides this insight.

> Later, when *Isaac himself* was a father, he likewise *stressed the importance of not intermarrying into the local Canaanite culture*. In Genesis 28:1-2, *Isaac charges his son Jacob to travel to Padan-Aram to marry from among his kindred*. In those days, cousins were considered to be ideal matches. Because there was already a common family loyalty and bond that assured compatibility on social and economic levels, it was felt that the new marriage would have increased stability.
>
> Only a disobedient and rebellious son would marry a woman of his own choice without the prior consent of his father. Whenever this happened, the results were never happy. *When Esau chose and married two Hittite women without consulting his parents, it caused Isaac and Rebekah great bitterness and grief of mind* (Genesis 26:34-35). *Such an action generally caused the son to lose his position of respect and authority in the family and often resulted in the forfeiture of the birthright and his role as a spiritual leader and patriarchal head.* Ref 24

Nielson's book gives several additional examples from the scriptures where intermarriage with non-Israelites resulted in family members being lost to other traditions. Certainly the marriages of Lehi and Ishmael to their wives were accomplished in the traditional manner, and since both were respected heads and patriarchs of their families, it is highly unlikely that either had broken the traditional covenants handed down from their

fathers. Thus, the most plausible marriage scenario is that both of these couples were of the same priestly lineages stemming from Shem and both were under the marriage covenant of fidelity to their kindred. It would be improbable for them to have done otherwise. The fact that Lehi sent his sons to obtain Ishmael's family so that they might have suitable wives who would share their common belief systems and lineage cannot be overstated.

Another notable Hebrew marriage custom or tradition is that of marrying nieces of deceased brothers (or siblings?). Certainly Abram (Abraham) desired to provide for his brothers daughter, and it was important that both of them shared such close familial and spiritual ties. This practice was obviously accepted as normal since Abram's brother Nahor married his other brother Haran's daughter Milcah.

> Now *Abram had two brethren, Nahor and Haran*: of these *Haran left a son, Lot; and also Sarai and Milcha his daughters*; ...These married their nieces. Nahor married Milcha [Milcah] and *Abram married Sarai*. Ref 5

Further confirmation of the importance of these ancient Jewish marriage covenants is clearly stated by Frank Moore Cross, a recognized expert in this field.

> The social organization of the *West Semitic tribal groups was grounded in kinship. Kinship relations defined the rights and obligations, the duties, status and privileges of tribal members... Kinship was conceived in terms of one blood flowing through the veins of the kinship group. Kindred were of one flesh, one bone*. Ref 25

The role of kinship in these ancient groups cannot be overemphasized. It played a part in nearly every societal and daily decision, but was especially important in relation to the marriage covenant.

What is the likelihood that either Lehi or Ishmael would have taken a wife from another lineage?

It is highly doubtful that either Lehi, Sariah, Ishmael or his wife were of African or Asian lineages based on what is known of ancient Jewish marriage customs, but it is acknowledged that it remains an uncertainty. While the genetic lineages of the founding populations of the Book of Mormon are not known with complete clarity and certainty, there are still important general inferences that can be made based on what is known from the scriptural indications of Lehi's genealogical background, and ancient Israelite marriage customs. What seems to emerge from what we know and what we can infer is that Lehi's group would be in today's genetic vernacular, a "European" group.

Their entire group was, in all probability, of the patriarchal lineages of Shem, forming the foundation upon which the majority of Book of Mormon related mtDNA was passed down. This is consistent with the ancient Hebrew and Jewish customs of not intermarrying with other lineages and maintaining marriage covenants within their own group, both religiously and genealogically.

Is the assumption that Sariah, Ishmael's wife and daughters-in-law are of the same lineages as their husbands substantiated by DNA studies of modern day Jewish populations? Is the ancient Jewish custom of marriage within one's kinship group still practiced today? Current DNA studies do support the fact that even today, with somewhat less stringent enforcement of the ancient marriage covenants among their groups, and with Jewish populations being scattered throughout the world among other geographic populations, they still tend not to intermix with their host populations.

Examples that support this conclusion are found in the genetic literature. In other words, Jewish populations do not tend to intermix significantly with their host popula-

tions, even though they are broadly scattered over the earth. These ancient rites and practices still effect their overall populations. As succinctly stated in his article, "Counting the Founders: The Matrilineal Genetic Ancestry of the Jewish Diaspora," Doron M. Behar describes how Jewish social and religious restrictions have affected admixture with their host Arab and Berber populations.

> Hence, the lack of U6 and M1 chromosomes among the North African Jews and the low frequency of Hg L(xM,N) lineages, *renders the possibility of significant admixture between the local Arab and Berber populations with Jews unlikely, consistent with social restrictions imposed by religious restrictions*. Ref 26

Although Jewish populations have been "scattered" or dispersed over the globe, they tend to remain genetically isolated from their host populations. In other words, they tend not to intermarry into the cultures wherein they live, but rather marry within their own culture. This causes their populations to be more cohesive internally and less dispersed into their host population. This is what would be expected and indeed this is what the DNA evidence bears out.

> Second, *despite their high degree of geographic dispersion, Jewish populations from Europe, North Africa, and the Near East were less diverged genetically from each other than any other group of populations* in this study. Ref 27

This is significant because this article is stating that the Jewish populations mentioned have not had significant intermixing; they are not found to be "diverging" much genetically from their own group, as is found in the other populations in this study.

> Indeed, *every Jewish population has a lower mtDNA diversity than any non-Jewish popu-- lation*. ...
> The *greatly reduced mtDNA diversity in the Jewish populations in comparison with the host populations,* together with the wide range of different modal haplotypes found in different communities, indicates female-specific founding events in the Jewish populations. Although we cannot be certain whether this occurred immediately after the establishment of the communities or over a longer period of time, *a simple explanation for the exceptional pattern of mtDNA variation across Jewish populations is that each of the different Jewish communities is composed of descendants of a small group of maternal founders. After the establishment of these communities, inward gene flow from the host populations must have been very limited. Jewish populations therefore appear to represent an example in which cultural practice—in this case, female-defined ethnicity—has had a pronounced effect on patterns of genetic variation.* Ref 28

This quote from *American Journal of Human Genetics* clearly provides the understanding that Jewish traditional marriage plays a vital role in their relationships with other populations and among themselves. In the quote, "female-defined ethnicity" can be more easily understood to mean that Jewish women tend to have children within their ethnic group, and not outsiders. This tendency provides a "pronounced effect" on their genetics.

It is clear that it was the Jewish cultural practice to marry within their kindred lineage (otherwise known as ethnic group) in ancient times, and that this practice is demonstrated through mtDNA analysis to continue today. It is therefore highly unlikely that either Lehi or Ishmael would have married outside of their kindred, and had they done so they most likely would have been stripped of their stature as patriarchs of their families as well as lost the calling of prophet.

Since it is highly probable that all of those sojourning with Lehi's group were of the same genetic stock stemming from Shem due to religious covenant making in marriage, their genetic signatures today would most certainly be classified by geneticists as "European" rather than Asian or African. This being the case, is there any DNA evidence anywhere in the Americas for an ancient European migration establishing a lineage that could potentially be related to the Book of Mormon's history?

Now that we have established that Lehi and Ishmael's wives had a high probability of being of their same lineage or ethnic group, what can we expect from the different Book of Mormon groups? Again, we are not looking for forensic type DNA evidence, but for plausibilities and probabilities.

The Lamanite genetic picture…

The importance of the marriage covenant provides a basis for understanding how the genetic makeup of Lehi's group may have been affected throughout the Book of Mormon. It is fundamental to understanding what DNA evidence would be expected to be found that might support its claims.

After arriving on the land of promise, about 589 BC, the families of Lehi and Ishmael lived together until the two eldest sons of Lehi, Laman and Lemuel, began to threaten their younger brother Nephi, who, because of his righteousness had been favored with many special blessings from the Lord and their father. They knew that Nephi was to rule over them (2 Nephi 5:19), yet they were the oldest sons and believed that they should be the rulers over all their families.

Fearing for his life, Nephi, and all those who would go with him, left the lands of their first inheritance and journeyed into "the wilderness" for an unspecified number of days (2 Nephi 5:7). There they established a place to live, calling it "Nephi" after their leader.

Those that remained with the more wicked brothers, Laman and Lemuel, had a curse placed upon them because of their rebellion against Nephi, and also because of their "transgression." This "mark" is described as a "skin of blackness" which would distinguish them visually from their lighter skinned counterparts which would tend to discourage intermixing of their posterity.

> 21 And he had *caused the cursing to come upon them*, yea, even a sore cursing, *because of their iniquity*. For behold, *they had hardened their hearts against him*, that they had become like unto a flint; wherefore, as they were white, and exceedingly fair and delightsome, that they might not be enticing unto my people *the Lord God did cause a skin of blackness to come upon them*.
>
> BoM 2 Nephi 5:21

> 6 And the *skins of the Lamanites were dark, according to the mark* which was set upon their fathers, which was a curse upon them *because of their transgression and their rebellion* against their brethren, who consisted of Nephi, Jacob, and Joseph, and Sam, who were just and holy men.
> 7 And their brethren sought to destroy them, therefore they were cursed; and the Lord God set a mark upon them, yea, upon Laman and Lemuel, and also the sons of Ishmael, and Ishmaelitish women.
> 8 And *this was done that their seed might be distinguished from the seed of their brethren*, that thereby the Lord God might preserve his people, *that they might not mix and believe in incorrect traditions* which would prove their destruction.
> 9 And it came to pass that *whosoever did mingle his seed with that of the Lamanites did bring the same curse upon his seed*.
>
> BoM Alma 3:6 - 9

What was the "transgression" spoken of in verse six and the "incorrect traditions" of verse eight? Why would the Lord want to keep the people of Nephi's group, or Nephites, from mixing with the people of Laman and Lemuel, collectively called the Lamanites? Could it be that the transgression made by the Lamanites was they were intermarrying outside of their lineage, which went against not only their marriage "traditions" but was considered a "transgression" against the Lord?

If the Lamanites broke their covenants and began to intermix with other populations already established on the Promised Land, most likely to have been of Asian or Mongolian descent according to DNA studies, how many generations would be necessary for their children to begin taking on the genetic traits of these other people? If these other people had features such as hair, eyes and skin that were dark, and they intermixed with people who have light features, what effect would this have on their children?

From a genetic standpoint, dark physical features such as hair, eyes and skin are typically dominant, while light features are generally recessive, making even first generation children born of such a union to have a high probability of exhibiting the dominant darker physical features. Such intermixing between the Lamanites and an Asian population with their own unique physical features could have created sufficient visual differences to make it easy to distinguish between a "Lamanite" and a "Nephite" by sight. Such may have been the case with the Lamanites, but it is not known specifically if Laman and Lemuel themselves incurred the curse or if it was their children or families that were primarily affected.

Certainly the Lord understands the mechanisms to alter DNA and has shown that making a change in someone's DNA can be nearly immediate, such as in the case of Cain himself receiving the dark skin "curse" after killing Abel his brother (Gen. 4:8-9, PoGP Moses 7:22). However, the genetic coding for skin coloration is only a miniscule change in the overall genetic information encoded in human DNA. This same effect could also be accomplished through natural means if intermixing was occurring between peoples with differing skin pigmentation.

It is much more practical when dealing with an entire population of people collectively for them to simply intermarry with another people. It is not only possible, but probable that such may have been the case with the Lamanites. When they broke their marriage covenant and began to mingle their seed with other nationalities, their children began to be able to be distinguished from their former primarily "light-skinned" lineage. While how this change occurred is not known from the Book of Mormon itself, such an affect is consistent with the natural laws of heredity and with ancient Israelite marriage customs.

How much of this intermixing occurred between the Nephites and the Lamanites?

As was discussed previously, during the first 500 or more years it appears that very little Lamanite infiltration occurred within the Nephite population, but the Lamanites may have been mixing to some extent with another population. That some mixing occurred is likely, but wholesale mixing with another population, as will be discussed, is unlikely. The first definite instances of intermixing from the text itself did not show up until within less than 100 years before Christ. There does not appear to have been significant outside mixing within the Nephite faction until this time. The following scriptural passages give us a few details.

> 15 But behold, *there are many books and many records of every kind, and they have been kept chiefly by the Nephites*.
> 16 And they have been handed down from one generation to another by the Nephites, even until they have fallen into transgression and have been murdered, plundered, and hunted, and driven forth, and slain, and scattered upon the face of the earth, *and mixed with the Lamanites until they are no more called the Nephites*, becoming wicked, and wild, and ferocious, yea, *even becoming Lamanites*.
>
> BoM Helaman 3:15 – 16, 49-39 BC

> 22 And those who were faithful in keeping the commandments of the Lord were delivered at all times, whilst *thousands of their wicked brethren have been consigned to bondage, or to perish by the sword, or to dwindle in unbelief, and mingle with the Lamanites*.
>
> BoM Alma 50:22; 72-67 BC

From these verses it is clear there were some Nephite defectors that left their group to become Lamanites. It does not appear to be widespread, although in verse 22 it talks about "thousands." However, these thousands are spread among all the different ways that they were removed from Nephite association; it does not say that thousands "mingled with" the Lamanites.

Did the Lamanites intermix with other populations?

Is there any way to discern how much the Lamanites may have intermixed with others? What clues do we have from the text itself?

From the books of Alma and Helaman we learn that, like the Nephites, the Lamanite group had also maintained records or oral histories of their ancestry and there were direct descendants who could trace their ancestry back to one of the founding individuals from Lehi's voyage. Of course this does not preclude mixing with other groups as somewhere along the line, and any number of times, mating between a literal descendant of Laman and an outsider could have occurred. As long as an unbroken linkage could be made back to a founder, such a claim could still be made.

> 21 And thus Ammon was carried before the king who was over the land of Ishmael; and his name was Lamoni; and *he was a descendant of Ishmael*.
> BoM Alma 17:21; 91 BC

Actual descendants from Ishmael within the "Lamanite" group were still known up to 91 years before Christ.

> 29 Now, among those who joined the people of the Lord, there were none who were Amalekites or Amulonites, or who were of the order of Nehor, but they were *actual descendants of Laman and Lemuel*.
> BoM Alma 24:29; 90-77 BC

Less than 100 years before Christ there were some who were "actual descendants of Laman and Lemuel."

> 3 Behold, two thousand of the sons of those men whom Ammon brought down out of the land of Nephi—now ye have known that *these were descendants of Laman*, who was the eldest son of our father Lehi;
> BoM Alma 56:3 about 66 BC

The two thousand stripling warriors, so loved by Latter-day Saints, knew that they were descendants of Laman.

> 23 I am Ammoron, and *a descendant of Zoram*, whom your fathers pressed and brought out of Jerusalem.
> BoM Alma 54:23; 63 BC

A literal descendant of Zoram is mentioned just 63 years before Christ.

> 4 And now it came to pass that when Moroni had said these words, he caused that a search should be made among his men, that perhaps he might find *a man who was a descendant of Laman* among them.
> 5 And it came to pass that *they found one, whose name was Laman*; and he was one of the servants of the king who was murdered by Amalickiah.
> BoM Alma 55:4 – 5: 63-62 BC

> 24 And it came to pass that in the eightieth year of the reign of the judges over the people of Nephi, there were a *certain number of the dissenters from the people of Nephi, who had some years before gone over unto the Lamanites*, and taken upon themselves the name of Lamanites, and also a *certain number who were real descendants of the Lamanites*, being stirred up to anger by them, or by those dissenters, therefore they commenced a war with their brethren.
> BoM Helaman 11:24; 20-6 BC

Among the Gadianton robbers were both Nephites who defected to the Lamanites and "real Lamanites" who apparently knew their ancestry back to Laman. This again allows us further glimpses into the demographics of this people at this time in their history.

In the text of the Book of Mormon, 6 BC is the last time that claims are made from the original Lamanite group of having descended from one of the founders of Lehi's group. Does the fact that no one claimed to be a descendant of these founders in the text of the Book of Mormon after this date indicate that they had mixed to the point of being indistinguishable from those with whom they had mixed? Certainly not.

It could mean any number of things, the most likely of which is simply that later authors did not include such detail in their records. It could also be that if the Lamanite ancestral histories were not written, but oral, and they could have become lost. There is any number of possible scenarios that could account for this lack of additional claims after Christ, but they all remain only speculation, which will not help our understanding. However, as we saw previously, there were Nephite records indicating a pure genetic lineage all the way up to the end of the Book of Mormon record.

> 20 *I am Mormon, and a pure descendant of Lehi...*
> BoM 3 Nephi 5:20

By this simple statement we know that a pure genetic lineage had in fact been presserved among the Book of Mormon peoples for over a thousand years! Had his ancestors mingled their bloodlines with those of the "cursed" Lamanite group or any other unknown group from the area, how could he have claimed to have a lineage that is "pure"? In other words, it appears that Mormon is revealing that his priestly lineage had kept its covenants in terms of marrying within his own kinship group up to that time and that such a heritage was known.

This is significant because it indicates that, in at least one small segment of the population, their genetic signatures would have been relatively unmixed with any other groups, continuing to expand this specific lineage over the course of a thousand years. This means one of the primary assumptions of those attempting to explain the lack of DNA evidence in Mesoamerica, that Lehi's group was a miniscule genetic drop in an ocean of Asiatic population, may not be the case after all.

At a rate of one generation every 20 years, Mormon's ancestors had been true to their ancient marriage customs for close to 50 generations. Certainly, this could not be considered a "drop in the bucket," but rather would represent a very significant contribution to the genetic lineages found on the American continent.

One note that must be made at this point regarding the terms "Nephite" and "Lamanite" as used at different times in the Book of Mormon. A well researched article on this subject was produced by Matthew Roper called "Swimming the Gene Pool: Israelite Kinship Relations, Genes, and Genealogy." He describes how these two terms specifically changed over its history to some degree. At the beginning the original founders, Nephi and Laman and those that followed them, were very cohesive familial groups with the overwhelming majority of their members being actual descendants from their founding members. As time went on, intermixing with others, defections from the Nephites, wars, prisoners, and times of peace caused substantial changes in the groups' familial, and thus genetic, dynamics.

However, it should still be conceded that even after the 200 years of peace, when the terms were more of a designation of faith than a declaration of ancestry, it could still very well have been that a majority of the members from each group had ancestry going back to their original groups. In other words, those whose ancestors had previously associated themselves with the Nephites, may have made up the majority of the newly formed "Nephite" group, and the same with the Lamanite group. They were originally, after all, aligned in a similar way, believing Nephites, and non-believing Lamanites. The new designations were not significantly differing from their original meanings, but were less genetically oriented, and more belief structured.

THE CASE FOR DNA EVIDENCE: POSSIBLE, PLAUSIBLE, OR PROBABLE?

What types of DNA markers might we reasonably expect to find from a population with the background of Lehi's group? The answer to this question can be quite complex, so we will begin from the most obvious.

First: We should expect to find DNA markers in the Native American populations consistent with known Caucasian lineages stemming from Shem at the very least. We would not expect to find significant levels of Asian or African DNA profiles within Lehi's group. Later admixture with an established Asian population could have diluted much of their unique DNA characteristics away, but probably not completely, skewing their genetic profiles heavily towards Asian lineages.

We would then expect to find profiles that were predominantly Asian, with lower frequencies of European markers among at least some populations within a large sampling. As a result of the three known genetic bottlenecks, even if there was a large Nephite or Lamanite population that did not intermix with Asian populations, it seems likely that their overall genetic contribution to modern Native American populations would be relatively small. If we were to find such "Caucasian" markers, termed "European" in DNA nomenclature, we could then make the claim that there is the potential for DNA evidence supporting the claims of the Book of Mormon. This would indicate that the Book of Mormon story is historically *possible*.

Second: To narrow it down further, we may hope to find DNA markers common to or consistent with those found more specifically among known Jewish or Israelite lineages. Should such DNA markers be found, we may be able to more reasonably claim that there is stronger evidence that actually favors the Book of Mormon position and that the Book of Mormon history is *plausible*.

Third: Additional refinements to the probabilities could include the following, each level becoming progressively more robust as evidence:

- If Native American markers consistent with progressively more specific lineages such as Semitic (good), Israelite (better), or Jewish (best) lineages were found and/or
- If such lineages could be shown to have existed in the correct region or area anciently and/or
- If such lineages were found to have existed near the time that Lehi left the old world and/or
- If markers were found linking Native Americans to a specific population from the same time frame and area from which Lehi's group left

If any or all of these refinements can be made, then a stronger case can be assembled and a more robust claim made that the Book of Mormon story may actually be *probable*. We must remember that without actual DNA samples from both a source and a control population, no one can make a claim of "proof" for or against the Book of Mormon. We are only dealing with probabilities here.

Genetic background of the other two Book of Mormon migration groups

What do we know of the genetic background of the two other groups spoken of in the Book of Mormon, the Jaredites and the Mulekites?

The Mulekites

Mulek was a son of Zedekiah (Helaman 8:21) who was a king of Judah in Jerusalem when it was conquered by Babylonian forces led by King Nebuchadnezzar in 586 BCE (2 Kings 25:7). His people, called Mulekites, left Jerusalem prior to its destruction and traveled by boat to the Promised Land. The Mulekite group shared a common ancestry with Lehi, Ishmael, and their group, in that Mulek was a son of the King of Judah, a Jewish royal lineage going back to Jacob (Israel), the father of both Joseph and Judah. The fact that Zedekiah was a Jewish King indicates that his lineage was not likely to have intermarried with non-Israelites, because had any of his fathers done so, they may have been stripped of their familial rights resulting in loss of their societal rights to authority within the Israelite community.

From a DNA perspective, they would have had DNA markers remarkably similar to Lehi's group in the general sense because they could both trace their ancestry back to Jacob or Israel, although from differing sons, Judah and Joseph. What we could expect from their genetic lineages is roughly similar to what we could expect from those of the Lehi group…that is that they should harbor some DNA markers consistent with Caucasian/ European, Israelite or Jewish lineages.

The Jaredites

The Jaredites consisted of several families that migrated to the Promised Land in enclosed ships or barges (Ether 2:16-17) near the time of the Tower of Babel (Ether 1:33). Their lineage and heritage is obscure. The Jewish historian Flavius Josephus, in his book *Antiquities of the Jews* written circa 94 AD, claims that it was Nimrod, the son of Ham that instigated the building of the tower and of "turning men from the fear of God" that ultimately caused the confusion of languages resulting in the great building project being thwarted.

> Now it was *Nimrod* who excited them to such an affront and contempt of God. He was *the grandson of Ham, the son of Noah*, a bold man, and of great strength of hand. He *persuaded them not to ascribe it to God*, as if it were through his means they were happy, but to believe that it was their own courage which procured that happiness. He also gradually *changed the government into tyranny, seeing no other way of turning men from the fear of God, but to bring them into a constant dependence on his power*... Now the multitude were very ready to follow the determination of Nimrod, and to *esteem it a piece of cowardice to submit to God*; and they built a tower,... When God saw that they acted so madly, he did not resolve to destroy them utterly, since they were not grown wiser by the destruction of the former sinners [in the Flood]; but he caused a tumult among them, by *producing in them diverse languages*, and causing that, through the multitude of those languages, they should not be able to understand one another. The place wherein they built the tower is now called Babylon, because of the confusion of that language which they readily understood before; for *the Hebrews mean by the word Babel, confusion*... Ref 5

Historical sources such as the works of Josephus and the Midrash teachings claim it was Nimrod that caused the building of the tower; however, other Rabbinical sources give a somewhat different account, stating only that he separated from those who were the builders. It is also unknown if the brother of Jared was of the same lineage as Nimrod or not. If so, then the Jaredite people may have been descended from Ham, if not, then we simply don't know what his lineage might have been.

Finding a European Lineage in the Americas

Getting back to the controversy over mtDNA findings we begin from the initial research conducted on Native American populations throughout the Americas that found that they all could be categorized into four primary haplogroups, identified as A, B, C, and D. All four of these "founding Haplogroups" were correspondingly found in native populations in Asia, lending support for the dominant theory of the peopling of the

Americas over the Bering Strait land bridge during the last ice age. Confirming this concept is an article in the journal *Science* in 1998.

> Researchers had already identified *four common genetic variants, called haplogroups A, B, C, and D, in the mitochondrial DNA (mtDNA) of living Native Americans* (*Science*, 4 October 1996, p. 31). *These haplogroups turned up in various Asian populations, lending genetic support for the leading theory that Native Americans descended primarily from these peoples*. But researchers also found a handful of other less common variants, *one of which was later identified as X*. Ref 29

The end of this quote makes reference to an interesting find among a handful of Native Americans that was originally thought to be an insignificant outlier and categorized as "other" for its markers were not found among the other four haplogroups.

> The remaining few Native Americans that do not exhibit one of these four haplogroups have been termed "others." Ref 30

It wasn't until DNA testing got underway in Europe and comparisons could be made with newly developed European DNA databases that it was discovered the set of markers found in this smattering of Native Americans were the same set of markers also found in some European populations.

This same article goes on to say:

> Anthropologists have long assumed that the first Americans, who crossed into North America by way of the Bering Strait, were originally of Asian stock. But recently they have been *puzzled by surprising features on a handful of ancient American skeletons*, including the controversial one known as Kennewick Man--*features that resemble those of Europeans rather than Asians* (*Science*, 10 April, p. 190). Now a new genetic study may *link Native Americans and people of Europe and the Middle East*, offering tantalizing support to a controversial theory that a band of people who originally lived in Europe or Asia Minor were among the continent's first settlers. Ref 29

This article started a firestorm of excitement and controversy among geneticists and archaeologists conducting DNA and archaeological research. They found that in a few ancient American remains there were features that more closely resembled Caucasian populations than Asian ones. This would be contrary to the dominant theory if these markers could not be found in the Asian populations, thought to be the source populations for the peopling of the Americas. Originally denoted "other," now this particular lineage received a designation: Lineage or Haplogroup X, which is technically defined as follows.

> Bailliet et al. (1994) suggested the possibility of a fifth haplogroup, defined by a C = T transition at np 16278 and the absence of the mutations that characterize haplogroups A, B, C or D. Haplogroup X is also characterized by *Dde* I site losses at np 1715 and np 10394, mutations that are otherwise rare in North America. Ref 30

Upon investigation it was initially found that no such markers turned up in Asia, suggesting that a separate migration may have taken place by an ancient European population into the Americas. The suggestion was made that a possible link had been found between European populations and Native Americans.

> The new data, from a genetic marker appropriately called *Lineage X, suggest a "definite -- if ancient -- link between Eurasians and Native Americans*," says Theodore Schurr, a molecular anthropologist from Emory University in Atlanta, ... Ref 29

Further investigation into the source population for this lineage found in Native Americans revealed that indeed, this was a European lineage, as this same set of mtDNA markers were confirmed in the European populations of Italians, Finns, and most interestingly for this research, Israelis. It was still not found in the source populations of Asia.

> Haplogroup X was different: It was spotted by Torroni in a small number of European populations. So *the Emory group set out to explore the marker's source. They analyzed blood samples from Native American, European, and Asian populations and*

> *reviewed published studies*. "We fully expected to find it in Asia," like the other four Native American markers, says Brown. To their surprise, however, *haplogroup X was only confirmed in the genes of a smattering of living people in Europe and Asia Minor, including Italians, Finns, and certain Israelis*. The team's review of published mtDNA sequences suggests that it may *also be in Turks, Bulgarians, and Spaniards*. But Brown's search has *yet to find haplogroup X in any Asian population*. "It's not in Tibet, Mongolia, Southeast Asia, or Northeast Asia," Schurr told the meeting. "*The only time you pick it up is when you move west into Eurasia*." Ref 29

What Native American populations have haplogroup X?

What Native American populations were found to have these markers, known today as Haplogroup X? The *American Journal of Physical Anthropology* published an article titled "Distribution of mtDNA Haplogroup X Among Native North Americans" in 1999 that reported finding the markers designating Haplogroup X in seven "unrelated language families."

Why is the fact that they are unrelated language groups important? If a group of populations share a common genetic ancestry, but their languages have had time to diverge one from another, then that gives some indication that this lineage existed a very long time ago—long enough that their languages had diverged from each other. Human language changes much more rapidly than does DNA. If the DNA is the same, and the languages have changed, then that DNA lineage must have arrived a very long time ago to give sufficient time for the changes and resultant diversity in languages.

These seven language families are today found throughout North America. The markers were found in highest concentrations in the Canadian Subarctic/Great Lakes region, the Southwestern region, the Southern Plains, and the Central and Northwest Coasts of North America. The broadest language group is known as Algonquian, which encompasses over 100 Native American tribal groups.

> *Haplogroup X* has now been reported in contemporary members of *seven specific unrelated language families* (Athapaskan, Algonquian, Kiowa-Tanoan, Wakashan, Plateau Penutian, Northern Hokan, and Siouan) which are *distributed throughout* markedly noncontiguous geographic regions of the *Canadian Subarctic/Great Lakes region, the Southwestern U.S., the Southern Plains and the Central and Northwest Coasts,... confirming its legitimacy as a founding haplogroup.* Ref 30

Such wide distribution then justified "X" being classified as a "founding haplogroup" taking its place with the other four founding groups. Today these remain as the five founding haplogroups: four Asian based bloodlines, and only one European based bloodline. Haplogroup X is the only founding European lineage in the Americas to date, and it is highly unlikely that any other "founding lineages" will be found, as there have now been tens of thousands of mtDNA samples taken from among every known Native American group. It requires large distribution to qualify for "founding" status, and there are simply no haplogroups with large distributions except these five groups. Of course things in science can change, but in this case it is very highly unlikely that any additional haplogroups will reach "founding" status. If there were other such founding haplogroups, they would already have been found.

The producers of the anti-Mormon DNA documentary completed their research near the end of 2002 and began distribution early in 2003. Not long before their DVD was completed, scientific journals such as the *American Journal of Human Genetics* and the *American Journal of Physical Anthropology* began publishing new findings from mtDNA sequencing that verified the existence of one lineage that had been found in Italians, Finns and Israelis, making it a "European" group. It was later verified to be among the Algonquian speaking Native American tribes in the Canadian Subarctic and Great Lakes region of

the United States, establishing it as a "founding haplogroup." This lineage was denoted Haplogroup X but was not recognized in the earlier Native American DNA results until DNA sequencing of Europeans got underway which provided a "link" that was previously classified as "other" among the Native American population.

Haplogroup X, Verified as an Ancient Founding Lineage

This European type mtDNA was initially thought to have been the result of recent admixture of Europeans with Native American populations which is known to have occurred after the time of Columbus. It became necessary to determine if this set of markers arrived in the Americas anciently or more recently, after the 1492 arrival of Columbus to the New World and the European explorers began their incursions. If it was found to be ancient, then this lineage could hold some tantalizing new clues to the peopling of the Americas.

Archaeologists submitted ancient remains for radiocarbon and mtDNA testing. Their findings confirmed that *not only was there a European type of DNA in the Americas, but it was in the Americas long before European exploration and settlement.* This verified the prehistoric presence of haplogroup X in North America.

> The most convincing evidence that haplogroup X is not the result of Viking or even more recent European admixture would be its presence in ancient Native Americans. *We confirmed the presence of Haplogroup X in one prehistoric sample* excavated at a site on the Columbia River near Vantage, Washington and *radiocarbon dated to 1,340* [+/-] 40 years BP [before present]. To the best of our knowledge, *this is the first evidence of haplogroup X in prehistoric America to be confirmed* using both control region markers and the diagnostic restriction site gain in the coding region. *This verifies a prehistoric presence of haplogroup X in North America* ... Ref 31

Later, another set of remains from west-central Illinois was tested, again confirming a pre-Columbian presence of haplogroup X in the heartland of America.

> ...*haplogroup X also have been found* in two individuals from the Norris Farms Oneonta burials, a *700-year-old cemetery in west-central Illinois*...the Norris Farms *sequences are virtually identical to those of modern Algonquians from the Great Lakes region confirmed to be members of haplogroup X*. Ref 3

These remains were recovered near what is called the Dixon Mounds about 40 miles east of present day Nauvoo, Illinois. This is also near the site of what has become known as the "Zelph Mound" (or archaeologically denoted as Naples-Russell Mound #8), from an event during Zion's Camp march, (see History of the Church Vol. 2:79-80) wherein Joseph Smith claimed to have received a revelation about the remains of a "white Lamanite" who died in one of the last battles between the Lamanites and Nephites and whose bones were found in an ancient burial mound overlooking the Illinois River.

Five specific mtDNA markers differentiate this lineage from other European lineages, and its existence in ancient North American native populations was verified by DNA sequencing of remains pre-dating European exploration and conquest. Remains radiocarbon dated to 1300 or more years before present were found to harbor this lineage; other ancient remains have confirmed that Haplogroup X was among the ancient American inhabitants of North America. To date, it is the only "European" lineage known to be a "founding" or primary genetic contributor to Native American populations.

Haplogroup X Not Found in Asia

A fundamental difficulty with this particular haplogroup when it came to conformity with the dominant Bering Strait theory of the peopling of the Americas is that any trace for its passing through Asia was missing. The theory had shown that all of the other four founding haplogroups could be traced back

into Asia as the theory would suggest; haplogroup X, however, was different. If the theory is correct, that all Native American populations came from or at least through Asia, there should be some genetic evidence left behind from such a long migration. It is thought that populations large enough to sustain a new civilization would mate with other populations along their journey, thereby leaving traces of their genetics along their path. However, at first, such a trace for haplogroup X appeared to be completely absent, unlike the other four founding haplogroups.

> *Haplogroup X is an exception to this pattern of limited geographical distribution*. It is found, generally at low frequencies, in both West Eurasians and some northern groups of Native Americans, but, intriguingly, it is *absent in modern north Siberian and East Asian populations*, which are genetically and geographically closest to those of Native Americans. Among Siberians, *haplogroup X mtDNAs have only been detected in some Altaian populations of southwestern Siberia*. Ref 32

After further investigation it was found that haplogroup X had indeed been located in the Altaian population of southwestern Siberia and critics of the Church again made a flurry of claims that this now proved that haplogroup X did come through Asia as was shown for the other founding haplogroups. Unfortunately, again they were premature, jumping to their conclusions.

> *To extend the survey of Asian mtDNAs for the presence of haplogroup X, we screened the mtDNAs of a total of 790 individuals for the RFLP markers that define this lineage.*
> *Haplogroup X mtDNAs were detected only in Altaians, at a frequency of 3.5%.*
> *It should also be noted that none of the Altaian X mtDNAs harbored the 225A variant, which is a marker for a major part of haplogroup X.*
> However, *the X mtDNAs that we detected in the Altaian sample do not bear the 16213A and 200G variants that are characteristic of most American Indian haplogroup X mtDNA.* Ref 33

This article in the prestigious *American Journal of Human Genetics* reports extensive surveying of the Asian mtDNA data, looking for traces of haplogroup X, which was found in a few Altaian samples. However, upon closer examination they were found not to have particular markers common to Native American haplogroup X carriers, and that their markers were more likely explained by a much later incursion of European bloodlines, making the Altaian group unrelated to the Native American groups.

> ...the few *Altaian and Siberian Haplogroup X lineages are not related to the Native American cluster*, and they are more *likely explained by recent gene flow from Europe* or from West Asia. Ref 32

An explanation for the detection of the Altaian haplogroup X was given in a 2005 article in the journal *Annals of Human Genetics*.

> Several "west" Eurasian haplogroups, including H, V, J, U4, U5, W, *and X*, were also detected. Their confinement to the southwest part of Siberia might be indicative of an Upper Paleolithic dispersal from the Middle East/southeastern Europe, the traces of which have not been erased by subsequent migrations and gene flow. Alternatively, a *relatively recent gene flow mediated by women of European/West Asian ancestry could have occurred at the time of the expanding Mongolian Empire*. Ref 34

The explanation given is that the haplogroup X strain found among the Altaians was most likely a result of the conquests by the Mongol warrior Genghis Khan who dominated this region between 1206 and 1405 AD. It was confirmed that the Native American haplogroup X mtDNA lineages were not derived from this group.

The Bering Strait theory is so prevalent that researchers were still trying to find some sort of trace in Asia, rather than accepting the idea that another (possibly European) migration had actually occurred. However, as of 2009, Haplogroup X is still not found in Asia, and continues to frustrate the theory, causing researchers to invoke the "it got lost" explanation.

> Unlike in the case of all other Native American haplogroups, *a close molecular counterpart for X2a has not been found in Asians*, suggesting that its X2 ancestor *became lost in Asians* after entry in Beringia, most probably because of genetic drift. Ref 35

In summary, haplogroup X was not initially found in modern populations of Asia, but in 2001 it was thought to have been found among Altaians in Mongolia. It was later shown not be directly related to the Native American Haplogroup X groups, but to have been possibly related to the conquests of Genghis Khan around 1206-1405 AD. No DNA matching with Native American haplogroup X has yet been found in Asia, indicating that it may have arrived via a different mode of transport than walking over the Bering Strait during an ice age, which is the current dominant theory of the peopling of the Americas.

