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**Abstract** Review of *Rediscovering the Book of Mormon Remnant through DNA* (2009), by Rod L. Meldrum.

# OFTEN IN ERROR, SELDOM IN DOUBT: ROD MELDRUM AND BOOK OF MORMON DNA

Gregory L. Smith

Review of Rod L. Meldrum. *Rediscovering the Book of Mormon Remnant through DNA*. Honeoye Falls, NY: Digital Legend Press, 2009. viii + 169 pp., no index. \$19.95.

This isn't right. This isn't even wrong.<sup>1</sup>

*Physicist Wolfgang Pauli*

## Introduction

Rod Meldrum has, he believes, found compelling scientific evidence for the Book of Mormon. *Rediscovering the Book of Mormon Remnant through DNA* is his effort to present that evidence “in a synergistic way that may offer support to some of the physical claims of the Book of Mormon” (p. iii). And lest we should be inclined to doubt the compelling nature of his findings, we are presented with

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There are so many spelling, punctuation, and grammatical errors in *Remnant through DNA* that it would prove distracting for the reader if they were flagged whenever they are reproduced in this review. Thus all quotations appear as they do in the original.

In this article, I speak only for myself. I'm grateful for the feedback and help of many friends and colleagues. These include Louis Midgley, Ugo Perego, Matthew Roper, Robert B. White, Michael Whiting, and Allen Wyatt. David Keller, Matthew Roper, and James Stutz helped me track down references. Any errors or misapprehensions remain mine alone.

1. Cited in John D. Barrow, P. C. W. Davies, and Charles L. Harper, *Science and Ultimate Reality: Quantum Theory, Cosmology, and Complexity* (Cambridge: Cambridge University Press, 2004), 325.

a page of “endorsements” by various authors with titles such as “Plant Pathology,” “Ph.D.,” “MS MD,” and “Ph.D., Plant Geneticist” (p. iv).

Unfortunately, science does not proceed by enthusiasm, endorsement, or testimonial. The data and arguments must speak for themselves, and we ought to require no preliminary assurance that the book is “very well researched and accurate,” filled with “an impressive and virtually-unassailable mountain of scriptural and archaeological data.” “Anyone,” we are assured, “who would study this evidence with an open mind would have a difficult time refuting it scripturally or scientifically” (p. iv). I regret to say that this last statement is only partly true—the difficulty lies mainly in the abundance and variety of errors both scientific and scriptural, not in refuting it on theological or scientific grounds.

Nevertheless, Meldrum tells us that “many scholars and historians support [his] research and its findings, with many more anticipated as this information continues to gain momentum and change ‘accepted’ paradigms” (p. iii).

#### A. *The Conspiracy*

Despite the endorsements and claims of wide acceptance, there are “many scholars that do not support this research” (p. iii). The author has an explanation for that, which becomes clear as *Remnant through DNA* unfolds:

[Evolutionary dating] 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)<sup>2</sup> 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. (pp. 109–10)

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2. The National Academy of Sciences is the correct name.

No source is provided for these astonishing assertions. As nearly as I can determine, they are false. I contacted Dr. Jay Labov, senior advisor for education and communication at the National Academy of Sciences, and asked him what he thought of this paragraph. He pointed out that the “NAS and AAAS are not funding organizations, so they cannot dictate how such funds are awarded.” Labov went on to note that as for Meldrum’s second claim, that the NAS has surveyed its membership on their religious affiliations, if any, “this statement is patently false. The NAS has never done that. . . . Several papers appeared in *Nature* and *Scientific American* in the 1980s and 1990s that reported on surveys of NAS members, but the authors conducted those surveys independently.”<sup>3</sup>

Meldrum informs us, though, that “there is much documentation on this issue by outstanding organizations”—including, one hopes, the claim that the non-funding NAS and AAAS control research funding—but the best place to learn about the “strangle-hold on the scientific purse-strings” is the Ben Stein documentary *Expelled: No Intelligence Allowed* (p. 110).<sup>4</sup> Despite all the documentation that exists, “this is not the place to delve into this subject”—and so the reader must simply trust that Meldrum has gotten it right.

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3. Jay Labov, e-mail to author, 17 December 2009.

4. Stein’s documentary has certainly not been universally praised as either educational or fair. While one would expect scientists to be unappreciative (see Michael Shermer, “*Expelled: No Intelligence Allowed*—Ben Stein Launches a Science-Free Attack on Darwin,” *Scientific American*, 9 April 2009, [www.scientificamerican.com/article.cfm?id=ben-steins-expelled-review-michael-shermer](http://www.scientificamerican.com/article.cfm?id=ben-steins-expelled-review-michael-shermer) [accessed 23 March 2010], even movie reviewers were relatively unimpressed. Jeffrey Kluger called it “dishonest” and “not the stuff of deep thought” (Jeffrey Kluger, “Ben Stein Dukes It Out with Darwin,” *Time* magazine, 10 April 2008, [www.time.com/time/magazine/article/0,9171,1729703,00.html](http://www.time.com/time/magazine/article/0,9171,1729703,00.html) [accessed 23 March 2010]. Roger Ebert says it “is cheerfully ignorant, manipulative, slanted, cherry-picks quotations, draws unwarranted conclusions, makes outrageous juxtapositions, . . . segues between quotes that are not about the same thing, tells bald-faced lies,” and so on (Roger Ebert, “Win Ben Stein’s Mind,” *Chicago Sun-Times*, 3 December 2008, [blogs.suntimes.com/ebert/2008/12/win\\_ben\\_steins\\_mind.html](http://blogs.suntimes.com/ebert/2008/12/win_ben_steins_mind.html) [accessed 23 March 2010]). One source that amalgamates movie reviews and averages the score gave the film a 10 percent rating and, on the basis of forty-one reviews, concluded, “Full of patronizing, poorly structured arguments, *Expelled* is a cynical political stunt in the guise of a documentary” (Rotten Tomatoes, “*Expelled: No Intelligence Allowed*,” [www.rottentomatoes.com/m/expelled\\_no\\_intelligence\\_allowed](http://www.rottentomatoes.com/m/expelled_no_intelligence_allowed) [accessed 23 March 2010]).

*B. Scientific Races?*

*Remnant through DNA* is unfortunately rife with folk concepts given a scientific sheen. For example, Meldrum confidently assures his audience that “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” (p. 7). One of Meldrum’s cited references (no. 10, pp. 22–23) repudiates any effort to tie genetics to common conceptions of race:

One definite and obvious consequence [of DNA findings] . . . is that races in any meaningful sense of the term do not exist in the human species. The term race as popularly imagined implies groups that can be cleanly separated from one another, and within our species, there simply are no such groups. Rather, differences among groups of humans are always graded, and decisions about whom to cluster with whom on genetic grounds always must include arbitrary criteria.<sup>5</sup>

Meldrum even claims, on the basis of no cited evidence whatever, that “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 lineages” (p. 7). One can certainly determine a genetic lineage, but it is difficult to shoehorn everything into a clean threefold division of humanity. One study found that drug metabolism varied among *four* genetic clusters of humans, but even “these clusters had a generally poor correspondence with ethnic labels.”<sup>6</sup>

It is thus misleading for Meldrum to discuss Noah’s children and claim that “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” (p. 10). This claim is false, at

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5. 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): 137–38.

6. Goldstein and Chikhi, “Human Migrations,” 138–39, referencing J. F. Wilson et al., “Population genetic structure of variable drug response,” *Nature Genetics* 29/3 (2001): 265–69.

least as it applies to the current scientific evidence. There *are* super- or macrohaplogroups L, M, and N, found at highest frequency in Africa, Asia, and Europe, respectively. Members of each haplogroup are, however, found in each area—it is not enough, for example, to find a member of macrohaplogroup N and label that individual “European.” Furthermore, macrohaplogroup L is the ancestral group (according to the mtDNA evidence, macrohaplogroups M and N are descended from L). So for Meldrum’s model to work, Ham would have to be a distant ancestor of Shem and Japheth, not a brother. *Remnant through DNA*’s representation of the scientific evidence is simply wrong.

The genetic data demonstrate instead that “no matter how such [racial] groups are defined, it is well known that the majority of the genetic variation in the human species is due to differences between individuals within, rather than between, [racial or ethnic] groups.”<sup>7</sup> Modern genetics simply does not support the idea of discrete races, the claim that there are three sibling “supergroup” clusters to which one can easily assign most modern individuals, or the belief that “all the world’s peoples descended [from Noah’s three sons] after the great flood” (p. 10):

While DNA scholars try mightily to find variation among populations, the most obvious insight generally remains unstated: namely, that we humans are practically identical when it comes to our genetic makeup. Physical traits that we recognize at a quick glance, such as skin color, eye shape, and body size, may precondition us to believe that there exist significant genetic differences . . . between us. In fact, these physical traits are rooted in insignificant variations at the level of our DNA. . . .

. . . There are no pure races or ethnic/national groupings. The entire eugenics edifice rested on the perception that humans came in a few unadulterated varieties—most commonly Africans, Asians, and Caucasians—as well as a range of mixed or mongrel populations between them. It went

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7. Goldstein and Chikhi, “Human Migrations,” 138.

without saying [and still does for Meldrum] that these pure races were tangible, stable, and easily ascertained. Modern DNA research has shown the wrongheadedness of such discrete groupings.<sup>8</sup>

Meldrum is welcome to believe such things based on his own reading of scripture, but he cannot recruit present-day science to confirm them.

Further, his confidence that the Lamanites could have had “sufficient visual differences to make it easy to distinguish between a ‘Lamanite’ and a ‘Nephite’ by sight” (p. 67) is inconsistent with portions of the Book of Mormon text and demonstrates an acceptance of folk reading with little reflection.<sup>9</sup>

An even more problematic folk idea revolves around *Remnant through DNA*’s treatment of skin color. We are told that “the Book of Mormon refers to Lehi’s group as being a ‘white’ and ‘delightful’ people (1 Nephi 13:15, 2 Nephi 5:21, 3 Nephi 2:15), indicating that their lineage did not carry the Canaanite bloodlines and therefore are most certainly not of the genetically referred to African or Negroid descent” (p. 12). Meldrum here does not engage the implications of Joseph Smith’s 1840 edit of 2 Nephi 30:6 to “pure and delightful” instead of “white and delightful.”<sup>10</sup> *Remnant through DNA* also betrays no awareness of the discussion regarding “white” in a Nephite context, which may differ from American conceptions of race.<sup>11</sup> It is also somewhat troublesome that he considers a label of “delightful”

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8. Andrés Reséndez and Brian M. Kemp, “Genetics and the History of Latin America,” *Hispanic American Historical Review* 85/2 (May 2005): 296–97. Here again, one of Meldrum’s sources (no. 37, pp. 79–80) disagrees with him.

9. See discussion of Alma 55:7–9 in Brant A. Gardner, *Second Witness: Analytical and Contextual Commentary on the Book of Mormon* (Salt Lake City: Greg Kofford Books, 2007), 4:696–97.

10. George Horton, “Understanding Textual Changes in the Book of Mormon,” *Ensign*, December 1983, 25.

11. For the range of the discussion, see Douglas Campbell, “‘White’ or ‘Pure’: Five Vignettes,” *Dialogue: A Journal of Mormon Thought* 29/4 (Winter 1996): 119–35; Gardner, *Second Witness*, 2:110–26; Hugh W. Nibley, *Lehi in the Desert; The World of the Jaredites; There Were Jaredites*, ed. John W. Welch with Darrell L. Matthews and Stephen R. Callister (Salt Lake City: Deseret Book and FARMS, 1988), 73–74; John A. Tvedtnes, “The Charge of ‘Racism’ in the Book of Mormon,” *FARMS Review* 15/2 (2003): 183–97.

as one criterion that “most certainly [does] not” imply a reference to an “African or Negroid” person.

This casual embrace of folk doctrine reaches its height with the matter of Cain:

Certainly the Lord understands the mechanism 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). (p. 67)

While this was a popular reading of the Cain story—and it remains so in some circles—it is a dubious one. There is no indication from scripture that Cain was cursed with a black skin—the “mark” placed upon Cain is for his protection, not given as a curse (Genesis 4:15). It is not even clear that Cain *had* dark skin or that skin color was the mark, despite centuries of Christians who concluded otherwise,<sup>12</sup> and from whom nineteenth-century Mormons may have imbibed the idea. This notion’s attractiveness was heightened by its use in justifying the pre-1978 priesthood ban. Yet it seems clear in retrospect that such readings were rather circular, based on assumptions that were not proved.<sup>13</sup> By 1954 President David O. McKay would reportedly affirm that “there

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12. See Stephen R. Haynes, *Noah’s Curse: The Biblical Justification of American Slavery* (New York: Oxford University Press, 2002).