Haplogroup X Distribution

Haplogroup X was found at highest frequencies among Native American Algonquian speaking language groups. These include such tribes as the Arapaho, Blackfoot, Cheyenne, Cree, Gros Ventre, Illini, Kickapoo, Lenni Lenape, Delaware, Lumbee, Mohican, Menominee, Sac and Fox, Miami, Micmac, Ojibwa, Shawnee, Sioux, Wiyot, and Yurok along with many others. This language group today consists of more than 100 individual tribes. It has also been found to be geographically widespread throughout nearly all of North America, present among groups that share no close historic or linguistic ties.

An article titled "Origin and Diffusion of mtDNA Haplogroup X" in the *American Journal of Human Genetics* in 2003 provided significant additional evidence of this relationship. It states that Haplogroup X could be separated into two distinct groups called clades, denoted as X1 and X2. X1 is restricted to North and East Africa, whereas X2 appears in greatest frequency in populations of the Near East and Mediterranean Europe. The article states that the Native American populations having the X haplotype derive from X2, the Mediterranean group, distinguished by a unique combination of five mutations. The article ends by stating that the subgroups of haplogroup X suggest that the Near East (which includes the Levant area and Israel) is the likely geographical source for the North American Indian X2 mtDNA lineages.

> The results of this study point to the following conclusions. First, *haplogroup X variation is completely captured by two ancient clades* that display distinctive phylogeographic patterns—*X1 is largely restricted to North and East Africa*, whereas *X2 is spread widely throughout West Eurasia*. Second, it is apparent that *the Native American haplogroup X mtDNAs derive from X2* by a unique combination of five mutations. Third, the few *Altaian and Siberian Haplogroup X lineages are not related to the Native American cluster*, and they are more likely explained by recent gene flow from Europe or from West Asia. Finally, phylogeography of the subclades of haplogroup X suggests that *the Near East is the likely geographical source for the spread of subhaplogroup X2*, and the associated population dispersal occurred around, or after, the LGM (Last Glacial Maximum) when the climate ameliorated. *The presence of a daughter clade in northern Native Americans testifies to the range of this population expansion*. Ref 32

The findings of this research article are compelling. The haplogroup X subgroup, denoted as X2, which stems from the Mediterranean area of Europe is the same type of haplogroup X that is found in modern and ancient Native Americans. The question then is how did the haplogroup X lineage get from the Mediterranean (region around Israel) to the Americas at least 800 years before Columbus and the ensuing European colonization?

> It is notable that *X2 includes the two complete Native American X sequences* that constitute the distinctive X2a clade, a clade that lacks close relatives in the entire Old World, including Siberia. Ref 32

Once haplogroup X had been discovered and its subgroup or "clade" brought out, a search for matching mtDNA X2 resulted in no exact matches with the subgroup. This suggested that it may have been in the Americas,

and evolved, over a still longer period of time, possibly dating much further back than 1340 years ago as indicted by the Kennewick man remains in Washington State. Without an exact match, but with close genetic relationships, haplogroup X must have arrived in the New World long enough ago to allow some changes, called mutations, to occur making this sub-lineage distinct from other haplogroup X lineages. Such changes could provide new clues to the arrival time of haplogroup X from the Mediterranean into the Americas.

> These findings leave *unanswered the question of the geographic source of Native American X2*a in the Old World, although our analysis provides *new clues about the time of the arrival of haplogroup X in the Americas*. Ref 32

Haplogroup X had been found in the mtDNA of Native American tribes distributed geographically over the entire North American continent, which provides additional clues as to when this lineage arrived in the New World. Such a wide dispersion of this lineage must surely indicate that it arrived long enough ago for it to have been dispersed among many populations in the Americas, an obvious sign that it came a very long time ago. However, it was not long enough ago that it spread throughout all the Americas as did the other four Asian haplogroups as will be seen.

> Although apparently sharing a matrilineal ancestor with the European haplogroup X at some point deep in time, *the Native American sequences formed their own branches independent of European representatives of haplogroup X*. The distribution of haplogroup X is also consistent with a pre-Columbian source. Though presently thought to be most common among speakers of Algonquian languages, *haplogroup X*, which reaches a frequency of 20% in some Algonquian populations, *is geographically widespread throughout North America among groups sharing no close historic or linguistic ties.* Ref 3

This article amazingly not only confirms that Haplogroup X is a "founding" American Indian or "Amerindian" group, but that it is geographically widespread throughout North America. It is found in highest frequency in the region surrounding the Great Lakes and the Great Plains, which is precisely where Joseph Smith sent the very first missionaries of the Church "unto the Lamanites" (D&C 28:8-9, 30:5-6, 32:1-3) with original copies of the Book of Mormon. It also establishes that this haplogroup or lineage did not come from Asia as Bering Strait theory would predict, as no matching Haplogroup X population has been found there to date.

The very latest results in mtDNA research reaffirm that haplogroup X2a continues to be restricted to North America. In a January 2009 article in *Current Biology*, LDS geneticist Ugo Perego confirms that haplogroup X2a is found primarily in the Great Lakes and Great Plains areas of North America.

> ... the latter *[X2a] being restricted to northern North America, with no instances detected south of the United States*. ...An analogous query for the X2a control-region motif confirmed that *this haplogroup is confined to northern North America, with a frequency peak in the Great Lakes area*. ... the other rare Native American haplogroup, *X2a*, despite a similar expansion time, *is restricted to northern North America, with a focus in the Great Lakes and the Great Plains regions*. Ref 35

In summary, haplogroup X, a known European based mtDNA lineage, is confirmed. It is found in high frequency in the Great Lakes and Great Plains areas among present day Native American Algonquin-speaking language groups, yet is widespread throughout North America, among distantly related groups. No European mtDNA lineages have been deemed as a founding lineage except haplogroup X. Two individual sets of remains from west-central Illinois, which is near where Joseph Smith's Zelph mound experience took place, were found to possess this European DNA lineage, again confirming haplogroup X's ancient, pre-Columbus and pre-Viking heritage. Also very importantly, modern Algonquin Indians from the Great Lakes area have nearly identical DNA sequences as those found in ancient burial mounds in Illinois.

Any Haplogroup X in Mesoamerica?

The question arises of whether or not DNA evidence for a Mesoamerican setting for the Book of Mormon exists. An article in *American Journal of Physical Anthropology* in 2005 provides additional insight. The article "Is Haplogroup X Present in Extant South American Indians" gives a stark answer: "The results indicate that *haplogroup X is not present in these samples*." Ref 36

This survey of 1,159 samples from 25 South Native American populations that include Central America, found no evidence for the presence of haplogroup X in Native South American populations. They are all members of haplogroups A through D; the Asian lineages found throughout the Americas. It goes on to state that up to the time of publication, "*haplogroup X has only been found in North America*." Ref 36 Thus, *no evidence for an ancient founding European lineage migration has been found in the native populations of Central or South America through DNA research and analysis*. This is the region generally accepted through consensus by the LDS scholarly community to have been the location of the lands of the Book of Mormon.

The study was conducted on 25 South Native American populations, looking for a particular haplogroup X distinguishing marker. Their results found no evidence for haplogroup X among these populations.

> *ABSTRACT: A total of 1,159 mitochondrial DNA samples* from two Mongolian, two Siberian, and *25 South Native American populations was surveyed for the presence of the C16278T mutation, frequently found in haplogroup X*. The tests involved all the control region, as well as the presence of characteristic mutations in seven coding fragments, totalling [totaling] 5,760 base pairs. *The results indicate that haplogroup X is not present in these samples*. Ref 36

The article continues by stating that haplogroup X is not restricted to Europe, but is found throughout West Eurasia, which comprises both Europe and the Mediterranean region. They also mention that because of its ancient arrival, and status as a founding lineage, it is anomalous that its distribution is restricted to North America.

> Despite some initial speculations that haplogroup X in modern Native North Americans may have its origin in Europe, *subsequent research found it actually widely distributed in West Eurasia*, although it is not yet possible to answer the question of the more exact geographic origin of this haplogroup in the Old World. *Its presence in ancient Native North Americans and its ancient coalescence time also helped to corroborate its position as a major founder haplogroup. However, this haplogroup has an anomalous distribution pattern in the New World, apparently being restricted to North America*. Ref 36

Finally, this article makes it clear that haplogroup X is a lineage that is not found in indigenous South American populations.

> The evidence presented here strongly supports the hypothesis that *haplogroup X is likely absent in modern Native South American populations*. Ref 36

Another 2005 article in *Hispanic American Historical Review* titled "Genetics and the History of Latin America" provides a second witness to the previous article. It contains a chart with the five founding haplogroups listed across the top, and Native American populations north of Panama down the side bar. It indicates that both contemporary and ancient Mayan populations, which are considered by most Mesoamerican theorists to be the most likely population to be descendants of the Book of Mormon, have zero percentage of haplogroup X, or any other European lineages among them. The ancient Maya (Quintana Roo) were primarily of haplogroups A (87.5%), C (8.3%), and B (4.2%), which are all Asian lineages. Are there any large indigenous populations in the Americas that have not yet had mtDNA testing performed?

> What can the geographic distribution of mtDNA variation teach us about the history of Latin America? *Thus far, scholars have studied genetic markers of indigenous groups in all major areas of Latin America,*

> *including South America, Central America, the Caribbean, Mexico, and the American Southwest, and they have found that haplogroups A, B, C, and D are widely dispersed throughout the hemisphere.* Ref 37

Every significant indigenous population in the Americas has now undergone DNA testing. While it may be possible that there remains some small, hidden population deep in a mountain jungle in Central America that has not yet been tested, it is highly unlikely. Such a small population is not what would be expected by a population group the size described in the Book of Mormon. We are not looking for a tiny, insignificant remnant because the Book of Mormon itself testifies otherwise. We are not looking for every indigenous people to have these lineages either, as set forth by the First Presidency in the change to the introduction page of the current Book of Mormon.

Haplogroup X, which is the *only* founding European lineage known to have occurred anywhere in the Americas anciently, is found only in Native American populations in North America, making it the most likely, qualified, or suitable candidate lineage for establishing a possible, plausible or probable case for the historicity of the Book of Mormon according to the findings of DNA research.

> Although *haplogroup X is now accepted as a pre-Columbian Native American haplogroup, controversy still surrounds its origin*. ... This has led to the hypothesis, fueled by morphometric studies of the Kennewick Man remains in Washington state and other Paleo-Indian remains, that *there was a prehistoric migration of Europeans to the New World.* Ref 3

Old World Populations having Haplogroup X mtDNA

What Old World populations have Haplogroup X mtDNA? Haplogroup X lineages have been reported in Europe and Western Eurasia, but what specific populations were they found in?

The Mediterranean Druze Population

A 2007 article in *BMC Evolutionary Biology* studying Saudi Arabian populations reported haplogroup X in high frequency among a population known as the Druze. The Druze population is found primarily in Syria, Lebanon, and Israel according to the Israel Central Bureau of Statistics.

The Druze is a religious order that has strict rules pertaining to many areas of its members' lives, including matrimony. They do not proselyte and the only method of becoming a "Druze" is by birth or through the death of a member, for which a replacement is permissible. An article in *PloS ONE* of May 2008 concludes that the "Galilee Druze" provide a "sample snapshot of the genetic landscape of the Near East prior to the modern age." According to geneticists, the Druze population is the sample population for Israel before the modern age, further strengthening the genetic connection between the old world populations of the Mediterranean and the American Indian populations of North America.

Who are the Druze and where are they located today?

> *The Druze reside primarily in Syria, Lebanon, and Israel,* with a smaller community in Jordan. *The Israeli Druze are mostly in Galilee (70%) and around Haifa (25%), the Golan Heights*...is home to about 20,000 Druze ... Ref 38

A study of 100 Saudi Arabian populations found that haplogroup X was present, and that the Israeli Druze population had a high frequency of this particular lineage. This was significantly different from the other Saudi Arabian populations sampled. The Israeli Druze is a Saudi Arabian population living in Israel within a roughly circular area between the regions of Galilee, Lebanon, and the Golan Heights, northwest of the Sea of Galilee.

> A total of 120 mtDNA Saudi Arab lineages were analyzed for HVSI/II sequences and for

> haplogroup confirmatory coding diagnostic positions.
> *…the Druze sample was significantly different* from all the other populations, *mainly because of a high frequency of haplotypes (27%) belonging to the minority haplogroup X* and to K (20%). Ref 39

No geographic origin had yet been found for Haplogroup X in the Old World. This article in *PLoS ONE* (Public Library of Science) suggests the Druze population as the potential source population for this lineage.

> *No population or geographic region has been identified to date, in which haplogroup X and its major subhaplogroups are found at both high frequency and high diversity,* which could provide a potential clue as to their geographic origin. *Here we suggest that the Druze population of northern Israel may represent just such a population.* Ref 40

The article then infers that the Druze population is unique because of its religious and social policies regarding marriage with those outside of their order. This is somewhat akin to the genetic findings of Jewish populations scattered abroad that don't tend to mix with their host populations.

> *The Druze population has a unique historyical, social and demographic structure, which is closely connected with their religion*. The contemporary Druze population constitutes a small minority *in four countries of the Near East: Syria, Lebanon, Israel and Jordan*. In total, the estimated population number is fewer than 1,000,000 in the Near East and fewer than 100,000 in the Druze Diaspora. *The Israeli Druze population is estimated at 150,000, and is distributed over three geographical sub regions: the Carmel, the Galilee, and the Golan Heights*. Ref 40

The Druze represent a small minority of the populations of the countries wherein they reside. These countries are Syria, Lebanon, Israel, and Jordan, which are all considered to be within the eastern Mediterranean or also known as the Levant region. This is the Holy Land area where much Biblical history took place. This is the exact area where Lehi's group departed from on their journey to the Promised Land according to the Book of Mormon. This population has genetic markers that match Native American markers today. The possibilities are intriguing.

> Conclusions: Our findings suggest that *the Near East maternal genetic landscape differed substantially in the past from its current structure, and was enriched in diverse lineages of the mtDNA X haplogroup*. These findings have been uncovered due to the *unique demographic features of the Druze population*, and the adjusted sampling method employed in the current study. *The combination of a high frequency and diversity of the Druze mtDNA haplogroup X lineages, in a confined geographic region, and the low migration rate with nearby populations make it unlikely that this diversity was imported. It is thus likely that the global diversity of this haplogroup evolved in the Near East* and adjacent *regions of western Eurasia*, during a long incubation period coinciding with and following the most recent out of Africa expansion as dated by mtDNA coalescence simulations. *The Druze population of the Galilee represents a contemporary refugium of this past genetic landscape*. Ref 40

This quote states that in the history of the Druze, haplogroup X lineages may have been enriched in their diversity, which could help to explain any differences in the subgroups of lineage X. They clearly state that the global diversity of haplogroup X likely began from the Near East (Holy Land and Israel) region. The Druze population of the Galilee gives us a sampling of this ancient genetic landscape.

> Abstract Conclusions: These findings were enabled through the use of a paternal kindred based sampling approach, and suggest that *the Galilee Druze represent a population isolate*, and that the combination of a high frequency and diversity of the mtDNA X haplogroup signifies a phylogenetic refugium, *providing a sample snapshot of the genetic landscape of the Near East [Syria, Lebanon, Israel and Jordan] prior to the modern age.* [before 1400 AD] Ref 40

Earlier the subhaplogroups of X, namely X1 and X2, were discussed. Haplogroup X is a unique group because it does not exhibit a geographic pattern as do the other

haplogroups. Another unique factor about the Druze population is that it has both X1 and X2 within its lineage. The explanation of this is that X subdivided within this group anciently.

> Unlike other mtDNA haplogroups, *X does not exhibit a geographic pattern*. Its major subhaplogroup X1 is widely dispersed throughout North Africa whereas *X2 is widespread from Europe to Northern America* but in very low frequencies. *Druze is the first population identified where both subhaplogroups are represented, and their diversity is high.* A proposed explanation for these results is that Druze of Galilee represent the "refugium" population where haplogroup X remained since ancient times when it was more frequent. Ref 41

Which, then, came from which? Did X1 come from X2 or vice versa?

> ...thus, *it cannot be completely ruled out that X1 is indeed a subset of X2* that reverted at both nucleotide positions. However, this possibility *appears very unlikely*, especially *when one considers the time depth* and the distinct *geographic distribution* of X1. Ref 32

It is still unknown which came first. The point is that the Druze population has both subsets of haplogroup X, which was highly surprising to those conducting this research.

In summary, the Druze population which is found in the Levant region around Israel has a high frequency of haplogroup X mtDNA. Their practice of intermarrying within their group rather than without is shown to have created a genetically isolated population (refugium) that has remained relatively unchanged over a minimum of 600 years.

It has been proposed that this population be used in the field of genetics as the "sample" genetic population of the Near East (Syria, Lebanon, Israel, and Jordan) prior to the modern age (roughly 1400 AD). This same population shares haplogroup X2 in common with Native Americans in North America. The Druze population presents a "snapshot" of the genetic landscape prior to this time. This is thought to be the source population from which the other haplogroup X lineages stemmed, such as the Northern Native Americans who share this lineage.

This is the area from which Lehi's ancestry arose and where he lived and preached prior to their departure to the Promised Land. The significance of the linking and interconnectedness of this ancient Holy Land region mtDNA lineage with Native North American populations cannot be overstated.

The Jewish Population and Haplogroup X: More Robust Evidence from the Mediterranean Area.

There is one aspect of the Druze population that may, however, be a little unsettling. They are not Jewish. The Druze are more closely akin to Arab, Lebanese, and Palestinian lineage groups. They most certainly would be considered to be able to trace their ancestry back to Shem, making them a "European" genetic group, but they are distinct from Jewish populations both by ancestry as well as religion. If the Druze haplogroup X lineage is the source of the Native American haplogroup X lineage, could their ancestry trace back to Jacob and Joseph, thereby linking Lehi and Ishmael's wives ancestry with the Druze? The answer to this is as yet unknown.

Further research into other Old World populations that have or "harbor" haplogroup X reveals even more startling possibilities for linking this lineage with Book of Mormon people. While the Druze have haplogroup X, but are not a Jewish population per se, haplogroup X has now been determined to be a primary mtDNA marker for many genetically known Jewish populations, including one very interesting one that harkens directly back to Lehi's time and place.

In a 2008 medically related article on the frequency of Type 2 Diabetes among Jewish populations from *BMC Genomics*, author Jeanette Feder outlines the 12 most

prevalent mtDNA haplogroups in Ashkenazi Jews, which is one of the largest Jewish population groups, and haplogroup X is among the 12 distinctive Jewish markers.

> Results: A total of 1,179 T2DM [Type 2 Diabetes] patients comprised of *three populations* (762 *Ashkenazi Jews* [Ash], 191 *non-Ashkenazi European Jews* [Seph], and 226 *North African Jews* [NAF]), were genotyped and assigned to different mtDNA haplogroups. Almost 90% of the subjects belonged to one of *the 12 most prevalent mtDNA haplogroups in Ashkenazi Jews*, i.e., K1, K2, U (non-K), H, V, J1, J2, T, N1b, I, *X*, W. Ref 42

Modern Jews in the following article in *PLoS ONE* in 2008 were divided into two groups: Ashkenazi Jews and non-Ashkenazi Jews. The Ashkenazi group ancestral lineages hearken back to Europe, while the non-Ashkenazi Jews have continuously resided in the Near and Middle East and North Africa where they had been scattered. The article again confirms that Jewish religious practices have had a profound effect on their mtDNA genetic histories. It also states that they are probably descendants of the Babylonian exile.

> *Contemporary Jews*, whose number is estimated at 13 million, *can be divided to Ashkenazi and non-Ashkenazi*, which are each in turn comprised of numerous different constituent communities. *Ashkenazi refers to Jews whose recent ancestry over the past millennium traces to Central and Eastern Europe. The geographically much more widespread non-Ashkenazi Jewish communities are also culturally more diverse, and are comprised of the Jewish communities that have continuously resided in the Near and Middle East and in North Africa and in different geographic locations to which Jews fled* or to which they were deported including the Iberian expulsion in 1492–1495. These communities also *share similar religious rituals*, probably due to their presumed common historical origin from the *descendants of the much earlier Babylonian exile*. As a result of common ritual practices, they are sometimes collectively referred to as the *Sephardic* (Spanish) or *Mizrahi* (Eastern) *Jews*. Ref 43

The Haplogroup X lineage has now been identified in Moroccan, Libyan and Tunisian Jewish populations, albeit with differing sub-lineages represented by X2b and X2e. In one article, ten out of twenty (50%) of Libyan Jews were reported to have haplogroup X2e.

> *One X2b Moroccan Jewish putative founding lineage* was analyzed using 2 complete mtDNA sequences. One putative founding lineage in Hg T2 was shared by Iraqi and Iranian Jews, and was assessed by two complete mtDNA sequences. *Two putative founding lineages* (one in Hg H and one in Hg *X2e*) *were shared by Libyan and Tunisian Jews*, and were assessed by the same complete mtDNA information. Ref 43
>
> The Libyan and Tunisian Jewish communities shared among them an X2e1a1a lineage as the most frequent. Ref 43
>
> *One-half of the Libyan Jews belong to a rare subclade of haplogroup X2e*, defined by a transition at np 15310, that is widespread in the Caucasus and Central Asia. Ref 44
>
> The maternal founding event in *Libyan Jews* is evident, as *39.8% of their mtDNAs could be related to one woman carrying the X2e1a1a lineage*, supported by an earlier observation, where *ten out of twenty Libyan Jews were found to share this haplotype*. Ref 43

Figure 2 in the article "Jewish and Middle Eastern non-Jewish populations share a common pool of Y-chromosome biallelic haplotypes," published in *PNAS*, in 2000, shows a dramatic demonstration of the closeness of the Druze population with several Jewish populations. The Druze are in the same quadrant as the majority of Jewish populations, including the Near Eastern Jews, Yemenite Jews, North African Jews, Kurdish Jews, and Roman Jews. This plot was based on Y-chromosome haplotype data from 29 populations made up of 22 non-Jewish and 7 Jewish populations.

> *The Ashkenazi, Roman, North African, Near Eastern, Kurdish, and Yemenite Jewish populations formed a fairly compact cluster* between the North African and European groups. This Jewish cluster was interspersed with the Palestinian and Syrian populations, whereas the other *Middle Eastern non-Jewish populations* (Saudi Arabians, Lebanese, and *Druze*) *closely surrounded it*.

> Of the Jewish populations in this cluster, the *Ashkenazim were closest to South European populations* (specifically the Greeks) and also to the Turks. *The close genetic affinity of Jewish and Middle Eastern non-Jewish populations was confirmed in population differentiation tests*. Pairwise comparisons between population groups indicated that *only 0.8% of the total genetic variance in Jewish and Middle Eastern non-Jewish populations was attributable to between-group differences*. Ref 45

The Druze population is in fact closely related genetically to Jewish populations. The Jewish population clusters were closely surrounded by the non-Jewish populations in this study such as the Druze. In other words, the Druze and Jews are genetically related if taken back enough generations in their ancestry.

The Iraqi Jews

The non-Ashkenazi (Levant or Holy Land area) Jewish populations make up some of the most ancient populations of this lineage group.

> *The Jewish communities of Iraq and Iran constitute the oldest non-Ashkenazi Jewish communities outside the Levant and were established during the 6th century B.C.E.* [Before Common Era, or more commonly 600 BC]. Ref 43

The oldest non-Ashkenazi Jewish communities outside of the Holy Land area were established about 600 BC and are primarily located in Iraq and Iran. Why would 600 BC and the lands of Iraq and Iran be significant?

Returning to the Book of Mormon and the account of Lehi we read.

> 13 And he read, saying: *Wo, wo, unto Jerusalem*, for I have seen thine abominations! Yea, and many things did my father read concerning *Jerusalem—that it should be destroyed, and the inhabitants thereof; many should perish by the sword, and many should be carried away captive into Babylon.*
> BoM 1 Nephi 1:13

> 18 Therefore, I would that ye should know, that after *the Lord had shown so many marvelous things unto my father, Lehi*, yea, *concerning the destruction of Jerusalem*, behold *he went forth among the people, and began to prophesy* and to declare unto them concerning the things which he had both seen and heard.
> BoM 1 Nephi 1:18

From this vision Lehi learns that Jerusalem is about to be destroyed by the Babylonians, and that they will carry many Jews as captives back to Babylon. Lehi went among the people of Jerusalem and proph-esied about what he had learned in vision. They did not believe him and sought his life (1 Nephi 1:19-20). Lehi then left with his family.

> 4 Yea, even *six hundred years from the time that my father left Jerusalem, a prophet would the Lord God raise up among the Jews—even a Messiah, or, in other words, a Savior of the world.*
> BoM 1 Nephi 10:4

Lehi and his family left Jerusalem, according to this verse, 600 years before the Messiah or Christ came, making the date of his departure 600 BC. Fourteen years later, the Babylonians, according to historical sources, did in fact destroy Jerusalem and its temple, carrying these very people that Lehi had prophetically warned with them back to Babylon, now known as the country of Iraq.

To answer the previous question about the significance of this date and location regarding the non-Ashkenazi Jewish populations that were established in Iraq and Iran, it is interesting that these populations may be the actual descendants of the very people to whom Lehi prophesied. This begs the question: Is there a Jewish population still remaining in Iraq, the location of the ancient empire of Babylon? And if there is, what mtDNA lineages do they have? An article published in the *American Journal of Human Genetics* in 2002 provides additional historical insight.

> *Iraqi Jews* are Jews who were born—or whose parents or grandparents were born—in Iraq; *Jewish tradition places the origin of this community in the exile following the destruction of the first temple in 586 B.C. Iranian Jews* are Jews who were born—or

> whose parents or grandparents were born—in Iran; the origin of the community is obscure, but *it is thought that it may be an offshoot of the Iraqi community.* Ref 46

This 2002 article clears up these questions by stating that there is such a Jewish population in Iraq, that they are thought to be the descendants of those that were taken captive from Jerusalem just as Lehi prophesied. This population does in fact harbor haplogroup X mtDNA. However, only one individual was sampled, resulting in haplogroup X1a rather than X2. No further information about this particular Jewish group is at present known. The extremely small sampling (one person) and the possibility of another population besides the Druze that may have both X1 and X2 clades of haplogroup X, leaves open the possibility of even closer genetic relationships between this population and Native North Americans.

TABLE 5. Distribution of mtDNA Haplogroups in 9 Israeli Populations

			Number of individuals in each mtDAN haplogroups																				
Populations	No. Ind.	No. Hap.	L0-L3	M	X	W	N1/I	R*	J	T2	U1a	U3	U6	U7	U5/U2	K	(preHV)1	pre*V	HV*	HV1	HV3	H*	H1
Ethiopian	21	17	8	7		1					1						4						
Ashkenazi	20	16			1	1	2		1	1			1	1	1	9		1	1				
Iraqi	20	17		1	1	1	1		3	4	1	6									1	1	
Libyan	20	13	1		10				1					1					1			4	2
Moroccan	20	19			2				3	1		1				1	1	1		3		4	3
Yemenite	20	18	1				1	1	2		3	2				2	2			4	2		
Samaritan	16	6								9			1	5								1	
Druze	20	17						1	2		1					4	1					7	4
Palestinian	20	19	2	2			1			2	2		1		1	1		1	2	2		3	

Native American haplogroup X2a is unique in that to date no matching lineage in the Old World has been found. However this 2009 article in *Current Biology* by LDS geneticist Ugo Perego clarifies that the Native American lineage is considered to be associated with the Old World "branches" of X2 that include X2b-X2f.

> *As for haplogroup X2a*, all but one of the sequenced mitochondrial genomes harbored the distinguishing X2a coding-region motif 8913-12397-14502. The exception was one of the Ojibwa sequences, which did not cluster either with *X2a or any of the known Old World X2 branches (X2b–X2f).* This novel X2 branch has been named X2g, and its presence in Native Americans most probably indicates an additional and very rare Native American founder. Ref 35

To summarize, haplogroup X has been established as a European lineage which has now been found throughout the Near East or Mediterranean area in both non-Jewish populations such as the Druze as well as the Jewish Ashkenazi, Sephardic, North African, Libyan, Iraqi, Moroccan and Tunisian groups. All of these groups hearken from the Holy Land area where Lehi, Ishmael and their families undoubtedly lived prior to their sojourn into the wilderness. It has been shown that the very people to whom Lehi preached and that were later a part of the fulfillment of Lehi's prophecy concerning their being taken captive to Babylon have descendants that today harbor haplogroup X mtDNA.

Now it can be said with confidence that modern North American Native peoples do in fact share a common lineage with Jewish populations stemming from the Mediterranean area of the Old World. This fact is inescapable according to mtDNA findings, and strongly supportive of the claims of the Book of Mormon. The significance of the correlations between multiple Jewish and non-Jewish populations in the Levant or Holy Land region with Native populations in North America through mtDNA backed research cannot be mistaken by those with an understanding of the Book of Mormon history.

A SUITABLE LOCATION

If we are to find DNA evidence that may potentially be related to the Book of Mormon, a critical factor that must be addressed is whether it is sought for in a correct location. What chance is there of finding DNA or other physical evidence in support of the truthfulness of the Book of Mormon if we are looking for it in the wrong place?

While the previously discussed LDS scholarly articles demonstrated excellent knowledge and expertise on the subject of genetic research, the arguments are based on an underlying deep-rooted belief that the Book of Mormon history occurred within the confines of Central, or Mesoamerica. This belief has resulted in dismissal of potential evidence supporting the Book of Mormon by the linking of ancient Mediterranean people with Native American populations in North America.

Overwhelming confidence that a Mesoamerican setting is beyond doubt or question has in fact caused some LDS groups and LDS critics to either ignore the obvious implications, or to do all possible to discredit the evidence. These implications are certainly detrimental to all the effort that has been expended in developing the Mesoamerican theories into what they are today.

The disappointment felt as a result of years of laborious study by dozens of highly educated individuals within the academic LDS community, where a general consensus was finally thought to have been reached cannot be underestimated. That this consensus may now be seriously challenged by "outsiders" may be unwelcomed by those within it. Anyone can understand how it must feel to devote so much time and effort into an idea, only to see it dismantled and a new paradigm take its place. Such is the nature of science and theories, which is why beginning from a firm foundation of truth is so crucial.

Since the scholarly consensus has been that Mesoamerica *is* the setting for the Book of Mormon, there may seem to be no perceived value in seriously considering alternative evidence in other locations. The published explanations already given for the lack of European lineages in the proposed geographies of Mesoamerica certainly apply equally to all other locations. In other words, it might be assumed that the case for DNA evidence for the Book of Mormon is closed.

Why would the LDS scholarly community seriously consider this or any new DNA related information, when they have clearly addressed the DNA issue and have concluded that there will most likely never be any evidence for or against the Book of Mormon? Their explanations certainly apply equally to North America as to Mesoamerica. Therefore, any information to the contrary may be viewed as insignificant or old news. Yet the research presented herein is very recent, very exciting news to the vast majority of Latter-day Saints.

It is hoped that this research will reopen the discussion on DNA evidence for Book of Mormon geography to allow a new model to be seriously considered, rather than simply attempting to discredit and criticize the model or its author; or is that to be expected from those who have put their reputations on the line for the Mesoamerica theories? With their help, this new information could transform the level of evidence and excitement throughout the membership of the Church. It remains to be seen whether the LDS scholarly community will look into this research with helpful objectivity, or utter contempt. It will certainly be interesting to see the response from the LDS scholarly community to this research either way. It is certainly hoped that objectivity and a spirit of helpfulness and willingness to take a new look at the information contained herein may be established, and that these newly forged relationships

might provide additional support for the truthfulness of the Book of Mormon. But that remains to be seen.

Haplogroup X in Ancient North American Populations

First, we must establish what ancient North American civilizations existed from which those who have haplogroup X today may have descended. The time period of the Book of Mormon, between 600 BC and 400 AD approximately, corresponds with what is known in archaeological time frames as the Early and Middle Woodland Periods, defined as 1000 BC – 0, and 0-500 AD respectively. Is there a highly advanced North American civilization that parallels the Book of Mormon time frame? The answer, surprisingly to most Latter-day Saints, is a resounding yes.

What mtDNA lineages are found among the descendants of the builders of the mighty ruins of Mesoamerica?

> Studying genetic markers in narrower regions has much to add to our understanding of history. Some tantalizing *patterns emerge in the case of Greater Mexico*, for example. *In the core regions of Mexico—roughly coterminous with the extent of Mesoamerica — haplogroup A predominates, with additional but smaller pe-centages of the other haplogroups*. DNA studies conducted among Nahua, *Maya*, Mixe, *Zapotec*, and *Mixtec populations show significant genetic similarities*. The similarity of haplogroup frequencies across these groups is remarkable if we bear in mind that *they represent all four major linguistic families of Mesoamerica*—Uto-Aztecan, Mayan, Mixe-Zoquean, and Otomanguean, respectively. Ref 37

Among the entirety of Mesoamerican populations, not one carries a known European mtDNA lineage or heritage. This is in addition to the fact that the majority of the mighty Mayan ruins of Mesoamerica do not date within the time frames of the Book of Mormon, but are considerably later. This evidence forms the basis of the attacks against the historicity of the Book of Mormon by anti-Mormon critics.

There is simply no genetic evidence in Mesoamerica in support of the claims of the Book of Mormon in this area, especially the prophetic claims that there will be a "remnant" of the house of Israel remaining on the land of promise in the latter days. It has been prophesied that the genetic remnant will be the people that build up the New Jerusalem in North America. It is the assumption that the Book of Mormon occurred in the proposed limited Mesoamerican settings, where no supporting evidence has yet been found, that drives the anti-Mormon groups continued attacks.

Thus the primary indigenous haplogroups in Mesoamerica are dominated by haplogroups A and B, with significant levels of C and minor levels of D. Haplogroup X, the only known European founding lineage, is conspicuously absent from any Mesoamerican or South American populations. Haplogroup X has, to date, only been found in North American indigenous populations.

Have any correlations been found with the actual remains in North America dating to the time frames of the Book of Mormon?

A civilization, known within the field of archaeology as the Hopewell people, was highly advanced, having a knowledge of astronomy, metallurgy, construction of large cities, and crop production. They built massive geometric earthworks that are the largest on earth, some of which are oriented toward astronomical alignments. They built massive burial mounds of earth to honor their dead and it is from these mounds that they began to be known. One such mound was discovered by the brethren on Zion's camp whereupon Joseph Smith had a vision of a "white Lamanite" in Illinois. This is known as the Zelph account in Church History.

They are called the Hopewell Mound Builders after Mordecai Cloud Hopewell on

whose land one of the first archaeological digs of this civilization was done. What has become known as the Hopewell interaction sphere broadly outlines their culture which stretched east to west from the Appalachian Mountains to Yellowstone, WY, and south to north from the Gulf of Mexico to the Great Lakes. This region is roughly known today as the Heartland of America. It is in honor of this special region of America that our new research of Book of Mormon geography was named the Heartland Model.

This highly advanced Hopewell civilization began to appear in the archaeological record between 300 and 200 BC, then by all archaeological accounts collapsed or ended rather abruptly between 400 and 500 AD. This corresponds closely to the time frames recorded in the Book of Mormon, with the exception that the Book of Mormon history began in the Americas somewhat earlier.

This slight discrepancy can be accounted for to a large extent by understanding that it would take time for Lehi's group to grow large enough to become detectable in the archaeological record. Their civilization has been shown by this author to have over 25 correlations with the Nephite culture of the Book of Mormon. This brief overview here is given for the purpose of background information only, and has been and will be treated in depth in other works.

The Algonquian speaking language groups that today harbor haplogroup X mtDNA are thought to have descended from a civilization that flourished in the heartland of America, but it is not known precisely whether the Algonquians arose from the Hopewell. However, it is known that the Algonquian language is one of the most widespread language families today, making it also among the first in North America, providing at least some possible correlations with the spread of haplogroup X. This fact is reiterated in an article in the *American Journal of Physical Anthropology* which briefly discusses the role of linguistic diffusion.

> *Algonquian is the most widespread of the three language families, extending beyond the Northeast into the Subarctic and the Plains and occupying nearly one-fourth of North America.* Ref 47

The linguistic and cultural expansion of the Algonquian language group is thought to have occurred between 2,600 and 1,500 years before present, which correlates to around 600 BC to 500 AD, another potential correlation with the Book of Mormon timeline.

> Although using linguistics to date events is somewhat rudimentary, this migration is proposed to have occurred ~3,000 BP [Before Present] (Denny 1989, 1991), and to have been followed by a *linguistic, and likely cultural, expansion of Algonquians between 2,600 and 1,500 BP*... Ref 47

This is a truly amazing correlation with the Book of Mormon record. This non-LDS 2008 article used linguistics to provide a rough estimate of the rise of this language group by the ancestral Algonquians, resulting in an approximate date of 600 B.C to 500 AD. That is incredibly close to a match with the timeline of the Nephites in the Book of Mormon record.

Did the Ancient North American Hopewell Mound Builder Civilization have Haplogroup X DNA?

Astonishingly, the Hopewell civilization, the most likely candidate civilization in North America that dates to the correct time frame to be associated with the Book of Mormon's Nephite culture and has been shown to have 25 correlations with it, also carried within its mtDNA haplogroup X! A 2008 article in the *American Journal of Physical Anthropology* completed the first ever sequencing of remains of Hopewell Mound Building people, and amazingly found the haplogroup X lineage. This alone should make the Hopewell Mound Building civilization the most likely candidate civilization anywhere in the Americas to have been associated with the Book of Mormon. This is the target civilization to have been the Nephites by the Heartland

Model geography for the Book of Mormon as it has been proposed.

> *Haplogroup X has been detected in 3% of individuals from a Middle Woodland Hopewell site in Illinois (1,825–1,625 BP [Before Present]; Bolnick and Smith, 2007) and 6% of the Norris Farms individuals* (Stone and Stoneking, 1998). Yet, _700 years later, it is at extremely high frequencies in some Northeastern populations (50% in Minnesota Chippewa). Haplogroup X does, however, exhibit a relatively high level of haplotype diversity, more than might be expected to accumulate from recent (\100 years of) growth and diversification. *Thus it is more likely that haplogroup X was present at higher frequencies in other prehistoric Northeast, or neighboring, populations and has gone undetected.* Ref 47

These mtDNA remains of the Hopewell civilization were radiocarbon dated to 1825-1625 years BP (before present), making them correlate to 183 AD and 383 AD respectively. These dates, of course, directly correlate with the Nephite civilization after the time of Christ, when we know there still existed "pure" descendants of Lehi, as claimed by Mormon (3 Nephi 5:20). This landmark article makes a direct genetic connection between the ancient Hopewell people who lived in the Heartland of America during the time frame of the Book of Mormon, and ancient genetic lineages from the Mediterranean area, just as would be expected from the Book of Mormon's historical account.

No other civilization anywhere in the Americas can make such a claim at this time. It is also very interesting to note the last sentence of the previous quote. The implication is that haplogroup X was more prominent in other ancient populations, but thus far only these few remains have been sequenced.

The Most Important Point

The fact that haplogroup X has been found at any frequency is the most important point because it establishes positively that this lineage was in fact in North America during the time frame of the Book of Mormon. No other model ever proposed for the geography of the Book of Mormon has the level of potential evidence provided through DNA as the Heartland Model.

To summarize this section we go back to the questions and review the case for DNA evidence: Possible, Plausible, or Probable?

It was determined previously what types of DNA markers we might expect to find. The following table presents what we have thus far.

Expectations from the Book of Mormon and this genetic research

Native American (Remnant) Population	Verified? Yes	Verified? No
European (Caucasian) DNA lineage markers found in modern Native American population(s)	**X**	
High Frequency of Asian DNA markers found among Native American populations	**X**	
Small Percentage of European DNA in overall Native American populations	**X**	
DNA in Native Americans that correlates with Mediterranean lineages	**X**	
European/Mediterranean DNA verified to have existed anciently in Native American populations	**X**	
European/Mediterranean DNA verified in remains in America within the archaeological time frame of the Book of Mormon	**X**	
European/Mediterranean DNA verified in remains of the Hopewell Mound Builders, the target civilization suggested to have been the Nephite culture by the Heartland Model	**X**	
European/Mediterranean DNA remains arriving in America near 600 bc		**Not yet**
Old World (Source) Population		
European (Caucasian) DNA markers in the Mediterranean area	**X**	
DNA lineage that can potentially be a source population for Native North American populations	**X**	
DNA lineage from a Semitic population that is associated with Native North American populations	**X**	
DNA stemming from Jewish populations that is associated with Native North American populations	**X**	
DNA lineage verified to be ancient and existing at the time Lehi left Jerusalem	**X**	

DNA DATING

Since haplogroup X2 mtDNA really did come from European/Mediterranean ancestry, what have we established?

- X2 has been found in the ancient remains of people who existed during the time of the Book of Mormon in America
- It exists in modern day Native Americans as prophesied according to scripture
- It is on the Promised Land understood to be the United States of America according to prophesy
- It is where Joseph Smith claimed it would be, and where he and the Lord sent the first missionaries "unto the Lamanites."

Why then couldn't it be supporting evidence for the Book of Mormon…from Lehi's group?

Haplogroup X mtDNA dating techniques

The primary remaining obstruction for haplogroup X to be evidence in support of the Book of Mormon is its dating. When did this lineage arrive in America?

The most significant objection to the discovery of Haplogroup X being related to the Book of Mormon is its published time of arrival in the Americas, which states that it arrived long before the Jaredites and Lehi's group. Critics of the Book of Mormon and some LDS scholars alike have taken issue with haplogroup X potentially being related because of this dating. Next we will explore in detail the foundational basis for DNA dating, how the dating is accomplished, what the results were and are, and why there is currently such a controversy concerning dating with mtDNA.

This section will deal directly and in depth on this subject, because it is the primary barrier to making probable correlations between DNA findings and the historical authenticity of the Book of Mormon record. There have been those in both the LDS scholarly community as well as those who are critics of the Book of Mormon who seem to be utterly unaware of the DNA dating debate happening at the very time of this publication.

It is the belief of this author that all truth springs from one source, the Lord. The foundational sources that He has provided as a guide for us are the revelatory words of the scriptures and the prophets. We must first gain perspective from this basis before moving on to the dating techniques of mtDNA.

The Scriptural and Prophetic Basis of Earth's Age and Creation

> The Church? The Church? *What is "the Church?" And what difference does it make whether the Church takes a position on anything or not. The important thing is that God has taken a position on everything and it is up to you to find out what it is.* Ref 48

This sage advice from President Harold B. Lee gives us a clear perspective on whether or not the Church must take an "official position" on everything before we can know what is the truth, or God's position. Certainly God knows all truth, so it is by coming to an understanding of his position that we can also find the truth.

How can we know God's position? The most practical method is through the scriptures and the teachings of his prophets. Study, research and pondering can lead to further understanding and towards truth. Surely a person can gain additional insights and knowledge by study and also by faith as

the Lord has commanded. Beyond that, personal revelation can certainly be gained; however, it is just that…personal. The author hereby makes no claim to have received revelation for the Church on this matter. The words of the Lord are given by the Lord for each of us to either:

- acknowledge and accept
- put on "hold" waiting further knowledge
- defend or justify our present position
- or reject.

The following are His words through the scriptures and His mouthpieces, the Prophets. These verses and quotes are not raised to cause contention, but to establish a base line for understanding this section on dating, which is fraught with the "theories of men." The author and many thousands of Latter-day Saints believe those theories are irreconcilable with our interpretation of the scriptures and the words of the prophets. For clarity, the author would restate his position from the commencement of this work.

The position of the author of this work is that when there is an inferred conflict between scientific theories and scriptural truths, the scriptures will always be demonstrated true, and the theories of men, put forward through science, will eventually conform to the truths of the gospel, not the other way around. Of course error can be made in the interpretation of scripture. There are some who strain at interpretations while ignoring or disregarding the more obvious overarching messages and meanings.

When the scriptural truths are clear without having to strain at interpretations and also supported by prophetic or revelatory understanding, and they still cannot be reconciled with the current theories of science, then it should be understood by most LDS faithful that eventually the scientific theories will be altered to comply to and harmonize with God's truth—even if that means that the understanding comes in the next life. The theories (beliefs) of men that don't harmonize with the truths (facts) of God are in error and are subject to alteration.

Modification or rejection of theories that are demonstrated to be false by empirical (experimental) evidence should be a foundational understanding of science. Unfortunately, this is not always the case in scientific endeavor, as will soon be seen. God's facts are not subject to alteration by the theories of men in order to reconcile them. It is scientific theories that are subject to alteration by God's facts in achieving reconciliation.

It is also understood that there are those who feel that the following scriptures and prophetic quotes can be harmonized using different interpretations, and that overly literal interpretations are potentially harmful to proper understanding. To those we extend our sincere compliments at having achieved peace in reconciling scriptural interpretations with your other beliefs. Everyone is entitled to their best understanding of the Lord's words for them. It is hoped that more literal and potentially differing scriptural interpretations and beliefs will be given the same courtesy and respect.

To the scriptures…

> 19 For *in six days the Lord made heaven and earth*, and the sea, and all that in them is; wherefore the Lord blessed the sabbath day, and hallowed it.
> BoM Mosiah 13:19

> 11 For *in six days the LORD made heaven and earth*, the sea, and all that in them is, and rested the seventh day: wherefore the Lord blessed the sabbath day, and hallowed it.
> OT Exodus 20:11

> 17 *It is a sign between me and the children of Israel for ever: for in six days the Lord made heaven and earth*, and on the seventh day he rested, and was refreshed.
> OT Exodus 31:17

At least three times in the scriptures we read that in six *days* the Lord made the heaven and earth. All words have meaning,

including the use of the word "day" in the all the above scriptures. It can be defined as the period of time for a planet to make one complete revolution upon its axis. This definition applied to this earth is a period of 24 hours, according to man's time. The Book of Abraham in the Pearl of Great Price establishes the relationship between the "Lord's time" and "earth time."

> 4 And the Lord said unto me, by the Urim and Thummim, that Kolob was after the manner of the Lord, according to its times and seasons in the revolutions thereof; that *one revolution was a day unto the Lord, after his manner of reckoning, it being one thousand years according to the time appointed unto that whereon thou standest. This is the reckoning of the Lord's time, according to the reckoning of Kolob*....
> 9 And thus there shall be the reckoning of the time of one planet above another, until thou come nigh unto Kolob, which *Kolob is after the reckoning of the Lord's time*; which *Kolob is set nigh unto the throne of God to govern all those planets which belong to the same order as that upon which thou standest.*
> PoGP Abraham 3:4, 9

From these scriptures in Abraham we learn that the reckoning of time that the Lord is using is that of the planet Kolob, which was set to "govern" all the planets that are a part of the same "order" as the earth. In the period of time that it takes the planet Kolob to make one complete revolution (its "day"), the earth will have completed 1,000 revolutions around our sun (its "year"). Thus, 1,000 years on earth equals 1 day for Kolob. Why would the Lord have provided these scriptures if he wanted us to disregard what they are clearly stating? This explicitly defines the length of time that the Lord used to make the heavens and the earth.

The prophet Joseph Fielding Smith is in agreement with the scriptures when he states:

> *This earth was created on the Lord's time,* which is celestial time. *By revelation we know exactly the nature of that time, and just how many days of celestial time were required to create this earth.* Moreover, *we know how long this earth has endured, approximately, and how long it will endure according to our present rate of reckoning.* Ref 49

In his statement, the Prophet Joseph Fielding Smith makes an undeniable claim that the scriptures are literal and that we know the number of days that were required to create this earth. In the following verse from the Doctrine and Covenants, the Lord clarifies for Joseph Smith the relationship between the creation's "six days" and the earth's "seven thousand years."

> ...as *God made the world in six days*, and on the seventh day he finished his work, and sanctified it, and also formed man out of the dust of the earth, even so, *in the beginning of the seventh thousand years will the Lord God sanctify the earth, and complete the salvation of man...*
> D&C 77:12

Joseph Fielding Smith again comments on these scriptural passages.

> Here we have the *Prophet comparing the days of creation with seven periods of 1,000 years each, corresponding to days, according to the Lord's time, in harmony with the teaching of Abraham and the other scriptures.* The *earth's temporal existence, according to this, is to endure for just one week, or seven days of 1,000 years each.* Moreover, since the earth was built according to the celestial time, which is the Lord's days, *which he clearly defined to Abraham, we can hardly be justified in trying to harmonize the days of creation with the extended periods of millions of years according to the reckoning of the so-called scientists.* Both from the Bible and from the Book of Doctrine and Covenants, we know that the flood came in the year 1600 from the driving of Adam out of the Garden of Eden. We know that Abraham was living in the days of Shem, son of Noah, if not in the days of Noah himself. *Profane history corroborates the history of Israel and Abraham. So a man is willfully blind who would push these days back tens of thousands, much less, hundreds of thousands of years.* Ref 49

The Prophet Joseph Fielding Smith spoke plainly for all who will listen. Nevertheless there will always be those that will strain at the prophetic meanings, offering their

own interpolations to assist in conforming to their own personal beliefs. Dates reaching back past 6,000 years for human history are not in agreement with the clear message of the scriptures and the prophetic messages, as viewed by this author.

Again, it is recognized that there are those who will take such literal interpretations as foolishness that shows a profound lack of understanding of the principles and understandings of science. To those, the author humbly submits that his knowledge is in fact, foolishness before the Lord's knowledge, and therefore is subjugated to it. The author does not attribute his position as having a lack of knowledge, but rather a profound faith that the Lord's words are correct, immutable, and eternal.

It is freely admitted that there are many things that appear difficult to reconcile with a proposed "young" age of the earth, but this is tempered by the hope and faith that one day all these things will become known and the author believes that we will find that God and His prophets were right all along, and the philosophies of men were in error, when that day comes.

According to a revelation given to Joseph Smith the Prophet, at Hiram, Ohio, March 1832, the Prophet wrote:

> In connection with the inspired translation of the Scriptures, I received the following explanation of the Revelation of St. John.
>
> D&C 77:Heading

> 6 Q. What are we to understand by the book which John saw, which was sealed on the back with seven seals?
>
> A. *We are to understand that* it contains the revealed will, mysteries, and the works of God; the hidden things of his economy concerning *this earth during the seven thousand years of its continuance, or its temporal existence*.
>
> 7 Q. What are *we to understand* by the seven seals with which it was sealed?
>
> A. We are to understand that *the first seal contains the things of the first thousand years, and the second also of the second thousand years, and so on until the seventh*.
>
> D&C 77:6–7

And once again the prophet Joseph Fielding Smith offers these words of plainness for additional clarification.

> *Here is a definite statement by revelation to us that this earth will go through 7,000 years of temporal existence*. Temporal, by all interpretations, means passing, temporary or mortal. This, then, has reference to the earth in its fallen state, for the earth was cursed when Adam, who was given dominion over it, transgressed the law. Before that time this earth was not mortal any more than Adam was.
>
> *We have evidence beyond dispute that Adam was driven out of the Garden of Eden about 6,000 years ago, or perhaps a short time less. It is possible for us, by using the Bible chronology and that given by the Lord in the Book of Mormon and Doctrine and Covenants to figure this almost accurately.* Ref 49

> 17 *Who shall say that it was not a miracle that by his word the heaven and the earth should be; and by the power of his word man was created* of the dust of the earth; and by the power of his word have miracles been wrought?
>
> Mormon 9:17

The Lord knew that at some point in time men would begin to disbelieve His holy words and begin to question His power and ability to accomplish His "great and marvelous" works. This must have been the reason that he gave so many warnings to his children in the scriptures to beware of the "philosophies of men."

> 28 O that *cunning plan of the evil one*! O the vainness, and the frailties, and the foolishness of men! *When they are learned they think they are wise, and they hearken not unto the counsel of God, for they set it aside, supposing they know of themselves*, wherefore, *their wisdom is foolishness* and it profiteth them not. And they shall perish.
>
> BoM 2 Nephi 9:28

> 42 And whoso knocketh, to him will he open; and the wise, and the learned, and they that are rich, *who are puffed up*

> *because of their learning, and their wisdom*, and their riches—yea, they are *they whom he despiseth*; and save they shall cast these things away, and *consider themselves fools before God*, and come down in the depths of humility, *he will not open unto them.*
>
> BoM 2 Nephi 9:42

> 26 Therefore, *I will proceed to do a marvelous work among this people*, yea, a marvelous work and a wonder, *for the wisdom of their wise and learned shall perish, and the understanding of their prudent shall be hid*.
>
> BoM 2 Nephi 27:26

> 8 Behold, *great and marvelous are the works of the Lord*. How unsearchable are the depths of the mysteries of him; and *it is impossible that man should find out all his ways*. And no man knoweth of his ways save it be revealed unto him; *wherefore, brethren, despise not the revelations of God*.
> 9 For behold, by the power of his word man came upon the face of the earth, which *earth was created by the power of his word*. Wherefore, if God being able to speak and the world was, and to speak and man was created, *O then, why not able to command the earth, or the workmanship of his hands upon the face of it, according to his will and pleasure*?
> 10 *Wherefore, brethren, seek not to counsel the Lord*, but to take counsel from his hand...
>
> BoM Jacob 4:8-10

The prophet Joseph F. Smith raised his prophetic voice to warn us of teachings and teachers that disbelieve the inspired accounts of the scriptures.

> *Some ... limit the power of God to the power of men, and we have some of these among us and they have been among our school teachers. They would have you disbelieve the inspired accounts of the Scriptures ... but we know better... . And I say, beware of men who come to you with heresies that things come by laws of nature of themselves, and that God is without power.* Ref 50

Speaking on the subject of organic evolution, the prophet Joseph Fielding Smith declares again that what the Lord has revealed supersedes the theories of men, specifically pointing out the theory of evolution. He acknowledges that it takes faith to believe in the scriptures over men's theories.

> *If men prefer to believe the strong delusions taught by evolutionists, rather than what the Lord has revealed, we cannot help it, but it certainly shows in them a lack of faith*, which is not to their credit. Ref 49

He then goes on to warn that there may come among us those who are not content to simply teach the theory of evolution, even in our Church schools, but who will try to indoctrinate students into a belief in evolution, which he claims are "theories and nothing more." This quote is taken from a book authored by President Joseph Fielding Smith called, *Man, His Origin and Destiny*.

> *These theories* [of organic evolution] *taught in our schools should be taught only as theories for they can be nothing more. Unfortunately as previously said, they are presented by many instructors as though they were well established facts*, with a positive assurance that belongs only to established truth. Between *belief in God and the fact that he has directed and does direct his servants by revelation, vision, and personal visitation, and the theories based on organic evolution, there is a gulf that can never be bridged. These theories are man-made deductions but the testimony of the prophets are actual facts*, attested by sufficient witnesses, according to the decree of the Almighty, and thus it becomes incumbent upon every soul unto whom these testimonies come to carefully weigh them in the spirit of humility and prayer by which the knowledge of the truth may be received, and then accepted. Ref 51

President Ezra Taft Benson, another prophet of God, wrote concerning Joseph Fielding Smith's book, *Man, His Origin and Destiny*, wherein he gives his support and testifies that the truths in it will "stand the test of time." In his doing so we have a double witness from two prophets, backed up by the foundational witness, the scriptures. Speaking of a scholar who took offense at President Smith's words and wrote a rebuke of the prophet in defense of evolution, Ezra Taft Benson stated in his book *This Nation Shall Endure* the following.

> *When one understands that the author to whom I allude is an exponent for the theory of organic evolution, his motive in disparaging President Joseph Fielding Smith becomes apparent*. To hold to a private opinion on such matters is one thing, but when one undertakes to publish his views to discredit the work of a prophet, it is a very serious matter. *It is also apparent to all who have the Spirit of God in them that Joseph Fielding Smith's writings will stand the test of time*. Ref 52

President Benson taught similar ideas about the teaching of evolution in his book, *God, Family, Country: Our Three Great Loyalties*.

> *If your children are taught untruths on evolution in the public schools or even in our Church schools, provide them with a copy of President Joseph Fielding Smith's excellent rebuttal in his book Man, His Origin and Destiny.* Ref 53

Finally, President Spencer W. Kimball boldly testifies that the truths of God will not be changed by man's opinions, even if a million brilliant minds agree or come to a consensus about either the creation of the earth by a cosmic "big bang," or the creation of man through the process of evolution.

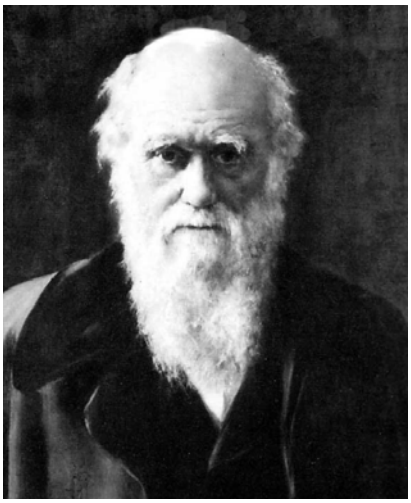
> *The Gods organized the earth* of materials at hand, over which they had control and power. *This truth is absolute. A million educated folk might speculate and determine in their minds that the earth came into being by chance. The truth remains.* The earth was made by the Gods...opinions do not change that. *The Gods organized and gave life to man and placed him on the earth. This is absolute. It cannot be disproved. A million brilliant minds might conjecture otherwise, but it is still true*. Ref 54

President Kimball clearly states his position on the subject of the creation of this earth and life upon it. It was not by chance. There are numerous statements on the subject of evolution by at least 12 latter-day prophets. Not one of them has come out in open support of the theory of evolution thus far, while all have come out clearly in refuting it as a false teaching.

Still there are those that hold out that one day the Lord will reveal the truthfulness of the theory of evolution and the Church will pronounce an "official position" in its support. To this idea, the author reiterates the words of President Harold B. Lee when he said that it matters not so much whether the Church takes an "official position," but that we as children of God do our utmost to align ourselves with His position.

To this author it is clear that acceptance of one of the prime pillars of the theory of evolution, that man and animals evolved from lower life forms, is in direct defiance of the scriptural and prophetic accounts of the creation. Some have argued that evolution is true with one exception, that man was placed on the earth, and that everything else evolved according to the theory. This is not in harmony with the scriptures which are clear that man was the crowning creation after He had created all other life.

Those who believe in macro-evolution as the method by which life on this planet came about cannot with impunity accept that man was "placed" here and everything else came about through evolutionary means because the idea that man is but an advanced species is a foundational tenet of evolution, as will be shown in subsequent information. To accept the primary tenet of evolution and reject this one aspect of it, in an attempt toward reconciliation with scriptures, seems foolhardy as one may as well conform completely with the scriptures and reject evolution forthright as reject one of evolution's fundamental suppositions.



2 Charles Darwin, 1881

Another founding tenet of the theory of evolution is that one species can evolve into another species through several processes, such as natural selection, genetic mutation, and "lateral gene transfer" to name a just a few. The scriptures again seem to refute this evolutionary concept of "speciation" which science has never observed in the wild or been able to replicate in a laboratory.

> 12 And the Gods organized the earth to bring forth grass from its own seed, and the herb to bring forth herb from its own seed, *yielding seed after his kind*; and the earth to bring forth the tree from its own seed, yielding fruit, *whose seed could only bring forth the same in itself, after his kind*; and *the Gods saw that they were obeyed*.
> PoGP Abraham 4:12

Still another is that the earliest form(s) of life began by accident through an unknown process involving chemicals and energy that billions of dollars have not been able to unravel, much less duplicate. Yet the creation of just one living cell is so complex as to make such a belief tantamount to a miracle, which of course it was, albeit a divinely created miracle, not an accidental one.

There are also those LDS who have attempted to reconcile the theory of evolution with scripture through questioning what is meant by the term "day" in scripture, invoking a "time" or "period" of creation without any specific parameters. The scriptures and Presidents Smith and Benson made the answer to this abundantly clear. There are parameters, and they have been given by revelation.

Still others speculate that since the Lord "organized" the earth, maybe He simply consolidated some materials previously used for other "earths" to put together this one, which is how dinosaur bones and petrified wood came to be. However, both of these formerly living things, that are now mineral, are found near the surface of the earth, and are known to be a surface phenomenon of this planet. Had the Lord used previous materials, it would seem logical that they would be found throughout the geological strata of the earth, not exclusively near its surface. Yet this is not the case. In fact, the scriptures give some indication that life on earth had not existed prior to God's placing it here.

> 5 And every plant of the field before it was in the earth, and every herb of the field before it grew. For *I, the Lord God, created all things*, of which I have spoken, spiritually, before they were naturally upon the face of the earth. For I, the Lord God, had not caused it to rain upon the face of the earth. And I, the Lord God, had created all the children of men; and not yet a man to till the ground; for *in heaven created I them*; and *there was not yet flesh upon the earth, neither in the water, neither in the air*;
> PoGP Moses 3:5

Thus there are many things about the creation of the earth and life upon it that are as yet unknown. Still, this author believes that there will come a day when the truths from the scriptures will be proven out by the truths in empirical, experimental science. Until then, we must have faith that the scriptures are the surest foundation upon which to build our understandings, and be watchful for the truths that may come.

DNA Dating and the Arrival of Haplogroup X in America

According to the following 2003 article from the *American Journal of Human Genetics*, Haplogroup X lineages from the area of

Europe are supposed to have coalesced (or traced back to a common ancestor) between 17,000 and 30,000 years ago, while the haplogroup X lineage stemming from the Near East (Mediterranean area) coalesced 13,700-26,600 years ago.

> When the sequence variation of the first hypervariable segment of the control region is analyzed, *haplogroup X mtDNAs from Europe and the Near East are found to yield similar coalescence times: 17,000–30,000 years before present (YBP) and 13,700–26,600 YBP, respectively.* Ref 32

Native American haplogroup X lineages have been estimated to have coalesced between 12,000 and 36,000 years BP (before present) depending on what parameters and methods are used in the estimation. Such estimates are often "targeted" to match another source of reference, such as the theoretical Last Glacial Maximum, postulated to have occurred about 12,000 to 20,000 years ago.

This "ice age" is supposed to have held so much water in the glacial ice that it caused world-wide ocean levels to drop some 90-100 feet, which caused a "land bridge" between Alaska and Russia called Beringia, over which humans travelled from Northeast Asia into extreme Northwest America. Exactly what the mechanism is that would cause such a catastrophic change in climate in unknown.

Whether any humans would have survived such a precipitous and consistent drop in temperature across the globe is also unknown. The resulting crop and plant failures due to year round freezing temperatures would make it impossible for most animals and humans to find food and would cause a complete collapse in the normal food chains and populations of the earth.

Such an event is speculative and without precedence or actual observation according to human historical accounts. It is also speculated to have occurred nearly twice as long ago as mankind was on the earth according to the scriptures and the prophets. Nevertheless this is the accepted theory of the peopling of the Americas.

How did humans migrate to the Americas?

It is what is known as an *a priori* assumption, made by the modern scientific fields of archaeology and anthropology, that humans of earlier times knew nothing of boats. Without knowledge of boats, it is assumed that ancient people could not have come to the Americas except as a result of the arrival of an ice age. After its freezing arrival, and subsequent reduction in ocean levels, these ancient people decided to leave whatever shelters they had in place, and embark on a tremendous journey of possibly several thousand miles to the extreme reaches of the north, rather than turn south toward traditionally warmer climates. Such is the realm of theory. This theory has been accepted through consensus to be the way in which the peopling of the Americas occurred. This forms the basis for understanding the dating of the arrival of haplogroup X to North America.

Among Native American haplogroup X carriers, the proposed coalescence times date back to between 23,000-36,000 years for an earliest common ancestor, and 12,000-17,000 years for the latest. The methods and number of assumed founders used in this article have made the estimates consistent with a migration either before or after the proposed time of this ice age.

> Moreover, *Native American haplogroup X* mtDNAs form a clade distinct from that of West Eurasians and with *coalescence time estimates varying widely depending on both the method of estimation and the number of assumed founders*. Thus, *the coalescence times ranged from 12,000–17,000 YBP to 23,000–36,000 YBP, times that are consistent with both a pre- and a postglacial population diffusion.* Ref 32

Depending on the method used and the number of founders, some assumptions are made that produce dates corresponding with the times before and after the supposed ice age. The following article in *American Journal of*

Human Genetics relates that it is still unknown where a source population for haplogroup X can be found in Asia, but new assumptions are proposed that speculate on some ideas as to their time of arrival in the Americas. Because no source population has been found in Asia, it was then proposed that the lineage developed independently after arriving in the Americas. However, this is completely incompatible with the rate of change in mtDNA that will be discussed hereafter. Which leaves the question, when did the Native American haplogroup X lineage begin to diverge from this source population?

> *These findings leave unanswered the question of the geographic source of Native American X2a in the Old World*, although our analysis provides *new clues about the time of the arrival of haplogroup X in the Americas.* Indeed, *if we assume* that *the two complete Native American X sequences* (from one Navajo and one Ojibwa) *began to diverge while their common ancestor was already in the Americas, we obtain a coalescence time of 18,000 [+/-] 6,800 YBP [Years Before Present], implying an arrival time not later than 11,000 YBP.* Ref 32

The Native American haplogroup X lineages that are shared between the Navajo and Ojibwa tribes have diverged from one another over time. If an "assumption" is made that they diverged after coming to the Americas, rather than before, then a different coalescence time (the date of the last common ancestor) can be assumed to have been between 11,200 and 24,800 years ago. This "implies" an arrival time not later than 11,000 years ago (18,000 minus 6,800). The manipulation of the parameters (or the assumptions) has affected the results.

This example established two concepts. One is that haplogroup X is thought to have arrived in the Americas as long as 36,000 years ago but possibly as short as 11,000 years ago which is a tremendously divergent range.

Second is that mtDNA dating methods are much more speculative than definitive. In order to know what types of dating are used in science and which are more theory based vs. experiment- or observation-based, it is important to have an understanding of their foundations. For this reason the foundations of DNA dating are going to be covered in detail. This paper is not meant, however, to be a definitive work on the subject of dating, but only to give the reader a broader understanding of its basis.

DNA Dating: Methods and Assumptions, the Foundations of the Two Dating Methods

LDS scholar David A. McClellan wrote in his very informative and well researched article, *Detecting Lehi's Genetic Signature: Possible, Probable, or Not?*

> Accumulated fixed differences between the "other" haplotypes of Native Americans and the European/Druze *haplogroup X indicate that they may have had a common ancestor between 12,000 and 36,000 years ago*, representing a fifth founding lineage of Native Americans.
> *However, this may be an overestimate if the original founding population was very small;* as discussed above, *population size and the probability of fixation have an inverse relationship, so small historical populations may appear to be older than they are* if the assumption of constant, large population size is asserted when no evidence to the contrary is forthcoming. Ref 14

This honest observation provides a basis for questioning the validity of the assigned mtDNA dating for Haplogroup X arrival into North America speculated to have been some 36,000 years ago. If the original population was very small, as was clearly the case by the text of the Book of Mormon, then it may not have contributed sufficiently to the overall resulting large civilizations' DNA to establish a proper founding date.

The Assumptions of DNA dating

Scientific technologies, such as age dating, DNA testing, etc. are powerful, yet non-perfect tools for finding truth. Scientific history is full of amendments, revisions, rescissions and the resultant discarding of ideas

and theories in the search for natural laws and ultimately in the search for finding truth. A scientific idea thought to be true today may be proven false tomorrow. Don't put all your faith in science, because science is in a state of constant flux.

On the other hand, it is the belief of the author that through science and the use of a proper scientific method many new and exciting things can become known that will bless the lives of others. Trust in the Lord, and question the science that does not square with His truths. All true science will be completely and totally compatible with the truths of the gospel and the Lord. For those who claim a testimony of the gospel, it can be no other way, for something cannot be true in "true science," and false in "true religion" or vice versa.

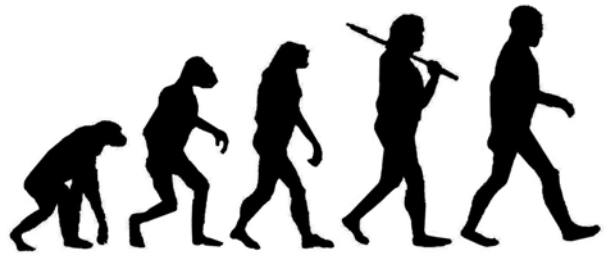
The Evolutionary Basis of the Assumptions

Scientific dating methods have underlying assumptions. If there is found solid evidence that the theory is incorrect or incompatible with the observational reality, there are good reasons to then challenge the theory and discard those assumptions shown to be incurrect. However, there are some scientific theories that have become dogma that are protected by disallowing honest challenge.

You, the reader, are about to embark on a profound example of what happens when just such a condition occurs. Such an example may challenge fundamental assumptions of modern science that have been held up as some of the "firmest facts ever validated by science" for many decades.

> What strange set of historical circumstances, what odd disconnect between science and society, can explain *the paradox that organic evolution*—the central operating concept of an entire discipline and *one of the firmest facts ever validated by science—remains such a focus of controversy, even of widespread disbelief, in contemporary America*? Ref 55

Yet macro-evolutionary assumptions are in direct conflict with the revealed word of God. The majority of Americans believe in God and the Bible forms the primary basis for those beliefs. Even many of those having the Bible only, that enjoy no modern revelation as do LDS, have difficulty in reconciling the scriptures with the theory of evolution. The most common method for reconciling these two disparate ideas is to consider the Bible as a "story" rather than a literal history and prophetic work. Unfortunately, there are some who feel the Book of Mormon lies also within this same "storytelling" realm.



3 A step above animals or a step below God?

In the following pages a clear example will be shown of how a belief in evolution, the theoretical scientific dogma of our day, is used to discount and ignore empirical scientific data and fact. Human and animal DNA sequencing may be demonstrating the truth of God's creation, challenging the theory of organic evolution. Empirical DNA evidence has been undermined and to some extent overcome through theoretical methods and "explained away" in an effort to force a fit between the observed truth and the dogmatic theory.

Such is not good science and if bad science is being left unchallenged, then it continues to grow and develop based on a "sandy foundation" until it becomes like the "great and spacious building" of Lehi's dream which has no foundation. Any theory of man that is not built on the firm foundation of the scriptures and the prophets should be likened to this building. The theory of evolution is, in the author's opinion, one of those theories.

> 26 And I also cast my eyes round about, and beheld, on the other side of the river of

water, *a great and spacious building; and it stood as it were in the air*, high above the earth.

BoM 1 Nephi 8:26

Contrast the great and spacious building with the firm foundation on which to build according to the Lord.

12 And now, my sons, remember, remember that it is upon the *rock of our Redeemer, who is Christ, the Son of God, that ye must build your foundation*; that when the devil shall send forth his mighty winds, yea, his shafts in the whirlwind, yea, when all his hail and his mighty storm shall beat upon you, it shall have no power over you to drag you down to the gulf of misery and endless wo, because of the *rock upon which ye are built, which is a sure foundation, a foundation whereon if men build they cannot fall.*

BoM Helaman 5:12

The great and spacious building was built on thin air, while a building built on the foundation of Christ's teachings will withstand the buffetings that come against it. Theories not based in reality are like the great and spacious building, without a solid foundation, and all it will take to make it fall are a few strong challenges that strain its weaknesses to the point of breaking.

The Book of Mormon and the prophets have instructed and warned us repeatedly about how we should learn and the conesquences for diverging from his instructtions. We are told to learn "line upon line" beginning from a firm "foundation" of the "truth of God" and then hearken or listen to his precepts and counsel. We are also warned that trusting in the theories or precepts of man will bring upon us a "curse" wherein the truths that God has already made clear will be "taken away."

30 For behold, thus saith the Lord God: *I will give unto the children of men line upon line, precept upon precept*, here a little and there a little; and *blessed are those who hearken unto my precepts, and lend an ear unto my counsel*, for they shall learn wisdom; for unto him that receiveth I will give more; and from them that shall say, We have enough, *from them shall be taken away even that which they have*.

31 *Cursed is he that putteth his trust in man*, or maketh flesh his arm, *or shall hearken unto the precepts of men*, save their precepts shall be given by the power of the Holy Ghost.

BoM 2 Nephi 28:30 – 31

The Lord also foresaw and predicted that those who choose to accept the theories of men rather than follow the wisdom of God will become angry because they will believe their wisdom to be greater than God's truth. Those who seek God's truth will find happiness in new information that is founded on and conforms to it. In contrast, those that have built their beliefs on the sandy foundations of man's wisdom will become angry and fight against the truth, but ultimately they will fall whether in this life or in the next.

28 And in fine, *wo unto all those who tremble, and are angry because of the truth of God!* For behold, *he that is built upon the rock receiveth it with gladness; and he that is built upon a sandy foundation trembleth lest he shall fall.*

BoM 2 Nephi 28:28

The A Priori *Assumptions:*

Note: *a priori* assumptions are based on hypothesis or theory rather than results of experiment or experience.

From one of the most prestigious scientific journals in the world, *Nature*, we learn a little of the theory of modern human origins. Its author postulates that all modern humans descended from one woman who is "postulated" to have lived 200,000 years ago in Africa.