13. In saying this, I do not disparage those who may have erred on this matter in the past. But certainly we with more revealed “light and knowledge” on the subject might be more wary of perpetuating dubious ideas. Discussion along these lines is available in Bruce R. McConkie, “All Are Alike unto God,” address to a Book of Mormon symposium for seminary and institute teachers, Brigham Young University, 18 August 1978; Marcus H. Martins, “All Are (Really) Alike Unto God: Personal Reflections on the 1978 Revelation,” transcript of BYU-Television lecture, 12 June 2001, [w2.byuh.edu/academics/religion/martinsm/Papers/AllAlike.htm](http://w2.byuh.edu/academics/religion/martinsm/Papers/AllAlike.htm) (accessed 24 March 2010); Martins, “Thinking Way Back’: Considerations on Race, Pre-Existence, and Mortality,” expanded version of talk given to Genesis Group, Salt Lake City, 1 August 1999, [w2.byuh.edu/academics/religion/martinsm/Papers/PreExistence.htm](http://w2.byuh.edu/academics/religion/martinsm/Papers/PreExistence.htm) (accessed 24 March 2010); Martins, “A Black Man in Zion: Reflections on Race in the Restored Gospel,” 2006 Foundation for Apologetic Information and Research (hereafter FAIR) conference presentation, [www.fairlds.org/FAIR\\_Conferences/2006\\_Black\\_Man\\_in\\_Zion.html](http://www.fairlds.org/FAIR_Conferences/2006_Black_Man_in_Zion.html) (accessed 24 March 2010); Marvin Perkins (director of African American Relations for the Southern California Public Affairs Council of the Church of Jesus Christ of Latter-day Saints), and “Blacks

is no doctrine in this church and there never was a doctrine in this church to the effect that the Negroes are under any kind of a divine curse.”<sup>14</sup> If the skin was the curse, then by Meldrum’s reasoning there ought to be no modern-day blacks, since they are not under a curse. That the author acts as if genetic science confirms or justifies any of these hoary ideas about race only makes it more painful.

*Remnant through DNA*’s racial muddle reaches its worst depths, however, when the reader is told that the Lamanites’ near eradication due to European diseases is rather like “the Jewish holocaust” since “both of these ‘House of Israel’ populations have suffered the calamities promised for unrighteousness” (p. 40). It is difficult to know what to say to the idea that six million people received slaughter from poison gas, overwork, and starvation because they were “unrighteous.” One has to ask when, exactly, twentieth-century Jews received prophetic warnings prior to such punishment. Here again, Meldrum ignores the Book of Mormon text, for the future Gentiles are rebuked for their attitude toward and treatment of the Jews:

And what thank they the Jews for the Bible which they receive from them? Yea, what do the Gentiles mean? Do they remember the travails, and the labors, and the pains of the Jews, and their diligence unto me, in bringing forth salvation unto the Gentiles? O ye Gentiles, have ye remembered the Jews, mine ancient covenant people? Nay; but ye have cursed them, and have hated them, and have not sought to recover them. But behold, I will return all these things upon your own heads; for I the Lord have not forgotten my people. (2 Nephi 29:4–5)

This hardly sounds like the Nazi horror was an instrument of divine justice. Furthermore, Mormon commands his Gentile readers well before Hitler’s Germany:

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and the Priesthood,” address in Westwood Chapel, Los Angeles, 8 September 2002, [www.fairlds.org/Misc/Blacks\\_and\\_the\\_Priesthood.html](http://www.fairlds.org/Misc/Blacks_and_the_Priesthood.html) (accessed 24 March 2010).

14. Cited in Roger O. Porter, “Educator Cites McKay Statement of No Negro Bias in LDS Tenets,” *Salt Lake Tribune*, 15 January 1970, [www.blacklds.org/Mckay](http://www.blacklds.org/Mckay) (accessed 24 March 2010).

When the Lord shall see fit, in his wisdom, that these sayings [the Book of Mormon] shall come unto the Gentiles according to his word, then ye may know that the covenant which the Father hath made with the children of Israel . . . is already beginning to be fulfilled. . . . Yea, and ye need not any longer hiss, nor spurn, nor make game of the Jews, nor any of the remnant of the house of Israel. (3 Nephi 29:1, 8)

While putting such racial folk concepts into print may have been understandable and excusable in 1959, I think it both irresponsible and evidence of ignorance to contribute to their continued currency by writing, endorsing, or selling this volume in 2009.

All of these matters demonstrate that the author is not likely to challenge any of his audience's comforting ideas or biases. He also appears to be unfamiliar with a fairly extensive literature. We will see that this is a persistent problem that particularly afflicts his discussion of genetics.

### *C. Inspired?*

One aspect of Meldrum's work that has been criticized previously (including by me)<sup>15</sup> is his implicit and explicit claim that his theories are inspired, and that his advocacy in their behalf is directed by

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15. In one article, I cited physicist Richard Feynman in a discussion of Meldrum's scientific errors (Gregory L. Smith, "Advice from a Nobel Prize Winner," FAIR blog, 6 July 2008, [www.fairblog.org/2008/07/06/advice-from-a-nobel-prize-winner](http://www.fairblog.org/2008/07/06/advice-from-a-nobel-prize-winner) [accessed 24 March 2010]). Specifically, I quoted Feynman's admonition that the scientist must have "a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty—a kind of leaning over backwards. . . . Details that could throw doubt on your interpretation must be given, if you know them. You must do the best you can—if you know anything at all wrong, or possibly wrong—to explain it. If you make a theory, for example, and advertise it, or put it out, then you must also put down all the facts that disagree with it, as well as those that agree with it. . . . In summary, the idea is to try to give all of the information to help others to judge the value of your contribution; not just the information that leads to judgment in one particular direction or another" (Richard P. Feynman, "Cargo Cult Science [from 1974 Caltech Commencement Address]," *Engineering and Science* 37/7 [June 1974]: 10–13). This led Meldrum to declare that he would "take the scriptures any day over a devout atheist when looking for truth. Greg Smith would do well to do the same, but it is his decision. He has already cast his lot with the atheists in this matter" (Rod Meldrum, e-mail to Scott Gordon, 30 July 2008). For the record, I am a believer in the Latter-day Saint scriptures (as well as a convinced Christian

God.<sup>16</sup> Perhaps in response to this type of critique, *Remnant through DNA* contains disclaimers, as it must if it is to get any traction among Meldrum's target audience—believing Latter-day Saints.

For example, "I do not claim to know that this proposed theory is true," we are told, "nor is any claim made that it has been received by revelation" (p. 5). One could be content if the matter rested here, but it does not. Meldrum's "FIRM Foundation" Web site contains pages of "testimonials" that he has chosen to publicize. He does not include any of the negative reviews or comments he has received. One presumes, then, that he wishes *these* testimonials to influence how we perceive his work—and he continues to link to them in e-mails selling seats at his seminars.<sup>17</sup> It is quickly apparent that, despite any formal disclaimers made, Meldrum's style of presentation is heavily laced with the implication that he is a special, chosen person on a divinely sanctioned mission. If he did not convey these ideas, from where did his correspondents get them? And if he does not agree with this portrait of his work, why does he publicize such ideas? We will, therefore, consider several of Meldrum's disclaimers and contrast them with other statements that undercut his *pro forma* denials.

*Meldrum: "I do not claim to know that this proposed theory is true" (p. 5). "No level of DNA evidence will ever 'prove' the truthfulness of the Book of Mormon" (p. 45).*

Meldrum sent an e-mail on 9 May 2008 in which he invited those who had purchased his DVD to become members of his FIRM Foundation. This communiqué strikes quite a different tone:

After fasting and praying about it with my family, and after reading my patriarchal blessing, . . . it was clear that I was going to have to leave [my job] to work on these projects full time, but I wanted more of a 'sign' from the Lord. So I had

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and theist) despite agreeing with the atheist Feynman that complete honesty is a necessity prerequisite for scientific work. I was surprised to find this a point of disagreement.

16. See "Misguided Zeal and Defense of the Church," 30 June 2008, [www.fairlds.org/Book\\_of\\_Mormon/MisguidedF.pdf](http://www.fairlds.org/Book_of_Mormon/MisguidedF.pdf) (accessed 24 March 2010).

17. The FIRM Foundation, "A Celebration of the Prophet Joseph, April 1–2 Conference Information," promotional e-mail, 3 March 2010.

three big projects about to close with [my job], and I told the Lord that if he wants me to make this project my #1 priority to please cause that none of these jobs go through. . . . Well, within three days all three of the jobs were either terminated by the client, lost to another company, or delayed until next year! So on Monday, April 21st, I put in my two weeks notice and began my new life working full-time on this project.<sup>18</sup>

This reply was reportedly received from a patriarchal blessing, fasting, and prayer. Meldrum then seeks a sign from God and gets it. Yet he argues that we are unjustified in concluding that this account strongly implies that God supports or agrees with what he is doing. Why would God give him a sign to spread a *false* theory about the Book of Mormon full-time? And why would he tell others about his sign-seeking unless he wants to influence them? Why would such divine instruction come to him and not to the president of the LDS Church?

Recipients were then told about a blessing that he had requested from an emeritus General Authority, “my dear friend”:

[My wife] and I had the most incredible and special experience as we met with [him]. . . . [We were given] the most incredible blessing[s] imaginable. They were incredibly powerful and caused both [my wife] and I to no longer doubt the validity of work in which we are engaged.

There is no doubt in the Meldrums’ minds about the *validity* of what they are doing. This again seems a claim of certainty for the theory Rod Meldrum is teaching full-time—or it is an attempt to exaggerate his importance so that others will support him. The reported blessing goes on to promise fruit from his efforts:

The only thing I can share from the blessings is that the overall understanding is that this information will go out to “millions” who will be touched by the work, and that this will

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18. Rodney Meldrum, “Update, and request to serve on the FIRM FOUNDATION Counsel?” promotional e-mail, 9 May 2008, [www.fairblog.org/2008/10/07/the-truth-will-out-at-last](http://www.fairblog.org/2008/10/07/the-truth-will-out-at-last) (accessed 24 March 2010).

“embolden” the saints to open their mouths and declare anew the truthfulness of the gospel of Jesus Christ so that millions will find and enter his kingdom! The spirit was overwhelmingly wonderful and we felt so blessed to have that privilege.

So this theory will inspire millions, and millions will convert and be saved. And other matters are alluded to that the recipients cannot yet know. One must ask, are we to conclude that God would use a false or uncertain theory for such lofty purposes?

This written material predates the publication of *Remnant through DNA*. The same theme continues even today, however, on the FIRM Foundation Web site.<sup>19</sup> For example, a spiritual witness of Meldrum’s theories is asserted:

- “It is nice to hear opinions that can be *confirmed by the Holy Ghost*.”

- “Several people have stated that *this is an answer to prayer* because of weak testimonies and questions that some Bishops & Stake Presidents can’t answer—this will assist them. The children are asking questions and this should give answers.”

- “We have never been to the Hill Cumorah that is in Central America, but *the Spirit tells us* that the one [in New York] is the Hill Cumorah, or Ramah spoken of by the Prophet Joseph Smith.”

- “You have done a masterful job, *we know that what you have uncovered is right*.”

The Web site likewise repeats the theme of certainty and proof:

- “Like so many other things science has again *proved* that Joseph Smith is a prophet and did know what he talked about.”

- “I have felt in the past that the location of the lands of the Book of Mormon was controversial and now feel that the controversy *is now over*.”

- “This must find a way to the general public because of its authenticity and *direct correlation with truth*.”

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19. “Testimonials,” [www.bookofmormonevidence.org/testimony.php](http://www.bookofmormonevidence.org/testimony.php) (accessed 24 March 2010); emphasis added, spelling and grammar unaltered.

- “It is so nice to see modern science *prove out* the gospel.”
- “How exciting that there are so many *irrefutable evidences!* Thank you so much for this gift of *knowledge!*”
- “There is a certain satisfaction knowing that the words of the Lord are *verified by the scientific community*, whether they intended to do so or not.”
- “The stable blend of reason and revelation that will one day be acknowledged by all as the *unshakable foundation* upon which all truth is based . . .”
- “Surely you are following Joseph’s counsel to ‘waste and wear out your life bringing to light’ facts that have not been evident before some of today’s newer scientific procedures have made such *methods of proof* possible.”

Clearly, Meldrum’s theory is repeatedly described as having “proved” Joseph’s prophetic status, it is “irrefutable,” and it is an “unshakable foundation upon which all truth is based.” If Meldrum disagrees with such enthusiasm, why does he use it to sell his materials? And why should we believe his book’s disclaimer when the evidence for what is really going on is all over his other writings and Web site?

Several grandiose claims are also made:

- “This is a major turning point in LDS and Book of Mormon history. It’s hard to express the importance of these discoveries.”
- “These are amazing and powerful break-‘with’ findings that need to become more and more accessible to thousands if not millions of people.”
- “It’s a relief to see someone take on the DNA argument against the Book of Mormon. I think people like you will be critically important to defending the Mormon faith against attacks by outsiders.”
- “Brother Meldrum, I can’t even sleep! I know in my heart that you are on to something very significant.”

Such over-the-top praise seems unlikely to be instigated—much less publicized—by someone offering his audience a cautious theory. Note too the recurrence of the same theme that Meldrum emphasized

from his purported General Authority blessing: his work must affect thousands or millions.

*Meldrum*: “Nor is any claim made that [my theory] has been received by revelation” (p. 5). “God has not revealed it at this point” (p. 45). “[Some have] claimed that the author declared the research true by revelation, which is patently false” (p. 152).

Meldrum’s May 2008 e-mail announced that God had revealed the name of the foundation and how other aspects of its work should be conducted:

- “I have pondered and prayed about a name for this organization and the name that was received is ‘Foundation for Indigenous Research and Mormonism’ and it will be called ‘The FIRM Foundation.’”
- “Within 48 hours the Lord provided the answer to how this was to be accomplished.”
- “Within 48 hours again the Lord provided another ‘miracle.’”
- “Right then he was prompted and he said ‘We can make it into a research lab/facility to study these artifacts!’ So the Lord is watching out for this project!”

Meldrum’s 2008 DVD presentation claims that God helped him discover that buffalo were evidence for the Book of Mormon account: “I was being directly guided in this particular portion.”<sup>20</sup> How are we to understand these claims, if not as assertions that God is giving revelation on these matters, which Meldrum is then publicizing?

The testimonials also claim that Meldrum has been called by God to spread his theory:

- “What you are being called to do is so much more, it’s world wide and effects millions of people.”
- “How exciting to be able to talk to the very person who is behind such a great work. I felt so blessed when I hung up the phone and so thankful that the Lord has guided you through this sacred project.

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20. Rodney, Meldrum, “Buffalo Evidence,” *DNA Evidence for Book of Mormon Geography: New Scientific Support for the Truthfulness of the Book of Mormon; Correlation and Verification through DNA, Prophetic, Scriptural, Historical, Climatological, Archaeological, Social, and Cultural Evidence*, DVD (Rodney Meldrum, 2008), sec. 8. Subsequent citations will reference the DVD’s section title and number.

For now we will put out the word and pray daily that this will bring millions to the gospel.”

- “You have your work cut out for you. However, because it is true, you will definitely and infinitely find a guiding hand of assistance.”

- “All I can say is WOW!!! . . . How does it feel to be such a marvellous instrument in the Lord’s hands? I am so impressed on so many levels and to think I actually know you.”

- “I am grateful to you for staying close to the Lord.”

- “I certainly enjoyed the insights you offered on the Almighty’s pouring down knowledge from Heaven on the heads of honestly seeking Later-day Saints. . . . We love you for your noble efforts to be an instrument in the Lord’s hand, and are praying for the Spirit to continue guiding you in such an important undertaking.”

Meldrum is “called” to be “an instrument in the Lord’s hand,” the “Spirit [is] guiding” him, he will bring “millions” to the truth, and it is an honor just to speak to him. Even reading such gushing, fawning praise makes me ill at ease, and I am not even its target. But Meldrum has no hesitation about publicizing “their words” so they “will touch the lives of others in positive ways.”

*Remnant through DNA* asks us to believe that none of this is intended to make it appear that Meldrum is claiming any revelatory sanction for what he is doing. How, then, is his audience so confused? And why does he advertise the error by posting their praises on his Web site?

*Meldrum: “As the Church has taken no official position on the . . . geography of the Book of Mormon, . . . 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” (p. 149).*

Despite this disclaimer, FIRM Foundation testimonials portray church programs as misguided. Missionary work is missing the target, and the seminary program is spreading “speculative ideas” that differ from Meldrum’s and against which children must be protected:

- “I’m afraid we may have missed the boat with our missionary efforts to the Lamanites! I agree with you on Christ visiting the

Mayan—there is just too much evidence. Too many of us have just confused the Lamanites with this other people.”

- “It seemed to confirm everything I thought was right when I was a child until they taught me differently in seminary.”

- “I am already looking forward to teaching my children these things so that when they are in Seminary, they will not be swayed by other speculative ideas.”

The disclaimers notwithstanding, it is thus clear that Meldrum’s audience is getting a quite different message—and he is doing much to spread that different message.

Either the disclaimers in *Remnant through DNA* are not offered in complete sincerity or the author is untroubled by mixed messages. We will see below that despite his nod in the direction of restraint, he pursues his course with an evangelistic zeal and certitude. It is perhaps this aspect of his work that is most disturbing.

Meldrum is elsewhere perfectly frank about what he is attempting, announcing that “he produced a DVD titled ‘DNA Evidence for Book of Mormon Geography’ which has resulted in what is now being termed a ‘movement’ within the latter day saint community.”<sup>21</sup> Coauthor and business competitor Bruce H. Porter told the *Salt Lake Tribune* that “the word is out now. There is a movement going through the church.”<sup>22</sup> I am wary of such “movements” that are not under the direction of the prophets and apostles.

#### *D. Outline of This Review*

This review consists of three broad sections. In part I we will review Meldrum’s underlying assumptions and the rhetorical strategies he uses to marginalize those members of the church who would dare disagree with him. We will also examine his slapdash

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21. The FIRM Foundation, “A Celebration of the Prophet Joseph, April 1–2 Conference Information.”

22. Kristen Moulton, “Book of Mormon geography stirring controversy,” *Salt Lake Tribune*, 25 March 2010, [www.sltrib.com/faith/ci\\_14750506](http://www.sltrib.com/faith/ci_14750506) (accessed 14 June 2010). On the business competition between Porter and Meldrum, see Michael De Groote, “Mormon geography conferences to compete this weekend,” *Deseret News*, 30 March 2010, [www.deseretnews.com/article/700020516/Mormon-geography-conferences-to-compete-this-weekend.html](http://www.deseretnews.com/article/700020516/Mormon-geography-conferences-to-compete-this-weekend.html) (accessed 14 June 2010).

approach to scientific matters, and our findings here will serve as a prelude for what we will encounter later. In part II we will confront the morass of data presented by the author as he attempts to demonstrate his DNA theory. We will see that his presentation of the scientific data is incomplete, selective, and misleading and that he invokes the atheist and evolutionist conspiracy that we have already encountered to explain why others have not accepted his views. Part III concludes with a brief examination of the risks that Meldrum's approach and proffered worldview pose to those who embrace them. This theme is explored through a comparison with nineteenth-century credal Christianity's encounter with the revolution wrought by Wallace and Darwin's theory of natural selection.

## Part I—Presentation, Tactics, and Assumptions

### *I.A. Sloppy Work*

Meldrum describes his work as

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. (p. iii)

The book is attractively and professionally bound. Unfortunately, the presentation of material between the covers does not inspire confidence in its accuracy or scientific validity. A self-published work, *Remnant through DNA* is in dire need of a good copy editor, for mechanical errors and stylistic lapses are scattered throughout.<sup>23</sup> Many claims are made without any supporting documentation whatever. Footnoted claims are simply denominated with a reference number. Each reference is listed in the numbered bibliography,

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23. For example, common lapses include missing apostrophes, commas, hyphens, semicolons, italics, and quotation marks; incorrectly or inconsistently applied capitalization; misspellings; and word usage errors.

which is inconsistently formatted, with some entries displaying stray underlining marks that appear to be the result of simple online cutting and pasting.<sup>24</sup> Six of the references are repeated twice.<sup>25</sup> There is no index, and the bibliography is not particularly useful, partly because page numbers are often lacking.<sup>26</sup> Source citations within the text refer to the entire article or book rather than to specific pages, making it hard for the reader to heed the author's encouragement to "check up and verify the validity of the quotes" (p. iii).<sup>27</sup> Some articles do not have even a month or an issue number, making it difficult to locate the article within a year of the bound journal. This is not an apparatus that lends itself well to verifying the author's material.

More surprising, the author reports that he has been a "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" (p. v). Having read a few university-level science textbooks, I fear that the work under review does not measure up—it does not even seem to have had paid careful attention to research methodology or the requirements of written English. This does not mean that valid insights cannot be inelegantly or even poorly expressed, but such errors make one wonder how well the same author has mastered the intricacies of modern genetics, especially when he informs readers that his "professional research activities have not been specifically focused in the area of genetics" (p. iii).

The amateurish feel of the work is unfortunately not restricted to the niceties of written English and documentation style. Enthusiastic remarks pepper the pages, such as promises that "one of the most exciting discoveries of human genetics regarding the Book of Mormon

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24. Many articles list only one author when all authors or the designation *et al.* ought to be included.

25. Reference nos. 4, 26, 27, 28, 35, and 77 are repeated in nos. 30, 43, 45, 46, 79, and 83, respectively.

26. Only 11 articles of 107 have some type of page reference. It again appears as if references were just digitally copied and pasted with no attempt to style them consistently. The last reference is, inexplicably, in boldface type.

27. Reference no. 6, for example, refers only to "Journal of Discourses, Vol. 23."

is about to be unfolded to your view, and the results are nothing short of amazing” (p. 15). This tendency further detracts from any perception of scientific rigor or restraint.

### *I.B. Meldrum and “the Scholars”*

As recently as last year—in seminars and on a DVD sold online—Meldrum told his audiences that when DNA and the Book of Mormon first became an issue, he was “totally confident that the LDS scholarly community would find the answers,” only to later conclude that “there were several LDS scholars who were attempting to address the issue, but didn’t really have an answer.”<sup>28</sup> In Meldrum’s view, the scholars then went from incapable to dangerous. He accused various Latter-day Saint scholars (including some associated with Brigham Young University) of giving comfort to anti-Mormon enemies: “This is the kind of stuff that the anti-Mormons just love. They love to see our LDS scholars dismissing Joseph Smith because they know, they can see these things that Joseph Smith has written and they’re not being followed by the scholarly community of the church, unfortunately.”<sup>29</sup> This type of in-your-face hostility toward scholars is happily less prevalent in the earlier chapters of *Remnant through DNA*.

I had hoped that he had perhaps overcome some of his animus toward scholars, but later sections in the book disappointed me. It became clear that Meldrum is full of praise and admiration for any snippet of text, any idea, or any scholar that can be made to agree with his theory. But when an author’s position does not sustain Meldrum’s model, that person either is left unmentioned or is castigated for ignoring the prophets, twisting the scriptures, or being blinded by ad hoc or a priori assumptions. We will see ample examples of each tactic in subsequent sections.

Matthew Roper’s work, for example, is described in *Remnant through DNA* as “informative” (pp. 19, 49) and “excellent” (p. 32) when sections can be used to support Meldrum’s theories. Despite such praise, however, Roper’s work has been cited by Meldrum as evidence

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28. Meldrum, *DNA Evidence*, “Introduction.”

29. Meldrum, *DNA Evidence*, “Joseph Smith,” sec. 3.

that the “fruit” of placing the Book of Mormon in Central America is Latter-day Saint researchers “dismissing” Joseph Smith, accompanied by warnings that “in the gospel, we know that it is by their works that you shall know things.”<sup>30</sup> How can Roper be both so right and so misguided?