Mitochondrial DNAs from 147 people, drawn from five geographic populations have been analyzed. All these mtDNAs stem from one woman who is *postulated to have lived about 200,000 years ago*, probably in Africa. Ref 56

The peopling of the earth is supposed to have originated in Africa, after humans and the great apes separated from each other there,

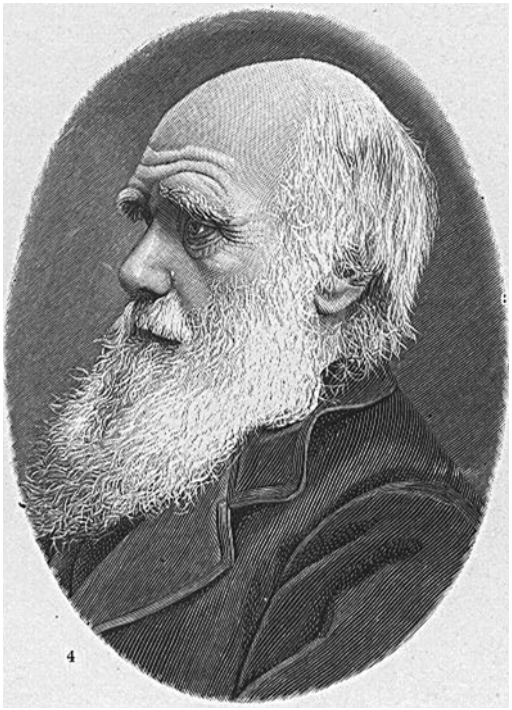
and then spread roughly northward and eastward into the Mediterranean, then Europe and western Asia. The continued expansion pushed up into southern, central and northeast Asia. Following this expansion they moved across the Beringia land bridge and into North America and then finally south into Central and South America. The beginning of this human expansion is thought to have occurred 200,000 years ago, which is, by simple calculation, 194,000 years before Adam was placed on this earth, according to the Holy Scriptures.

What is the origin, or the foundations of this theory? Where does the 200,000 year concept originate? It will be shown that this idea stems from the theory of evolution and the fossilization theories of geology.

Neither of these two theories have empirical evidence to experimentally demonstrate their validity. Nowhere has any reproducible experiment demonstrated unequivocal macro-evolutionary speciation in any life form, although it has been attempted numerous times. It has not been seen in the wild nor in the laboratory. Some evolutionists have maintained that it is "untestable" by experiment (because of the tremendous time-frames thought necessary for evolutionary speciation to occur), which then, in this author's opinion, places it into the realm of philosophy, not empirical, experimental science.

Along these same lines, nowhere has any experiment shown the formation of "life" from any non-life which is absolutely essential to have "naturally" occurred many millions of times to "jump-start" the evolution process that would eventually take hold and begin to replicate.

And another case: nowhere has any experiment demonstrated that the theorized process of fossilization can be duplicated in a laboratory so that it can be known with certainty how a piece of bone or wood can be turned into a rock. These theories are based completely upon *a priori* assumptions of men. Note: The previous non-referenced comments will not be covered in detail until release of a future work by colleagues titled *The Universal Model*.



4 Charles Darwin

The fact that mtDNA dating is based on the theory of evolution is evident in the following quotes. First, from the journal *Science* in 1998 in an article titled "Calibrating the Mitochondrial Clock," is a statement clearly articulating that mtDNA dating relies or is based upon the point in time when humans and chimps supposedly split from each other. It then goes on to disclose that the evolutionary estimate used for human beings isn't even based on humans but on the number of mutations found between all the great apes, timed by using dates from the fossilized remains of one ape ancestor. This rate is then applied to humans, who, according to the adherents of evolution, came from the apes.

> The *most widely used mutation rate* for noncoding human mtDNA *relies on estimates of the date when humans and chimpanzees shared a common ancestor, taken to be 5 million years ago. That date is based on counting the mtDNA and protein differences between all the great apes and timing their divergence using dates from fossils of one great ape's ancestor. In humans, this yields a rate of about one mutation every 300 to 600*

generations, or one every 6,000 to 12,000 years (assuming a generation is 20 years) says molecular anthropologist Mark Stoneking of Pennsylvania State University in University Park. Ref 57

Thus human mtDNA dating methods are based on the evolutionary concepts of humans from chimps, the genetic differences between the apes, and the time frames of fossilization.

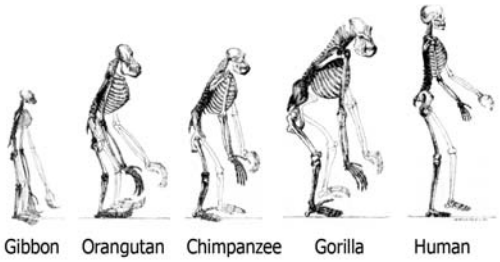
In a more recent 2006 article it is even admitted that this is an "assumed" basis for the 160,000- 200,000 year dating postulation. This article was published to the scientific community establishing what is known as the "average rate of mutation." This rate is accomplished by mathematic extrapolation. An "assumed" split between humans and chimps occurred somewhere between 5 and 6 million years ago but their common mtDNA is thought to go back even further to when it is postulated that the chimp and human mtDNA coalesced at 6.5 million years ago.

Taking this assumed date and dividing by the total number of differences or substitutions found to exist within the combined diversity of the great apes, a number or rate is extrapolated. This number, when applied to humans, indicates that on average one new substitution has taken place every 6,764 years for all human forms (not only modern humans, but Neanderthals, etc.). Modern humans are thought to have diversified from each other much more recently. The number of substitutions multiplied by the extrapolated average rate of 6,764 years results in an estimated date of the most recent common ancestor at about 160,000 years ago.

Assuming 6 million years for the human-chimp species split and 6.5 million years for the most recent common ancestor of their mtDNA lineages, we estimated the average transversion rate at synonymous and rRNA positions as 2.1×10^{-9} and 4.1×10^{-10}/year /position, respectively. Using the observed relative rates of different substitution types in humans, the average transition rate at 4212 synonymous positions is 3.5×10^{-8} /year/position. Over all genes in mtDNA thus would be equivalent to accumulation of one synonymous transition / 6764 years on average. The coalescent date of the human mitochondrial DNA tree using this rate is 160,000 (SD [Standard Deviation] 22,000) years. This coalescent date is broadly consistent with the dates of the Homo sapiens fossils recognized so far from Ethiopia. Ref 58

This is found to be "broadly consistent" with Homo sapiens' fossils which are theorized to have originated in this same time frame, thus being supported by the fossil record. Truth, like good science, should be able to be verified from multiple sources, for if something is true in one realm, how can it not be true in another? Truth is truth. It makes complete sense, then, that scientific theories in one field should be compared for consistency in other fields. This cross-checking is invaluable for verifying whether the theory is correct or not. It is interesting to note, however, that the cross-checking being done above is to check one theory against another theory… is it any coincidence that they are consistent with each other?

This time frame is again inconsistent with and contrary to the teachings of the Lord through his scriptures and the prophets.



5 Humankind's origins per evolutionary theory

The Theory of Uniformitarianism and the Molecular "Clock" Assumption

As can be seen from these following quotes, one of foundational principles underlying DNA dating methods is that DNA or organelles follow the rules of uniformit-

arianism, which is the idea that all processes in nature observed today are the very same processes that have taken place throughout earth's history. While most of science has accepted a modified version, sometimes called punctuated equilibrium which embraces some level of catastrophism, the theory of uniformmity is still followed in a more general sense.

This theoretical principle is at the basis of the idea that mutations in DNA take place at regularly "scheduled" intervals, much like the ticking of a clock. Thus, if mutations arise in an orderly, consistent manner, it is theoretically possible to simply count the number of times the "clock" has ticked (the number of mutations in a population) and deduce how long ago the mutations must have happened (the number of mutations times the length of time between each "tick."

As an example, if it is known that mtDNA mutates exactly every 6,764 years, and we find two lineages where their mtDNA is separated by three mutations, then by doing the simple math (6,764 x 3) we can theoretically assume that they "diverged" from one another 20,292 years ago, or three "ticks" on the mtDNA clock.

> *The fast, relatively predictable rate of "neutral" mitochondrial mutations* – ones that are neither beneficial nor harmful – *lets the organelles operate as molecular clocks. Counting the differences in the number of mutations (ticks of the clock) between two groups, or lineages, allows a researcher to construct a genetic tree that tracks back to a common ancestor – Mitochondrial Eve,* (despite the Biblical allusion, this Eve was not the first woman: her lineage, though, is all that has survived) or another woman who founded a new lineage. *Comparison of the ages of the lineages from different regions permits the building of a timeline of human migrations.* Ref 59

To verify that this is the standard approach to DNA dating, the following quote provides additional confirmation. Once the "clock" is calibrated then it is checked against the theoretical "clock" of fossilization in geology.

> ...a standard approach is to derive a phylogenetic tree, then date branch lengths by reference to an *assumed molecular clock, calibrated with divergence dates from the hominoid fossil or human archaeological record*. Ref 60

This article suggests that the fossil and archaeological records be used to calibrate, or establish a baseline understanding of the phylogenetic or evolutionary rate using an assumed "molecular clock." While it is certainly commendable to substantiate or attempt to verify a theory using other established fields of science, it brings up a question. Does comparison or calibration of one non-empirical theory through the use of another nonempirical theory equal validity? In other words can a theory be relied upon that has been validated only by other undemonstrated theories? Isn't there some point where the theories must be verified by physical experiment or observation in reality to be demonstrated to be true? Theories based on theories do not a truth make, anymore than a lie can be substantiated by another lie to create truth.

This is why it is so critical to base all research on a foundation of something that is known to be true and build upon it, line upon line as the scriptures indicate. Beginning from a theory often leads to more and more elaborate theories until truth comes along and may, in an instant, collapse the pillars upon which the theories were built. Truth on the other hand stands the test of time and forms the basis of other truths.

Such was the case when men began to speculate on the nature of God. More and more elaborate theories were given to account for all the many aspects thought to be His nature. This continued until there were many churches established, each with their own views of what "God" was. Then a young farm boy went into a grove of trees one early spring morning with tremendous faith and a question. The glorious vision that transpired forever answered and refuted all the false theories that had been built up by men over hundreds of years.

This account of Joseph Smith is invoked for the sole purpose of providing an example of how theories of men developed for even thousands of years can be destroyed in a few minutes through God's truth. This author believes that God has provided his scriptures and prophets to provide that guidance.

There is no intended inference that God has revealed the information in this work to be true and no such claims are made by the author. Joseph Smith's experience in the sacred grove provides an excellent example of God's truth completely refuting hundreds of years of theory and speculation … and it only took minutes.

The previous article, from 2006, provided a published account of the method used in mtDNA dating; however the method had already been being used for several years prior to the article. To test the hypothesized evolution-based dating, a "real world" mtDNA test was completed and published in the journal *Trends in Ecology & Evolution or (TREE)* in 1997. Again it is admitted that the dating is based on evolution and that the human-chimp split is "hypothetical." Note the use of the words "inferred" and "hypothetical" in the following quotes.

> *Evolutionary substitution rates inferred by this kind of approach range from 0.025 to .26 substitutions/site/million years, corresponding to an age of approximately 60,000 to 630,000 years for "Eve."*
> *The hypothetical descent of mankind from "mitochondrial Eve" has been much debated …some claim 800,000 years to be the upper limit, while most researchers suggest a date of approximately 200,000 years.* Ref 61

What is interesting is the rather enormous range in dates that have been suggested; in this case, between 60,000 years and 800,000 years. How much confidence in the evolutionary assumptions does this demonstrate? It would appear that this is in reality more of a "suggestion" than a "finding."

The Parsons Study

To test the evolution-based estimates, known as the phylogenetic rate, experimental tests were performed and reported in a very important article in *Nature Genetics* in 1997. Primary contributing author Thomas J. Parsons and his colleagues conducted an extensive study of actual generational changes by comparing Grandmothers with grandchildren in multiple lineages to see how often substitutions or "mutations" would occur in their mtDNA.

With his background as a molecular geneticist at the Armed Forces DNA Identification Laboratory in Rockville, MD, Parsons is well qualified to perform this type of research. It was done to establish an empirical calibration point from which to form a basis in reality for mtDNA dating rates.

> We performed an *extensive collaborative study to empirically determine the frequency with which maternal relatives differ in mtDNA sequence*. We compared sequences of the two CR [Control Region] hypervariable regions from close maternal relatives, *from a large number of mtDNA lineages*. Ref 60

An article in the journal *Trends in Ecology & Evolution* outlines the assumptions as well as the expectations of Parsons' study, again confirming that mtDNA dating is based on the split between apes and humans, that it assumes a constant rate of change (or substitution), and that the period of time over which this was to have occurred is also assumed or postulated.

News writer Laurence Loewe explains the need for actual experimental data from which to base the assumptions, and then explains what Parsons' research expected to find based on the theoretical phylogenetic rate estimates. According to the evolution-based phylogenetic estimates, it had been determined that Parsons should expect to find one change or mutation in 600 generations on average.

> *Results are based on a correct date of divergence between great apes and humans,*

> *which is disputed. Furthermore, a constant substitution rate for all sites investigated and the total period of time elapsed must be postulated.*
> *What is needed, therefore, are experimental data which measure mutation rates directly. This is where Parsons et al. [the original research article] come in.*
> *Based on phylogenetic considerations, Parsons et al. expected approximately one mutation in 600 generations.* Ref 61

The Case for Pedigree Dating

It is critical to establish with certainty the rate of change, or mutation, in mtDNA as it is used in forming assumptions of the time-frames for human evolution and migration, as well as forensic testing in court cases. It is equally important that this rate be based on reality and not solely on theory. Dating based on the reality of pedigrees is exactly what Parsons and his colleagues accomplished. Their findings were summarized as follows.

> *Summary: The rate and pattern of sequence substitutions in the mitochondrial DNA (mtDNA) control region (CR) is of central importance to studies of human evolution* and to forensic identity testing. We compared DNA sequences of two CR hypervariable segments from close maternal relatives, from *134 independent mtDNA lineages spanning 327 generational events. Ten substitutions were observed, resulting in an empirical rate of 1/33 generations, or 2.5/site/Myr. This is roughly twenty-fold higher than estimates derived from phylogenetic analyses.* Ref 60

Parsons states in the summary of the article the importance (and significance) of establishing an empirical rate estimate, then relates his findings. Ten mutations were observed in 327 "generational events" or, in other words, Grandmothers to grandchildren DNA comparisons. While the evolution-based estimate of a single mutation in 600 years was expected, what was found in reality was that one occurred in only 33 generations on average from this substantial group that included multiple lineages. The evolutionary rate estimate differed from the factual or empirical rate by 20 times!

Reporting on Parsons' research article, Laurence Loewe writes in the "News and Comment" section of *Trends in Ecology and Evolution (TREE),* in an article titled "Mitochondrial Eve: The Plot Thickens," the following.

> *Surprisingly, they detected a roughly 20-fold higher mutation rate of the mtDNA* control region used in typical Eve studies. ... they calculate an intergenerational (roughly 20 years [per generation]) *substitution rate of 1.2-4.0/site/million years* (95% confidence interval, 2.5 as mean value), if extrapolated to a large timescale. Ref 61

How does this reality-based rate compare with the theory-based phylogenetic rate?

> *The observed substitution rate reported here is very high compared to rates inferred from evolutionary studies.* A wide range of CR [Control Region] substitution rates have been derived from *phylogenetic studies, spanning roughly 0.025-0.26//site/Myr....*
> Ref 60

The empirical findings of Parsons' extensive study using actual pedigrees of real people yielded a rate of 1.2 to 4.0 substitutions per site per million years. In contrast, the evolution theory based rates ranged from 0.025 to 0.26. The rate variance or range is huge in phylogenetic studies, so huge they have been questioned as "not reflecting the true state of affairs." These are the incredulous results as reported in this article in 2005 from *Annual Reviews of Genomics and Human Genetics.*

> For example, Hasegawa et al. showed that *a model that includes rate variation in the mtDNA control region gave an estimate for the age of the human mtDNA ancestor that was half that obtained when a single mutational rate was assumed*. Therefore, *average estimates* of the mutation rate for human mtDNA *do not reflect the true state of affairs, and should be viewed as simplistic tools for phylogenetic studies.* Ref 62

In other words, when using a specific set rate, a certain date was obtained, but when using the range of rates, they found that the specific rate result had produced half the age resulting from the range of rates. Because of

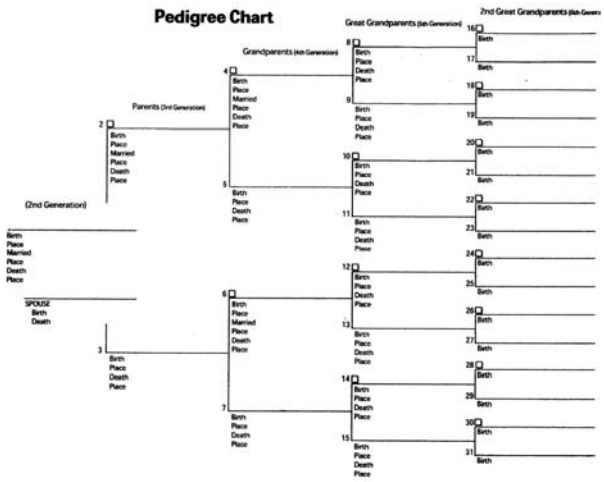
the large range in theoretical rates, caution is suggested in using phylogenetic rates for anything other than "simplistic tools for phylogenetic studies."

What does a 20-fold higher (faster) rate of substitution mean to dating and human evolution? Parsons provides the answer to this incredibly important question. Remember that this rate, as stated previously, is of "central importance to studies of human evolution." Parsons concludes:

> *Thus, our observation of the substitution rate, 2.5/site/Myr, is roughly 20-fold higher than would be predicted from phylogenetic analyses. Using our empirical rate to calibrate the mtDNA molecular clock would result in an age of the mtDNA MRCA [most recent common ancestor] of only ~6,500 y.a.,* clearly incompatible with the known age of modern humans. Ref 60

The evolution theory-based phylogenetic rate yielded a date back to the most recent common ancestor of around 200,000 years. By applying the actual rate based on and verified in reality from many lineages of real people, that time frame shrank to only 6,500 years for "Eve." This figure is so unbelievably low that Parsons immediately questions his own findings by his dogmatic statement that his own reality-based results are "incompatible with the 'known' age of modern humans."

How is this supposed "true age" of humans "known?" It isn't. There are theories based on geological and fossil records, but these are based on several primary assumptions that must also be true in order for them to be claimed as fact. One of those primary assumptions is that evolution is the basis for life on earth.



According to modern revelation, and actual genealogical records from human history in the Bible, the infinitely better defined "known" age of modern humans is approximately 6000 years, a figure that appears to have been demonstrated as accurate by mtDNA empirical data. This study was not simply based on one single lineage, but multiple lineages which were sequenced and studied. The significance of Parsons research is hard to fathom. What is even harder to fathom is what Parsons does next. Rather than accepting his (and others) testing on real people done under experimental conditions and questioning the admittedly "assumed" theory of the evolution-based phylogenetic rate, he instead begins looking for reasons to make his reality-based findings comply with the evolutionary estimate, calling the rate "unsettled" until they can "fix" the obvious discrepancy.

Why would it be automatically assumed that evolution-based dating is valid? The simple answer is because it is dogma for the most powerful scientific lobbies. Funding for anything that might challenge evolution is strictly off limits by the three largest scientific organizations in America, the NSF (National Science Foundation), the NAS (National Academy of Science) and the AAAS (American Association for the Advancement of Science). These three groups control the vast majority of funding for scientific research and their leaders and members are, by their own surveys, more than 90% atheists. A belief in the theory of

evolution is practically a prerequisite to advancement within these scientific organizations. They have such a strangle-hold on the scientific purse-strings that it was documented in the movie "Expelled: No Intelligence Allowed" by Ben Stein.

How Important is Establishing a Correct Rate of Mutation?

> *Thus, rate* and pattern *of mtDNA substitution remains an unsettled issue of central importance*. Ref 60

Parsons claimed in 1997, in his article "A High Observed Substitution Rate in the Human Mitochondrial DNA Control Region," in *Nature Genetics*, that the rate of mtDNA substitution (or mutation) is "unsettled" but he also agrees that it is of central importance. In this article, Parsons asks an extraordinarily important question.

> *What could account for the disparity between the observed substitution rate and those derived from phylogenetic analyses?* Ref 60

He then proceeds to offer four possible reasons why his empirical mtDNA mutation rate may be incorrect, as surely it must be since it did not even come close to the evolutionary rate. He discusses the possibilities of:

- "mutational hotspots" in the mtDNA
- the frequency of new substitutions and the effect of genetic drift on them
- the possibility of "mechanistic bias"
- and finally that some substitutions may be "deleterious" and removed over time.

Each explanation he then dismisses in turn as most likely not a factor, although he also submits that he may not be considering all possibilities involved with these four attempts at explaining the discrepancies. Not once does he even begin to question whether the evolution theory-based phylogenetic rate itself could be in error. Again the question must be begged—Why not?

In his news article, Loewe actually corrects Parsons' previous error when he claimed that his findings were "incompatible" with the "known" age of modern humans. Loewe changes the wording to state that Parsons' rate is incompatible with "current theories" on human origins. He then further illuminates the challenge that this creates for evolutionary science by openly stating that it is an enigma that mtDNA should show that human populations arose in only the past few thousand years.

Why is this so difficult to believe? Do we not have an ancient historical record that clearly follows these lineages back all the way to Adam? Have not most of the Bible's claims been verified through archaeological research? Why can't the Bible be used as a basis for calibrating the dating? The answer is obvious: such verification would cause the scientific community and the world to admit that the Bible is true historically, which may also lend support to the idea that it is also true doctrinally and spiritually, and that would lead to an admission of the validity of Christ. To the leaders of these scientific organizations who are nearly all atheists, this is not tolerable.

Therefore, anything that may lend support to evolution is embraced, and anything that may run counter to it is shunned. There has been much documentation on this issue by outstanding organizations, but this is not the place to delve into this subject. Again, the film "Expelled: No Intelligence Allowed" is a good exposition of this bias within the scientific community.

Commenting on the Parsons study, Laurence Loewe writes in *Trends in Ecology & Evolution (TREE)* in 1997 that:

> If molecular evolution is really neutral at these sites, *such a high mutation rate would indicate that Eve lived about 6500 years ago – a figure clearly incompatible with current theories on human origins*. Even if the last common mitochondrial ancestor is younger than the last common real ancestor, it *remains enigmatic how the known distribution of the human populations and genes*

> *could have arisen in the past few thousand years*. Ref 61

A year later another group of researchers further substantiated Parsons' findings while conducting mtDNA testing on Czar Nicholas II of Russia. They found that the Czar had received two different copies (or sequences) of mtDNA from his mother, termed "heteroplasmy," that had occurred in his lineage. As succinctly stated by Ann Gibbons, in the journal *Science* in 1998, the mtDNA mutation rate was causing evolutionists to become very concerned about the basis for their theory.

If this new empirical rate is true, then evolution isn't, for it could not have accomplished what it is proposed to have done in such an incredibly short time frame. Such a rate could spell the end of evolution…but that cannot be allowed because so much is at stake. Such a dramatic paradigm shift would require rethinking the basis of archaeology, anthropology, and many other scientific fields, even lend credibility to religions and the historicity of the Bible. It might bolster Christianity's claims and cause a spike in belief in God.

> Regardless of the cause, *evolutionists are most concerned about the effect* of a faster mutation rate. For example, *researchers have calculated that "mitochondrial Eve"* – the woman whose mtDNA was ancestral to that in all living people—*lived 100,000 to 200,000 years ago in Africa*. *Using the new clock, she would be a mere 6000 years old*. No one thinks that's the case... Ref 57

Again Parsons' study is vindicated, restating nearly the same 6000 year figure derived from the new rate and again the caveat is made … "No one thinks that's the case." Why is such a statement made? Why is the empirical finding so easily dismissed as faulty?

Surely none of the atheists at the head of these scientific organizations thinks Eve lived 6,000 years ago, but there are a lot of people in this world that believe in the Old Testament, that think the 6,000 year figure is the correct one. The problem is that acceptance of this actual data would "complicate" things for the theory of evolution and those that espouse it. This fact is acknowledged by Gibbons in her article:

> *Resolving the issue is vital*. It could also *complicate the lives of evolutionary scientists who use the mtDNA mutation rate as a clock to date such key events as when human ancestors spread around the globe*. Evolutionists have *assumed that the clock is constant*, ticking off mutations every 6000 to 12,000 years or so. But if the clock ticks faster or at different rates at different times, some of the spectacular results – such as *dating our ancestor's first journeys into Europe at about 40,000 years ago – may be in question. "We've been treating this like a stopwatch, and I'm concerned that it's as precise as a sun dial*," says Neil Howell, a geneticist at the University of Texas Medical Branch in Galveston. "I don't mean to be inflammatory, but I'm concerned that *we're pushing this system more than we should*." Ref 57

The quote by Neil Howell, geneticist with the University of Texas, is incredibly revealing in that he is more clearly seeing the problem. His statement about evolutionists attempting to use their theoretical assumptions as a "stopwatch" when in fact they should be used, if at all, as a "sundial" is amazingly still as valid in 2009 as it was in 1998, 11 years previously. This same debate continues to rage after 11 years of wrangling.

A year after Parsons completed his historic study, he reported to colleagues in a special international workshop called to address this severe problem. This conference, "the First International Workshop on Human Mitochondrial DNA," was held in October 1997 in Washington, D.C., and Parsons related that in the year since his publication, he had continued with his research, doubling the number of lineages and events tested, with the same results. His robust initial findings were indeed continuing to be confirmed under additional mtDNA sequencing and analysis, lending additional strength to his empirical rate estimates.

> The data [Parsons'] were published last year in *Nature Genetics*, and *the rate has held up as the number of families has doubled*, Parsons told scientists who gathered at a

> recent *international workshop on the problem of mtDNA mutation rates*. Ref 57

The strength of Parsons' arguments are so damaging to the arguments of evolutionary time scales and human evolution, that they spurred this article by Kate Wong in *Scientific American* called "Is Out of Africa Going Out the Door?" In it she admits that the mystery of human origins is far from solved, but then makes an incredibly mind-numbing accusation against the ability of DNA to provide solid evidence, turning again to the theoretical fossil record to provide the support needed for evolution, as DNA reality dating seemed to be closing the door on the theories of human origins based on the theory of evolution.

> The mystery of human origins is far from solved, but *because DNA may not be as diagnostic as it once seemed*, Thorne says, "*we're back to the bones*." University of Oxford geneticist Rosalind M. Harding agrees. "It's really good that *there are things coming from the fossil side* that are making people worry about other possibilities," she muses. "It's their time at the moment, and *the DNA studies can just take the back seat*." Ref 63

Wong is proposing that mtDNA empirical research be sidelined in the hunt for the truth about human origins in favor of the theory of fossilization. This is incredulous when one considers that DNA testing is used in forensics and courts of law and can be submitted as testimony in cases involving capital punishment. To suggest that DNA is not reliable and that the answers to human origins lie in the theoretical fossil record is misguided to say the least. So far as is known by this author, no capital punishment case has ever been decided on the findings of geology, yet DNA testing is consistently used.

Wong is suggesting that theory be used over actual experimental findings and direct empirical comparisons. This is not scientifically sound practice. If experimental or observational findings do not match the theories, then it is the theories that must be altered, not the other way around.

Of course data can also be manipulated, but in this case Parsons is a staunch believer in evolutionary time scales and yet he himself understands that his data may be causing a direct refutation of the theory of evolution. This is why he offered four areas where his findings could be off, yet they continue to be verified by him and many others as being insufficient to bridge the chasm between reality and theory.

Phylogenetic Dating and Pedigree Dating: The Great DNA Dating Debate

There are two methods of arriving at a rate of mutation for mtDNA: the first is called "phylogenetic dating;" the other is called "Pedigree dating" as this dating has been taken from direct observation of the changes that occurred in actual pedigrees, such as the Parsons' study previously mentioned. To review what has been established thus far, the following bullets list the salient points.

Phylogenetic Dating is based on the *un-verifiable assumptions* that:

- the theory of evolution is true
- apes and humans shared a common ancestor
- the rate of mtDNA mutation in prehistoric great ape populations is known
- the rate of mutation of apes is the same for humans
- the rate of mutation is constant
- the theory of fossilization is true
- the theory of geologic time is true
- the theory of uniformity is true

Pedigree Dating is based upon these *experimentally verified* events:

- direct measurement of observed substitutions in actual mtDNA loci

- direct testing of multiple genealogical lineages
- observed rate of substitutions in human populations
- rate of mutation over hundreds of actual genetic events (births)

These are the two methods or approaches to using mtDNA for studies of human evolution and pre-historic human population movements. Which of these two methods would produce the most reliable and factual results based on reality?

The DNA Dating Discrepancies, a Severe Problem

As has been seen already, the two primary DNA dating methods, phylogenetic (theory based) and pedigree (observation based) are not correlating with each other, and in fact pose a severe problem in genetics. A better perspective on how these challenges have been progressing over time will now be accomplished through a quick review of many of the published studies, and how they have changed (in more or less chronological order).

In 2000, the control region (CR) mutation rate estimates from phylogenetic studies was published in an article in the *American Journal of Human Genetics* entitled pointedly "The Mutation Rate in the Human mtDNA Control Region." It gave a wide range for mtDNA dating because of the many uncertainties in the assumptions of the theories and the lack of any real calibration points from which to draw definite conclusions.

> The range of *published estimates of the CR mutation rate, from phylogenetic studies, is 0.025–0.26/site/1 million years (Myr).* Ref 64

In this same article the published rate of mutation from Parsons' comprehensive study were also given. Note that the experimental pedigree rate is not listed as a large range as the phylogenetic rates, because it is based on experimental factual evidence and not nebulous theories.

> The availability of high-throughput sequencing recently has allowed *direct estimation of mtDNA mutation rates, simply by a counting of the number of mutational events observed in pedigrees.* The largest such study to date, by Parsons et al. (1997), reported *a mutation rate of 2.5/site/Myr*, on the basis of 10 mutations in 327 transmission events, principally from motherchild, grandmother-grandchild or sib-pair comparisons. Ref 64

In the article, one of the most astounding evidences of the severity of the discrepancy between the two dating methods is clear.

> *The mutation rate of the mitochondrial control region has been widely used to calibrate human population history.* However, *estimates of the mutation rate in this region have spanned two orders of magnitude*. Ref 64

An order of magnitude in scientific terms relates to a given item of a specified amount being compared to another amount of the same item. The ratio generally used in science is 10 times. A difference of one order of magnitude between two items equals a 10-fold or 10 X change. A two order of magnitude difference is a 100 fold difference or 100 X change. The article is stating that between phylogenetic and pedigree studies, differences of as much as 100 times have been seen.

In 2003, after many attempts at "correcting" the pedigree dating rates to bring them more into line with the phylogenetic rates, they were still an order of magnitude different.

> Taken together, the cumulative results support the original conclusion that *the pedigree divergence rate for the control region is ~10-fold higher than that obtained with phylogenetic analyses.* Ref 65

By 2005 additional pedigree studies were coming out as the result of more and more mtDNA sequencing being completed all around the world. The resultant findings continued to support the fact that pedigree rates are consistently higher than the evolution based phylogenetic theory would predict. Even after significant "massaging" and theor-

izing over the question of why such a huge discrepancy would still be unexplained after this many years, the problem continues.

> Recent *studies based on population-level and pedigree data have produced remarkably high estimates of mutation rate, which strongly contrast with substitution rates inferred in phylogenetic (species-level) studies*. Ref 66

The inability of the two mtDNA dating methods to be reconciled by 2005, some eight years after Parsons' landmark study, has now blossomed into an actual debate, with the phylogeneticists defending their theories and the pedigree geneticists defending theirs. Why is this occurring?

Accusations began flying in the journals between the two groups about which rate should be applied to which studies. Because the two rates are so utterly incompatible, geneticists were often left with the challenge of "choosing" sides in their reports. Which should they use? Thus a debate was sparked that does not appear to be ending anytime soon. The phylogeneticists accused the pedigree geneticists of poor work and carelessness, and the pedigree geneticists responded by defended their position, calling into question the theories of phylogeneticists. This debate is ongoing.

> *Phylogenetic comparisons*, based on either interspecific or intraspecific comparisons, *yielded estimates of 0.075–0.165 × 10−6 substitutions/ site/ year.*
> However, *direct observations of mtDNA mutations in families or deep-rooting pedigrees led to estimates ranging from 0.0–1.46 × 10−6* substitutions/ site/ year, with an *overall average* (based on more than 2600 transmissions) *of 0.47 × 10−6 substitutions /site/year, which is significantly higher than phylogenetic estimates. There is now a debate as to which rate reflects the "true" state of affairs, and which to use for studies of population history.* Ref 62

Two more years of attempts to figure out and "massage" the pedigree rates in various ways to help move them in the direction of the phylogenetic rates have resulted in a continuing inability for them to be reconciled, causing Brent C. Emerson of the Center for Ecology, Evolution and Conservation at the School of Biological Sciences at the University of East Anglia, Norwich, UK to again confirm the controversial rate differences in this 2007 article.

> Howell et al. (2003) obtained a *pedigree divergence rate of 1.0 mutations/bp/Myr* (mutations per base pair per million years) for the control region. Building on these data, Howell et al. (2003) also *combined data from a number of unrelated pedigree studies and obtained a broadly similar control-region pedigree divergence rate of 0.95 mutations /bp/Myr.* Ho et al. (2005) point out that *this value is vastly greater (approximately 50X) than the phylo-genetically derived divergence rate of approximately 0.02 mutations/ bp/Myr* for protein-coding mitochondrial DNA. Ref 67

Just after the above lines in his article, Emerson softens the magnitude of the problem by offering the suggestion that the control region "evolves much faster than the protein-coding regions" within human mtDNA which might alter the rates sufficiently such they are only five to ten times the phylogenetic rates.

Phylogenetic Dating vs. Pedigree Dating: An Example

What, then, is the real mtDNA mutation rate, and what is its significance to human evolution and population genetics studies?

- Phylogenetic Dating (theory based) average rate of mutation is 0.025 mutations per site, per 1 million years.
- Pedigree Dating (observation based) average rate of mutation is 2.5 mutations per site, per 1 million years.
- There is a maximum discrepancy of two orders of magnitude (or 100 times) faster rate of mutation between the two primary DNA dating methods.
- A phylogenetic mtDNA date estimate of 200,000 years could, in reality be as low as only 2,000 years using pedigree dating.

A constant rate of mutation?

Several articles have brought up one of the underlying assumptions of phylogenetic analysis yielding very low rates of mutation. In an article in July of 2005 from the journal *Science*, author David Penny of the Allan Wilson Center for Molecular Ecology and Evolution, Massey University, Palmerston North, New Zealand restates what has obviously been a hallmark of evolutionary theory involving DNA studies.

> The *relative constancy of the rate at which DNA sequences evolve has been a treasured icon of molecular evolution for nearly 40 years*. Ref 68

Brigitte Pakendorf of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, provides an invaluable overview of the current state of knowledge involving human mtDNA to her fellow geneticists. She cautions restraint in relying too heavily on mtDNA dating for several areas of genetics including human genetic variation, ancient DNA analysis, forensic DNA applications and genealogical purposes.

> This means that *care must be taken when using mtDNA data to date phylogenetic events, as the underlying assumption of neutral clock-like evolution may not hold*. Ref 62

After extensive review of all the latest material, Pakendorf offers the warning that the assumption of a constant rate of mutation, otherwise called "clock-like evolution" may not be valid and needs to be reassessed.

Mutational "Hotspots"?

In the animal realm, mtDNA dating is also a serious problem for evolution. While there is not time or space in this work to address all the issues with evolutionary mtDNA dating, it can be said that the same challenges seen in the human mtDNA dating exist in the animal kingdom as well. This is not solely a human DNA challenge, but one that appears to be a systemic problem found in every living organism. An article entitled "The Pedigree Rate of Sequence Divergence in the Human Mitochondrial Genome: There Is a Difference Between Phylogenetic and Pedigree Rates" clearly indicates from the title the significance of the difference in rates.

> The issue of the mtDNA divergence rate has been studied in animals other than humans. Lambert (2002) observed that *the empirically derived rate* of *penguin* mtDNA-control-region divergence *was two to seven times higher than the phylogenetically derived rate*. Denver et al. (2000) estimated the rate of *mtDNA divergence in mutation accumulation lines of Caenorhabditis elegans [roundworm] to be 8.9 mutations/site/Myr, a rate that is ~100-fold higher than phylogenetically derived divergence rates*. The authors obtained *no evidence that mutational hotspots* were causing the high rate of divergence. Ref 65

In many species where DNA testing has been done, similar dilemmas are occurring. An article in *American Journal of Human Genetics* happens to mention this fact in relation to human DNA dating problems because of the ongoing disagreement between phylogenetic and pedigree rates. What is worse for evolution-based phylogenetic dating is that the very basis in human evolutionary theories, the apes, is also in the same potentially catastrophic situation.

> Their analyses of *primate and bird data sets reveal that there is indeed a decided acceleration of molecular evolution on short timescales. This is an effect that demands explanation;* moreover, estimates for *the timing of recent events in population biology will need to be reconsidered*. Ref 68

David Penny, who we learned of previously, is of course justified in demanding an explanation, as are all of those who believe in the scriptures and the prophets. He then, as so many others have done, insists that the timing of evolution-based events need to be reconsidered. Coming from a scientist who works for an organization whose name is emblazoned with the word "evolution," this is heady stuff.

Those reading this material may have already noticed the names of so many of the organizations and institutes that bear the word "evolution" in their titles. It is any wonder that there would be so much resistance to questioning the dogma of evolution? Who would want to conduct experiments that might lead to forcing a renaming of their very organization? As stated before, such experiments would never make it out of committee of the scientific organizations for funding.

In 2008, an exchange between Dr. Bandelt of the University of Hamburg, in Germany and Neil Howell, now at Matrilinex LLC in San Diego, CA, is most enlightening in understanding the level to which this debate has reached. Dr. Bandelt, a phylogenetic oriented professor of mathematics, fired an opening salvo in an article titled "Time Dependency of Molecular Rate Estimates: Tempest in a Teacup" in which he takes issue with problems in the difference in rates. He discusses the question of the use of "fashionable software" to "treat" data, takes issue with taking rates at "face value" and charges that pedigree analysis is fraught with errors and bias and is not well defined. A staunch evolutionist, Bandelt claims that other researchers failed to utilize "phylogeographic insight" meaning the "insights" obtained through evolution theory-based models.

Howell fires back an amazing article titled "Time Dependency of Molecular Rate Estimates for mtDNA: This is not the Time for Wishful Thinking" in which he addresses Bandelt as follows.

> Firstly, there is a steady *accumulation of reports that human mtDNA does not evolve in a clocklike manner*. Sequence sets that "pass" a robust clock test are the exception. Secondly, *we lack adequate calibration points for accurate time estimates*, even if there were a human mtDNA clock. Ref 69

Howell acknowledges the problem with two of the assumptions of evolutionary phylogenetic based dating, the uniformity of the rate of mutation, and the lack of any way to actually calibrate the "clock" in prehistoric times. He goes on to acknowledge the discrepancy between the two dating methods and rightfully defends pedigree dating as more empirical and less theoretical than phylogenetic analysis.

> Dr Bandelt again takes the opportunity to dismiss the *discrepancy between mtDNA rate estimates from pedigree analyses and those from phylogenetic analyses. We disagree that the pedigree rate is not well defined. It has an explicit operational definition and is, in fact, more empirical and less model-dependent than phylogenetic rate estimates*. Ref 69

Howell continues to confirm that pedigree analysis is preferable to phylogenetic analyses and that in his analysis the pedigree rates again showed an order of magnitude different rate than the phylogenetic rate, complaining that those rates vary widely.

> Dr Bandelt also makes the *unsubstantiated charge that pedigree analyses "...seem to suffer from ascertainment bias and ... sequence Errors ...." We cannot find evidence for either* and the issues he raises have been addressed previously.
> Our meta-analysis *confirmed that the pedigree rate was less than one set of phylogenetic rates by an order of magnitude.* A more significant problem is that *phylogenetic rate estimates vary widely*, something that should trouble "stopwatchers." Ref 69

While we have not even touched on the paternally transmitted y-chromosomal DNA dating methods, they also yield similar results as indicated by Howell's ongoing response to Bandelt.

> It is worth noting at this point that a *three-to fourfold pedigree/phylogenetic discrepancy has been observed for rate estimates of the Y chromosome* microsatellite sequences.
> Ref 69

These next two sentences contain a very important and yet unanswered question: Why would there be any difference between rate estimates, if there is a simple mtDNA molecular clock?

> Our disagreements with Dr Bandelt on these technical issues are important, but they should not detract from the *point of general significance*: *the pedigree rate of substitution is* significantly less than the molecular rate of mtDNA mutation but *greater than the "zone" of phylogenetic rate estimates. Why would there be any differ-ence between rate estimates, if there is a simple mtDNA molecular clock?* Ref 69

The final words of this eye-opening article demonstrate the depth of the problem of having a huge chasm of confusion between the theory and the data. In about as stinging a rebuke as is likely in a peer reviewed journal article, Howell makes an incredibly revealing commentary on the state of mtDNA dating: "When it come to mtDNA, one should not use a sundial as a stopwatch."

> It is our contrary view, based both on our research and that of many other groups, that *mtDNA evolution is not clock-like* and that the evidence for time-dependent rates should not be dismissed. *When it comes to mtDNA, one should not use a sundial as a stopwatch.* Ref 69

The problem with rapidly deleterious mutations

In 1999 one group attempted to correct the discrepancy between the two dating methods by proposing that there might be mutations that combine in a synergistic way that actually ends up destroying the organism, causing death. In this way mutations that would have otherwise remained in the population get removed from it. However, based on this theory, the rate of "deleterious" mutations was so high that species with low birth rates would soon become extinct…such as humans and chimps, our supposed "relatives."

> *The deleterious mutation rate appears to be so high in humans* and our close relatives [apes] *that it is doubtful that such species, which have low reproductive rates, could survive if mutational effects on fitness were to combine in a multiplicative way.* Our results instead indicate that synergistic epistasis may occur between deleterious mutations, in hominids at least. Ref 70

Regarding the work of Eyre-Walker and Keightley, in their article "High genomic deleterious mutation rates in hominids" quoted above, Deem Rana writes:

> The authors had to rely upon a rare association of mutations, termed synergistic epistasis to explain why the numerous hypothesized deleterious mutations have not overwhelmed our genome. *Instead of postulating the obvious (that the human genome is not as old as evolution would teach), evolutionists must rely upon the improbable to retain the evolutionary paradigm.* Ref 71 at http://reasons.org/resources/apologetics/humanevolution.html, 1999.

An article in *Genetics* tackled the issue one year later when Michael W. Nachman wrote about the "paradox" of such a high deleterious mutation rate. He found that at that rate, each female would have to have 40 children in order for only two to survive to reproduce. Obviously this is not the case in humans, and the idea of high deleterious mutations being used to reconcile evolutionary estimates with pedigree rates was for all intents and purposes dropped.

> The *high deleterious mutation rate in humans presents a paradox*. If mutations interact multiplicatively, the genetic load associated with such a high U would be intolerable in species with a low rate of reproduction. The reduction in fitness (*i.e.*, the genetic load) due to deleterious mutations with multiplicative effects is given by $1 - e^{-U}$. For $U = 3$, the average fitness is reduced to 0.05, or *put differently, each female would need to produce 40 offspring for 2 to survive and maintain the population* at constant size. This assumes that all mortality is due to selection and so the actual number of offspring required to maintain a constant population size is probably higher. Ref 72

The Severity of the mtDNA Rate Problem

What are the implications of the severity of the problem for genetics with regard to the theory of evolution? As evolution

is the foundation upon which the phylogenetic dating method is based, what would happen if science were to begin to rely on the experimental pedigree dating? The reason why the pedigree dating is being maintained as viable is because of forensic testing done for court cases that cannot base their findings on theories, but must, of necessity, base them on reality.

The evidences for their validity are overwhelming, even in the face of massive pressure to maintain the evolutionary stranglehold in the houses of higher learning and to continue its teaching to every school child in America as if it is the now established truth, supplanting the truths of the scriptures and creation. The belief in evolution to some is tantamount to the belief in God in others. To deny evolution would be to an evolutionist the same as denying God to a Christian. Neither can be definitively proven scientifically, which makes them a belief. They are both belief systems, but the difference is that one of those belief systems is now a state run institution, with government mandating its teachings to our children.

DNA Dating Implications for the Theory of Evolution

What does all this mean for the theory of evolution? As with most dogma it will survive until something better comes along to replace it, as is typically the case with paradigm shifts, according to Thomas Kuhn's influential book *The Structure of Scientific Revolutions*. In the meantime, the evolutionists are clinging to its teachings and maintaining their hold on its concepts. Rather than question evolution, the empirical evidence is being manipulated to induce a fit to the theory. If that doesn't work, then it might be ignored altogether. This is exactly what is happening in this debate at this time.

Here is what some of the scientists have to say about the well known discrepancy between these two dating methods. LDS scholar Jeffrey D. Lindsay discussed the fact that seems to be missed in most scientific minds today: the reality based dating rates pose a serious threat to the theory of evolution.

> It is *not just non-coding mtDNA where unexpectedly high mutation rates have been encountered*. Adam Eyre-Walker and Peter D. Keightley's article, "High Genomic Deleterious Mutation Rates in Hominids," published in the prestigious journal, *Nature* (Eyre-Walker and Keightley, 1999) shows that mutations in the coding DNA of the nucleus occur at a *much higher rate than previously realized, so high that it poses serious problems for standard evolutionary models*. The reported conservative estimate is 4.2 mutations per person per generation, with 38% being deleterious—though the actual number might be significantly higher. Ref 70 as quoted in Ref 73

Dan Mishmar, of the Center for Molecular and Mitochondrial Medicine and Genetics, at the University of California, Irvine understood the seriousness of the problem when he wrote in *PNAS* in 2003 that the proposed "timing of human migrations need to be reassessed." He also states that the molecular clock may not have been constant.

> If selection has played an important role in the radiation of human mtDNA lineages, then the *rate of mtDNA molecular clock may not have been constant* throughout human history. *If this is the case, then conjectures about the timing of human migrations may need to be reassessed*. Ref 74

David Penny, discussed previously, understood what the implications were for evolution and spoke out, verifying that overestimation of timing has occurred.

> Overall, however, the *implication is that the timing of many recent events in human evolution has been overestimated* by past studies. Ref 68

Simon Ho, also discussed previously, had this to say about the large rate disparities which, according to him, presented a direct challenge to aspects of evolution.

> *The most marked differences have been seen between rate estimates directly measured from pedigree or population studies and*

those inferred in phylogenetic (species level) studies. The *large rate disparities present a direct challenge to the neutral hypothesis of molecular evolution,* which postulates that the overwhelming majority of mutations are selectively neutral. The substantial difference between mutation and substitution rates cannot be satisfactorily explained by the slow fixation rate of neutral mutations. Ref 66

It must be remembered that all of these individuals believe in evolution, but they also understand the strength of real experimental evidence as opposed to theory. They are desperately holding onto the theory rather than embracing the evidence.

The published rates of the two dating methods Over Time

The table below gives the progression of the mutation rate ranges for the given methods.

Date and Dating Type	Rate or Date obtained
2000, phylogenetic range	.025 - .26 / site / Myr
2000, pedigree range	2.5 / site / Myr
2005, phylogenetic range	.075 - .165 / site / Myr
2005, pedigree range	0.0 – 1.46 / site / Myr
2005, pedigree average	0.46 / site / Myr
2003, pedigree divergence rate average, study 1	1.0 / basepair / Myr
2003, pedigree divergence rate average, study 2	0.95 / basepair / Myr
2005, phylogenetic divergence rate average	0.02 / basepair / Myr
2006, synonymous transition	6764 years per mutation
2009, coding region	5140 years per mutation
2009, synonymous transition	6760 years per mutation
1998, Date of human-chimpanzee species split	5 million years ago
2006, Date of human –chimpanzee species split	6 million years ago
2006, Date of human/chimp most recent common ancestor	6.5 million years ago

Attempting to Resolve the Discrepancies

In the conclusion of his article in *American Journal of Human Genetics,* Neil Howell confirms the fact that the two rates are not in agreement and then offers some suggestions about how to go about finding the factors that may be causing the difference.

> In conclusion, the results presented here indicate that *the pedigree rate of control-region divergence is significantly higher than the phylogenetic divergence rate.*
>
> The results of our analyses, as well as those from other studies, indicate that *there is a difference in the two rates,* and we discuss the factors that are most likely to produce this difference. Ref 65

The factors that are most likely to be producing the discrepancy are then listed.

> *The disparity is unlikely to be caused by a single factor or evolutionary process,* and we suggest that *mutational hotspots,* random *genetic drift,* the *inability* of phylogenetic methods *to adequately capture the high levels of control-region homoplasy,* and *selection are involved.* Ref 65

These are the factors thought to be causing the difference between the theoretical rate and the observed rate as of the time of this article in 2003. They are much the same as brought out by Parson's 1997 article.

Howell factors, 2003	**Parsons factors, 1997**
"mutational hotspots" in the mtDNA	"mutational hotspots" in the mtDNA
random genetic drift	the frequency of new substitutions and the effect of genetic drift on them
inability to capture high levels of homoplasy	the possibility of "mechanistic bias"
unknown evolutionary selection processes that might be involved	some substitutions may be "deleterious" or removed over time

It is interesting that again the evolution-based phylogenetic theory is not even being questioned. Each of these remedies is an attempt at altering the pedigree dating findings, to figure out why they are not matching the phylogenetic theory, and to bring them into alignment. Why is this being done? Twice in his article Howell makes it clear where he thinks the discrepancy is derived.

> Although *phylogenetic approaches underestimate*, to some extent, the control-region divergence rate, *the main issue is the elevated rate of divergence in pedigrees*. Ref 65

He admits that the evolution-based theory consistently underestimates the rate, but then he shows in the last half of the sentence where he feels the "main issue" or problem is. He claims that the main issue is with the observed pedigrees. It is disconcerting that the theory is thought to produce more accurate results than the observed findings based on real people, which in this case are thought to be the culprits.

And then he again places the factual findings of observational science in a position subservient to the un-verifiable theory of evolution. He states that he hopes that pedigree analyses may provide a "complementary" role to phylogenetic analyses (rather than the primary role) in coming to an understanding of human evolution. Would it not be more appropriate to form a basis using pedigree rates and "complement" them with phylogenetic rates? This would have the effect of again establishing reality over theory, which should be one of the foremost tenets of science.

> *Pedigree analyses provide a complementary approach to phylogenetic analyses* that will allow us to more fully understand the processes that shape the evolution of the human mitochondrial genome. Ref 65

When did theories become foundational or "ground" truth rather than experimental evidence? Why would factual observations be made subservient to nebulous theories? These are very important questions that highlight the state of affairs within the scientific community and its theory of evolution. No one dares challenge it for fear of their jobs being lost, being denied funding, or being ridiculed by their colleagues.

Unfortunately this same problem is faced by many faithful LDS scholars and scientists. For them to get tenure and funding, they must also "toe the line" and "not rock the evolution boat" that continues to take our children farther and farther from the safe harbor of the Lord and the scriptures. There are many LDS educators and scientists actually supporting and defending the evolution boat rather than standing for truths in the scriptures and prophets. Remember the scriptures warn us about putting one's trust in the "arm of flesh."

To his credit, Howell does offer a few comments on the phylogenetic side that he

feels may help close the gap between the two rates. He states that the phylogenetic rates have some "complications" that need to be addressed such as variability in the control region of DNA, a possible high rate of parallel mutations, and that there are violations of clocklike evolution. He also mentions the need to account for other potential effects such as the dynamics of a population, intermixing, and migration.

> The noncoding control region, or D-loop, of the human mitochondrial genome (mtDNA) continues to be widely used to "time" human evolution and population movements, both ancient and modern). *Many of these studies continue to rely on phylogenetic analyses* of mtDNA-control-region haplotype trees and *phylogenetically derived rates* of divergence, *despite the complications* that arise from the effects of marked site *variability in the control region*, a *high rate of parallel mutations*, evidence for *violations of clock-like evolution* and of nonneutral evolution, and the *failure* of most phylogenetic approaches *to factor in the effects of population dynamics, admixture, and migration.* Ref 65

That at least one of the areas Howell mentions is based on "unknown" and "complex" histories becomes evident in this article in the *Annals of Human Genetics* in the same year when Bandelt claims:

> *Leaving aside problems inherent in the calibration of the mtDNA substitution rate, methodological shortcomings may further exacerbate the estimation of the ages of mtDNA founder clades*. There is a long tradition in using nucleotide diversity ("sequence divergence") for estimating "divergence" times;... *This sort of estimation, however, depends heavily on the unknown and presumably complex demographic history* of the population groups *and is bound to deliver biased haplogroup ages.* Ref 75

In their review of Howell's work, Pakendorf and Stoneking confirm Howell's proposals for correlating more closely the two divergent rate methods.

> However, Howell et al. argue that the difference in mutation rates estimated from pedigree and phylogenetic studies *does [do] not have one causal factor, but instead is due to mutational hot spots, genetic drift, selection, and lack of detection of recurrent mutations in phylogenetic studies.* Ref 62

Pakendorf and Stoneking then offer their own ideas on the matter by stating that fast evolving sites might be detected in pedigree studies more easily and that the longer term phylogenetic studies may be picking up more of the slowly evolving sites.

> The most likely explanation for the *discrepancy between phylogenetically based and pedigree-based estimates* of the mutation rate in human mtDNA is *that fast evolving sites are preferentially detected in pedigree studies, whereas phylogenetic studies (which encompass a larger number of transmissions) pick up mutations at the slowly evolving sites as well.* Ref 62

The question is, how do we know for a certainty that the deep-time phylogenetic studies are actually picking up the slowly evolving sites? What empirical basis is there for this assumption?

A Two Rate Approach: a Rate to Fit Evolutionary Theory and a Rate to Fit the Observations.

A method to correct for the disparity is thought possible with a new theory that has been recently proposed. The idea is that it may be possible for rates of mutation to have been much, much lower in the theoretical past than in the reality of today. The new proposed method to correct the problem is to assume that the rates inexplicably began accelerating tremendously rather recently. Therefore the evolutionists can have their theory-based dating, and the experimentalists working with real world DNA, such as forensics, can have their own rates for "today's needs."

Brent Emerson offers a possible solution to the problem: assume that the mutation rate anciently was much, much lower, to account for the theory-based long term phylogenetic rates, and that this rate has highly accelerated to what we are observing today. In other words, at some point in deep

time, it is assumed that the theoretical rate of mutation was much lower. At what point in time did this supposed "shift" occur?

> *Studies based on pedigree data have produced remarkably high estimates of mutation rate (Howell et al., 2003) compared with* the more moderate mutation *rates typically inferred from phylogenetic studies. This begs the question of when the apparent high rate estimate derived from pedigree data falls to a level compatible with traditional phylogenetic estimates,* and this is a *fundamentally important question for molecular evolutionary biologists.* Ref 67

Since the two rates at this time cannot be reconciled, more complex assumptions are being brought forward to account for the obvious dilemma of the theory not matching the data. Rather than extrapolating the actual pedigree rates to account for the timing of the most recent common ancestor, the idea that the rate changes on evolutionary time scales is introduced.

> Our results show that *it is invalid to extrapolate molecular rates of change across different evolutionary timescales, which has important consequences for studies of populations,* domestication, conservation genetics, *and human evolution.* Ref 66

David Penny does acknowledge that it may be the evolution-based theory that may require a re-analysis, rightly claiming that the appropriate constraints have been put in place by pedigrees.

> In some cases the constraints are from recent events, and *it is the long-term events that require re-analysis.* Ref 68

This novel approach does seem to calm the troubled waters, as each group gets the rates they "want." With this method, the long-term phylogenetic researchers can theorize about when humans evolved from apes, and the forensic researchers can have their observed rates. Everyone would then be happy.

> In any event, because a significant number of the mutations observed in pedigree data have arisen recently and will probably not become fixed, *the phylogenetic rate may be preferable for studies of deep history, whereas it may be advisable to use the pedigree rate for studies of recent history.* Ref 62

This is the "make everybody happy" approach wherein each group that wants or has experimentally verified a particular rate is allowed to have it their way. Everybody gets their own rate, but then that begs additional questions: at what point does the rate switching occur so that the "proper" rate can be utilized? How do we know if any rate changing has actually occurred? What is the mechanism that caused the rate change to occur?

> Alternatively, studies of population history could incorporate models that *allow for different classes of sites with different evolutionary rates.* Ref 62

Of course the most obvious difficulty with this approach is that it is based on a complete unknown. No one knows if the mutation rate has accelerated, it is purely an assumption in an effort to find a way to reconcile the discrepancy.

A more classical approach: simple comparative analysis

Comparative analysis dating could be used to determine which lineages occurred earlier than another.

> *We cannot know for sure when a particular mutation first occurred, and therefore DNA provides only a crude historical clock.* But we do know that *some lineages are more widespread and basic than others, indicating that the former occurred earlier than the latter.* Ref 37

Of course this is only true if a laundry list of assumptions is true. Unfortunately the Book of Mormon history itself easily refutes this approach. For example, a population bottleneck like that of the Jaredites and Nephites would certainly skew the genetic scenario and the timing of who was earlier than who, based on how widespread they

were later found to be. The Jaredites predated the Nephites and were a huge population but, due to their self annihilation, their descendants are effectively zero while the Lamanites today are still with us, even though they came much later. This method has many potentially fatal flaws.

One of the areas where a simple comparative DNA approach can offer signifycant clues is when sequencing is used to make comparisons between groups rather than trying to establish genetically based dates. Such work is more akin to forensic DNA work. There are two types of approaches to using mtDNA data in studies that are elucidated in the following quote.

> There are *two basic approaches to using mtDNA in studies of human evolution: the lineage-based approach and the population-based approach*. The *lineage-based* approach attempts to *unravel the history of mtDNA lineages*, called haplogroups, while the *population-based approach attempts to study the prehistory of individual populations*, of geographical regions, or of population migrations by using human population groups as the unit of study and applying population genetic methods to the data. Ref 62

The lineage-based approach is focused on the mtDNA lineage itself, tracing a particular line back to where it joins with other similar lines and applying dating mutation rates to determine when these connections occurred. The population-based approach compares the genetic lineages between entire populations and is much less dependent on speculation and theory, and more on observation. Certainly, like nearly all scientific endeavors, there can also be some theory involved, but on the whole such finds are generally more empirical and less speculative.

There has been a tendency, according to Pakendorf and Stoneking, to think of the date that a lineage traces into another lineage as being the same as the date that the two lineages arrived in a new location. Such is not the case. When a population migrates, it may be carrying several or even many lineages depending on the size of the group and the diversity within the group. All of these come to bear on the group's genetic identity. That is why a group approach may be more accurate in determining relationships than a mtDNA exclusive approach which only provides a snapshot of one single solitary lineage back into time.

Any group the size of Lehi's group would carry with them many separate lineages in their nuclear DNA, but only seven mtDNA lineages (assuming none of the women had heteroplasmy) were carried into the New World by Lehi's group.

> *A problem with the lineage-based approach of studying haplogroups is that it only elucidates the history of the haplogroups themselves,* and does not provide direct insights into the history of the individual populations in which they are present. *There has been an unfortunate tendency to equate the age of a haplogroup with the age of a population, and to assume that the spread of each individual haplogroup reflects a separate migration. The reality, of course, is that when a population migrates, it carries all of its haplogroups with it, not just one of them*, and the ages of the haplogroups in the migrating population indicate when the point mutations defining the haplogroup occurred, not when the migration occurred. Ref 62

The understanding that coalescence dates and migration dates are not necessarily equal is important because in many cases it is somewhat assumed. A genetic lineage could "age" in one location and emigrate many generations later. The fact that a particular lineage is found rather exclusively in one area does not necessarily indicate that it is where the lineage derived.

Massaging the Pedigree Rates

Still another approach is to massage the pedigree rate until it conforms to the phylogenetic rate through the use of multiple theoretical assumptions thought to possibly be wrong with the experimental results and that could be applied to help them conform. For example, take the empirically derived esti-

mate, and manipulate it using the assumed changes that might reduce the rate to more closely match the theory based rate. You could adjust for the sex of individuals, the "probability" of mutations becoming fixed in a population, or the (unknown) effect of selection. This is rather suspiciously similar to "cooking the books" done by crooked accountants. If it doesn't fit, keep working with it until it does.

> Our *empirical estimation of mtDNA coding region mutation rate, calculated taking into account the sex of individuals* carrying new mutations, the *probability of intra-individual fixation of mutations* present in heteroplasmy and, to the possible extent, the *effect of selection*, is *similar to that obtained using phylogenetic approaches.*
> *Conclusion:* Based on our results, *the discrepancy previously reported between the human mtDNA coding region mutation rates observed along evolutionary timescales and estimations obtained using family pedigrees can be resolved when correcting for the previously cited factors*. Ref 76

Use of Phylogenetic Software Programs to Massage the Rates

As a further example of creating ways to massage the data, new software simulation programs have been developed to make it much easier to see the results of a "modification" of the data nearly instantly. These "phylogenetic software" programs make it possible to "massage" the numbers with greater ease, and also have the added benefit of allowing a claim that one's results have been analyzed by computer, giving the pale of non-human objectivity. Oh, they have impressive nomenclatures such as BEAST, Bayesian-Skyline Plot Analysis, etc. First from Ho, then from Bandelt we have:

> We reanalyzed the data…using the Bayesian *phylogenetic software* BEAST… Ref 77
> There is often a striking imbalance between the poor choice of data and models and the *enormous efforts that are undertaken to treat the data with fashionable software*. Ref 78

Here an admission is made that phylogenetic software is employed to "treat" the data. If the data had originally matched the evolutionary theory dates or even exceeded them, would there have been as much effort put into finding ways of massaging the data? It is highly doubtful. A more likely scenario is that the data would have simply been accepted and the theory moved further out in time to compensate for any difference. In this case, where the results call into question the theory of evolution, no one is willing to objectively question any of the primary assumptions, it would sadly seem.

Questioning Pedigree Research Results and Accusing Pedigree Researchers

Questioning the validity of pedigree rates and accusing pedigree analysis of having errors is the approach of Dr. Bandelt. He accused pedigree rate analysis of being riddled with mistakes and problems in methods, thus discrediting the unwanted rate. He does exactly that with his statement that "one should never take any result in this field at face value." Does this not cast doubt on the published mutation rates he is disparaging?

> The approach of Ho et al. (2007) was to "take four published mutation rate estimates at face value." Well, this is the crux of the matter: *one should never take any result in this field at face value* in view of *omnipresent laboratory artifacts and ill-applied methodology.* Ref 78

Dr. Bandelt levels a broadly sweeping accusation that those conducting DNA sequencing and pedigree analysis have allowed laboratory errors and have used improper methods in obtaining their results. This is because their results continue not to correlate with the evolution-based phylogenetic rates that Dr. Bandelt refuses to question.

Another Solution: Ignoring the Pedigree Rates

Yet another approach to reconcile the two dating rates for human population analysis is to simply ignore the pedigree rates alto-

gether and only apply phylogenetic rates. This is a subset of the earlier idea of using pedigree rates for historic time frames and phylogenetic rates for pre-historic time frames. As an example of this, the most recent mutation rate estimates, proposed by geneticist Ugo Perego of the Sorenson Molecular Genealogy Foundation in Salt Lake City, Utah and colleagues, in *Current Biology*, in January of 2009, offer two new rates for use by geneticists, both based on phylogenetic perspectives, and no pedigree-based rates are mentioned.

> *Mutation-Rate Estimate*
> *We propose here for the first time a new mutation rate* taking into account the previous estimates reported by Mishmar for all coding-region base substitutions and by Kivisild for only synonymous transitions. With three decimal digits used throughout, the *rounded values were 5140 years per coding-region substitution and 6760 years per synonymous transition, respectively.* The rho *estimated* (average distance of the haplotypes of a clade from the respective root) *human coalescence times are then 202 kya according to Mishmar et al. and 160 kya according to Kivisild* et al. Ref 79

Using the very latest theoretical phylogenetic rates of mutation, the resulting dates for the most recent common ancestor was recalculated to be 202,000 to 160,000 years respective to their original dates.

For members of the Church, there are absolute calibration points that non-members do not have. These are the Bible, the Book of Mormon, the Pearl of Great Price, and the words of prophets of God. If the theories of men were replaced with the truths of God, there would be no discrepancy whatever in the dating of the most recent common ancestors, Adam and Eve, 6,000 years ago.

If a belief in and an understanding of creation had been used as the calibration for the basis of human "evolution" and population movements, the initial mtDNA pedigree based mutation rate showing Eve at 6,000 years ago would have been completely compatible with the mtDNA findings. There would be no such debate or controversy as to the empirical mutation rate or whether haplogroup X could be related to the Book of Mormon. It would all correlate nicely. Truth is like that.

To help clarify the importance of obtaining a correct dating mechanism the following examples are given. According to the sources mentioned previously, the types of dating and their respective rates are shown. This will provide additional prospective on the "evolution" of mtDNA dating as well as help the reader to see the potential effect on the mtDNA claims against the Book of Mormon.

Implications for Native American DNA Studies

The purpose for delving so deeply into mtDNA dating is to demonstrate that the very basis for mtDNA dating is in question by the inability to reconcile the rate of mutation in human mtDNA between the two dating methods and a professional refusal to consider that the evolution-based phylogenetic theories are erroneous. The account of the creation clearly indicates that the extreme time periods required for the supposed evolution of species to have occurred is without basis in reality, and is an assumption, and not a fact as some would suppose.

With this understanding in mind, the purpose of all this mtDNA information can more clearly be seen. Because the dating is in serious question, not only by the scriptures and the prophets, but by the field of genetics itself, then the issue of haplogroup X mtDNA hypothesized as arriving in the Americas 12,000 to 36,000 years ago is also in question. These estimates were based on the coalescence times of haplogroup X which of course are based on the phylogenetic rate estimates that are in question. Haplogroup X2a shares no precise correlation with any known Old World population, which has lead to the idea that it has been in the Americas long enough to develop its own mutations independent of its sister groups.

This 1996 article in *PNAS* by Peter Underhill discussed Y-chromosomal transitions and depending on the rate used, gave dates for the transition to have occurred of 30,000 years ago, or using the results of Weber and Wong a date of 2,147 years was obtained. This is an enormous difference, and by using the latter date puts the transition in the Americas during the time-frame of the Book of Mormon, as would be predicted by it.

> Based on a *recent estimate of an average mutation rate of 1.5 X 10-4* derived from 700 tetranucleotide loci using the distribution of allelic differences in terms of number of repeats, and an average generation time of 27 years, *the C [to] T transition should have occurred 30,000 years ago*. This value is *similar to an earlier estimate of the time of entry to America (32,000 years) based on classical genetic markers*. However, *in contrast, the mutation rate of 2.1 X 10-3 reported by Weber and Wong [1993] would indicate that the C [to] T transition had occurred only 2147 years ago, which obviously represents an underestimate*. Knowledge of the mutation rate of this particular tetranucleotide would be important for validating this dating. Ref 80

In working with Native American DNA samples Lev Zhivotovsky and colleagues found such a large difference between their evolutionary and their pedigree rate estimates that the geneticists actually questioned in their journal article in *American Journal of Human Genetics*, which rate would be appropriate to use. They confided that an inappropriate choice of rate could result in a ten times difference in the age of the population events. Frustrated by this dilemma, Zhivotovsky exclaims that the two kinds of estimates "need to be addressed."

> By counting the number of mutations in the branches of a haplotype network from *samples of Native American populations*, Forster et al. (2000) found *a striking difference between their "evolutionary" estimate* (2.6×10^{-4} per 20 years) *and the "pedigree" estimate* described above. *It is unclear which rate should be used*; for evolutionary studies, we need to know those mutations that are involved in differences between lineages or populations. *An inappropriate choice of the mutation rate value may produce a 10-fold deviation from the true age of past population events*. The discordance between the two kinds of estimate needs to be addressed. Ref 81

The hypothetical evolution based dating results in ages that are so skewed that they cannot be reconciled with the oldest supposedly ancient archaeological findings in the Americas. This conundrum is addressed in two articles below.

> And *mtDNA studies now date the peopling of the Americas at 34,000 years ago, even though the oldest noncontroversial archaeological sites are 12,500 years old*. Recalibrating the mtDNA clock would narrow the difference. Ref 57
>
> In a recent *study of Native American mitochondrial genomes,* Fagundes et al. claimed to have *found molecular evidence that the colonization of the New World occurred well before the appearance of the Clovis cultural horizon.*
>
> In fact, upon closer *examination of the calibration techniques* involved in the two studies, there *appears to be little support for an American colonization event significantly antedating the earliest physical evidence of human occupation*. Ref 77

The theoretical evolution-based phylogenetic rate doesn't seem to be able to correctly match any evidence in reality. Even the most optimistic archaeological dating of human cultural sites in the Americas is in disagreement with the phylogenetic rate based results, even though the archaeological dating is also based largely upon the theory of evolution.

There are many methods of accomplishing dating in the sciences, but all of them have been created under the assumptions of evolution. This is not to say that they are all incorrect, but that the method being used is critical to an understanding of just how much credibility a particular date may have in relation to both observation and the scriptures.

Certainly it is not possible to accept the scriptural account of Adam, the first man to have been on the earth 6,000 years ago and also accept that there were humans in the Americas 12,000-36,000 years ago. One or the other is correct, and as stated at the beginning

of this work, if there is a clear answer from the scriptures and there is a conflict, this author is upholding the scriptures. To the best of his understanding, in this case, the scripturally based entry to the earth by Adam and Eve happened 6,000 years ago. This makes any claimed entry into the Americas before this time impossible and therefore incorrect.

Certainly these cultures existed at some point in time, but the timing has been skewed by the overarching belief in evolution permeating the sciences. If the dates don't fit the revealed word of the Lord, they must be recognized as being in error. This is not wholesale rejection of the evidence, but if a similar effort was put forth to demonstrate the truth of the scriptural calibration points as was accomplished in trying to find an answer to the problem of mtDNA dating, we very well may have attained complete harmony within the scientific world and the religious one. Not only this matter but others such as the age of the earth, effects of Noah's flood on scientific dating, the process of fossilization and a host of others could be resolved.

Acceptance of a theory or achieving a consensus among a group does not make something true. Although widely accepted, the truths of the Godhead were found to be completely mistaken because of the faith and prayer of a simple farm boy. Consensus is good, in that it can pool knowledge and understanding in a cohesive way. It can also, however, stymie new, fresh ways of looking at things.

The fact that there is not only a discrepancy between dating methods in DNA, but also a discrepancy between DNA dating and archaeological dating is very significant. Again the fact that there are no DNA dating calibration points is noted in the following quote from an article in January's *Current Biology* issue of 2009. Ugo Perego, the author of the article, also recognizes this point. He states that the arrival times, expansion events, and migration routes in the Americas remain controversial because so far it has not been possible to correlate the fields of linguistics, archaeology, and genetics on this matter.

Why not? It can certainly be claimed that this is a very complex issue. However, if the scriptures are true, and if dates and archaeology used these factual human histories for calibration points rather than evolution when formulating their theories, there would be not controversy, but harmony.

> It is *widely accepted that the ancestors of Native Americans arrived in the New World via Beringia approximately 10 to 30 thousand years ago* (kya). However, *the arrival time(s), number of expansion events, and migration routes into the Western Hemisphere remain controversial* because *linguistic, archaeological, and genetic evidence have not yet provided coherent answers*. Ref 79

One of the assumptions made by those inexperienced with the field of genetics is that the coalescence date is the same as the arrival date. In other words, just because haplogroup X is claimed to have coalesced some 30,000 to 36,000 years ago, does not necessarily mean that this is when it arrived in the New World. It could very well be that it coalesced in the Old World just prior to departure. This further complicates such things as migration dates and routes, and at what point populations experienced significant expansions, all of which were outlined by Perego. That he is correct is reinforced by Pakendorf and Stoneking.

> The reality, of course, is that when a population migrates, it carries all of its haplogroups with it, not just one of them, and *the ages of the haplogroups in the migrating population indicate when the point mutations defining the haplogroup occurred, not when the migration occurred*. Ref 62

From his 2008 article in *Heredity*, Bandelt makes the claim that most of the lineages in America came from outside of it. Certainly this is compatible with the claims of the Book of Mormon and the Bible.

> Phylogeography thus dictates that *most parts of the entire mtDNA tree of Amerind*

populations evolved outside the Americas. Ref 78

The primary purpose for this section on the implications of the dating debate on Native American studies is to establish that there is no compelling reason to accept the notion that haplogroup X arrived in the Americas prior to the time of the arrival of Lehi's group at 600 BC. Even the closest ranges in mtDNA dating have only managed to bring the two dating methods to within a 10 – 20 fold difference. If this is the case, then application of the empirical dating to the current theories would easily yield dates roughly consistent with the Book of Mormon historical account.

For example, the proposed arrival times of haplogroup X have ranged from 12,000 to 36,000 years ago based on very broad phylogenetic rates of mutation. Using conservative empirical rate estimates, this rate could just as well be 1,200 to 3,600 (10X rate adjustment) which is an average between the two of 2,400 years ago, or about 400 BC This is most certainly within the realm of possibility based on all the dating problems reviewed. This also happens to be in the range of the time-frames of the Book of Mormon.

There is no solid evidence to the contrary that can objectively reject or refute this theory. It is simply a matter of which dating scheme one chooses to utilize. Since there is no accepted rate of mutation, there is no authoritative scientific rule pertaining to which rate can be used. Based on the fact that the phylogenetic dating is highly skewed towards older ages in comparison with empirical dating, the consideration of haplogroup X as a potential candidate for demonstrating the correctness of the Book of Mormon cannot be denied.

POPULATION MOVEMENTS AND MIGRATIONS IN THE AMERICAS

As with nearly all scientific work, there are assumptions. The most widely held assumption regarding the peopling of America is that of the Bering Strait theory. This theory has been maintained for many years. It is essentially the idea that the Asiatic peoples crossed over what is known as Beringia into North America during the last ice age.