*Remnant through DNA* begins its discussion by lauding the fact that certain critics’ faulty “assumptions have been thoroughly addressed by the LDS scholarly community and will not be covered in detail in this work” (p. 17). We are told that “it has also been well argued that the internal indications from the text of the Book of Mormon itself dealing with travel distances . . . [are] more easily explained by a somewhat more limited geography. . . . There are many volumes of work on this subject by competent LDS scholars for which all should be grateful” (p. 19). One must ask, though, why the author was unaware of these facts before? Why did he go to such great lengths—in a DVD prepared only one year before this book’s publication and still available for sale<sup>31</sup>—to condemn Latter-day Saint scholars as not only *unable* to respond to the DNA critics but also wobbly in their support of Joseph Smith? Either he did not read or understand the material that was already available—for none of what he cites is new—or he has now changed rhetorical tactics.

The first chapters of *Remnant through DNA* contain several complimentary references to various DNA articles published by FARMS, so Meldrum has apparently decided that Latter-day Saint scholars have been doing all right after all. “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” (p. 16). Yet until very recently Meldrum was both questioning and denying exactly that.

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30. Meldrum, *DNA Evidence*, “Joseph Smith,” sec. 3.

31. FIRM Foundation Web site, “Products,” [www.bookofmormonevidence.org/products.php#4](http://www.bookofmormonevidence.org/products.php#4) (accessed 24 March 2010).

Before Meldrum saw the light on this issue, his Web site insisted that “their attempts are simply to attempt to discredit DNA science in general or grasp some ‘reason’ why DNA studies have not (as yet) vindicated the truthfulness of The Book of Mormon.”<sup>32</sup> Now he tells us that “while some have addressed the issue (including FARMS or Foundation for Ancient Research and Mormon Studies) with well reasoned research that is certainly plausible, their explanations fall short of providing a solid answer that both addresses the DNA issues *and* validates the claims of *The Book of Mormon*.”<sup>33</sup> So it seems his previous condemnation was ill-placed—the Latter-day Saint scientists he previously summarily dismissed were not out to disprove DNA science after all, and actually did good work: “All of these arguments have been thoroughly addressed by LDS scholars. Several excellent articles [which remain uncited] clarify and largely refute these assumptions” (p. 23).

#### *I.C. What Have the Scholars “Missed”?*

*Remnant through DNA* is not content with what it describes as the mere “neutral argument” (p. 25), offered by Latter-day Saint geneticists, which only defangs the critics’ efforts to use DNA to *disprove* the Book of Mormon.

Rather, Meldrum wants more. He insists that “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*” (p. 46, emphasis in original). Meldrum then proceeds at great length to try to provide a DNA evidence of exactly this, which we will examine below.

*Remnant through DNA* faces a problem, however. The Latter-day Saint DNA scientists, whose work he now certifies, praises, and agrees

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32. Rod Meldrum, “Frequently Asked Questions,” [www.bookofmormonevidence.org/FAQ.php](http://www.bookofmormonevidence.org/FAQ.php) (accessed 6 July 2008). Archived version with minor changes available at [web.archive.org/web/20080217211822/www.bookofmormonevidence.org/FAQ.php](http://web.archive.org/web/20080217211822/www.bookofmormonevidence.org/FAQ.php) (accessed 24 March 2010).

33. Meldrum, “Frequently Asked Questions,” boldface and italics in original.

with, clearly do not take what he sees as the next step. They do not embrace his theories about DNA evidence *for* the Book of Mormon. This state of affairs has its advantages—the reader is told in the preface that many scholars and historians accept this information, and the implication is that more are joining up every day. The situation is made into a polarized one of “us” versus “them.” Many readers will be sympathetic to the plucky underdog who dares to buck the established wisdom.

This risks obscuring the key issue, however. Why would so many DNA scientists disagree with Meldrum’s theory? He has assured us that they are competent, informed, and thorough. Why have they now dropped the ball so badly? It cannot be due to incompetence in matters of genetics—Meldrum states that he has no genetics training, and genetics has not even been a focus of his textbook research (p. iii). By contrast, the Latter-day Saint authors he cites have considerable experience: John M. Butler (PhD, University of Virginia, NIST Fellow, leader of Human Identity DNA Measurements Group), David A. McClellan (PhD, Louisiana State University, senior research scientist for the Bigelow Laboratory for Oceanic Studies), D. Jeffrey Meldrum (PhD, State University of New York, associate professor of anatomy and anthropology and adjunct associate professor of the Department of Anthropology at Idaho State University), Ugo Perego (PhD, University of Pavia, Italy, senior researcher at the Sorenson Molecular Genealogy Foundation),<sup>34</sup> Trent D. Stephens (PhD, University of Pennsylvania, professor of anatomy and embryology at Idaho State University), and Michael F. Whiting (PhD, Cornell, director of BYU’s DNA Sequencing Center, and associate professor of integrative biology).<sup>35</sup> Yet none of them are willing to follow Meldrum’s lead.

Meldrum tells us that despite the clear Book of Mormon promises that a remnant will remain in the latter days, “this irrefutable fact seems not to have been considered or addressed while presenting the

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34. Perego’s research in human population genetics focused on mtDNA applied to the origins of Amerindians. He could not be better suited to evaluate Meldrum’s science.

35. References to these authors include Butler (pp. 22, 26–27), McClellan (pp. 26, 101, 151), D. J. Meldrum (pp. 23–24), Perego (pp. 78, 85), Stephens (pp. 23–24), Stubbs (p. 23), and Whiting (p. 23).

multiple explanations of why no evidence of ‘European’ type DNA has been found in Mesoamerica” (p. 46). This is quite astonishing—these supposedly thorough, competent, believing scholars have either ignored or neglected a major theme of the Book of Mormon. As Meldrum told others who disagreed, “You are not protecting Joseph Smith’s revelatory words, but ignoring them. . . . The truth will prevail.”<sup>36</sup> To disagree with Meldrum is to be charged with ignoring Joseph Smith’s revelations.

*I.D. Great Expectations, Part 1: Genetic Evidence*

Many of Meldrum’s ideas about DNA and Book of Mormon geography become explicable when we realize what he expects to find. He is convinced that if scripture is true, there is going to be evidence—and it must be the kind of evidence he expects: “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” (p. 3).

One cannot overemphasize the consequences of this article of faith in Meldrum’s work, nor should we ignore its potentially dangerous implications if it proves misleading. Meldrum presents himself and his reader with a simple equation: if the Old Testament is true, then archaeology must bear it out.<sup>37</sup> Meldrum assures us that it has—yet archaeological evidence has not compelled atheists into Judaism or Christianity. But what would it even mean for archaeology to “bear out” the Old Testament? Is it enough to locate Jericho and Jerusalem? Troy and Olympus likewise exist, but this does not “bear out” either the gods or the plot of Homer’s *Iliad*. What does it mean for the Old Testament to be considered “true”? Do only its basic moral message or covenant promises have to accurately reflect God’s will? If so, how does a moral message find confirmation in the dirt of archaeology? Does the Bible have to be historically accurate in every particular? If so, what are we to do with the complete absence of archaeological evidence for

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36. Rod Meldrum, e-mail to Scott Gordon, 3 September 2008.

37. This assertion is made in even more passionate terms on p. 110. See discussion below in part III.

a global flood,<sup>38</sup> the conquest of Canaan,<sup>39</sup> the destruction of Jericho in the proper time frame,<sup>40</sup> the people and events of the patriarchal and Mosaic periods,<sup>41</sup> Joseph's rule in Egypt,<sup>42</sup> or the Exodus and the forty-year sojourn in Sinai?<sup>43</sup>

Can a “true” Old Testament be somewhere between the two extremes of completely accurate history or inspiring myth? If so, where do we draw the line so that we may say with confidence what type and degree of agreement archaeology must have with our beliefs about scripture?

William Dever noted that archaeology cannot “prove the Bible in any sense—either by demonstrating that the events . . . actually happened, much less by validating the theological inferences that are

38. Christopher G. Weber, “The Fatal Flaws of Flood Geology,” *Creation/Evolution* 1 (1980): 24–37; and Molleen Matsumura, “Miracles in, creationism out: ‘The geophysics of God,’” *Reports of the National Center for Science Education* 17/3 (1997): 29–32. For the alternative view, see the classics John C. Whitcomb and Henry M. Morris, *The Genesis Flood* (Philadelphia: Presbyterian and Reformed, 1961); and Henry M. Morris, *The Genesis Record* (Grand Rapids: Baker Book House, 1976).

39. See William J. Hamblin, “Basic Methodological Problems with the Anti-Mormon Approach to the Geography and Archaeology of the Book of Mormon,” *Journal of Book of Mormon Studies* 2/1 (1993): 186.

40. Hamblin, “Basic Methodological Problems,” quotes Bryant G. Wood, “Did the Israelites Conquer Jericho? A New Look at the Archaeological Evidence,” *Biblical Archaeology Review* 16/2 (1990): 57: “One major problem remains: the date, 1400 B.C.E. Most scholars will reject the possibility that the Israelites destroyed Jericho in about 1400 B.C.E. because of their belief that Israel did not emerge in Canaan until about 150 to 200 years later, at the end of the Late Bronze II period.” Hamblin goes on to note: “And scholars have excellent reasons for dating the Exodus to the thirteenth century [BC], since a fifteenth-century [BC] Exodus creates more problems in the biblical account of the conquest of Canaan than it solves” (p. 184). “The only way Wood’s theory works is if you redate the end of the Middle Bronze Age from c. 1550 to c. 1400 B.C., and then redate the Exodus from c. 1250 to c. 1450 B.C., a total shifting of standard chronology of 350 years” (p. 184 n. 78).

41. “After a century of modern research neither Biblical scholars nor archaeologists have been able to document as historical any of the events, much less the personalities, of the patriarchal or Mosaic eras.” William G. Dever, “Archaeology and the Bible: Understanding Their Special Relationship,” *Biblical Archaeology Review* 16/3 (May/June 1990): 52; cited in Hamblin, “Basic Methodological Problems,” 184.

42. Dever, “Archaeology and the Bible,” 54–55; cited in Hamblin, “Basic Methodological Problems,” 184.

43. Dever, “Archaeology and the Bible,” 55; cited in Hamblin, “Basic Methodological Problems,” 184.

drawn from these events.” This citation appears in one of the works cited by Meldrum, but he has not taken its lesson to heart.<sup>44</sup>

That the scripture is “true” implies a host of potential interpretations, each of which invokes a legion of other claims—none of them necessarily clear, and few borne out by archaeology. *Remnant through DNA*’s claim sounds good, but what does it mean? Is it realistic? (This claim is an excellent example of the book’s repeated tendency to make sweeping claims with no documentation and to treat them as clear and unambiguous. Further elements of the argument then simply treat these points as givens, constructing an increasingly rickety logical structure.) An entire essay could be written on the issues raised by this single claim regarding the Old Testament. Unfortunately, I fear science bears out far less of Meldrum’s reading of the Old Testament than he assumes.

We are likewise told that if the Book of Mormon is true, then there must be evidence. And that evidence must be genetic (pp. 3, 24). But what if the literal Book of Mormon events are such that genetic evidence simply cannot be found? Not all historical processes leave traces that can be discerned later. Some—even most—are lost beyond recovery, forever. Most of the words spoken, songs sung, lives lived, plants grown, and creatures spawned have left exactly no trace that is recoverable to science. Does that mean these things did not exist? Can DNA prove that the biblical patriarchs or the Savior himself ever lived?

To take an example: I am convinced that Jesus’s feeding of the multitude really happened. Yet what if we were to insist that there must be archaeological evidence of it? Where are we left if we refuse to consider that a group of five thousand Galilean peasants eating a single meal of miraculously produced bread and fish two millennia ago simply will not be found by even the most intrepid latter-day Indiana Jones?

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44. James E. Smith, “Nephi’s Descendants? Historical Demography and the Book of Mormon,” *FARMS Review* 6/1 (1994): 282, citing William G. Dever, “Archaeology, Syro-Palestinian and Biblical,” in D. N. Freedman et al., *The Anchor Bible Dictionary* (New York: Doubleday, 1992), 1:366. See also the entire discussion in Hamblin, “Basic Methodological Problems,” 183–87.