The *A Priori* Assumption: the Bering Strait Theory

As mentioned previously, this migration is thought to have occurred between 12,000 and 36,000 years ago. This is why, when it comes to population movements in the Americas, it is an *a priori* (theory-based) assumption that this is how, when, and where everything "human" began in the Americas. An excellent example of how well entrenched this theory is can be seen in the following quote from *Current Biology*, 2009. Only two possible scenarios are offered, both of them based on the Bering Strait theory.

> *A priori, we can envision two possible scenarios*. First, haplogroup *X2a could have entered into the Americas by following the Pacific coastal path… Alternatively, haplogroup X2a might have arrived from Beringia through a path that was different* from that followed by the pan-American haplogroups. *According to environmental and paleoecological data, such a path existed and was represented by the ice-free corridor between the Laurentide and Cordilleran ice sheets*, which opened approximately 15 kya or possibly was never completely closed. Ref 79

These two scenarios follow essentially the same course across the "land bridge" between present day Alaska and Russia and then split, one following the west coast of America to the south and the other moving further inland into the northern reaches of the Great Plains of America in Canada. This area is thought to have been left iceless between the two massive ice sheets covering most of North America at the time. Thus the people arrived without leaving evidence of their trail into what could be considered the heartland of America, east of the Rocky Mountains in what is now the Great Plains. This is the scenario proposed in the article and continued below as relating to haplogroup X2a.

> Through such a corridor, where some glacial-refuge areas have been recently identified, *X2a could have moved from Beringia directly into the North American regions located east of the Rocky Mountains. This latter scenario would imply that the X2a expansion in America occurred in the Great Plains region*, where the terminal part of the glacial corridor ended, and is in *complete agreement with both the extent of diversity and distribution of X2a observed in modern Native American populations.* Ref 79

This scenario suggests that haplogroup X2a came by way of the Bering Strait and then expanded in the heartland of America. It does not, however, take into account that as of this time Asia has been found to be completely devoid of any trace of haplogroup X2 related to the Native America groups.

It would require that a people who are thought to have originated in the Mediterranean area migrating across the entire continent of Asia, the largest in the world, before or during an ice age. It would further require them crossing the Bering Strait while the ocean there was supposedly 90 feet shallower than it is today, trudging across Alaska to the east following a narrow strip of ice-free passage between the two massive ice sheets to the northeast and west of this northwest-southeast stretching corridor. Finally it finds them tumbling out onto the vast plains of North America without leaving a trace of their ancestry anywhere among the peoples through which they must have passed along the way.

There is no genetic evidence for their having been in eastern Asia, the Bering Strait area (Eskimos or Inuits) or northern Canada anciently, nor is there archaeological evidence for such an occurrence during the time frame proposed. It is totally conjecture—based on theories only.

No boats?

Another *a priori* assumption made in the fields of archaeology and paleoarchaeology presupposes that the ancient peoples of the earth knew nothing of boats. This is evident because of the assumption that the ancients must have had to wait for an ice age before they could cross the 53 miles separating the two continents near the Bering Strait today. Of course without knowledge of boats this would be impossible to cross, but to think it more feasible that humans would have to wait for an ice age before crossing, rather than simply building a small boat or raft to make their way from island to island until they arrive in America seems a much shorter stretch. Combine this with the fact that it was the Lord that guided Noah and Nephi through the process of boat building and if He wanted people in America, He could certainly show them how as well.

The Book of Mormon claims that all those led out of other countries by the hand of the Lord (2 Nephi 1:5) will be brought to it. This also is not to say that there won't be others who come into the land that are not brought by the Lord, but they will not enjoy the same promises as those who are.

However the fact still remains that the Book of Mormon utterly refutes the idea that its inhabitants arrived by walking across the Bering Strait. It absolutely establishes the fact that no less than three maritime crossings were responsible for at least some of the civilizations that flourished on the Promised Land anciently. It was promised that the seed of those people would never be destroyed, even in their wickedness which was foretold. Therefore, somewhere in the Americas there must be people who are a remnant of the house of Israel who are in fact still upon the land. The Book of Mormon prophesizes that they will be, and they will be.

How Many Migrations to America?

The number of migrations to America has been hotly debated and multiple journal articles have taken differing positions. As demonstrated previously, there is tremendous resistance against any theory that discredits the dominant theory of the peopling of America. This powerfully protected theory plays a tremendous role in the underlying assumptions that are made in practically all work on migrations to America.

At the onset, there were many theories about multiple waves of migrations coming to the Americas, but those ideas were pushed into alignment with the Beringia theory relatively quickly. A few offered limited numbers of migrations, but in 2008 a study was released that seemed to put an end to speculation on the number of migrations. This article, titled "Mitochondrial Population Genomics Supports a Single Pre-Clovis Origin with a Coastal Route for the Peopling of the Americas," by Nelson Fagundes, confirms again the Beringia bias in the opening summary statement. This study claims that all mtDNA lineages can be explained by a single migration across Beringia.

> It is *well accepted that the Americas were the last continents reached by modern humans, most likely through Beringia*. However, *the precise time and mode of the colonization of the New World remain hotly disputed issues*. Native American populations exhibit almost exclusively five mitochondrial DNA (mtDNA) haplogroups (A–D and X). Haplogroups A–D are also frequent in Asia, suggesting a northeastern Asian origin of these lineages. *However, the differential pattern of distribution and frequency of haplogroup X led some to suggest that it may represent an independent migration to the Americas. Here we show*, by using 86 complete mitochondrial genomes, that *all*

> *Native American haplogroups, including haplogroup X, were part of a single founding population, thereby refuting multiple migration models.* Ref 82

Fagundes confirms that Beringia is the *a priori* assumption; he then takes issue with others who have suggested that, because haplogroup X is not as widespread as the other four founding groups, this could indicate it arrived later and has not had as much time to expand. To this Fagundes responds that haplogroup X was a part of the single migration that occurred through Beringia. He acknowledges this in the quote below.

> *The history of haplogroup X is more elusive*; it is presently *found in the New World at a relatively low frequency and only in North America*, it is rare in West Eurasians, and it is almost *absent in Siberia*. In addition, some have claimed that Native *American haplogroup X is less diverse and has a younger coalescence time* than haplogroups A–D. Ref 82

However, Fagundes has a serious potential flaw in his assumption that haplogroup X was in this hypothesized founding population. The sub-type of haplogroup X that is associated with the Native Americans, that of X2a, has still never been found in Asia, the source of the other groups. Undaunted, Fagundes grasps for some explanation to this dilemma. This leads to several attempts to explain this problem.

> Although it was *not possible to determine where in northeast Asia this population stayed during this long period of isolation, Beringia represents the best candidate for that location*, at least for the moderate bottleneck period (~20 kya) before the expansion. Ref 82

According to Fagundes, the "best candidate" location for the hypothetical population wherein haplogroup X "evolved" is Beringia, which is now under 90-100 feet of ocean. Of course this is purely speculative on his part, with no viable possibility of verification.

His theory requires that a population move into an area previously inhabitable, but now under the ocean, in the middle of an ice age, and stay there for a period of time extending long enough for their DNA to mutate into a separate sub-group (which by their own methods of phylogenetic approach would take millennia). Then once sufficiently changed so that it cannot be detected in populations on either side of Beringia (Alaska or Russia) the X2 population groups migrate south to the warmer California coastline. There is no actual physical evidence in support of this theory for haplogroup X. Fagundes is grasping at straws.

The assumed explanations of how haplogroup X may have entered the source population and yet left no trace behind previous to its entrance in any other population is highly questionable. Yet it is being offered up as an explanation for the entrance of haplogroup X to the Americas by way of Beringia.

In a portion of the discussion from his article, Fagundes addresses the finding of J. Hey, who offered an estimated time for the arrival of people in the Americas at only 7,000 years ago. As Fagundes points out, that is only half of the assumed age of the Monte Verde site in South America, arguably the oldest occupation site in the Americas at this time. Fagundes again proposes some explanations for the discrepancies between his dating and that of Hey.

> Such differences may be explained by the different demographic models *assumed* by these studies, by *dataset composition*, and by *differences in values from key parameters* (e.g., generation time, *date for human versus chimp divergence*, uncorrected distances for *mutation-rate estimates*). Ref 82

Fagundes offers as explanations the possibility of dataset challenges, yet this is the dataset he uses to argue from, then he questions differences in the generation time frames (20 yrs/generation vs. 27 yrs/generation), the date of the human-chimp split (5

million or 6 million year ago) and their associated phylogenetic rate estimates. All of these parameters, except the dataset itself, are purely theoretical. Then he makes a claim that could just as easily turn back against him. In addressing those who have claimed support for a separate migration for haplogroup X, Fagundes notes,

> There are a veritable HOST of other possibilities to this theory because *their information is based on assumptions in all of these areas, any one of which could upset the entire basis for their theory.* Ref 82

Fagundes could very well turn those words upon his own research, which is also based on assumptions in all of these areas, and any one of which could upset his entire basis. It is interesting to note that Fagundes does not see the irony in his statement. Yet he goes on with another possibility:

> *It is likely* that this haplogroup [X] is absent in eastern Siberian populations because of drift effects, which impact rare variants more strongly. Thus, *its probability of being lost* through random effects would be high. In support for this hypothesis, we note that current Siberian and Native American sequences belonging to the haplogroup X are distantly related, *suggesting that the intermediate lineages have been lost.* Ref 82

This quote demonstrates the length some will go to support their theory, no matter how unlikely it may be. Here Fagundes raises the possibility of drift effects because of being rare (yet today it is found on over half of the hemisphere), of becoming lost in the supposed source populations, because of "random" effects, and then suggests that all of its intermediate lineages might have simply gotten lost. Again, every one of these assumptions is without validation in reality. That is the marvelous thing about assumptions; you get such wonderful conjecture from something completely unverifiable. Fagundes continues with the assumptions:

> In the Americas, a *likely explanation* for the observation that haplogroup X has a much more restricted distribution would be that *if we assume it was relatively rare in the founding population, then it could have been lost by successive founder effects and genetic drift* as the expansion wave moved southward. Ref 82

The problem is that these explanations could be used to explain away any unwanted information a researcher may want to eliminate. And that is the serious problem with basing things on theories and assumptions: they are much too easily manipulated both manually and by computer. Fagundes has no verifiable evidence for haplogroup X being within this hypothetical source population, as he has no population anywhere in the regions that the lineage is supposed to have arisen. He provides several possible explanations based on speculative assumptions without any supporting physical evidence.

Fagundes then discloses the rate estimate he used in his work:

> All of the above age *estimates were calculated with the standard mtDNA coding-region substitution rate that was presented by Mishmar* et al. Ref 82

The results were "calculated" through the use of computer modeling which is clear from the beginning of the article. These results are computer simulations which are based on the data, but also manipulated through all the parameters outlined previously.

Fagundes used the already heavily discussed phylogenetic calibration rates that are based on the human-chimp split of evolutionary theory, which is understandable, but as has been pointed out, produces dates incompatible with observational reality.

Simon Ho, four months after the Fagundes article appeared, provided a rebuttal to the editor, claiming several issues with Fagundes' work, one of which was already discussed here about the archaeological findings in the Americas being incompatible with the phylogenetic based dates which are consistently and systemically conflicting with observed rates. He brings into question the

dating methods of Fagundes, using the difference in pedigree and phylogenetic rates to support his claims.

> *Fagundes employed two approaches to calibrating their date estimates.* The first ...assumed a global substitution rate of 1.26 x 10^{-8} subs/site/year, *originally obtained by Mishmar [2003] et al. with the use of a human-chimpanzee calibration at 6.5 Myr. The second method was to include a chimpanzee sequence* in the phylogenetic analysis, again *fixing the age of the human-chimpanzee split to 6.5 Myr.* Ref 83

Fagundes wrote a reply back to Ho and bemoans again the problem with the rates but then quickly points out that the pedigree rates would cause the resulting dates to be irreconcilable with "even the most radical supporters" of a late entry into America by haplogroup X in a separate migration. He states:

> This uncritical dismissal of alternative rates reflects an unsettling trivialization of the effect of calibration choice. *Recent observations have indicated that substitution rates estimated within species are considerably higher than those estimated on phylogenetic (interspecific) scales.* This results in an average coalescence time for the NA haplogroups of ~11 kyr ago and a population expansion of ~9–7 kyr ago. *These dates are clearly irreconcilable with even the most radical supporters of a later entry* for the peopling of the Americas. Ref 84

What does he mean by calling those who have proposed a separate migration "radical supporters"? Why the disparaging remark? To bolster his theory, Fagundes employs the use of some "fashionable software" as described previously. Namely the newly-released software program called by its acronym, BEAST.

> To investigate *whether our inferences were robust* when the assumption of a strict molecular clock was relaxed, *we used the Bayesian approach for the estimation of the coalescence times implemented in BEAST v1.4, which applies Markov Chain Monte Carlo integration for parameter estimation* over the space of all equally likely trees. Population size dynamics through time (i.e., *a Bayesian Skyline plot*) were also *estimated with this approach in BEAST.* Ref 84

Having used the latest in software tools, Fagundes hoped to create validity for his assumptions, but software parameters are very easily manipulated resulting in easily manipulated data. Of course this may be the very reason for the development of the software program—in anticipation of the newest approach to reconciling the dating dilemma. It now has a name and it is being called "intraspecific calibration."

> We agree with H&E [Ho & Endicott] that *improvements in mtDNA evolutionary-rate estimation are needed* to better clarify details of human prehistory, including the peopling of the New World. We also agree that perhaps *a better method to achieve this could be the use of intraspecific calibration.* Ref 84

What is intraspecific calibration? It is the approach of giving the theorists the dating method they feel matches their theories, while the experimentalists can use the observed rate for their studies. Everybody is then happy and evolution continues unchecked and unquestioned as "one of the firmest facts of science." This is dishonest science and is detrimental to all the good work that is done every day in the scientific fields. The problem is not with the observed rates, the problem is the theory of evolution.

Fortunately, more reasoned minds have come to bear on the migration front. Natalia Volodko, and Ugo Perego in articles published in May of 2008 and January of 2009 respectively, refute the computer simulated model of Fagundes.

> The maintenance of more than one refugial source, in the Altai-Sayan and mid-lower Amur, during the last glacial maximum appear to be *at odds with the interpretation of limited founding mtDNA lineages populating the Americas as a single migration.* Ref 85

Geneticist Ugo Perego and a host of colleagues published their article in *Current Biology*, January 2009. The article, "Distinctive Paleo-Indian Migration Routes from Beringia Marked by Two Rare mtDNA Haplogroups,"

again used phylogenetic dating but suggested that evidence, such as Fagundes' purely theoretical model, needs calibration and support from more observationally based approaches such as archaeology and population studies.

> The traditional three-wave model and *the now-popular three-stage model for the peopling of the Americas that emphasizes a single origin are somewhat too simplistic* to explain the initial and subsequent processes that eventually led to the settlement of the Americas. *The use of simple models in simulation studies cannot replace a more nuanced interpretation of archaeological findings and genetic variation*. Ref 79

Of course Perego is again correct in that computer models and simulations cannot take the place of physical findings such as archaeological evidence to support the models. The more streams of evidence involved in a calibration, the more robust, typically, are the findings. This is particularly true where at least some of the streams of evidence are based not on theory, but in reality. The authors of another article proposing a single migration for a "large portion" of Native American ancestry provide a glimpse into how multiple migrations could help reconcile some of the observed variation in the Native American population.

> Despite decades of archaeological, linguistic, morphometric, and molecular research, the details of *the peopling of the Americas remain unresolved*. One question that has received much attention is *whether all modern Native Americans descend from a single migration*. The ongoing interest in this question can partially be attributed to the idea that *multiple migrations could reconcile the large amount of phenotypic, cultural, and linguistic variation that has been observed in the Americas with the short evolutionary time frame* that the American archaeological record provides. Ref 86

Based on the observation that Native Americans are a diverse group in many ways, and that this diversity would take time to accomplish, the simplest explanation would be that more than one migration event occurred, even given an "evolutionary" time frame. If a pedigree-based time frame were assumed, it would shorten the time available to develop this diversity, making multiple migrations a more acceptable conclusion. With the longer evolutionary time, it is thought that the observed diversity could have developed from a single migration.

Schroeder's article discusses what has become known as the "9-repeat allele" which is found among modern Native American populations, Greenlanders, and along the northwest Pacific Rim areas but not in populations in Asia thought to have been the source of these peoples. This "private" allele, an alternative form of a gene located at a specific position on a specific chromosome, is thought to have "developed" apart from their Asian counterparts for thousands of years in isolation before they moved into the New World. From this postulated single source population came all the diversity now seen within the Native American populations. This specific allele is found in high frequency and has widespread distribution throughout the indigenous populations of the Americas. The concluding statement of the journal article reads:

> These results lend further support to our original inference that the geographic distribution of the 9-repeat allele is *inconsistent with the hypothesis that Native Americans derive large portions of ancestry from multiple founding populations*. Ref 86

This does not "confirm" that one, and only one, migration was responsible for all Native Americans, but only that a "large portion" of the Native American population can be traced back to a single migration event. This in no way "proves" that there were no other migration events, only that whatever migrations did occur happened long enough ago that these specific markers could be spread all through the Americas. Of course it is assumed that this process took many thousands of years (ranging from 7k - 39k years) but they are again basing this dating on phylogenetic theories, not empirical pedigree dating.

There were only 3 Native American groups sampled from northeastern USA,

where haplogroup X mtDNA is prevalent, along with 2 from southeastern USA. The remaining samples were found along the west coast of North America and down into South America. Further samples were from Asia (see Fig. 1 of the article). Whether the very small sampling among Native American populations with high frequencies of haplogroup X was deliberate or just coincidental is unknown. However, the small sampling could very well have impacted the results of this study.

Back to Known History

Another interesting fact from the actual journal article is that the Fox Indians, the tribe that Joseph Smith met with repeatedly and told that the Lord had shown him that they are remnant Lamanites, did in fact not have these particular alleles. As written in the History of the Church for Thursday, August 12th, 1841 concerning the visit of the Sac and Fox Indians to Nauvoo, Joseph records.

> I conducted them [Sac and Fox] to the meeting grounds in the grove, and instructed them in many *things which the Lord had revealed unto me concerning their fathers,* and the *promises that were made concerning them in the Book of Mormon.* Ref 87

One month before his martyrdom, on Thursday, May 23rd, 1844, the Prophet Joseph met again with the Sac and Fox leaders in his kitchen and again confirmed the fact that he had received a revelation from the Lord concerning their ancestry and their direct relationship to the Book of Mormon. From his personal journal Joseph writes:

> [I] found a book [presenting the Book of Mormon] which told me about *your fathers* & *Great Spirit told me*. Ref 88

Based on Joseph Smith's claim to have received revelation from the Lord that the Book of Mormon is a history of their ancestors of the Sac and Fox Indians in North America, it must be that the Sac and Fox have lineages stemming from the Book of Mormon.

The article by Schroeder simply confirms what is already known: the majority of Native American populations came from Asian populations. It does not "rule out" any other migrations as stated by some news articles reporting the findings. It is demonstrating that if there were other migrations, they did not contribute as much to the overall population of the Americas as did the Asian groups.

This is consistent with the Book of Mormon migrations. They were not the "primary" ancestors of the American Indians, but their descendants are "among" the Native American peoples. Most Native American groups that have European-based Haplogroup X mtDNA have average frequencies between 5-20%, meaning that between 95% and 80% of that remaining is Asian based. This is consistent with the findings of Schroeder.

A Pacific Crossing for Lehi?

Much has been speculated about the direction that Lehi and his family traveled to arrive on the Promised Land. The most commonly suggested route posits an easterly route beginning near the Saudi Arabian peninsula east toward Indonesia and then across the Pacific Ocean to a landing somewhere on the west coast of America. This route was established primarily due to a document thought to have been from Joseph Smith that claimed that Lehi landed thirty degrees south longitude in Chile, South America, but was later shown to be in the handwriting of William McClellan. This was neither revelatory nor even from the Prophet Joseph, but was pure speculation on the part of some early brethren of the Church, according to historical sources. There is no solid evidence for this route, but more than enough speculation.

There is not space here for a treatise on this subject, but there are several very significant obstacles to this theory. The most difficult to overcome is the fact that this route would put Lehi's boat going against nearly every known ocean and surface wind current

along the path. The Indian Ocean currents and associated winds generally travel in a counter clock-wise rotation from Indonesia around towards the north past India and on to Saudi Arabia. The north pacific rotates in a clockwise direction, while the south pacific runs counterclockwise.

Near the equator both the north pacific and south pacific ocean currents move from east to west and circle northwest and southwest toward the north and south hemispheres respectively. While a small counter current does exist right along the equator, this would also require crossing at nearly the widest point of the largest ocean on planet earth. Except during rare ENSO (also known as El Nino) events, the ocean currents and surface air currents flow against this route.

Following this route would have been miraculous not only to make the journey, but to survive it. Their group would have had to take enough fresh water and food aboard their ship to cross the largest ocean on earth at its widest point. Certainly with the Lord all things are possible, as is this, but there is a much simpler and less difficult route available that requires fewer miraculous interventions.

Of course it all depends upon where the voyage started and that is also an unknown, although like the ocean route, there has been much speculated. Everything changes if the point of departure is not where it is thought to have been, namely near Saudi Arabia. However after Lehi left Jerusalem he traveled in a nearly easterly direction…for eight years!

> 1 AND it came to pass that we did again take our journey in the wilderness; and *we did travel nearly eastward from that time forth*.
>
> …
>
> 4 And we did sojourn for the space of many years, yea, even eight years in the wilderness.
>
> BoM 1 Nephi 17:1, 4

How far might a caravan travel over the course of eight years? The possibilities are nearly endless. In eight years they could have crossed the entire continent of Asia had the Lord directed them to do so. We really don't have much information to base our speculations on. There have been many wonderfully enlightening proposals for the Old World departure and land Bountiful, and any one of them or none of them could be correct. We simply do not know, but obviously where their journey began would have tremendous consequences upon where they may have landed. A pacific route would be much more likely had they left from the eastern coasts of Asia and followed the currents north toward Alaska and then south along the west coast of North America.

An Atlantic Crossing has its Advantages

However, if the general Saudi Arabian peninsula was the departure point, then the most direct and advantageous route would be to follow the ocean currents and corresponding trade winds, catching the southerly flowing Indian current along the east coast of Africa, around Cape Horn, up the western coast of Africa and across the Atlantic near the shortest point between Africa and America. From there the route would take them up along the normal paths travelled by hurricanes and early explorers into either the Gulf of Mexico or the eastern seaboard of the United States. On this route they could have taken advantage of stops all along the journey to replenish supplies and secure food. It is acknowledged that no such stops were mentioned in the text, making it that much more important to establish the shortest route with the fewest stops required.

It is doubtful that they could have stored enough water for the entire journey with the size of their group on a ship of modest size most likely to have been built. This route would also have meant crossing the much smaller Atlantic Ocean at its narrowest point between Africa and America, and the terrible storm they endured may have been in the area of Cape Horn which is known for its raging storms at certain seasons. Again, we

simply don't know, but this route would be more efficient, shorter, less dangerous, and utilizing the natural paths of the wind and currents. There is no scriptural, prophetic, or historical justification to assume that Lehi landed on the west coast of America.

How does the route taken by Lehi relate to the subject of DNA? Scientific evidence for transoceanic contacts in America along the coast of northeast America have been recovered but poorly accepted because the findings are contrary to the Bering Strait theory. Archaeologist Alice Kehoe wrote in an article published in the *Journal of Scientific Exploration* of the taboo nature of evidence that goes contrary to this tenet of science.

> *Pre-Columbian contact between the Americas and travelers from other continents and islands are highly probable, but the topic is taboo to mainstream American archaeologists.* Seagoing fishermen were in the North Atlantic in the first millennium B.C., and probably earlier*, indicated by bones of deep-sea fish in coastal sites of northeast America… The probability of transoceanic contacts before Columbus is so high one might say it is a statistical certainty.* Ref 89

Such evidence tells us two things. There was a high probability of contact with the New World long before Columbus and, whoever they were, they must have had boats (because that is how deep-sea fish are caught), then left their fish bones in their campsites as "refuse."

When haplogroup X was first discovered among the Native people of northeast America, several hypotheses of how they may have arrived in the Americas were proposed. One proposed in 1997 suggested that early Europeans may have made a trans-Atlantic voyage to "colonize the Americas."

> Due to the *absence of haplogroup X in East Asia*, presumed to be the homeland of the founders of Native America, *diverse hypotheses were proposed* to explain the presence of this haplogroup in North America. Brown et al. (1998) suggested the possibility of an ancient European migration to North America. Stanford (1997) *suggested that early Holocene Europeans used a trans-Atlantic route to colonize the Americas…* Ref 31

This suggestion, however, has been much debated. Speculations range across the spectrum from the multiple migration theories of Ripan and Perego, to the articles by Fagundes and Schroeder that suggest that a single migration could account for all the lineages in the Americas. The Book of Mormon provides only one piece in this complicated puzzle, yet it is a significant piece.

From Mesoamerica to North America?

One common thought expressed by members of the Church on the subject of the Book of Mormon and its geography is the notion that the Book of Mormon lands were originally in Central or South America. Over time the people continued to move further and further northward (the Nephites), until they came into the southwestern quadrant of what is now the United States and then finally, due to continued Lamanite aggression, retreated all the way up into New York to gather at the Hill Cumorah. Surely if such a migration took place over the thousand year time span of the Book of Mormon we would find genetic evidence to support this migration from Central America into the American Southwest.

A very relevant article in the *American Journal of Physical Anthropology* in 2003 by Ripan S. Malhi titled "Native American mtDNA Prehistory in the American Southwest" brought comparative DNA analysis research to bear on this question. His findings are critical to knowing if such a migration actually took place.

> *We find no evidence of a movement of mtDNA lineages northward into the Southwest from Central Mexico…* Ref 90

Malhi continues…

> The large differences in haplogroup frequency distributions among populations of the main branches of Uto-Aztecan, along with the distribution of haplotypes in the haplo-

> group C network, suggest that *the spread of Uto-Aztecan was not the result of a population expansion northward caused by the development of maize cultivation in Mesoamerica. A population expansion caused by the development of agriculture would have likely involved the movement of women.*
> Ref 90

This article clearly articulates that had any migration from the populations of Mexico occurred, they would most likely have involved women because they were typically the planters and gardeners of their villages while the men were hunters and builders. This study specifically looked for any genetic evidence that might indicate a northerly migration into the American Southwest, and found no supporting evidence for such a migration. It does not appear from a DNA standpoint that female Mayan descendants migrated into North America as some members of the Church have supposed.

From Southeast USA to Northeast USA?

For those unfamiliar with the newly proposed "Heartland Model" of Book of Mormon Geography, a very quick overview is required to grasp the significance of the next few concepts.

The Book of Mormon – Heartland Model Geography

The Heartland Model Geography of the Book of Mormon is a newly proposed geography based on:

1. Scriptural prophecies and promises in the Book of Mormon;
2. Joseph Smith's revelatory and prophetic statements;
3. Historical accounts;
4. Correlations with the Book of Mormon in genetics research;
5. Archaeological findings;
6. Climatological research;
7. Cultural research; and
8. Many other fields of study.

It is a very comprehensive and robust theory that is supported by multiple streams of evidence and reasoning. The general geographic model postulates that Lehi's group landed somewhere in the Gulf of Mexico or on the east coast of what is now the United States. This is the "Promised Land" according to the prophecies in the Book of Mormon. From there the righteous Nephites left their wicked brothers and travelled into the wilderness and established the land of Nephi.

The proposed Land of Nephi corresponds with the Hopewell Mound Builder culture archaeological sites in the foothills of what is now the Great Smoky Mountains or Cumberland plateau area of the southern Appalachians in today's eastern Tennessee. The area here is at an elevation of nearly 5,000 feet and is found on the Tennessee River branch of the Mississippi River system of the central region of the United States.

The Land of Zarahemla in the Heartland Model is proposed to be where the Lord revealed it to Joseph Smith in D&C 125:3 wherein the Lord commands:

> Let them build up a city unto my name upon the land opposite the city of Nauvoo, and let the name of *Zarahemla* be named upon it.
> D&C 125:3

This was also in one of the largest Hopewell civilization complexes with archaeological sites throughout the area roughly known as the Mississippi River floodplain and the Illinois River valley areas. This is the area in which the Prophet Joseph Smith discovered and had a revelation regarding the ancient remains of a Lamanite warrior by the name of Zelph. Zarahemla, across the Mississippi river from Nauvoo, sits at about 670 feet.

The Land Bountiful of the Heartland Model is encompassed by the Ohio River valley area and includes the Hopewell people's mightiest achievements, in Newark and Chillicothe, Ohio. They created massive ceremonial grounds of earth banks and trenches unrivaled in the ancient world. The

northern reaches of this area included what is today the area surrounding Cleveland and Kirtland, Ohio, bordering Lake Erie.

The Hill Cumorah in the Heartland Model is right where the Prophet Joseph Smith received the ancient sacred record, near Palmyra, New York, USA. This model does not require a second Hill Cumorah to be proposed to satisfy the requirements of the Book of Mormon that the hill was within their lands and was where the plates were deposited.

Is there any mtDNA evidence to support such claims?

For a quick reference: Heartland Model proposed locations

Land of Nephi	Eastern Tennessee
Land of Zarahemla	Mississippi River Valley
Land Bountiful	Ohio River Valley

Up the Mississippi into the Heartland?

The following article from 2005 by Alan G. Fix called "Rapid Deployment of the Five Founding Amerind mtDNA Haplogroups Via Coastal and Riverine Colonization" discusses a computer simulation model that postulates that North America was populated by using waterways along coasts and rivers.

> *...colonization along coasts and rivers could have rapidly spread the founding lineages widely through North America...* Ref 91

While his simulation is based on the primary assumption of the peopling of America by way of the Bering Strait, one interesting aspect is the proposal that the interior of North America would have been most likely entered by navigating the Mississippi River from the Gulf of Mexico. Their model suggests a route, portions of which have already been refuted such as a migration north from Mexico into the USA. The model is still of interest because of the relationship with haplogroup X.

> Entry is by way of the Pacific coastal rim from northeast Asia, with settlement expanding along the north Pacific coast down to the narrow isthmus of Central America, crossing the isthmus, and continuing to spread up the Gulf and Atlantic coasts. *The Mississippi River would have served as an entry to the continental interior.* Ref 91

Thus the model proposes that the interior or heartland of America may have been populated by entering from the Gulf of Mexico then up the Mississippi River and expanding outward from "staging areas" into other areas of what is now the United States.

> *These pioneer coastal settlements, along with extensions up major river valleys such as the Mississippi, could have served as "staging areas" for the continuing colonization of the continental interiors.* Ref 91

Haplogroup X presents a challenge to their model, because their model suggests an incursion into Central America, yet haplogroup X is known not have made such an incursion being found only in North America.

> *Haplogroup X, although widespread in North America, in [is] not ubiquitous throughout the hemisphere*, so is less certain to have been a founding haplogroup. Ref 91

This is the only article found through this research that questions the validity of haplogroup X as a founding haplogroup, and it is likely to have done so based on the fact that haplogroup X is not found in Central or South America, which certainly makes it less widespread than the other four haplogroups.

A figure in the article (Fig. 2) illustrates the results from one of the computer simulation runs showing low levels of haplogroup X corresponding to the area at the mouth of the Mississippi River, and three times higher frequencies of haplogroup X further up the Mississippi River into the heartland, somewhat north of present day St. Louis, Missouri. The computer simulation model shows a peak of haplogroup X in the Heartland of the USA. It does not demonstrate convincingly that haplogroup X lineage carriers

colonized up the Mississippi River, which is also not postulated by the Heartland Model, but it does show that haplogroup X lineage levels were highest in the heartland of America.

From the Midwest to Northeastern USA?

A study of mtDNA based analysis involving population movements was conducted that demonstrated there is evidence that the Algonquian peoples migrated eastward from their homelands in the midwest where their ancestors, thought to be the Hopewell populations, appear to have grown into a large and powerful society.

> For example, Goddard (1994) demonstrated a *west-to-east cline* in declining depth of common ancestry among Algonquian languages, and this may be *interpreted as evidence that Algonquians migrated eastward from a homeland in the west.* Ref 92

According to the Heartland Model proposed geography of the Book of Mormon, there would have been a general chronological movement from the land of Nephi to the land of Zarahemla, then to the land Bountiful. In modern terms this equates to movement from eastern Tennessee, to the Mississippi River Valley and on to the Ohio River Valley. This DNA based finding is consistent with the northeastward movement from Illinois to Ohio, or from Zarahemla to Bountiful.

There is also evidence for a group of people (the Iroquois) to have come up from the southeastern USA that intruded into the Algonquian territory, causing a "discontinuity" or a shift or disturbance associated with this intrusion in the archaeological record. It is thought to have occurred somewhere near 800 AD, only off by 400 years the intrusion of the Lamanites into the Northeast that resulted in the extermination (discontinuity) of the Nephites. The date is not precise, but it is close enough that it could be within the margin of error as it is not known what dating method was employed in this date.

> Recently, however, Snow reiterated the idea of an Iroquoian intrusion and presented evidence of an *Iroquoian migration into the Northeast from the southeastern United States*, where other Iroquoian groups, such as the Cherokee, lived during the early historic period. Snow argued that *there is a clear discontinuity in the archaeological record resulting from the intrusion of Iroquoian-speaking people into Algonquian territory approximately 1200 ybp.* Ref 92

This DNA based population movement is potentially supportive of the history recorded in the Book of Mormon of a people coming from the southeast, or the land of first inheritance, according to the Heartland Model, and intruding into the northeast, disrupting the continuance of the Algonquian (Nephite) people. Again, this DNA based approach lends possible support to the historicity of the Book of Mormon record, as viewed through the Heartland Model.

IS THERE ANY DNA EVIDENCE CORRELATING NEPHITE AND LAMANITE POPULATION MOVEMENTS?

In the Heartland Model there are two primary regions defined loosely as the Mississippi and Ohio River valleys, proposed to be the lands of Zarahemla and Bountiful respectively. If this were the case, we know that the Nephites of the Book of Mormon enjoyed considerable interaction between these two major centers of activity.

Interaction between the Nephite Lands of Zarahemla and Bountiful?

> 23 And now he did *not tarry in the land of Zarahemla, but he did march forth* with a large army, even *towards the city of Bountiful*;...
> 29 And thus he did; and he did head them before they came to *the land Bountiful*, and gave unto them battle, insomuch that *they began to retreat back towards the land of Zarahemla.*
> BoM Helaman 1:23, 29

> 5...they succeeded in obtaining *possession of the land of Zarahemla*; yea, and also all the lands, *even unto the land which was near the land Bountiful*.
> BoM Helaman 4:5

> 23 And the land which was appointed was the land of Zarahemla, and *the land which was between the land Zarahemla and the land Bountiful*,...
> BoM 3 Nephi 3:23

We can also see that these two major Nephite centers were not within a day's journey, but in fact had a "land" between them.

DNA Evidence for Nephite Marriages between Zarahemla and Bountiful?

Is there any evidence for high levels of interaction between Zarahemla and Bountiful in the genetic record? Since these were two of the primary cities of the Nephites, it would be natural for there to have been considerable cultural, economic, and genetic exchange between these two Nephite populations. Does the DNA record support this claim as would be predicted using the Heartland Model of the Book of Mormon?

> ...Finally, when these data were considered in conjunction with mtDNA data previously collected from the Hopewell Mound Group in Ohio, they *demonstrated that migration and gene flow did accompany the cultural exchange between Hopewell communities in the Illinois and Ohio Valleys*. Ref 93

The genetic record is again in agreement with the Book of Mormon historical record in this instance as proposed within the Heartland Model. There was, in fact, "gene flow" between the Mississippi's Illinois Valley Hopewell (land of Zarahemla) and the Ohio Valley Hopewell (land Bountiful), just as would be expected from the Book of Mormon record. What is more profound is that this genetic exchange would not have occurred by conquest, which would show one primary event (war) occurring quickly, but rather a "flow" of genetic exchange, consistent with peaceful marriage relationships between culturally similar groups. This is how the Book of Mormon describes the relationship between Nephites in Zarahemla and Bountiful. Again, can this be shown in the DNA record of these people? Again the answer is yes.

From her article in *American Antiquity* in 2007, titled "Migration and Social Structure Among the Hopewell: Evidence from Ancient DNA," authors Deborah Bolnick and David Glenn Smith demonstrate that intermixing between the Ohio and Illinois Valleys was a part of their cultural exchange, even proposing

regional mating networks between these two ancient population centers.

> In particular, the results of this analysis *demonstrate that gene flow did accompany the cultural exchange between Middle Woodland communities in the Ohio and Illinois Valleys*. This genetic exchange was not the result of a mass population movement between Ohio and Illinois; rather, it most likely reflected the *movement of a small number of individuals each generation*. These individuals may have moved directly between Ohio and Illinois, but the genetic patterns reported here could also be due to the cumulative effects of short-range and incremental movements, perhaps *via local and regional mating networks*. Interestingly, the genetic data indicate migration and gene flow primarily in one direction, from Ohio to Illinois. Ref 93

Not only was there gene flow, but the DNA findings suggest that there may have been established regional "mating" networks between these two major Hopewell (Nephite) centers. Again this DNA evidence is completely consistent with the Book of Mormon within the proposed Heartland Model.