*I.E. Great Expectations, Part 2: Young Earth Worldview*

Before considering Meldrum's arguments for why such evidence should be expected, we must understand that he has a second prevailing bias or expectation—young earth creationism (YEC). Meldrum does not tell us enough about his views on this point to determine the degree to which his views on the creation match those of fundamentalist Protestants.<sup>45</sup> But just as he insists that genetic evidence should exist if the Book of Mormon is true, so he insists that if the Latter-day Saint prophets are to be believed, and if the scriptures are true, then young earth creationism must be correct (pp. 93–108).<sup>46</sup> And he insists that “there will come a day when the truths from the scriptures [which include a young earth and recent advent of humanity] will be proven out by the truths in empirical, experimental science” (p. 99). Once again, we see the conviction that his religious beliefs are true and that they will *therefore* be vindicated by science.

*I.E.1 Scriptural and prophetic imperative of a young earth view?*

Meldrum begins his discussion by quoting President Harold B. Lee: “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” (pp. 93, 149).

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45. For an introduction to the history and issues of this debate in the context of U.S. Protestant fundamentalism, see Eugenie C. Scott, *Evolutionism vs. Creationism: An Introduction*, 2nd ed. (Berkeley: University of California Press, 2009). For an excellent general history of evolutionary thought from before Darwin to the present, see Peter J. Bowler, *Evolution: The History of an Idea*, 3rd ed. (Berkeley and Los Angeles: University of California Press, 2003). For Christian reactions, see Peter J. Bowler, *Monkey Trials and Gorilla Sermons: Evolution and Christianity from Darwin to Intelligent Design* (Cambridge, MA: Harvard University Press, 2007).

46. In using the term *young earth creationism*, I am not seeking to impute all such ideas to Meldrum. I use it only as a convenient shorthand for one aspect of his views. Some aspects that dovetail well with Protestant YEC thinking, however, include emphasis on one “day” of creation corresponding to one thousand years (pp. 94–95); humans did not live on the earth before six thousand years ago (p. 96); there was no death of anything on earth before the fall of Adam (p. 96); there is no speciation for animals from other forms (pp. 98–99); humans did not arise from other species (p. 98); life did not arise spontaneously (p. 99); the “young’ age of the earth” does not match the present scientific consensus (p. 96).

Meldrum interprets this to mean that the church need not “take an ‘official position’ on everything before we can know what is the truth” (p. 93). This appears to be an effort to subtly insist that the views about creation that he will now present ought to be embraced, even if they are admittedly not “official.”

Here *Remnant through DNA*'s shoddy documentation causes problems. The source provided for this quotation of President Lee's is “BYU CES Summer School, 1970” (p. 167 n. 48). I could not find this quotation in any of the electronic databases at my disposal. Jeff O'Driscoll checked all of President Lee's 1970 discourses and could not find any such reference; he also searched an electronic database of all of President Lee's talks and addresses and could find nothing close to this. Clyde Williams, who edited *The Teachings of Harold B. Lee* and probably knows more about President Lee's writing and thought than anyone living, was likewise unable to find the citation in his database.<sup>47</sup> A Google search turned up the quotation without documentation on cougarboard.com and on a page created by Robert Marrot of BYU-Idaho's Department of History, Geography, and Political Science.<sup>48</sup> Marrot's citation is identical to that provided by Meldrum, and so I suspect this is Meldrum's source. Marrot indicated to me that it was an extemporaneous remark made by President Lee during the question-and-answer session. The remark was precipitated, Marrot explained, by a question about the church's position on birth control.<sup>49</sup>

In addition to the difficulties with verification and context, it is not even clear that President Lee would have agreed with Meldrum's conclusion in this instance. On the issue of the creation, Lee said:

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47. Jeff O'Driscoll, e-mail to Matthew Roper, 3 December 2009; Clyde Williams, e-mail to Matthew Roper, 4 December 2009. My thanks to Roper for conducting his own search and to all three researchers for helping me solve this puzzle.

48. Robert L. Marrot, “Was Jesus Married?” [emp.byui.edu/marrottr/JesusMarriedDaVinci.html](http://emp.byui.edu/marrottr/JesusMarriedDaVinci.html) (accessed 24 March 2010). My thanks to Marrot for his help.

49. “There was a question and answer session after Pres. Lee's address. Clifton Holt Jolley raised his hand and asked a question about what the Church's position on birth control was. Pres. Lee then gave the answer which you have included below. I was present and wrote it down. I don't know that I can find my original notes now.” Robert L. Marrot, e-mail to author, 5 December 2009.

Perhaps if we had the full story of the creation of the earth and man told to us in great detail, it would be more of a mystery than the simple few statements that we have contained in the Bible, because of our lack of ability to comprehend. Therefore, for reasons best known to the Lord, He has kept us in darkness. Wait until the Lord speaks, or wait until that day when He shall come. . . . Then we shall know all things pertaining to this earth, how it was made, and all things that now as children we are groping for and trying to understand.

Let's reserve judgment as to the facts concerning the Creation until we know these things for sure.<sup>50</sup>

Yet Meldrum seems to be implying that those who are really in tune with the Spirit will get the “proper” answer—which is to agree with *Remnant through DNA*. It is a long stretch from a remark about birth control to a stance on the age of the earth and Book of Mormon geography. The former has salvific implications and an answer that may vary from couple to couple,<sup>51</sup> while the latter are of purely academic interest. While God certainly has a position on the creation, President Lee apparently did not believe that we have yet received it or that we ought to be insisting that we have.

Meldrum does not, however, show as much restraint. Despite his preliminary caveat that “everyone is entitled to their best understanding of the Lord’s words,” and extending his “sincere compliments [to those who differ] at having achieved peace in reconciling scriptural interpretations with [their] other beliefs,” the

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50. *The Teachings of Harold B. Lee: Eleventh President of the Church of Jesus Christ of Latter-Day Saints*, ed. Clyde J. Williams (Salt Lake City: Bookcraft, 1998), 29, citing “Story of the Creation,” BYU Summer School Lecture, 22 June 1954.

51. “Church members are taught to study the question of family planning, including such important aspects as the physical and mental health of the mother and father and their capacity to provide the basic necessities of life. If, for personal reasons, a couple prayerfully decides that having another child immediately is unwise, birth control may be appropriate. Abstinence, of course, is a form of contraception. Like any other method, however, it has its side effects, some of which may be harmful to the marriage relationship.” Homer S. Ellsworth, “Birth Control,” in *Encyclopedia of Mormonism*, ed. Daniel H. Ludlow (New York: Macmillan, 1992), 1:116–17.

remainder of his discussion portrays those who differ as rejecting scripture and the prophets (p. 94).

According to Meldrum, “there are many LDS educators and scientists actually supporting and defending the evolution boat rather than standing for truths in the scriptures and prophets.” He then admonishes, “Remember the scriptures warn us about putting one’s trust in the ‘arm of flesh’” (p. 120). These statements don’t sound like things one would sincerely compliment someone for doing.

Having assured us that he doesn’t wish to impugn those who differ with him, Meldrum goes on to do just that, since “the following are [the Lord’s] 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” (p. 94). This is quite coy, but “causing contention” is exactly what Meldrum’s tactics are likely to do. The church has no official position on the vast majority of the issues related to organic evolution or the age of the earth, despite strong feelings and views expressed by many leaders.<sup>52</sup> Yet, Meldrum simply presents a *selection* of quotations from *some* church leaders that match his young earth reading of the scriptures. He declares that these are God’s “words through the scriptures, and His mouthpieces, the Prophets.” Meldrum thus insists that these are not merely the opinions or considered views of the men we sustain as prophets, but that they are words given by God to prophets in their official capacity as his mouthpieces. And we are urged to accept his *reading* of the scripture as divinely sanctioned.

Why would this cause contention? Because such a claim is plainly false. Meldrum draws heavily on Joseph Fielding Smith’s *Doctrines of Salvation and Man, His Origin and Destiny*.<sup>53</sup> He characterizes such works as the word of “the Prophet,” although Joseph Fielding Smith was not then serving as president of the church. Though admitting that such claims are “as viewed by this author,” Meldrum sets out to

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52. For documents treating evolution prepared for BYU students by the Board of Trustees, see William E. Evenson and Duane E. Jeffrey, *Mormonism and Evolution: The Authoritative LDS Statements* (Salt Lake City: Greg Kofford Books, 2006), 9–38.

53. Meldrum quotes from these writings on pages 95–97 (reference no. 49) and 97 (reference no. 51) of his book.

portray anyone who disagrees with President Smith as rebellious or less than faithful: “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” (pp. 95–96). It appears that Meldrum’s “sincere compliments” for those who come to a different view are less than sincere.

Yet, as President J. Reuben Clark of the First Presidency explained, “When any man, except the President of the Church, undertakes to proclaim one unsettled doctrine, as among two or more doctrines in dispute, as the settled doctrine of the Church, we may know that he is not ‘moved upon by the Holy Ghost,’ unless he is acting under the direction and the authority of the President. Of these things we may have a confident assurance without chance for doubt or quibbling.”<sup>54</sup>

Meldrum fails to tell us—if he knows—that Joseph Fielding Smith sought to have *Man, His Origin and Destiny* published by the church but that the church declined to do so.<sup>55</sup> When President Smith decided to publish the book, David O. McKay (who *was* the president of the church) wrote to the head of the University of Utah’s geology department that “on the subject of organic evolution the Church has officially taken no position. The book ‘Man, His Origin and Destiny’ [by Joseph Fielding Smith] was not published by the Church, and is not approved by the Church. The book contains expressions of the author’s views for which he alone is responsible.”<sup>56</sup> Two years later, he would reiterate this stance, writing, “The Church has issued no official statement on the subject

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54. J. Reuben Clark, Jr., “Church Leaders and the Scriptures” [original title “When Are the Writings or Sermons of Church Leaders Entitled to the Claim of Scripture?”], in *Immortality and Eternal Life: Selections from the Writings and Messages of President J. Reuben Clark, Jr.* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1969–70): 2:215–25. This address to seminary and institute teachers at BYU on 7 July 1954 was reproduced in *Church News*, 31 July 1954, and reprinted in *Melchizedek Priesthood Personal Study Guide* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1989), 66, and in *Dialogue: A Journal of Mormon Thought* 12/2 (Summer 1979): 68–81.

55. See Duane E. Jeffrey, “Seers, Savants, and Evolution: The Uncomfortable Interface,” *Dialogue: A Journal of Mormon Thought* 8/3–4 (Autumn/Winter 1973): 65.

56. The letter was reportedly published with the permission of President McKay, who gave permission on 18 October 1968. See William Lee Stokes, “An Official Position,” *Dialogue: A Journal of Mormon Thought* 12/4 (Winter 1979): 90–92.

of the theory of evolution. Neither ‘Man, His Origin and Destiny’ by Elder Joseph Fielding Smith, nor ‘Mormon Doctrine’ by Elder Bruce R. McConkie, is an official publication of the Church.”<sup>57</sup>

These letters have been often quoted, though an important caveat has often been ignored. In 1988 Elder Boyd K. Packer (then a member of the Quorum of the Twelve) gave an address in which he emphasized that such letters should not be understood to deny the existence of *any* official statements on evolution.<sup>58</sup> The First Presidency has taught, for example, that “it is held by some that Adam was not the first man upon this earth, and that the original human being was a development from lower orders of the animal creation. These, however, are the theories of men. The word of the Lord declares that Adam was ‘the first man of all men’ (Moses 1:34), and we are therefore in duty bound to regard him as the primal parent of our race.”<sup>59</sup> Elder Packer reminded his audience that official church doctrine is not established by letters to individuals; it requires the united voice of the First Presidency.<sup>60</sup>

Given this important clarification, then, I am inclined to view President McKay’s remarks about the lack of an official position as referring to any matters not set forth by declarations from the First Presidency. President McKay’s secretary wrote another member in this vein (that is, regarding the age of the earth, its creation, and so

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57. David O. McKay to A. Kent Christensen, 3 February 1959. A scan of the original letter from President McKay, along with the query that elicited it, is available online at [www-personal.umich.edu/~akc/evolution.htm](http://www-personal.umich.edu/~akc/evolution.htm) (accessed 14 June 2010).

58. Boyd K. Packer, “The Law and the Light,” in *The Book of Mormon: Jacob through Words of Mormon, To Learn with Joy*, ed. Monte S. Nyman and Charles D. Tate (Provo, UT: BYU Religious Studies Center, 1990), 22–23. (In deference to the request made by President Packer in the printed version of this address, I will not cite specifics here; the reader is encouraged to read it in its entirety. President Packer also made it clear that *he* was not speaking on behalf of the church or under assignment.)

59. Joseph F. Smith, John R. Winder, and Anthon H. Lund (First Presidency), “The Origin of Man,” *Improvement Era*, November 1909, 80. See also statements in “Words in Season from the First Presidency,” *Deseret Evening News*, 17 December 1910, pt. 1, p. 3; and Heber J. Grant, Anthony W. Ivins, and Charles W. Nibley (First Presidency), “Editors’ Table: ‘Mormon’ View of Evolution,” *Improvement Era*, September 1925, 1090–91. Excerpts from these statements are available in the appendix to Packer, “Law and the Light,” pp. 28–31. The complete statements are available online at [en.fairmormon.org/Evolution](http://en.fairmormon.org/Evolution) (accessed 24 March 2010).

60. Packer, “Law and the Light,” 23.

on), “Until either the Lord speaks directly upon the matter, or until the scientists are able to say that they have the ultimate truth covering these matters, it would only be confusing for the First Presidency to make any statement regarding such things.”<sup>61</sup> I would read this as saying that in the absence of a First Presidency statement, any declaration about other areas of doctrine that have yet to be addressed would be premature and liable to cause confusion unless undertaken by the First Presidency as a body. Certainly, however, President McKay did not see Joseph Fielding Smith’s remarks as either official or binding, as his diary entry noted: “I told them [four LDS educators] that that book [*Man, His Origin and Destiny*] should be treated as merely the views of one man. . . . It is true that [this] one man is President of the Twelve, and [that] makes it more or less authoritative, but it is no more to be taken as the word of the Church than any other unauthorized book.”<sup>62</sup>

In the case of *Man, His Origin and Destiny*, Elder Smith was clearly not acting in behalf of the church. By President Clark’s and President Packer’s reasoning, and by President McKay’s direct statement, this makes Elder Smith’s views solely his own where they go beyond statements made by the First Presidency.

Meldrum is welcome to accept such views as the word of God and the truth. But it is inappropriate for him to portray them—if only by implication—as more binding upon members than they are. He quotes two works written by Ezra Taft Benson prior to his call to the presidency of the church.<sup>63</sup> Meldrum tells us that this provides “a double witness from two prophets, backed up by the foundational witness, the scriptures” (p. 97). Furthermore:

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61. Joseph A. Anderson (secretary to the First Presidency) to Armin J. Hill (dean of BYU’s College of Physical and Engineering Sciences), 25 February 1959, cs.gmu.edu/~sean/stuff/Evolution.html (accessed 14 June 2010). Also cited in Gary James Bergera and Ronald Priddis, *Brigham Young University: A House of Faith* (Salt Lake City: Signature Books, 1985), 158.

62. David O. McKay diary, 13 September 1954; cited in Gregory Prince and Wm. Robert Wright, *David O. McKay and the Rise of Modern Mormonism* (Salt Lake City: University of Utah Press, 2005), 47.

63. Ezra Taft Benson, *God, Family, Country: Our Three Great Loyalties* (Salt Lake City: Deseret Book, 1974); and Benson, *This Nation Shall Endure* (Salt Lake City: Deseret Book, 1977). President Benson did not succeed to the Church’s First Presidency until 1985.

Certainly it is not possible to accept the scriptural account of Adam . . . 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. (pp. 126–27, emphasis added)

I find this sort of fundamentalist thinking and distortion extraordinarily troubling, and it is one reason why I consider Meldrum’s theories worthy of review. He distorts the status of this teaching for the Latter-day Saints, refrains from quoting any authorities who differ with his views, portrays his sources as more authoritative than they are, and insists that the scriptures require it, making any other reading or view “impossible.” Therefore, anyone who disagrees is ignoring the “clear” teachings of scripture. And anyone who differs is automatically less zealous in upholding the scriptures than Meldrum. “There are faithful members of the Church that have a deep belief in evolution and have been able to reconcile their beliefs. . . . Please know that your beliefs are respected,” we are assured (p. 149). Yet if my beliefs differed from Meldrum’s absolutism, I wouldn’t find much respect in his caricatured treatment.

In other venues the author has also criticized Brigham Young University on these same grounds: “Maybe you can tell me why we are teaching Evolution and an ‘old earth’ at the very university he [Brigham Young] founded.” Meldrum’s expressed conviction was that such teaching was done only “for accreditation compliance.”<sup>64</sup> I would be quite hesitant to charge the trustees of Brigham Young University

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64. Rod Meldrum, comment on FAIR blog, 8 September 2008, [www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5603](http://www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5603) (accessed 24 March 2010); Rod Meldrum, comment on FAIR blog, 8 September 2008, [www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5606](http://www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5606) (accessed 24 March 2010). For further information, see [en.fairmormon.org/DNA\\_Evidence\\_for\\_Book\\_of\\_Mormon\\_Geography\\_%28DVD%29/BYU\\_criticized\\_for\\_teaching\\_evolution](http://en.fairmormon.org/DNA_Evidence_for_Book_of_Mormon_Geography_%28DVD%29/BYU_criticized_for_teaching_evolution) (accessed 24 March 2010).

(which include the current prophets and apostles) with knowingly allowing Latter-day Saint youth to be instructed in pernicious and false ideas merely for the sake of a worldly matter like accreditation. I find Meldrum's attitude both disturbing and bewildering, and a clear sign that his line of reasoning presents both intellectual and spiritual dangers—despite the belied protestations of brotherhood and respect. Brigham Young University president Dallin H. Oaks, in his first address to BYU faculty in September 1971, “asked that guilty parties . . . ‘stop casting aspersions on [the] testimony and devotion of their colleagues’” over precisely this issue.<sup>65</sup> I think that wise counsel for all.

I am also troubled because Meldrum's insistence clearly risks causing the contention among members that he claims he does not intend. Unfortunately, conflict and mutual misunderstanding have frequently been the result when anyone besides the First Presidency has attempted to settle these matters. Given the lack of recent general conference addresses that treat this subject, it does not seem to me that the current leaders of the church feel that church members who have not embraced a young earth creationism need to be called to repentance or chastised.

Aspects of creation and its related matters not discussed by the First Presidency are not, in my view, issues of great spiritual consequence, save when one's views risk disaffection from the church or its covenant teachings. (Whether species have evolved, how long humans have been here, whether any species were subject to death prior to Adam, and whether the earth was created in thousands or billions of years seem minor religious points, not worth debating in church. By contrast, whether humans are only advanced animals with no moral duties to God or each other seems of far greater moment.)<sup>66</sup> I have too often seen cases in which members were told that they *must* embrace a young earth or advent of Adam in 4000 BC to be faithful to the church and gospel—and they have then concluded that the gospel

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65. Bergera and Priddis, *Brigham Young University: A House of Faith*, 161; the authors indicate that they are quoting Oaks's handwritten talk notes.

66. See Packer, “Law and the Light,” 21, 24; see also his address given at an eighteen-stake BYU fireside on 29 March 1992 and reproduced in his book *The Things of the Soul* (Salt Lake City: Bookcraft, 1996), 111.

of Christ must be false because they could not believe these claims against science, despite study and spiritual reflection.

Meldrum might reply that such an inability reflects a spiritual or intellectual weakness. Perhaps God has not made such views official or mandatory simply because of our immaturity, and if we would only embrace the higher law or knowledge that Meldrum offers, things would be better. Let us grant that this is so, for the sake of discussion—but even then, it is not Meldrum’s place to insist upon such doctrines when the presiding authorities have declined to do so.<sup>67</sup>

Even if the young earth position is granted to be true, the potential risk posed to vulnerable souls by Meldrum’s species of dogmatism strikes me as too steep a price for so tangential a matter. Keeping someone in the church—even with a false idea about the age of the earth—seems to me by far the better bargain. Following Paul, I am inclined to advise those who regard themselves as “strong” in such matters (on *either* side of the question) to “bear the infirmities of the weak, and not to please [them] selves.” After all, “if thy brother be grieved with thy meat, now walkest thou not charitably. Destroy not him with thy meat, for whom Christ died.” We ought to avoid “any thing whereby [our] brother stumbleth, or is offended, or is made weak.” If we are convinced that we have the proper answers to such questions, we ought, it seems to me, “have it to [ourselves] before God” (see Romans 14:19–15:1), until those who hold the keys instruct otherwise.

At the same time, we cannot always allow misrepresentation of a point of view to proceed unchallenged, lest some be misled. Those given false information often learn later that their trust was misplaced. They then complain that “the church” (rather than “a member of the church”) taught them falsehoods because misinformation was presented in a church context draped in the trappings of the gospel. Even if evolutionary theory is false in every particular, we do the cause of truth no service by creating strawmen, misrepresenting it, or minimizing the evidence offered in its behalf. We must deal with its most robust case if we are not to lead others to assume we were either

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67. See, for example, Joseph F. Smith, *Gospel Doctrine* (Salt Lake City: Deseret Book, 1970), 185; and Brigham Young, in *Journal of Discourses*, 3:318.

ignorant or disingenuous—neither state being a good apologetic. And if we are right to oppose evolution, any efforts that do not fully address the depth and breadth of the best evidence are doomed to failure.

Several chapters after his insistence upon a young earth, Meldrum suggests that he knows much of this: “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, . . . 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” (p. 149). This is good advice—but its moderation is nowhere apparent during Meldrum’s extended discussion of these issues, fifty pages earlier. And the text that follows this acknowledgment allows the author to undercut the church’s lack of an official stance by implying that those who don’t come to his conclusion simply haven’t done their spiritual duty. It reads:

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. . . . If the dates [for DNA] do not align with the teachings of the scriptures and the prophets, extreme caution is advised. (pp. 149–50)

Despite a nod to the lack of an official church stance on these issues, Meldrum makes his assessment of those who differ with him unmistakable. Other examples pepper the text:

- “The prophet Joseph F. Smith raised his prophetic voice to warn us of teachings and teachers that disbelieve the inspired accounts of the scriptures” (p. 97).
- “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” (p. 99).

Notwithstanding his note that the church has no official views on these issues, the latter citation again demonstrates that Meldrum is in practice not granting anyone much leeway to differ with him, lest one contradict prophets and the scriptures. (But he surely *respects* such people!) One ought not to even suggest a longer creative period than seven thousand years. Despite Meldrum’s personal certainty, “the scriptures do not say how old the earth is, and the Church has taken no official stand on this question. Nor does the Church consider it to be a central issue for salvation.”<sup>68</sup> If not central to salvation, then perhaps Meldrum’s dire warnings about “the philosophies of men” and need for “extreme caution” are a bit overblown. He is either unaware or untroubled that his stance would condemn such leaders as John A. Widtsoe and James E. Talmage, as well as some of the writings of Bruce R. McConkie. Elder Widtsoe wrote: “We must remember that Joseph Smith made this translation [of Abraham] long before the theologians of the world had consented to admit that the Mosaic days meant long periods of time; and long before geology had established beyond question that immense time periods had been consumed in the preparation of the earth for man.”<sup>69</sup> And further:

Though the exact, or even approximate, age of the earth is not known, it is fairly certain that immense time periods, hundreds of thousands or even millions of years in length, were consumed in preparing the earth for man’s coming. . . . The account of Moses as recorded in Genesis, first and second chapters, and also in the Pearl of Great Price, (Book of Moses, second and third chapters), speaks of six *days* in which God created the heavens and the earth. In the original Hebrew

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68. Morris S. Petersen, “Earth,” in *Encyclopedia of Mormonism*, 2:431–432. See also Packer, “Law and the Light,” 24, where the age of the earth and the length of time occupied by the creative process are said to be unknown.