The Land Bountiful, a Sacred Landscape?

If the Heartland Model is correct, then the Land Bountiful of the Book of Mormon was in the Ohio River Valley. Christ came to the Temple in the Land Bountiful of the Nephites where they had all gathered after the great destruction. Ohio is where the largest religious ceremonial earthworks in the world were built by the Hopewell people that carbon date to between 150 AD and 250 AD according to *American Archaeology* writer, Krisin Ohlson, where excavations at the Hopewell earthworks at the Hopeton site recovered charcoal which can be relatively accurately dated by radiocarbon dating methods.

> The team found charcoal in six trenches that yielded *radiocarbon dates between A.D. 150 and 250.* Ref 94

Mark Lynott, a National Park Service archaeologist who also teaches at the University of Nebraska, emphatically states that these massive earth works, including 25 foot high banks of earth and 20 foot deep trenches, were gigantic sacred ceremonial centers to the Hopewell people. The enigmatic thing about these works is that there is no evidence for large timbers being placed vertically into the top of the earth banks, making a palisade of timbers for protection. That was the normal arrangement in most other Hopewell archaeological sites and was described by Moroni in the Book of Mormon.

This lack of any defensive structure atop the mounds has lead some archaeologists to conclude that these were not built for defense, but for religious or ceremonial purposes, and that they were built quickly, in a time of prolonged peace, since so much cultural effort went into building structures that had no defensive purpose. Lynott explains:

> This part of *southern Ohio* [Newark & Chillicothe areas] *seems to have been a gigantic sacred landscape*, with such a *large number of earthworks being built in such a relatively short period of time*. Ref 94

That this was indeed a sacred ceremonial landscape was further postulated by Lynott because of evidence that very special artifacts were found within these sites not found elsewhere in Hopewell culture living sites.

A Nephite Religious Pilgrimage to the Land Bountiful?

According to the Book of Mormon account, the sign of the death of Christ occurred in the first month of the thirty and fourth year.

> 5 And it came to pass in the *thirty and fourth year, in the first month*, on the fourth day of the month, *there arose a great storm*, such an one as never had been known in all the land.
>
> BoM 3 Nephi 8:5

About one year after the terrible destruction at the time of the death of Christ, a multitude of people were gathered together at

the temple in Bountiful apparently in anticipation of the return of the Savior.

> 18 And it came to pass that in the *ending of the thirty and fourth year*, behold, I will show unto you that *the people* of Nephi who were spared, and also those who had been called Lamanites, *who had been spared*, did have great favors shown unto them...
> 19 ...and *an account of his ministry shall be given hereafter*.
> BoM 3 Nephi 10:18 – 19

> 1 AND now it came to pass that there were a *great multitude gathered together, of the people of Nephi, round about the temple which was in the land Bountiful*;
> BoM 3 Nephi 11:1

While not directly stated, it is apparent that the Lord had promised the people at the time of the destruction when they heard his voice from heaven (3 Nephi 9:1), that he would return and show himself to them. He likely also gave some instruction as to where and when this was to take place, because a great multitude had "gathered" at the temple in Bountiful. From the wording, it isn't likely the people were simply going about their lives and just happened to be in the area of the temple; they were "gathered" there for a purpose.

> 12 And it came to pass that when Jesus had spoken these words the whole multitude fell to the earth; for *they remembered that it had been prophesied among them that Christ should show himself unto them* after his ascension into heaven.
> BoM 3 Nephi 11:12

Thus, they were awaiting his coming as he had prophesied and promised to them. If the destruction and the voice of the Lord was heard throughout the land (3 Nephi 9:1) and Christ had covenanted to return, it could be safely assumed that a great many of the righteous people may have made a special journey, a pilgrimage, to be in attendance at the temple when Christ arrived. This appears to have been the case. It may also have archaeological support through the Heartland Model geography of the Book of Mormon as given by archaeologist Lynott.

> Lynott thinks that working on the walls may have been part of *some sort of religious ritual that brought pilgrims to Ohio from as far as the Rocky Mountains and the Gulf Coast*, in the same way that observant Muslims make a pilgrimage to Mecca. Ref 94

He goes on to say that he thinks that this religious pilgrimage was observed by bringing supplies of raw materials to make ritual objects for their ceremonial gathering. The article quotes Lynott as saying:

> This would explain why the raw materials use[d] to make *these artistic and ceremonial objects* found in the mounds and earthworks *weren't dispersed throughout the area between Ohio and the source of the raw materials*, as they presumably would have been if they were transported via trade. Ref 94

Zarahemla Established before Bountiful?

According to the Book of Mormon record, the land of Zarahemla was first established by the Mulekites who were later joined by the Nephites between 323 BC to 130 BC (Omni 1: 12, heading). Although there was a genetic flow occurring predominately in the direction of Ohio toward Illinois at some point, according to the Book of Mormon and the proposed Heartland Model the direction of chronological progression would suggest a population movement from Illinois to Ohio with cultural exchange taking place later after the two areas were established and flourishing. What evidence, if any, is there in the DNA findings that might support this understanding?

Again in the article, "Migration and Social Structure Among the Hopewell: Evidence from Ancient DNA," in *American Antiquity* we have another potential support, because mtDNA evidence suggests that the Illinois Valley (Zarahemla) Hopewell people preceded the Ohio Valley (Bountiful) Hopewell, as the Heartland Model of the Book of Mormon would predict.

> *...some Hopewell traditions appeared earlier in Illinois than in Ohio*. Ref 93

Previously the importance of using multiple streams of evidence to form conclusions was discussed. This article illustrated how vital this strategy is to support or enhance the findings from DNA research.

> This study *demonstrates the importance of incorporating ancient DNA analyses into archaeological research*. The ancient DNA analyses reported here show that both material culture and skeletal morphology can be poor proxies for genes. *Only by combining archaeological, osteological [bone study], and ancient DNA research is it possible to decipher the relationship between past patterns of cultural, morphological, and genetic variation and better reconstruct human prehistory.* Ref 93

Did the Lamanites have a Lifestyle Similar to the Plains Indians?

We might also expect from the history of the Book of Mormon that as the Nephite civilization grew and became more powerful, they expanded into new territory. The Lamanites were primarily to the south and the west of the Nephites. The Heartland Model suggests that a portion of the Lamanite group had crossed the Mississippi River to its western side onto the Great Plains of America, where there would have been herds of buffalo for food eliminating the need to grow crops. This may be supported by a passage in Enos.

> 20 And I bear record that the *people of Nephi did seek diligently to restore the Lamanites … they became wild, and ferocious, and a blood-thirsty people*, full of idolatry and filthiness; *feeding upon beasts of prey; dwelling in tents, and wandering about in the wilderness*…And many of them *did eat nothing save it was raw meat*;….
>
> BoM Enos 1:20

The nomadic lifestyle of the Lamanites described in the Book of Mormon parallels the lifestyle of the Plains Indians. They both lived in tents, and "wandered about" following the buffalo herds and "feeding upon beasts of prey" eating nothing but "raw meat."

The phrase "beasts of prey" could be interpreted as people eating "beasts that prey upon other beasts," but such an interpretation would seem to indicate that they would eat only beasts that kill other beasts. Why would people prefer to hunt and kill beasts that were capable of killing other beasts, rather than simply killing and eating the beasts upon which the others lived? It seems less dangerous to hunt animals that are not themselves hunters. Another possible interpretation is that the phrase means "beasts who are preyed upon" such as the buffalo herds that were preyed upon by wolves and bears, and with which the Indians would have been intimately acquainted as they competed with those large carnivores for food from the buffalo herds.

One of the earliest historical accounts of the Plains Indians was the journey of Coronado and the Spaniards into this area in 1540 AD. From their records a description was extracted detailing how they found the Plains people living at that time.

> *On his journey to Quivera [1540-1542 AD],* after passing down the Peace River, out of the mountains and *onto the vast plains* now known as the Staked Plains, [Kansas, Oklahoma, New Mexico and Arizona] *Coronado met countless herds of bison* or, as the Spaniards called them, "hump-backed oxen." After 10 days' travel on the plains the *Spaniards came to a settlement of people who lived in tents made of the tanned skins of the cows (buffalo)*. "These people are called Querechos and Teyas," Pedro de Castaneda wrote. … "*These people eat raw flesh and drink blood …*" Ref 95

Coronado and his men described the lifestyle of the Plains Indians nearly identically as Nephite the prophets. This is another possible correlation between the Book of Mormon and historical records.

WHAT CAN DNA STUDIES REVEAL ABOUT NEPHITE SOCIAL STRUCTURES?

What other possible correlations might be extracted from DNA based literature? There are many additional correlations that cannot be delved into deeply in this work. However, here are a few examples worthy of being shared.

Patriarchal Social Structure among the Hopewells?

From the Book of Mormon we learn that Nephite society was patriarchal in social order, with the males of the group taking leadership roles and holding responsibilities such as kings and judges. Their society was not matriarchal and this would certainly have been borne out in their burial traditions. Patriarchal societies tend to bury married couples together with those of the males' family and lineage, whereas matriarchal societies do the opposite. The Book of Mormon would suggest a patriarchal order of burial. Can DNA evidence offer any correlations with this practice among the Hopewell? Again, the answer is yes.

> For more than a century, archaeologists have studied the cultural and skeletal remains of the prehistoric Native Americans known as the "Hopewell Moundbuilders." While many aspects of the Hopewell phenomenon are now well understood, questions still remain about the genetic makeup, burial practices, and social structure of Hopewell communities. To help answer these questions, *we extracted mitochondrial DNA (mtDNA) from the skeletal remains of 39 individuals buried at the Pet Klunk Mound Group in Illinois*. The pattern of mtDNA variation at this site suggests that *matrilineal relationships did not strongly influence burial practices*. Because different forms of mortuary activity were not associated with distinct genetic lineages, this study provides *no evidence of a maternally inherited or ascribed status system in this society*. Ref 93

Thus, just as expected from the Book of Mormon, the DNA burial evidence suggests that the Hopewell (proposed Nephite) society was patriarchal rather than matriarchal.

Are there any Modern Day Descendants of the Hopewell Moundbuilders?

Could the Hopewell Mound builders (the proposed Nephites of the Book of Mormon according to the Heartland Model) be the ancestors of modern day Algonquian groups? An article in *Human Biology* in 2001 gives us some additional perspectives.

> It is also possible that the *populations of the Hopewell culture were descendants of proto-Algonquians,* as suggested by Denny (1991), and that *the Cherokee descend from the earlier inhabitants of the Ohio Valley, who might have been displaced to the southeastern United States by the proto-Algonquians*. Ref 92

It then appears that the proto-Algonquians are thought to have given rise to the Hopewell people who are genetically related to the modern day Algonquians (from which they derive their name). Both the ancient Hopewell Moundbuilders and modern Algonquians have haplogroup X DNA along with the other four founding lineages (A-D) to some extent.

The determination of which of the Native American groups today may be descended from the Hopewell is problematic. First, if the Hopewell were the Nephite group, they suffered a catastrophic genetic bottleneck at their near extermination. Secondly, as has been previously discussed, the Nephites at the final battle were not necessarily exclusively of the genetic lineages of Nephi, but rather a group of "believers." By that point in their history the original Lamanites and Nephites may have had significant intermixing. There may have

been some "Nephite" lineages even among the Lamanites as well as "Lamanite" lineages among the Nephites.

This appears to be confirmed by the prophet Joseph Smith in his revelation regarding Zelph, the "white Lamanite" who apparently fought for the Nephites and died in one of the final battles between the Nephites and Lamanites. He was found buried in a mound in west-central Illinois on a bluff overlooking the Illinois River. Ref 107 An excellent article by LDS historian Donald Q. Cannon titled "Zelph Revisited" describes in detail the importance of this historic event. The Zelph burial mound is among the few locations on earth where Church history intersects with Book of Mormon history. Zelph Revisited can be found at www.BookofMormonEvidence.org under the Downloads tab.

Another aspect of the Nephite (Hopewell) extermination is that the Hopewell culture collapsed around 400 AD and it is not known from an archaeological standpoint where they went or who their descendants might be. There are many questions. The following is what is understood thus far.

The Algonquian (Nephite?) Expansion

The Algonquian (potentially Nephite) expansion kept the ancient ancestors of the Sioux on the Great Plains. The Sioux and the Cherokee (possibly Mulekites and/or Lamanites?) share close linguistic ties with each other. However, no time frames are offered which would provide additional clarity.

Returning back to the potential DNA based correlations, the Sioux Indian group, who today have haplogroup X DNA, although to a lesser extent than other Algonquian groups, are thought to have been "pushed into the plains" by the Algonquians. If the Algonquians were the descendants of the Nephites (or the Hopewell), and the present day Sioux or Siouan groups were the Lamanite descendants, then another nice potential correlation to the Book of Mormon can be made within the context of the Heartland Model and DNA research.

The Algonquian and the Sioux

A very informative article by Ripan S. Malhi called "Distribution of Mitochondrial DNA Lineages Among Native American Tribes of Northeastern North America," published in the journal *Human Biology* in 2001 states that the Siouan groups (possibly Lamanite) were "pushed" into the Great Plains of the United States because of the expansion of the Algonquian groups (possibly Nephite).

> *Siouan groups that were pushed into the Plains by the expansion of Algonquian groups are closely related linguistically to groups that lived in the Southeast United States* at contact. Ref 92

The Siouan groups according to Malhi, are closely related linguistically to groups that lived in the Southeast United States, where the Cherokee are thought to have originally been located. The Siouan and Cherokee groups may also be genetically related to one another.

Both the Algonquian and the Siouan speaking groups have highly divergent DNA profiles, indicating a high level of intermixing, especially between the two groups. The Norris Farms population of the Hopewell (who have haplogroup X mtDNA) in Illinois have mtDNA profiles that are also highly divergent resulting in the suggestion that the Algonquian (potentially Nephite) and Siouan (potentially Mulekite/Lamanite) began intermixing with each other prehistorically. This is borne out in another quote from Malhi.

> The *extremely high level of sequence divergence in both Algonquian- and Siouan-speaking groups* in comparison to those of the Cherokee or other previously studied groups *is consistent with admixture between the two groups.* The presence of *a high level of mtDNA variation in the pre-Columbian Norris Farms population suggests that this admixture was a prehistoric event.* Ref 92

The Norris Farms Remains and the Algonquian and Siouan groups

In the article "Distribution of Mitochondrial DNA Lineages Among Native American Tribes of Northeastern North America," in *Human Biology*, in 2001, it is assumed that the Siouan groups are related to the earlier Norris Farms samples which had haplogroup X DNA.

> The *Norris Farms* (Oneota) *samples were extracted from skeletal remains collected from a pre-Columbian (approx. 700 ybp) cemetery site located in west-central Illinois* and analyzed by Stone and Stoneking. Based on the geographic location of this site, *its inhabitants are assumed to be ancestors of modern Siouan group.* Ref 92

Again DNA sequencing may offer further clues about which Native American populations today might be a part of the remnant of the House of Israel prophesied to remain until the gathering of this lineage prior to the millennium. The Norris Farms human remains of west-central Illinois, dating back to about 1,300 AD, were found to have haplogroup X DNA. This is long before the arrival of European exploration of the New World.

Since this is the case, it is possible that these people were also descendants of the Book of Mormon people because they have the DNA markers that stem from Mediterranean lineages. The Norris Farms site is in the location where the Sioux nations are thought to have originated. Could this be an indication of the Siouan groups being descendants of the Book of Mormon "Lamanites" who, according to the Heartland Model geography, would have taken over this area after the extermination of the Nephites?

The Hopewell and the Cherokee

In his informative article on the Native American tribes in Northeastern North America, Ripan Malhi offers the following Cherokee traditional oral history.

> The Iroquoian presence also conforms with *Cherokee oral tradition that their ancestors were the builders of the Hopewell Earthmounds in the Ohio Valley (approximately 2000 ybp [Years Before Present]).* Ref 92

The Cherokee people claim, by their oral history, to be descendants from the Moundbuilders who built the tremendous earth works of Ohio. The Hopewell people are thought to be the initial builders of Fort Ancient in Ohio, a mighty hilltop fortress and occupied city with miles of earth embankments and deep ditches for protection. The Fort Ancient site was later occupied around 1000 AD by what is known as the Fort Ancient culture. Through DNA testing it was found that the Cherokee may not be related to the later Fort Ancient culture, but could very well still be related to the Hopewell.

> Thus, this preliminary data suggest that it is *unlikely that the Fort Ancient individuals* analyzed by Merriwether are *ancestral to the Cherokee*. Furthermore, if *the ancestors of the Cherokee were the Ohio Valley Hopewell Moundbuilders, another population must have replaced them* before the onset of the Fort Ancient Culture period. Ref 92

Because it was found that the later Fort Ancient (about 1,000 AD) population does not appear to be related to the Cherokee people, it is thought that if the Cherokee are related to the earlier Hopewell people that originally built Fort Ancient, the Hopewell must have been replaced by another people that were not related to the Cherokee. If Fort Ancient was a Nephite stronghold and the Nephites were destroyed at about 400 AD, then it stands to reason that another people had taken over the site by 1,000 AD. If the Cherokee descended from the Hopewell civilization, they would not be related to those who later took over Fort Ancient, but could be related to the Ohio Valley Hopewell people who erected the monumental earth structures around the time of Christ. This could be tantalizing evidence of a possible connection between the Cherokee and the Book of Mormon if the Hopewell were the Nephites.

There is much more that must be researched in this area of study. As is the case with all research, the more that is found, the more realization there is of how little is really known. It is hoped that other experts will join in providing additional insights into this research area. It is certainly fascinating to explore the possibilities.

LDS SCHOLARS ON DNA DATING AND HAPLOGROUP X

The LDS scholarly community has, of course, known about haplogroup X DNA since its onset. The initial response to the news of a European lineage among Native Americans sparked interest in this unique mtDNA lineage. When "X" was found to be in North America, hopes began to swell that surely such a lineage would then be found in Mesoamerica, where the Book of Mormon research had reached a certain consensus and confidence was high that it was *the* place. But when it was later found not to have been present among the ancient or modern Mesoamerican populations, doubt and skepticism about its possibilities crept in.

There are two distinctive groups within the LDS community dealing with the subject matter of DNA and geography of the Book of Mormon. There are those who question the dating and those who accept the dating as their reality. For some, dates reflecting 30,000 or 50,000 years that are based upon evolutionary time frames are accepted. Of course these same individuals are also accepting of the phylogenetic dating methods and the basis from whence they spring (Evolution theory).

Many LDS scholars however believe in "Adam and Eve" and their "creation" as being more literal, but others think of the scriptures as more figurative. Some claim that Adam and Eve were "placed" on the earth, but the animals were derived from the processes of evolution. There are many diverse beliefs within the membership of the Church regarding the origin of human beings and animals, and the Church gives ample room for its members to exercise their agency along many lines.

However, every member of the Church should attempt to align themselves as best they can with the scriptures and the prophets on the matter, and have faith that the Lord knows more than mankind will ever know in this life. There are faithful members of the Church that have a deep belief in evolution and have been able to reconcile their beliefs. To them please know that your beliefs are respected. It is equally important to allow those who cannot reconcile some of the theories of men with the gospel according to their understanding and should also be allowed their beliefs without ridicule.

Certainly disagreement is inevitable, but as members of the Church we should always strive for Christ-like discussion and discourse, and not resort to name calling, character assassination and questioning of knowledge, understanding or motives. Such actions are unconscionable and all engaging in them should consider the teachings of the Savior and the prophets about bearing false witness and casting stones. The prophetic words of President Harold B. Lee are worth repeating.

> The Church? The Church? *What is "the Church?" And what difference does it make whether the Church takes a position on anything or not. The important thing is that God has taken a position on everything and it is up to you to find out what it is.* Ref 48

As the Church has taken no official position on the matter of the geography of the Book of Mormon, evolution, the age of the earth, the process of fossilization or any number of other theories, it is up to us as Latter-day Saints to do our best to find out what God's position is and follow it to the best of our ability. It is a slothful servant that must be commanded in all things (D&C 58:26) and it is a wise leadership that does not take an "official position" on everything. How blessed we are to use our best judgment and draw on the Lord rather than abrogating our responsibility to make corrective self-alignments as necessary to remain close to the Lord's

position without straying into the philosophies of men against which the Lord has repeatedly warned.

There are many wonderful examples of LDS scholars questioning the dating, whether they believe in evolution or not, simply on sound scientific principles. There are others, however, that do not question the dating for any number of reasons. It is hoped that readers will open their minds to the origins of the dating and determine for themselves the validity or credence that should be given the dates. If the dates do not align with the teachings of the scriptures and the prophets, extreme caution is advised.

It should be remembered that scholars are dealing every day with the world around them. For them to have credibility and be able to publish their findings, many find themselves in a dilemma of going along with some things they may not necessarily agree with in order to accomplish a broader goal. We must all choose our battles in life and some battles are just battles.

On the other hand if a scholar stands firm for what he or she believes, he or she may be terminated, denied tenure or experience any number of other chastisements resulting in his or her inability to make substantial contributions in other areas. Life is about choices. Each must do as they feel directed in their lives. No one should condemn nor defend a scholar in taking a position that may not seem to be in accordance with the gospel. We may take issue with the position, but must always remember to separate the scholar from the position and never attack or attempt to discredit the individual personally.

It is, however, legitimate discourse to question the position and offer counter ideas and suggestions, or even offer information that refutes a particular position. This is the nature of science and learning, but it can and must be done in a Christ-like manner of respect for the individual. When such discussion becomes focused on the individual, rather than the position, you can be assured that's generally because that individual's position is on solid ground and the opposition must resort to attacking the person rather than the position. Beware of such attacks and understand from where they originate.

LDS scholar and surgeon, Dr. David Stewart in his online article found on the Church's LDS.org website titled "DNA and the Book of Mormon," quotes fellow LDS scholar Martin Tanner, contributor to the Neil A. Maxwell Institute for Religious Scholarship (formerly FARMS), who explains his position:

> *The idea haplogroup X has been in the Americas for 10 to 35 thousand years is based solely upon the assumptions of the Hardy-Weinberg equilibrium*, which include: (1) completely neutral variants, (2) no mutation, (3) no migration, (4) constant near infinite population size, and, (5) completely random mate choice. *In the Book of Mormon account, most of the Hardy-Weinberg equilibrium assumptions are inapplicable*. The wilderness journey, the ocean voyage, and the colonization of the new world, result in patterns of genetic selection and DNA migration different from that found in Lehi's home environment. Closely related individuals married and we are dealing with an [initially] very small group, not a nearly infinite population which would dramatically alter DNA marker distribution and inheritance over time. *If we take these assumptions about haplogroup X instead of the Hardy-Weinberg assumptions, haplogroup X could have been introduced into the Americas as recently as one to two thousand years ago*, far less than the ten to thirty-five thousand years under the Hardy-Weinberg assumptions. Ref 96

Haplogroup X plausibility in relation to the Book of Mormon

Is there any possible correlation of Haplogroup X with the Book of Mormon and Lehi's group? Can we narrow down the potential connections? Is it possible, or even probable, that there will ever be any evidence in favor or support of the Book of Mormon's claim of being a historical account of real people? The understanding, of course, is that DNA cannot "prove" the historicity of the

Book of Mormon, but rather a case is being built that may support its authenticity.

After reading the information presented here it should be clear that each of these questions may now be answered with a resounding "Yes!"

Arguably one of the most knowledgeable DNA experts in the Church, David A. McClellan, gives his assessment of how he would conduct research (if he were forced to) relating to DNA evidence in support of the Book of Mormon. He states in his article, reprinted in the very latest 2008 DNA related publication on the issue called, "The Book of Mormon and DNA Research," published by the Neil A. Maxwell Institute for Religious Study:

> ...if I were forced to design an experiment that *would produce evidence in support of the Book of Mormon, I would look for haplotypes that are not closely related to any extant ethnic group, but appear to be older—perhaps much older—than 2,600 years. Curiously, documentation of such haplotypes is exactly what is emerging in the literature (haplogroup X*, haplotype C10, the "other" haplotypes from ancient and modern Maya, the unexplained Y-chromosome haplotypes, and so forth), but interpretation of these data is largely avoided in the individual studies because they do not correspond well to the current scientific paradigm. However, *I will stop short of interpreting these "other" data as belonging to the Book of Mormon peoples because it is completely unverifiable*. Ref 14

This is sage advice which gives us a framework within which to compare these results. We should be looking for a genetic lineage that is much older, according to phylogenetic dating methods, than would be expected from the text of the Book of Mormon. This is exactly what has been found. McClellan, a supporter of the Mesoamerican theories held by many of his colleagues, suggests haplogroup X, haplotype C10 and "other" groups in Mesoamerican Maya populations, as well as Y-chromosome haplo--types as potential groups that fall within this realm. However, of all of these groups, only one is accepted as a "founding haplogroup" and because there is no such group in Mesoamerica, McClellan cannot even offer a sub-haplotype in its defense. His statement is apparently meant to salvage the Mesoamerican models, which have no basis in DNA findings.

Haplogroup X has now emerged as the only founding European haplotype known to have been in the Americas both anciently and currently. In this hemisphere it is found only in North America; no other European haplotype has emerged or been verified as a founding group anywhere in Mesoamerica to this point. This is not to say that it could not happen, but at this point, most DNA scholars would agree, it is very highly unlikely that a new founding haplogroup will emerge.

LDS Scholar John A. Tvedtnes, Senior Resident Scholar of the Neal A. Maxwell Institute for Religious Scholarship at Brigham Young University, stated in a documentary produced for FAIR (Foundation for Apologetic Information and Research) called *The Book of Mormon and New World DNA* that indeed Haplogroup X could be related to the Book of Mormon peoples.

> These are the mitochondrial Haplogroups found among the Native Americans: A, B, C and D. Now, they're found throughout North and South America, but in different proportions. However, there are others that have been found, too. *X for example showed up, mostly in the eastern part of the United States*. For a long time people were worried about this because *X is found in Europe* and a few other places too. But, since it's only found, *mostly found* I should say*, along the eastern coast of the United States*, some have suggested that *it came from Europe*, people following across the ice flows and down the east coast of America, and ending up in places like Florida where quite a number of them have this and *Ohio also is another place where they found a lot of the X haplogroup*. But actually, *since it is more closely related to the kind of X that we find, X haplogroup we find, in the Middle East, there is no reason to exclude it as being from Book of Mormon peoples*. But that doesn't prove that it came from Book of Mormon peoples. Ref 97

John Tvedtnes made this statement on the DNA video produced by FAIR called *The Book of Mormon and New World DNA* that was released for sale Spring of 2008 (about the same time as *DNA Evidence for Book of Mormon Geography* was released). Unfortunately as an organization FAIR has now recanted this position and has embraced the evolution-based phylogenetic dating of haplogroup X, claiming that it arrived in the New World long before Lehi's group.

The FAIR Organization's Position

This is an interesting position, but it corresponds with other positions put forward by the leadership of the organization and some of its membership. The FAIR organization embraces or encourages belief in controversial positions such as belief in evolution, that Adam wasn't the first man (see http://en.fairmormon.org/Pre-Adamites), that Noah's flood may not have been a literal or world-wide event, that the earth is 4.3 billion years old, that the Garden of Eden was not in Missouri and many other philosophies and theories of men. FAIR's Allen Wyatt (who launched an attack on this author's research) wrote an article about some of FAIR's controversial positions on gospel related subjects, Sept. 6th, 2008 in an article titled "Once the church finds out…" See internet link at: http://www.fairblog.org/2008/09/06/once-the-church-finds-out/

Their mantra is "Defending Mormonism," which deserves the highest praise, but it would appear that this private organization (which according to their website disclaimer, is not owned, controlled by or affiliated with the Church of Jesus Christ of Latter-day Saints) is frequently found defending "philosophies of men" rather than the scriptures and the prophets in these cases. This is very unfortunate as they claim to be defenders of the faith.

They have also expended significant time and resources criticizing this author's *unscripted* live DVD presentation, scrutinizing each and every word while finding nothing commendable about it whatsoever. Although they generally employ their resources sparring with anti-Mormon critics, they have now focused their combined energies against those who would have the temerity to submit a new paradigm for consideration.

They did not provide a "well-balanced" scholarly review of the DVD but rather immediately resorted to ad hominem attacks against the author. FAIR claimed that the author declared the research true by revelation, which is patently false. They also charged that the research was poorly done (which is their collective opinion). FAIR is not the final word on truth within the Church, and their collective opinion is no more and no less valid or true than statements made by any independent member or organization.

FAIR consistently accused this author of deliberately withholding information, attempting "magic tricks" on the audience; they insinuated that this author is uninformed because he is not a recognized "scholar" in the field of genetics. All of these are peripheral attacks designed to suppress and purposely obfuscate this exciting new paradigm. Why would this organization do such things?

This author decided that, rather than respond in a defensive manner on-line where, again, the Church's critics would gladly seize upon such an exchange as additional fodder for their purposes ("fellow brethren fight it out on-line"), a simple statement would be made with an indirect response to FAIR's reviews more in concert with how the Church deals with its critics.

The FAIR organization, while claiming to be neutral about Book of Mormon geography, is anything but. Their reviews, website, conferences and symposiums are laden with Mesoamerican research and promotion, while alternative geographies are criticized

mercilessly and literally barred from discussion. While at the same time nearly all Mesoamerican theories and theorists receive an automatic "pass" over any real scrutiny from the organization.

This is best evidenced by the FAIR DVD entitled, *The Book of Mormon and New World DNA*, where in the very first sentence their claimed neutrality is dispelled as expert witness Keith Crandall states:

> *The most recent DNA evidence that I've seen in terms of peopling of the Americas shows this Middle Eastern haplotype at greatest frequency in the Mayan people*. So if that is your perception of where Lehi and company set up shop, then the DNA evidence would be consistent with that. Ref 98

This statement not only demonstrates the bias of the entire DVD, set with background photos throughout exclusively of Mesoamerican sites, art, and artifacts, but is also a statement that is completely unverifiable: *there is not a single citation within or reference to this or any other claim made throughout the entire DVD*. Exactly to what "recent evidence of Middle Eastern haplotype in the Mayan people" is Crandall alluding? As far as is known through all the DNA studies published to date; absolutely none exists. So where is this Middle Eastern DNA connection with Mesoamerica as claimed in the DVD's opening line? Yet FAIR castigates the author's research as un-academic and sloppy despite the fact that it is fully referenced throughout using mainstream scientific journal articles.

Why does FAIR claim neutrality on Book of Mormon geography when in fact nearly 100% of the publications, websites, symposia and tours are steeped in Mesoamerican archaeology, ruins, culture, art and history? Such a predisposition toward a given outcome makes it easy to understand why a review of any competing position would be quite thoroughly disparaged. It further follows (and one should not find it surprising) that for all of the above reasons there would be a significant vested financial interest in the Mesoamerican region as well. With all these facts on the table, it should become easier for the reader to understand why so much acrimony arises when an alternative paradigm is introduced.

Nevertheless, in deference to the many fine people at FAIR and the work they do, it must be stated that their reviews have helped to refine and strengthen the research in this publication in many respects for which the author offers his gratitude.

WHO ARE THE REMNANT LAMANITES?

Who, then, are the remnant Lamanites? This question of who the remnant Lamanites are today seems to be uncertain to many Latter-day Saints and scholars. As reflected in the hierarchy of evidence discussed previously, one of the most, if not the most, powerful evidence is when the Lord himself is speaking to his prophets by revelation. A simple search of the Lord's revelations to Joseph Smith as recorded in the Doctrine and Covenants gives us the following references of who the Lord Himself knows to be the remnant Lamanites and where they were located during Joseph's time.

Dr. David Stewart in his article, "DNA and the Book of Mormon," agrees that it was the Lord that called the Native American Indians "Lamanites."

> In the Doctrine and Covenants, the Lord himself repeatedly refers to the American Indians as "Lamanites." Ref 96

The scriptures wherein the Lord makes these claims are below. Note that in every case they were written in first person English, with the Lord as mouthpiece. Whether it was the Lord speaking, or the voice of his servant, Joseph Smith, it is the same (D&C 1:38)

> 8 And now, behold, I say unto you that *you shall go unto the Lamanites* and preach *my gospel* unto them; and inasmuch as they receive thy teachings thou shalt cause *my church to be established among them*; and thou shalt have revelations, but write them not by way of commandment.
> 9 And now, behold, I say unto you that it is not revealed, and no man knoweth where *the city Zion shall be built*, but it shall be given hereafter. Behold, I say unto you that *it shall be on the borders by the Lamanites*.
> D&C 28:8 - 9

> 14 And thou shalt assist to settle all these things, according to the covenants of the church, before thou shalt take thy journey *among the Lamanites*.
> D&C 28:14

> 6 And be you afflicted in all his afflictions, ever lifting up your heart unto me in prayer and faith, for his and your deliverance; for I have given unto him power to *build up my church among the Lamanites*;
> D&C 30:6

> 2 And that which *I have appointed unto him is that he shall go* with my servants, Oliver Cowdery and Peter Whitmer, Jun., into the wilderness *among the Lamanites*.
> D&C 32:2

> 8 And thus you shall *take your journey into the regions westward, unto the land of Missouri, unto the borders of the Lamanites*.
> D&C 54:8

It should be clear from these scriptures that the Lord himself has given ample evidence of the location of at least some of Lehi's descendants, the Lamanites. How can any LDS believer argue with this revealed information? Yet these multiple revelations must be ignored or discounted in order to move the "Lamanites" from North America and place them in Central America as none of these revelations resulted in the Lord, or the Prophet dispatching any missionaries to that region.

The Lord's use of the word "Lamanite," an example from the FAIR organization

The FAIR organization claims that the use of the word "Lamanites" in these passages is "confusing" members of the Church who might mistake them for the Lord's words. See internet link at:
http://en.fairmormon.org/Lamanites_in_the_Doctrine_and_Covenants

> He [Joseph Smith] was *quite happy to revise them*, edit them later, etc. Ref 99

No supporting reference is given for this claim, and it gives the obvious impression

that Joseph Smith made changes to these revelations on a whim. FAIR claims that Joseph was "quite happy," almost frivolous or flippant about changing "his" revelations to suit his needs. With the tremendous scrutiny that accompanied everything that Joseph said or wrote, does anyone think that Joseph would have written casually what was to become canonized scripture?

> This means that "Lamanites" to describe the American Indians was Joseph's word choice. Ref 99

Had the Lord, through his prophet Joseph, used the word "Lamanite" in these revelations only once, one might consider that Joseph might have made a mistake, but when multiple instances were revealed, it becomes much more difficult to believe that Joseph did not comprehend the significance of the Lord's use of the word "Lamanite." If we cannot rely on Joseph's words, used time and again, as being correct, where does it stop? What other revelations did he also take such liberties with as FAIR is alluding to? How can we then know that any of his words were in fact inspired, or that the words in his revelations can be relied upon?

The primary reason for doubting the validity of the words used in the holy revelations from the Lord to his prophet Joseph Smith would be to defend one's theory: that would indicate that the people to whom the first missionaries were sent were in fact not Lamanites, but another group of people, because they hold that the "real" Lamanites were 3,000 miles further south in Mesoamerica. This appears on its surface to be an attempt to supplant the Lord's written words to support a particular geographical theory in Mesoamerica.

Again it is found that FAIR seems to defend their theories at the expense of the scriptures and prophetic statements of Joseph Smith. It should be easy to see where this type of discounting of the Lord's revealed words through the Prophet, Joseph Smith leads. This is a dangerous path, one that leads to questioning the divine revelatory conduit between the Lord and his Prophet.

To What Native American People Did the Lord Send Missionaries, through Joseph Smith, "Unto the Lamanites?"

Parley P. Pratt tells of the first mission to the "Lamanites" in his autobiography and also in a book called *The Historical Record*, a monthly periodical published by Andrew Jenson. Volume 7 was published in 1888 in Salt Lake City. The four missionaries, Parley P. Pratt, Oliver Cowdery, Peter Whitmer, Jr., and Ziba Peterson left immediately upon the Lord's instruction and commenced the very first mission of the Church west of New York. According to this account,

> This was the first *mission performed by the Elders of the Church in any of the States west of New York*, and we were the first members of the same which were ever on this frontier. Ref 100

This mission began in October of 1830 and continued until May of 1831. While there were continual hardships because of the season, still they traveled 1,500 miles one way, mostly on foot, in four months. Their journey was described thus:

> This was about *fifteen hundred miles from where we started, and we had performed most of the journey on foot*, through a wilderness country, in the worst season of the year, occupying *about four months*, during which we had *preached the gospel to tens of thousands of Gentiles and two nations of Indians*. Ref 100

The Cattaraugus, Wyandot, Shawnee and Delaware Indian tribes

Upon returning, Parley P. Pratt reported their missionary work among the Indians. According to his autobiography, he outlines those Native Americans to whom these first missionaries had "preached the gospel."