69. John A. Widtsoe, *Joseph Smith as Scientist: A Contribution to Mormon Philosophy* (Salt Lake City: The General Board, Young Men’s Mutual Improvement Associations, 1908), [www.archive.org/details/josephsmithassci00widt](http://www.archive.org/details/josephsmithassci00widt) (accessed 24 March 2010).

from which Genesis was translated, the word rendered day means literally a time period of indefinite duration. . . . The more the matter is carefully examined, the firmer grows the belief that the creation of the earth occupied immense time periods, the exact length of which is not yet given to man to know. This view does not in any way discredit the book of books, the Holy Bible. The Bible must be read with understanding minds; as a book, it must no more be held to a word, than a man desires so to be held. By verse and chapter and book, the Bible will be found an accurate, inspired record of the most wonderful and valuable events and doctrines of the world. However, it must not be forgotten that the Apostle Paul has reminded us that “the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made.” God reveals himself in nature; and when nature is read understandingly God may thereby in part be comprehended. There is no conflict between the story of the rocks and the Bible, except as man has made it.<sup>70</sup>

Elder Talmage observed:

The oldest, that is to say the earliest, rocks thus far identified in land masses reveal the fossilized remains of once living organisms, plant and animal. The coal strata, upon which the world of industry so largely depends, are essentially but highly compressed and chemically changed vegetable substance. The whole series of chalk deposits and many of our deep-sea limestones contain the skeletal remains of animals. These lived and died, age after age, while the earth was yet unfit for human habitation. . . . *If the Usher chronology* be correct, or even approximately so, then the beginning of Adamic history as recorded in scripture dates back about 4000 years before the birth of Christ. . . . This record of Adam and his posterity is the only scriptural account we have of the appear-

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70. John A. Widtsoe, “The Time-Length of Creation,” *Improvement Era*, April 1909, 491, 494 (emphasis in original).

ance of man upon the earth. But we have also a vast and ever-increasing volume of knowledge concerning man, his early habits and customs, his industries and works of art, his tools and implements, about which such scriptures as we have thus far received are entirely silent. Let us not try to wrest the scriptures in an attempt to explain away what we can not explain. The opening chapters of Genesis, and scriptures related thereto, were never intended as a text-book of geology, archaeology, earth-science or man-science. Holy Scripture will endure, while the conceptions of men change with new discoveries. We do not show reverence for the scriptures when we misapply them through faulty interpretation.<sup>71</sup>

Though he repeats his well-known rejection of organic evolution and physical death for any creature prior to the fall, Elder McConkie is elsewhere not definite on the length of the creative periods:

But first, what is a day? It is a specified time period; it is an age, an eon, a division of eternity; it is the time between two identifiable events. And each day, of whatever length, has the duration needed for its purposes. One measuring rod is the time required for a celestial body to turn once on its axis. . . . There is no revealed recitation specifying that each of the “six days” involved in the Creation was of the same duration. . . . The temple account, for reasons that are apparent to those familiar with its teachings, has a different division of events. It seems clear that the “six days” are one continuing period and that there is no one place where the dividing lines between the successive events must of necessity be placed.<sup>72</sup>

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71. James E. Talmage, address delivered in the Tabernacle, Salt Lake City, Utah, Sunday, 9 August 1931; originally published in the *Deseret News*, 21 November 1931; subsequently published as a pamphlet by the Church of Jesus Christ of Latter-day Saints, 1931; later published in *The Instructor*, December 1965, 474–77, and January 1966, 9–15. This excerpt is from the 1931 pamphlet, with emphasis added.

72. Bruce R. McConkie, “Christ and the Creation,” *Ensign*, June 1982, 11. My thanks to Ugo Perego for bringing this quotation to my attention.

Brigham Young even warned about the risk to the souls of others, should we insist too much upon such things.

It was observed here just now that we differ from the Christian world in our religious faith and belief; and so we do very materially. I am not astonished that infidelity prevails to a great extent among the inhabitants of the earth, for the religious teachers of the people advance many ideas and notions for truth which are in opposition to and contradict facts demonstrated by science, and which are generally understood. Says the scientific man, "I do not see your religion to be true; I do not understand the law, light, rules, religion, or whatever you call it, which you say God has revealed; it is confusion to me, and if I submit to and embrace your views and theories I must reject the facts which science demonstrates to me." This is the position, and the line of demarcation has been plainly drawn, by those who profess Christianity, between the sciences and revealed religion. You take, for instance, our geologists, and they tell us that this earth has been in existence for thousands and millions of years. They think, and they have good reason for their faith, that their researches and investigations enable them to demonstrate that this earth has been in existence as long as they assert it has; and they say, "If the Lord, as religionists declare, made the earth out of nothing in six days, six thousands years ago, our studies are all in vain; but by what we can learn from nature and the immutable laws of the Creator as revealed therein, we know that your theories are incorrect and consequently we must reject your religions as false and vain; we must be what you call infidels, with the demonstrated truths of science in our possession; or, rejecting those truths, become enthusiasts in, what you call, Christianity."<sup>73</sup>

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73. Brigham Young, in *Journal of Discourses*, 14:115–16.

“The first great scientists were themselves devout Christians, who believed that in their scientific investigations they were but rethinking the thoughts of God,” noted Harold B. Lee.

As blind as the atheist—or as the Bible calls him, the fool—is the religious man who makes his faith rest upon the question of how God created the world and how long it took. Man’s major concern should not be an understanding of the ground from which he is brought forth, but the discovery of the will and purpose of the Creator. In other words, his major thoughts should not be in geology, but in theology, if he would be saved.<sup>74</sup>

#### *I.E.2 How to handle science and a young earth?*

Meldrum is aware that many aspects of modern science seem to contradict the young earth view upon which he rests so much:

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. (p. 96)

This is a wise approach. It is unfortunate, however, that Meldrum does not follow it. It is intellectually consistent to insist that although at present things *appear* one way to science, one can hope that eventual discoveries or changes in perspective will bring the scientific model in line with one’s reading of scripture. But Meldrum does not confine himself to this. He insists that genetic evidence in support of the Book of Mormon must exist and that his book is an exercise in seeking to apply the *current* scientific evidence to this issue. The problem is clear: the current science strongly contradicts many of his claims, yet he invokes that same science to bolster his theories. We will here

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74. *Teachings of Harold B. Lee*, 344, citing “Be Ye Not Deceived,” BYU address, 4 May 1965.

examine a few of his inconsistencies on tangential scientific matters because they illustrate in miniature the errors that *Remnant through DNA* makes in its main argument, which we will examine in part II.

### *I.E.2.a Carbon dating*

For example, Meldrum cites carbon-dated ages for human remains in the Americas to establish that haplogroup X preceded Columbus in the Americas (p. 90).<sup>75</sup> But this same dating technology is simply not consistent with the claim that humans did not exist prior to 4000 BC, or that a period of only seven thousand years was required to create the earth.<sup>76</sup> One must either accept that carbon dating can accurately date human and other biologic remains or reject this claim. In a scientific argument one cannot, as Meldrum does, invoke a principle when it supports a theory, only to disregard or ignore it when it does not. If carbon dating gives ages that are too old (as it must, if a young earth model is accepted), then how can we trust that human remains dated before Columbus are not likewise more recent than they appear?

### *I.E.2.b The Ice Age*

When evidence clashes with Meldrum's theories, he typically dismisses it. Of the ice age during which the Americas were colonized, according to current scientific models, Meldrum writes:

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75. Carbon dating measures the amount of radioactive carbon-14 (<sup>14</sup>C) present in materials that were once alive. Once living matter dies, it ceases to accumulate <sup>14</sup>C, which will decay in the remains at a known rate. Thus, the amount of <sup>14</sup>C remaining in the present-day sample provides a precise measure of the time since death. The current <sup>14</sup>C calibration curve has been correlated with independent techniques (such as dendrochronology [tree ring ages], ocean sediment samples, and sea coral growth data) and is accurate to within less than two centuries at least. See Paula J. Reimer et al., "IntCal 04 Terrestrial Radiocarbon Age Calibration, 0–26 Cal kyr BP," *Radiocarbon* 46/3 (2004): 1029–58.

76. As one example among hundreds, recent work in southern Chile carbon dates human occupation to around fourteen thousand years ago. See Tom D. Dillehay et al., "Monte Verde: Seaweed, Food, Medicine, and the Peopling of South America," *Science* 320/5877 (9 May 2008): 784–86, [www.sciencemag.org/cgi/content/full/sci;320/5877/784](http://www.sciencemag.org/cgi/content/full/sci;320/5877/784) (accessed 29 March 2010). One of Meldrum's cited references discusses this as well, placing Australian habitation at least sixty thousand years ago. See David A. McClellan, "Detecting Lehi's Genetic Signature: Possible, Probable, or Not?" *FARMS Review* 15/2 (2003): 76.

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. . . . Exactly what the mechanism is that would cause such a catastrophic change is 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. (p. 100)

It would be difficult to cram more misinformation and omission into the first paragraph. Far from being without precedent, the ice age is only one of several such periods evident from geological data. The key scientific problem is not in explaining one ice age, but in explaining why they seem to happen with such regularity.

Meldrum’s first error is one of logic—one need not be able to explain *how* something happened in order to know *that* it happened. We might lack the knowledge of economics and politics necessary to understand how the Great Depression occurred; this hardly means we then must doubt that there *was* a stock market crash, a dustbowl, and soup kitchens. We cannot explain the mechanism that underlies the atonement of Christ, but we need not doubt either its efficacy or reality.

Though we need not understand the mechanism behind an event to assert its happening, *Remnant through DNA*’s claim that the causes of ice ages are “unknown” is likewise misleading. Meldrum wants to know “exactly” what caused them, and the precision that he demands can doubtless be adjusted to make any explanation

inadequate (and, thus, putative grounds for disbelief in their occurrence). This tactic disguises, however, the fact that a variety of mechanisms are well-understood contributors to glacial periods (many rely on fundamentals of thermodynamics and Newtonian mechanics). Meldrum's preoccupation with certainty is obvious here; if something isn't "exactly . . . known," it is not to be trusted at all. Science is not about certainty, but about probability and plausibility.

Despite the author's rather blithe confidence, petroleum geologist Jim Snook's chapter "How the Glacial Cycle Works" is not blank, but contains an accessible discussion of the heat capacitance of land and water, energy variation due to sunspot cycles, an orbital-mechanical difference that cycles every 93,000 years, a terrestrial axial-tilt cycle that lasts 41,000 years, the earth's "wobble" cycle of 21,000 years, albedo (variation in the earth's reflectivity based on the amount of cloud cover, snow cover, volcanic ash, etc.), and so on.<sup>77</sup> Tectonic plate theory also plays a role since a unique alignment of land masses currently blocks both poles. This configuration prevents the normal circulation of warmed ocean water, increasing glaciation. The freezing point of seawater was also potentially altered by the sequestration of salt in a landlocked Mediterranean six million years ago.<sup>78</sup> There is nothing about an ice age that is impossible or contradicts currently known facts about the physical world.

Strangely, Meldrum claims that the risk of "crop" failures also makes the ice age scenario unlikely, yet the standard scientific model does not report the development of agriculture until the Neolithic revolution, well after the last ice age.<sup>79</sup> Crops are irrelevant to the

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77. Jim Snook, *Ice Age Extinction: Cause and Human Consequences* (New York: Algora, 2008), 31–47.

78. David Christian, *Maps of Time: An Introduction to Big History* (Berkeley and Los Angeles: University of California Press, 2004), 131.

79. One of the earliest sites is described in Tim P. Denham et al., "Origins of Agriculture at Kuk Swamp in the Highlands of New Guinea," *Science* 301/5630 (11 July 2003): 189–93, [www.sciencemag.org/cgi/content/full/301/5630/189](http://www.sciencemag.org/cgi/content/full/301/5630/189) (accessed 29 March 2010). Middle Eastern fig cultivation is dated to more than eleven thousand years ago in Mordechai E. Kislev, Anat Hartmann, and Ofer Bar-Yosef, "Early Domesticated Fig in the Jordan Valley," *Science* 312/5778 (2 June 2006): 1372–74, [www.sciencemag.org/cgi/content/full/sci;312/5778/1372](http://www.sciencemag.org/cgi/content/full/sci;312/5778/1372) (accessed 29 March 2010).

scientific argument. Ironically, the formation of soil suitable for human agriculture requires glacier action, save in the case of volcanic ash soils. Meldrum denies the occurrence of that which made agriculture possible.<sup>80</sup> His presumption that there were “year round freezing temperatures” also reflects a basic unfamiliarity with the model.<sup>81</sup>

Meldrum also seems unaware that Inuit and other arctic peoples have thrived for hundreds of years in circumstances no more hospitable than an ice age: it seems that humans are quite capable of surviving such conditions. He also fails to mention that the “land bridge” theory is based not only on a theoretical ice age model but also on archaeological evidence that reveals habitation during the proper time period. Indeed, evidence from archaeology and paleontology (large mammal bones and ancient pollen) indicates that during the last ice age, Beringia (the area that included the land bridge but also “stretches more than 4,000 kilometers from the Verkhoyansk Mountains in the west to the Mackenzie River in the east”)<sup>82</sup> was “a

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80. “Of the four major sources of fertile land—river flood plains and deltas, loess deposits, glacial till, and volcanic ash—only volcanic ash is not associated with glaciation.” Snook, *Ice Age Extinction*, 114.