> Thus ended our *first Indian Mission*, in which we had preached the gospel in its fulness, and distributed *the record of their forefathers* among three tribes, viz: the *Cattaraugus Indians, near Buffalo, N.Y., the Wyandots of Ohio, and the Delawares west of Missouri*. We trust that at some future day, when the servants of God go forth in power *to the remnant of Joseph*, some precious seed will be found growing in their hearts, *which was sown by us* in that early day. *Autobiography of Parley P. Pratt*, also Ref 100

The first Native American people to which missionaries were commanded by the Lord to preach the gospel and who were repeatedly referred to by the Lord through his prophet as "Lamanites" were the Cattaraugus, Wyandot, Delaware and Shawnee (see below) Indian nations in North America. These tribes were found in New York, the Ohio River Valley, and the broader Mississippi River Valley where they had been driven and displaced (scattered) from their former lands in Illinois, Michigan and the northeastern United States region. Interestingly, these are also the very same lands of the Book of Mormon as proposed and outlined by the Heartland Model geography.

That the early brethren considered the "Indians" in North America to be synonymous with the "Lamanites" of the Book of Mormon is unquestionable from this historical account.

> ...the others crossed the frontier line and *commenced a mission among the Lamanites, or Indians.* Passing through the *tribe of Shawnee* we tarried one night with them, and next day crossed the Kansas River and entered among the *Delawares.* Ref 100

In a statement made by Joseph Smith in 1835, as recorded in the book, *An American Prophets Record:The Diaries and Journals of Joseph Smith*, by Scott H. Faulring in 1989, he described the visit of Angel Moroni some twelve years earlier:

> He [the angel] said that *the Indians were the literal descendants of Abraham.* Ref 101

Certainly this statement by Joseph Smith, claiming to have originated by angelic ministration, is important to an understanding of who the remnant Lamanites are that have in their ancestral lineage the blood of Abraham.

These then are the "Lamanites" according to the Lord, who claimed that He would go "with them" and be "in their midst" as these brethren fulfilled their mission to the Lamanites as commanded them by the Lord.

> 3 And Ziba Peterson also shall go with them; and *I myself will go with them and be in their midst*; and I am their advocate with the Father, and nothing shall prevail against them.
>
> D&C Section 32:3

Surely the Lord would have guided these humble missionaries to the actual Lamanite descendants of the house of Israel. There is no indication of dissatisfaction by the Lord in their mission, and there is no compelling reason to think that those that they did preach to are in fact not the remnant "Lamanites." In other words, this is strong evidence that the Indian tribes to which the Lord guided and directed these first missionaries to visit are in fact at least a portion of the very Lamanite remnant spoken of in the Book of Mormon and the Doctrine and Covenants (3 Nephi 21:1-7, D&C 3:16-20)

The Sac [Sauk] and Fox Indians

Late in the summer of 1841 a group of Native Americans of the Sac and Fox tribes who had been displaced from their homelands in Michigan west of the Mississippi in present-day Iowa came to visit the Prophet Joseph Smith. The meeting was recorded in the History of the Church. Joseph writes of this meeting:

> *Visit of the Sac and Fox Indians* [to Nauvoo, IL, Aug. 12, 1841]
> Thursday, 12.—A considerable number of the *Sac and Fox Indians* have been for several days encamped in the neighborhood of Montrose. I accordingly went down, and met Keokuk, Kis-ku-kosh, Appenoose, and about

> one hundred chiefs and braves of those tribes, with their families. At the landing, I was introduced by Brother Hyrum to them; and after salutations, I conducted them to the meeting grounds in the grove, and instructed them in many things *which the Lord had revealed unto me concerning their fathers,* and *the promises that were made concerning them in the Book of Mormon.* I advised them to cease killing each other and warring with other tribes; also to keep peace with the whites; all of which was interpreted to them. Ref 102

Joseph Smith testified that the Lord had revealed to him that the Book of Mormon was "concerning their fathers" which makes it undeniable that this group of people are, in fact, remnants of the Book of Mormon. Three years later, and only one month prior to the martyrdom of The Prophet, another visit by the Sac and Fox was recorded by Joseph Smith in his personal journal wherein he again restates that the Lord told him.

> 23 May 1844 ◎ Thursday
>
> 1. P.M. held council with the Indians - Sac & Fox &c in my back kitchen. They told me (Joseph) "You are a big chief. We are sons of big men, and Priests as ever inhabited this land. You preach a great deal so say great Spirit. You be as great & good as our fathers that will do. Our worship is different, but we are good as any other men."
> I [Joseph Smith] Replied. Great spirit wants you to be united & live in peace. - *[I] found a book*, (*presenting the Book of Mormon*) *which told me about your fathers & Great Spirit told me*.- you must send to all the tribes you can, & tell them to live in peace, & when any of our people come to see you treat them as we treat you. Ref 88

The Sac (Sauk) and Fox, as well as the Kickapoo are all a part of the Algonquian language family. That this is the case is clearly stated in this 2009 article in the journal *Molecular Biology & Evolution.*

> The "Fox" sample in the present study is comprised of a Sauk-and-Fox individual and a Kickapoo individual; *Sauk, Fox, and Kickapoo are considered different dialects of Fox, an Algonquian language* (also referred to as Sauk–Fox–Kickapoo). Ref 86

Could it be that the Lord and Joseph Smith gave clear indications of those who are the remnant "Lamanites" of the House of Israel? Every one of these missionaries was sent to Indian tribes in and around the Great Lakes and heartland area of the United States. In fact, no missionaries were ever sent to Mesoamerica for over 100 years after these revelations had been given. This fact should give us a firm foundation for establishing the lands of the Book of Mormon. Either the Lord and Joseph Smith, his Prophet, knew who the Lamanite remnant is, or they didn't. Perhaps by following their clues, we might come to a clearer and fuller understanding of who the remnant is as well.

Thus we have at least six known Native American tribes that are, according to revelation from both the Lord himself and Joseph Smith, remnants of the Book of Mormon people and "Lamanites" according to his words. These 6 tribes and their related language families are summarized in this table:

Tribe	***Language Families***		***Tribe***	***Language Families***
Sac	Mesquakie-Sauk, Algonquian		Shawnee	Algonquian
Fox	Mesquakie-Sauk, Algonquian		Cattaraugus	Seneca, Iroquois
Delaware	Algonquian		Wyandot	Huron, Iroquois

It is interesting to note that the highest frequency of the Mediterranean-based haplogroup X mtDNA occur in the Algonquian group, the very group to which the Lord Himself and his prophet, Joseph Smith, sent the very first missionaries to gather the "Lamanites." Was this simply a fortunate coincidence or divine guidance?

The most reasonable explanation of these facts as they relate to the geography of the Book of Mormon is that the events occurred in the location and to the people that Joseph Smith testified that it did, the Native

American Indians in the United States of America.

Joseph knew.

The Declaration of Lineage in the Patriarchal Blessings of Latin Americans

What about the patriarchal blessings of Native Americans in Central and South American cultures? Many of them are of the lineage of Manasseh according to their blessings. Doesn't this indicate their genetic lineage?

Elder Boyd K. Packer while the Acting President of the Quorum of the Twelve, addressed this question in a talk given before the priesthood session of general conference in October, 2002. He stated:

> *An essential part of a patriarchal blessing is the declaration of lineage*...The Brethren have taught: "*In giving a blessing the patriarch may declare our lineage*"—that is, that we are of Israel, therefore of the family of Abraham, and of a specific tribe of Jacob. In the great majority of cases, Latter-day Saints are of the tribe of Ephraim, the tribe to which has been committed the leadership of the Latter-day work. *Whether this lineage is of blood or adoption does not matter.* (Pearl of Great Price, Abraham 2:10). This is very important, for *it is through the lineage of Abraham alone that the mighty blessings of the Lord for His children on earth are to be consummated* (Genesis 12:2, 3; Pearl of Great Price, Abraham 2:11)... Since there are many bloodlines running in each of us, two members of one family might be declared as being of different tribes in Israel. Ref 103

Patriarchal blessings are not a declaration of genetic heritage or genealogical lineage, but rather a declaration of which of the 12 tribes of Israel that person is assigned to. While the majority of patriarchal blessings among Latter-day Saints may be assigned to Ephraim, as President Packer has said, it could be by either blood (genetic lineage) or adoption and either is acceptable to the Lord. This is also true with those who have been declared to be of the tribe of Manasseh, in Central and South America. There is no reason to assume that a patriarchal blessing given to a Native American in Central America with a declared lineage of Manasseh is thereby a direct descendant of Joseph through Lehi, nor a genetic remnant of Book of Mormon peoples.

What Remnant Lamanites have been "Scattered" by the Gentiles?

One of the important prophesies to understand in identifying who the remnant Lamanites are today is that they will have been scattered. Like the House of Israel to which they belong, the Lamanites were promised and repeatedly warned that because of their unbelief, they would suffer the consequences of being scattered.

> 12 Yea, I say unto you, that *in the latter times the promises of the Lord have been extended to our brethren, the Lamanites*; and notwithstanding the many afflictions which they shall have, and notwithstanding they shall be driven to and fro upon the face of the earth, and be hunted, *and shall be smitten and scattered abroad*, having no place for refuge, the Lord shall be merciful unto them.
>
> BoM Helaman 15:12

> 15 And also that *the seed of this people* may more fully believe his gospel, which shall go forth unto them from the Gentiles; for *this people shall be scattered*, and shall become a dark, a filthy, and a loathsome people, beyond the description of that which ever hath been amongst us, yea, even that which hath been among the Lamanites, and this because of their unbelief and idolatry.
>
> BoM Mormon 5:15

The "seed" of this people, or in other words the Lamanites, will most assuredly be scattered. What does it mean to be scattered? The simplest answer could be found in the synonym "dispersed." What Native American groups have been "scattered" by the "Gentiles?" Again there are some possible answers from the DNA literature on the subject as given below. While this is not DNA evidence, per se, it nonetheless demonstrates

that it is widely and unquestionably known that the very tribes being discussed as potential candidates to be the remnant people of the house of Israel from the Book of Mormon lineages can in fact fulfill this ancient prophecy.

> Chafe has proposed the existence of a *Macro-Siouan language stock consisting of the Iroquoian, Siouan, and Caddoan language families*, which might have *originated in the Southeast. Populations from all three of these groups are now widely scattered throughout the Northeast, Plains, and Southeast regions*. Ref 92

The Algonquian and Iroquoian peoples that were in the heartland and Great Lakes regions of North America before the time of Columbus were all displaced, dispersed, driven from their homelands and smitten with disease, injustice, and inequality, just exactly as prophesied by their forefathers two millennia ago. It compounds this injustice when they are not properly given the respect and help that they deserve and that the Lord has commanded. It is time that these people who are known to be the "Lamanites" are given the facts about the possibilities of their heritage, so that they may again claim the mighty blessings reserved for them, the children of Israel, on the "Promised Land" of America. We, as Latter-day Saints, should be anxiously engaged in awakening this knowledge in those that Joseph Smith and the Lord clearly indicated are at least some of the actual remnant.

REVIEWING THE CASE FOR DNA EVIDENCE: POSSIBLE, PLAUSIBLE, OR PROBABLE—DID THE FOLLOWING EXPECTATIONS OCCUR?

What might reasonably be expected from the DNA evidence available today to demonstrate the possibility, plausibility or probability of the historicity of the Book of Mormon and what was found?

1. We expected DNA markers in Native American populations consistent with known Caucasian lineages stemming from Shem. They have been verified.
2. We expected DNA profiles that were predominantly Asian, with lower frequencies of European markers among a large sampling. This is what has been verified.
3. We expected DNA markers in Native Americans common to or consistent with those found among known Jewish or Israelite lineages. This has been verified.
4. We expected Native American markers consistent with specific lineages such as Semitic (good), Israelite (better), or Jewish (best) lineages. All three have been verified.
5. We expected these lineages to be shown to have existed in the Americas anciently, within the time-frames of the Book of Mormon. This has been verified.
6. We expected lineages that existed near the time that Lehi left Jerusalem to possibly share lineages with Lehi's group. This has been shown.
7. We hoped to find DNA markers linking Native American populations to populations from the same time frame and area from which Lehi's group left. Again, this has been shown.

As a result of all of these expectations having been fulfilled, all of these refinements make a progressively stronger case with a more robust claim that the Book of Mormon story may actually be *probable*.

Conclusions

To further develop the case for the authenticity of the Book of Mormon, some guidelines need to be established in analyzing old and new information regarding the Book of Mormon. These criteria, it is believed, will provide further strength to the case for the truthfulness of the Book of Mormon, while most likely never "proving" it. There will always remain unanswered questions for which faith is required. No level of evidence should ever take the place or supplant the role of faith in individual testimonies of the truths of the gospel.

It is the hope of this author that the information contained herein will renew excitement in exploring the truths of the Book of Mormon, both physical and spiritual. It is the most believable and credible book, which has time and again held up under intense scrutiny. It is a historical record of real individuals who lived out their lives somewhere in the Americas. Where it happened is much less important than the fact *that* it happened.

The Importance of the Historicity of the Book of Mormon

The historical reality of the Book of Mormon forms the very basis for its teachings. The importance of this understanding is critical. It cannot be overstated. Robert L. Millet, professor of ancient scripture at Brigham Young University, made the following statement on the importance of the historicity of the Book of Mormon.

> *The historicity of the Book of Mormon record is crucial. We cannot exercise faith in that which is untrue, nor can "doctrinal fiction" have normative value in our lives.* Ref 2

Faith, by definition is a belief in something that is true (Alma 32:21). That definition does not include fables or fairy tales. The Book of Mormon must be a true history in order for it to be true. There are those that believe that the book was simply an inspired story spun by the prophet Joseph Smith to teach spiritual truths. This is not consistent with the words of the book itself, the Lord, or his prophets. In order for the Book of Mormon to be spiritually true, it must also be historically true. Not perfectly historically accurate, since it was written by inspired men with human frailties, but true to the important aspects of the history. Millet goes on to clarify why its historicity is important.

> *Only scripture—writings and events and descriptions from real people at a real point in time,* people who were moved upon and directed by divine powers—*can serve as a revelatory channel, enabling us to hear and feel the word of God*. Ref 2

A New Set of Criterion for Book of Mormon *Research*

A new set of criterion for Book of Mormon geographical research is proposed. These criteria follow a natural progression based on the newly released book "Prophecies and Promises" by Bruce Porter and this author. It is proposed that all old and new proposed geographies for the Book of Mormon meet the following criteria or explain why doing so is not necessary. The proposed model:

1. Must not violate the 36 Prophecies and Promises as outlined in the book by that title
2. Must not violate Joseph Smith's revealed and historically documented words
3. Must be in the Promised Land of the United States of America as demonstrated scripturally in the book *Prophecies and Promises*
4. Must have at least a possible case for the remnant of the House of Israel to actually exist
5. Must demonstrate an advanced civilization within the Book of Mormon time frames
6. Must demonstrate that this civilization had at least some of the artifacts mentioned in the Book of Mormon (such as headplates, breastplates, pearls, metals, etc.)
7. Must demonstrate a civilization that had metalworking capabilities
8. Must have minable metal ore (copper, iron, gold) within its geography
9. Must have archaeologically verified cities built as described by Moroni with earth banks and trenches
10. Must demonstrate a basis for both an agrarian and nomadic hunting lifestyle within the proposed geography
11. Must demonstrate mass burials with evidence for wars of extermination
12. Travel distances must match known time frames from the Book of Mormon
13. Must have a plausible explanation for the destruction at the time of Christ
14. Must demonstrate road construction by the proposed civilization
15. Must demonstrate that the civilization deforested their lands
16. Must demonstrate that the civilization had capability of making cement
17. Must be able to be provide general correlations with the 550 geographic passages based on these new guidelines and with an understanding that they are, in fact, incomplete

Final Remarks

DNA expert David A. McClellan summarized his feelings. At the end of his article on detecting Lehi's genetic signature, he writes:

> I am convinced that there has been constant gene flow between Asia and the Americas, but *I am also convinced that there has been a trickle of migrants from other source populations*. Though far from verifying or proving the Book of Mormon, *this observation allows for the plausibility of the Book of Mormon* story line. *It is very possible that a group or groups of people from the Middle East found their way to the New World in 600 B.C.* Ref 14

Like McClellan, it is agreed that while current DNA research is far from "proving" the truth of the Book of Mormon, certainly it may offer plausible evidence in favor of its claimed historicity. Based on this new DNA research, and utilizing the haplogroup X DNA lineage, there is now not only plausible evidence favoring the claims of the Book of Mormon, but there is credible evidence that "probably" supports it.

It could very well be that haplogroup X is indeed related to a migration from the Mediterranean area in the time frames of the Book of Mormon once more empirical rates of mtDNA mutations are used. For anyone to claim that haplogroup X *cannot* be related to the Book of Mormon, they must first demonstrate the following.

- That the rate of mutation upon which their claim is based is factual, meaning based on solid observational evidence, and not on theoretical musings
- That haplogroup X is found in exclusivity within source populations that founded the other four founding haplogroups of the Americas and cannot be attributed to any other source
- That this source population was the actual origin for all Native American haplogroup X lineages found in the Americas
- That Native American haplogroup X is not at all related to Mediterranean haplogroup X lineages
- That the time of arrival into the Americas of haplogroup X is inconsistent with the timing of the Book of Mormon migrations

Does this DNA research and evidence "prove" the Book of Mormon is true? Emphatically NO. We still do not have a sample population from which to gain a solid basis of comparison, we don't know if anyone in Lehi's group had haplogroup X DNA in any frequency, we can't be positive that even if they originally had haplogroup X that it would have remained in sufficient quantity to reverse the effects of dilution or genetic bottlenecks. For that matter, we can't know for certain even if haplogroup X is the only marker that can be a distinguishing characteristic of ancestry deriving from ancient Mediterranean groups.

However, this fresh new research and its resulting Heartland Model geography for the Book of Mormon does provide at least the possibility that an ancient migration to America from a population in the Mediterranean area did occur, which is consistent with the historical account from the Book of Mormon. At the minimum we now have DNA evidence that may very well support the claims of the Book of Mormon in a positive way, rather than accepting the neutral approach that there is not now, and never will be supporting or contradictory evidence (positive or negative) for this sacred record. Do we have faith that the Book of Mormon is a true historical account or not?

The author invites those who would like to further this theory to do so, as well as inviting all who find discrepancies to make them known so that they can be corrected. The author acknowledges that as with all scholarly work, mistakes can and will be made, and invites those who choose to take issue with this research to do so in a Christ-like manner, rather than making personal attacks against the author's character, knowledge or motives.

The Heartland Model is consistent with the previously established location of the Promised Land as being the United States of America, and Joseph Smith's revelatory statements as outlined in the book *Prophecies and Promises*.

This research and information is not sponsored by or endorsed by the Church of Jesus Christ of Latter-day Saints. It is given in support of the gospel of Jesus Christ, the reality and truthfulness of the Book of Mormon, the Prophet, Joseph Smith and all subsequent prophets, and The Church of Jesus Christ of Latter-day Saints that encompasses each of these essential elements. The opinions given are not necessarily those of The Church of Jesus Christ of Latter-day Saints, but are those of the author.

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REFERENCES

1. Dallin H. Oaks, Speech before the Foundation for Ancient Research and Mormon Studies (FARMS), Provo, Utah, October 29th, 1993
2. Robert L. Millet, The Book of Mormon, Historicity, and Faith, *Journal of Book of Mormon Studies:* Vol. 2 (2), Provo, Utah: Maxwell Institute, 1993
3. Jason A. Eshleman, Ripan S. Malhi, David Glenn Smith, Mitochondrial DNA Studies of Native Americans: Conceptions and Misconceptions of the Population Prehistory of the Americas, *Evolutionary Anthropology*, Vol. 12, 2003
4. David Glenn Smith, Distribution of mtDNA Haplogroup X Among Native North Americans, *American Journal of Physical Anthropology* 110: (1999)
5. Flavius Josephus, *Complete Works of Josephus: Antiquities of the Jews, The Wars of the Jews, Against Apion*, etc. etc.,
6. *Journal of Discourses*, Vol. 23
7. Matthew Roper, Swimming in the Gene Pool: Israelite Kinship Relationships, Genes, and Genealogy, originally in FARMS Review: Vol. 15, Issue 2, 2003 as reprinted in *The Book of Mormon and DNA Research*, edited by Daniel C. Peterson, 2008.
8. Nephi's Neighbors: Book of Mormon Peoples and Pre-Columbian Populations, *FARMS Review*: Vol. 15 Issue 2, Provo, Utah: Maxwell Institute, 2003 as reprinted in *The Book of Mormon and DNA Research*, edited by Daniel C. Peterson, 2008
9. John M. Butler, Addressing Questions Surrounding the Book of Mormon and DNA Research, *FARMS Review*: Vol. 18(1), Provo, Utah: Maxwell Institute, 2006 as reprinted in *The Book of Mormon and DNA Research*, edited by Daniel C. Peterson, 2008
10. David B. Goldstein and Lounès Chikhi, "Human Migrations and Population Structure: What We Know and Why It Matters," *Annual Review of Genomics and Human Genetics* 3 (2002):
11. Michael F. Whiting, DNA and the Book of Mormon: A Phylogenetic Perspective, *Journal of Book of Mormon Studies*: Vol.12 (1) Provo, Utah: Maxwell Institute, 2003
12. Brian D. Stubbs, Elusive Israel and the Numerical Dynamics of Population Mixing, *FARMS Review*: Vol.15(2), Provo, Utah: Maxwell Institute, 2003 as reprinted in *The Book of Mormon and DNA Research*, edited by Daniel C. Peterson, 2008
13. D. Jeffrey Meldrum and Trent D. Stephens, Who are the Children of Lehi?, *Journal of Book of Mormon Studies*: Vol.12(1), Provo, Utah: Maxwell Institute, 2003 as reprinted in *The Book of Mormon and DNA Research*, edited by Daniel C. Peterson, 2008
14. David A. McClellan, Detecting Lehi's Genetic Signature: Possible, Probable, or Not? *FARMS Review*: Vol. 15, Issue 2, 2003 as published in *The Book of Mormon and DNA Research*, The Maxwell Institute for Religious Scholarship, David A. McClellan, Detecting Lehi's Genetic Signature: Possible, Probable, or Not? 2008
15. James E. Smith, Nephi's Descendants? Historical Demography and the Book of Mormon, *FARMS Review*: Vol. 6, (1), A review of *Multiply Exceedingly: Book of Mormon Population Sizes* by John C. Kunich, Provo, Utah: Maxwell Institute, 1994
16. *Through Indian Eyes: the Untold Story of Native American Peoples*, Reader's Digest Association, 1995
17. Russell Thornton, *American Indian Holocaust and Survival: A Population History Since 1492*, University of Oklahoma Press, 1990
18. Quote from display graphic, Fort Ancient Museum of Ancient History, Ohio Historical Society
19. Michael H. Crawford, *The Origins of Native Americans: Evidence from Anthropological Genetics*, 1998

20. Keith Hunley and Jeffrey C. Long, Gene Flow Across Linguistic Boundaries in Native North American Populations, *PNAS*, Vol. 102 no. 5, Feb. 1, 2005

21. *The New Lexicon Webster's Encyclopedic Dictionary of the English Language*, Deluxe Edition, 1990

22. Heber J. Grant, Conference Report, April 1930

23. *An American Prophet's Record: The Diaries and Journals of Joseph Smith*, ed. Scott H. Faulring (Salt Lake City: Signature Books, 1989)

24. Donna B. Nielson, *Beloved Bridegroom*, Onyx Press, 1999

25. Frank Moore Cross, as quoted in The Book of Mormon and DNA Research, Neil A. Maxwell Institute, article "Who are the Children of Lehi," reference 25 "From Epic to Canon: History and Literature in Ancient Israel"

26. Doron M. Behar, Counting the Founders: The Matrilineal Genetic Ancestry of the Jewish Diaspora, *PLOS ONE*, Vol. 3(4):1-16, 2008

27. M.F. Hammer, Jewish and Middle Eastern non-Jewish populations share a common pool of Y-chromosome biallelic haplotypes, *PNAS*, Vol. 97(12):6769-6774, 2000

28. Mark G. Thomas, Founding Mothers of Jewish Communities: Geographically Separated Jewish Groups Were Independently Founded by Very Few Female Ancestors, *American Journal of Human Genetics*, Vol. 70:1411-1420, 2002

29. Virginia Morell, Genes may link ancient Eurasians, native Americans, *Science*, Vol. 280, Issue 5363, 1998

30. David Glenn Smith, Distribution of mtDNA Haplogroup X Among Native North Americans, *American Journal of Physical Anthropology* 110:272 (1999)

31. Ripan S. Malhi and David Glenn Smith, Brief Communication: Haplogroup X Confirmed in Prehistoric North America, *American Journal of Physical Anthropology* 119:84–86, 2002

32. Maere Reidla and Toomas Kivisild, Origin and Diffusion of mtDNA Haplogroup X, *American Journal of Human Genetics*, Vol. 73:1178-1190, 2003

33. Miroslava V. Derenko, Tomasz Grzybowski, The Presence of Mitochondrial Haplogroup X in Altaians from South Siberia, *American Journal of Human Genetics*, 69:237-241, 2001

34. Elena B. Starikovskaya, Mitochondrial DNA Diversity in Indigenous Populations of the Southern Extent of Siberia, and the Origins of Native American Haplogroups, *Annals of Human Genetics*, vol. 69, Issue 1, January 2005

35. Ugo A. Perego, Distinctive Paleo-Indian Migration Routes from Beringia Marked by Two Rare mtDNA Haplogroups, *Current Biology* 19, January 13, 2009

36. Claudia L. Dornelles, Is Haplogroup X Present in Extant South American Indians*?*, *American Journal of Physical Anthropology* 127:439–448 (2005)

37. Andres Resendez, Genetics and the History of Latin America, *Hispanic American Historical Review*, Vol. 85(2):283-298, 2005

38. Israel Central Bureau of Statistics, *Statistical Abstract of Israel* 2006

39. Khaled K Abu-Amero, Ana M. Gonzalez, Jose M. Larruga, from ref 24: Eurasian and African mitochondrial DNA influences in the Saudi Arabian population, *BMC Evolutionary Biology*, Vol. 7, 2007

40. LI Shlush, DM Behar, G Yudkovsky, A Templeton, Y Hadid, et al. The Druze: A Population Genetic Refugium of the Near East. *PLoS ONE* 3(5): e2105. May 2008

41. Mateusz Baca, Research on ancient DNA in the Near East, *Bioarchaeology of the Near East*, 2:39–61, 2008

42. Jeanette Feder, Differences in mtDNA Haplogroup Distribution Among 3 Jewish Populations Alter Susceptibility to T2DM Complications, *BMC Genomics*, Vol. 9:198, April 2008

43. Doron M. Behar, Counting the Founders: The Matrilineal Genetic Ancestry of the Jewish Diaspora, *PLoS ONE*, Vol. 3(4):1-16, 2008
44. Peidong Shen, Reconstruction of Patrilineages and Matrilineages of Samaritans and Other Israeli Populations From Y-Chromosome and Mitochondrial DNA Sequence Variation, *Human Mutation* Vol. 24:248-260, 2004
45. M.F. Hammer, Jewish and Middle Eastern non-Jewish populations share a common pool of Y-chromosome biallelic haplotypes, *PNAS*, Vol. 97(12):6769-6774, 2000
46. Mark G. Thomas, Founding Mothers of Jewish Communities: Geographically Separated Jewish Groups Were Independently Founded by Very Few Female Ancestors, *American Journal of Human Genetics*, Vol. 70:1411-1420, 2002
47. Beth Shook, Alison Schultz, David Glenn Smith, Using Ancient mtDNA to Reconstruct the Population History of Northeastern North America, *American Journal of Physical Anthropology*, Vol. 137:14-29, 2008
48. Harold B. Lee, BYU CES Summer School, 1970
49. Joseph Fielding Smith, *Doctrines of Salvation*, 3 vols., edited by Bruce R. McConkie [Salt Lake City: Bookcraft, 1954-1956]
50. Logan Journal, April 7, 1914. Joseph F. Smith, *Gospel Doctrine: Selections from the Sermons and Writings of Joseph F. Smith*, compiled by John A. Widtsoe [Salt Lake City: Deseret Book Co., 1939], 372.
51. Joseph Fielding Smith, *Man, His Origin and Destiny*
52. Ezra Taft Benson, *This Nation Shall Endure*
53. Ezra Taft Benson, *God, Family, Country: Our Three Great Loyalties*
54. Spencer W. Kimball, Absolute Truth, *Ensign*, September 1978
55. Stephen Jay Gould, Darwin's More Stately Mansion, *Science*, Vol. 284, no. 5423, 25 June, 1999
56. *Nature*, Vol. 325, 1 January 1987
57. Ann Gibbons, Calibrating the Mitochondrial Clock, *Science*, Vol. 279, 2 Jan. 1998
58. Toomas Kivisild, The Role of Selection in the Evolution of Human Mitochondrial Genomes, *Genetics*, Vol. 172, January 2006
59. Traces of a Distant Past, *Scientific American*, July 2008
60. Thomas J. Parsons, A High Observed Substitution Rate in the Human Mitochondrial DNA Control Region, *Nature Genetics*, Vol. 15, April 1997
61. Laurence Loewe, Mitochondrial Eve: the Plot Thickens, *Trends in Ecology & Evolution (TREE)* vol. 12, no. 11, November 1997
62. Brigitte Pakendorf and Mark Stoneking, Mitochondrial DNA and Human Evolution, *Annual Reviews of Genomics and Human Genetics*, Vol. 6, 2005
63. Kate Wong, Is Out of Africa Going Out the Door? *Scientific American* vol. 281 (2), August 1999
64. Sigrun Siguroardottir, Agnar Helgason, The Mutation Rate in the Human mtDNA Control Region, *American Journal of Human Genetics* Vol. 66, 2000
65. Neil Howell, The Pedigree Rate of Sequence Divergence in the Human Mitochondrial Genome: There Is a Difference Between Phylogenetic and Pedigree Rates, *American Journal of Human Genetics*, Vol. 72, 2003
66. Ho, Simon Y.W., Time Dependency of Molecular Rate Estimates and Systematic Overestimation of Recent Divergence Times, *Molecular Biology and Evolution*, Vol. 22(7), 2005
67. Brent C. Emerson, Alarm Bells for the Molecular Clock? No Support for Ho et al.'s Model of Time-Dependent Molecular Rate Estimates, *Systematic Biology*, Vol. 56(2), 2007
68. David Penny, Relativity for Molecular Clocks, *Nature* Vol. 436, 14 July 2005

69. N Howell, C Howell and JL Elson, Time Dependency of Molecular Rate Estimates for mtDNA: This is not the Time for Wishful Thinking, *Heredity* 101, June 2008
70. Adam Eyre-Walker, High Genomic Deleterious Mutation Rates in Hominids, *Nature*, Vol. 397, 28 Jan. 1999
71. F. Rana, R. Deem, and H. Ross, A Scientific and Biblical Response To: "Up from the Apes. Remarkable New Evidence Is Filling in the Story of How We Became Human." *Time*, August 23, 1999
72. Michael W. Nachman, Estimate of the Mutation Rate per Nucleotide in Humans, *Genetics*, Vol. 156, Sept. 2000
73. Jeffrey D. Lindsay, Ph.D. *Does DNA Evidence Refute the Book of Mormon?* 16 Nov. 2003
74. Dan Mishmar, Natural Selection Shaped Regional mtDNA Variation in Humans, *PNAS* Vol. 100(1), January 7, 2003
75. H.J. Bandelt, Identification of Native American Founder mtDNAs Through the Analysis of Complete mtDNA Sequences: Some Caveats, *Annals of Human Genetics* Vol. 67: 2003
76. Cristina Santos, Mutation patterns of mtDNA: Empirical inferences for the coding region, *BMC Evolutionary Biology*, 8:, 2008
77. Simon Ho, The Crucial Role of Calibration in Molecular Date Estimates for the Peopling of the Americas, *The American Journal of Human Genetics*, Vol 83, July 2008
78. H-J Bandelt, Time Dependency of Molecular Rate Estimates: Tempest in a Teacup, *Heredity* Vol. 100, 2008
79. Ugo A. Perego, Distinctive Paleo-Indian Migration Routes from Beringia Marked by Two Rare mtDNA Haplogroups, *Current Biology* 19, January 13, 2009
80. Peter A. Underhill, A pre-Columbian Y Chromosome-specific Transition and its Implications for Human Evolutionary History, *PNAS (Proceedings of the National Academy of Science)*, Vol. 93, Jan. 1996
81. Lev A. Zhivotovsky, Peter A. Underhill, The Effective Mutation Rate at Y Chromosome Short Tandem Repeats, with Application to Human Population-Divergence Time, *American Journal of Human Genetics* 74, 2004
82. Nelson J.R. Fagundes, Mitochondrial Population Genomics Supports a Single Pre-Clovis Origin with a Coastal Route for the Peopling of the Americas, American Journal of Human *Genetics*, Vol. 82, March 2008
83. Simon Ho & Phillip Endicott, The Crucial Role of Calibration in Molecular Date Estimates for the Peopling of the Americas, *The American Journal of Human Genetics*, Vol. 83, July 2008
84. Nelson J.R. Fagundes, The Crucial Role of Calibration in Molecular Date Estimates for the Peopling of the Americas; Reply to Ho and Endicott, *The American Journal of Human Genetics*, Vol. 83, July 2008
85. Natalia V. Volodko, Mitochondrial Genome Diversity in Arctic Siberians, with Particular Reference to the Evolutionary History of Beringia and Pleistocenic Peopling of the Americas, *American Journal of Human Genetics* Vol. 82, May 2008
86. Kari B. Schroeder and Mattias Jakobsson, Haplotypic Background of a Private Allele at High Frequency in the Americas, *Molecular Biology & Evolution*, Vol. 26 (5), Feb. 12, 2009
87. *History of the Church*, Vol. 4, p401-402, Thursday, Aug. 12th, 1841
88. *Joseph Smith Diary* entry, Thursday, May 23rd, 1844, as kept by Willard Richards, archives of the Church of Jesus Christ of Latter-day Saints
89. Alice B. Kehoe, The Fringe of American Archaeology: Transoceanic and Transcontinental Contacts in Prehistoric America, *Journal of Scientific Exploration*, Vol. 17(1), 2003
90. Ripan S. Malhi, Native American mtDNA Prehistory in the American Southwest, *American Journal of Physical Anthropology* 120 (2003)

91. Alan G. Fix, Rapid Deployment of the Five Founding Amerind mtDNA Haplogroups Via Coastal and Riverine Colonization, *American Journal of Physical Anthropology*, Vol.128, 2005
92. Ripan S. Malhi and Beth A. Schultz, Distribution of Mitochondrial DNA Lineages Among Native American Tribes of Northeastern North America, *Human Biology*, v. 73, no. 1, February 2001
93. Deborah Bolnick, David Glenn Smith, Migration and Social Structure Among the Hopewell: Evidence from Ancient DNA, *American Antiquity* Vol. 72(4), 2007
94. Kristin Ohlson, Examining Hopewell Earthworks, *American Archaeology*, Vol. 9 no. 4, 2006
95. Martin S. Garretson, *The American Bison; The Story of Its Extermination as a Wild Species and Its Restoration Under Federal Protection*, 1938
96. Dr. David Stewart, *DNA and the Book of Mormon*, from personal communication, April 2004 with Martin Tanner. http://newsroom.lds.org/ldsnewsroom/eng/commentary/dna-and-the-book-of-mormon accessed 05.04.09
97. John A. Tvedtnes, documentary produced for FAIR (Foundation for Apologetic Information and Research) called *The Book of Mormon and New World DNA*
98. Keith Crandall, documentary produced for FAIR (Foundation for Apologetic Information and Research) called *The Book of Mormon and New World DNA*
99. See FAIR organization website, http://en.fairmormon.org/Lamanites_in_the_Doctrine_and_Covenants accessed 3/4/2009
100. Andrew Jensen, *The Historical Record*, Vol. 7, 1888
101. *An American Prophet's Record: The Diaries and Journals of Joseph Smith*, ed. Scott H. Faulring, 1989
102. *History of the Church*, Vol. 4:
103. Boyd K. Packer, The Stake Patriarch, *Ensign*, October 2002
104. Thomas S. Monson, The Call for Courage, *Ensign*, May 2004
105. John Taylor, Chapter 23: Eternal Truth, *Teachings of Presidents of the Church: John Taylor*; See LDS Church website: http://newsroom.lds.org/ldsnewsroom/eng/commentary/dna-and-the-book-of-mormon
106. Joseph Fielding Smith, *Answers to Gospel Questions*, 5 vols., Salt Lake City: Deseret Book Co., 1957-1966
107. **History of the Church, Vol. 2, June 3, 1834, 1948 ed**