81. Estimated global average surface temperature differences between geologically recent interglacial and glacial periods are only 6–8°C at most. Average temperatures in the tropics declined by perhaps 5–6°C. Some areas nearer the poles would always have been below freezing, but that is also true of the earth today. Geological evidence for an altered tree line demonstrates that the ranges of organisms shifted, but the earth was not completely glaciated, nor were all species pushed to extinction. See “General Overview of the Ice Ages,” [http://earthguide.ucsd.edu/virtualmuseum/climatechange2/01\\_1.shtml](http://earthguide.ucsd.edu/virtualmuseum/climatechange2/01_1.shtml) (accessed 3 May 2010); Richard Monastersky, “Ice age sent shivers through the tropics—temperature may have declined substantially in the tropics during ice age, contrary to common belief,” *Science News*, 29 July 1995, [findarticles.com/p/articles/mi\\_m1200/is\\_n5\\_v148/ai\\_17107423](http://findarticles.com/p/articles/mi_m1200/is_n5_v148/ai_17107423) (accessed 3 May 2010). None of these changes happened overnight; as temperatures gradually decreased, plants and animal ranges had time to shift. This is not to claim that there were no extinctions as a result, but the picture is not nearly as grim as Meldrum suggests. Genetic data is one line of evidence that points to the drop in ice age animal populations, with later recovery.

82. John F. Hoffecker and Scott A. Elias, *Human Ecology of Beringia* (New York: Columbia University Press, 2007), ix. “Beringia was truly continental in size, and most of it lay above latitude 60°N. It was a land . . . isolated to a significant degree from other parts of the earth” (ix).

productive grassland ecosystem, rather than an exceedingly harsh Arctic desert environment,”<sup>83</sup> as Meldrum seems to assume (p. 100).

If Meldrum wishes to dismiss the ice age, he must confront the voluminous evidence for its existence, not simply claim that it has unresolved problems. It is strange that he questions the ice age partly because there is no human-created *historical* record of such an event. If science must exclude everything about which there are no human records, it will not be left with much. Interestingly, the “Little Ice Age” occurred within human historical time (approximately AD 1450–1850) as a result of relatively well-understood mechanisms related to other glacial periods.<sup>84</sup>

I do not intend the above to argue *for* the ice age’s reality. Such an argument would require a much longer discussion from a variety of disciplines. But that is precisely the point—Meldrum has dismissed the data out of hand. He has ignored the strongest evidence and made numerous misrepresentations in a single paragraph. We need not agree that there was an ice age to demand that its best evidences be confronted and addressed.

### *I.E.2.c Evolution*

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83. Andrew Kitchen, Michael M. Miyamoto, and Connie Mulligan, “A Three-Stage Colonization Model for the Peopling of the Americas,” *PLoS ONE* 3/2 (2008), 5 (see pp. 1–2), [www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0001596](http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0001596) (accessed 3 May 2010). For more information, see Linda B. Brubaker et al., “Beringia as a Glacial Refugium for Boreal Trees and Shrubs: New Perspectives from Mapped Pollen Data,” *Journal of Biogeography* 32/5 (May 2005): 833–48.

84. “It appears there were two main causes for the Little Ice Age. First, there was a greater warming of the oceans prior to the Little Ice Age. This put more energy into the oceans, which enhanced evaporation and put more moisture into the atmosphere. Second, the Maunder Minimum in sunspot activity, which occurred from AD 1645 to 1715, reduced the sun’s energy output.” Snook, *Ice Age Extinction*, 39. More detail is available on pp. 118–23. Of interest to Latter-day Saint readers is 1816, the “year without a summer” due to the Little Ice Age and the cooling effect of the Tambora eruption. The resulting third year of crop failure prompted the Joseph Smith Sr. family to leave Vermont for Palmyra, New York. See Matthew O. Richardson, “The Road through Palmyra: Connecting the Restoration’s Witnesses,” in *Prelude to the Restoration: From Apostasy to the Restored Church: The 33rd Annual Sidney B. Sperry Symposium*, ed. Fred E. Woods et al. (Salt Lake City: Deseret Book, 2004), 198–211.

Meldrum elsewhere insists that while evolution argues that “one species can evolve into another species through several processes, . . . 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” (p. 99). Such sweeping claims have long been a shibboleth of the young earth creationist movement, but they are simply false. Laboratory speciation has been observed in a variety of species, including single-celled organisms,<sup>85</sup> plants, worms, and fruit flies. In-the-wild speciation has also been observed in many cases, including butterflies,<sup>86</sup> mosquitoes, the apple maggot fly, fish, birds, mice, rats, and rock wallabies.<sup>87</sup> One could well debate whether such mechanisms are *adequate* to explain the totality of life’s diversity, but to insist that such speciation events have *never* been seen is a triumph of conviction over data.

#### *I.E.2.d A pattern of behavior*

These brief examples demonstrate a phenomenon that occurs on a much wider scale when *Remnant through DNA* tackles DNA evidence—anything that supports the author’s model or reading of scripture is praised and embraced. Any aspect of the same studies or science that does not provide support is either left safely unmentioned or dismissed as inaccurate, implausible, or impossible.

I am not arguing that the data on these points must be accepted, or that they are without error, or that there is no room for a genuine debate about substantive issues. But they *are* the current scientific data. If we discard or ignore data based on whether they match our religious

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85. Mark A. Farmer and Andrea Habura, “Using Protistan Examples to Dispel the Myths of Intelligent Design,” *Journal of Eukaryotic Microbiology* 57/1 (January–February 2010): 4–5.

86. Kenneth Miller discusses the case of *Hedylepta* in a creation–evolution debate titled “Resolved: The Evolutionists Should Acknowledge Creation,” *Firing Line*, PBS, 4 December 1997, [www.bringyou.to/apologetics/p45.htm](http://www.bringyou.to/apologetics/p45.htm) (accessed 4 May 2010).

87. Multiple examples with references to the primary literature are conveniently available online in Joseph Boxhorn, “Observed Instances of Speciation,” [www.talkorigins.org/faqs/faq-speciation.html#part5](http://www.talkorigins.org/faqs/faq-speciation.html#part5) (accessed 3 May 2010), and Chris Stassen et al., “Some More Observed Speciation Events,” [www.talkorigins.org/faqs/speciation.html](http://www.talkorigins.org/faqs/speciation.html) (accessed 3 May 2010).

convictions, we may be right—but we are not doing science. It is one thing to claim that science cannot detect the things that it needs to, or that scientists do not know enough to properly interpret what they see. It is quite another to insist that the science actually supports a radically different view of matters, to which all except the true believer are blind.

*I.E.3 Why do people get the science wrong?*

Why is Meldrum among the few able to draw the correct conclusion? In the case of such matters as the age of the earth, evolution, or the ice age, Meldrum's answer is that other researchers are blinded by ignorance, bias, or predetermined conclusions:

- “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” (p. 100).<sup>88</sup>

- “The manipulation of the parameters (or the assumptions) has affected the results” (p. 101).

- “There are some scientific theories that have become dogma that are protected by disallowing honest challenge” (p. 102).

It is not surprising, then, that Meldrum uses identical reasoning to explain why his geography and genetic theories regarding the Book of Mormon have not been embraced by Latter-day Saints familiar with the relevant fields. He bemoans D. Jeffrey Meldrum and Trent Stephens's conclusion that “we probably never will find a genetic

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88. This claim is either false or a gross oversimplification since most anthropologists believe that Australia and New Guinea would have required settlement over 30–90 km of open water well before the postulated Bering Strait migration to the Americas. See Max Ingman and Ulf Gyllensten, “Mitochondrial Genome Variation and Evolutionary History of Australian and New Guinean Aborigines,” *Genome Research* 13/7 (2003): 1600, citing Richard G. Klein, *The Human Career: Human Biological and Cultural Origins* (Chicago: University of Chicago Press, 1989). There is also a vigorous debate about the role of boats in settling the Americas. See Majid Al-Suwaidi, “A Multi-disciplinary Study of Port Eliza Cave Sediments and Their Implications for Human Coastal Migration” (master's thesis, Simon Fraser University, 2005). Recent work dates the settling of Fiji and other areas of Polynesia from at least 3,200 years ago by boat. See Manfred Kayser et al., “Melanesian and Asian Origins of Polynesians: mtDNA and Y Chromosome Gradients Across the Pacific,” *Molecular Biology and Evolution* 23/11 (2006): 2234–44, [mbe.oxfordjournals.org/cgi/reprint/23/11/2234.pdf](http://mbe.oxfordjournals.org/cgi/reprint/23/11/2234.pdf) (accessed 3 May 2010). Thus, while at one time boats with early peoples might have been dismissed out of hand, this is not the case now.

marker for the children of Lehi, for the children of Abraham, or even for the ‘Children of God.’”<sup>89</sup> Writes Rod Meldrum:

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? (p. 24)

*Remnant through DNA* will apparently not accept that the “underlying cause” for such a view is that these two geneticists understand the evidence, its potential, and its limitations far better than Rod Meldrum does. Evidence for the Book of Mormon and other truths may well exist, but this does not mean that *mtDNA evidence* must. Absence of evidence from mtDNA (especially when due to the inherent limitations of that type of evidence) does not preclude evidence from a variety of other sources. But Meldrum has an all-or-nothing view—if our beliefs are true, there ought to be genetic evidence. He is disappointed in these scholars, even though he admits that they and others “have demonstrated a high level of understanding of the genetic and scientific principles and fields” (p. 24). He explains the failure of Latter-day Saint scholars to embrace his findings for the same reasons that scientists persist in believing in ice ages and an old earth:

- “Others who have an interest in propagating the old ideas may mock, disapprove, or laugh at it” (p. 21).

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89. D. Jeffrey Meldrum, “The Children of Lehi: DNA and the Book of Mormon,” FAIR Conference, 2003, [www.fairlds.org/FAIR\\_Conferences/2003\\_Children\\_of\\_Lehi\\_DNA\\_and\\_the\\_Book\\_of\\_Mormon.html](http://www.fairlds.org/FAIR_Conferences/2003_Children_of_Lehi_DNA_and_the_Book_of_Mormon.html) (accessed 3 May 2010); later published as D. Jeffrey Meldrum and Trent D. Stephens, “Who Are the Children of Lehi?” *Journal of Book of Mormon Studies* 12/1 (2003): 38–51; reprinted in *The Book of Mormon and DNA Research: Essays from the Farms Review and the Journal of Book of Mormon Studies*, ed. Daniel C. Peterson (Provo, UT: Neal A. Maxwell Institute for Religious Scholarship, 2008), 157–83. The text cited by *Remnant through DNA* on pages 23–24 is reportedly from the Peterson reprint.

- “While 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” (p. 87).

- “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” (p. 87).

- “[The standard Latter-day Saint scholarly response] 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’ [i.e., the evidence that Meldrum believes he has found but that others dispute], 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” (p. 25).<sup>90</sup>

Ironically, Meldrum seems to ignore the possibility that his own reaction to the critique of his ideas on scientific or scriptural grounds may stem from exactly the same psychodynamics. His beliefs about the Book of Mormon and the necessity of DNA support lead him to overlook, ignore, or disregard relevant evidence that clashes with his fundamentalist expectations, while “aggressively and unfairly” criticizing the Latter-day Saint scholars for “dismissing” or “disparaging Joseph Smith” when they do not share his views. His long amateur labors have been shown to be deeply flawed on multiple grounds. Can *this* disappointment be underestimated, especially

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90. This sentiment is repeated in almost identical language later on p. 45.

when coupled with feeling like an “outsider” without the training that others have? Or is he immune to the faults he sees in others?

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? (p. 87)

Meldrum insists that he only wants a serious discussion of models, though he began the discussion years ago by claiming that those who disagreed with him were producing bad fruit because they dismissed and disparaged Joseph Smith. Over a year ago, an extensive written review of the scientific and scriptural difficulties with his model was prepared and presented to him privately before its publication. He has yet to reply as he promised to, and *Remnant through DNA* has done little to address the many defects identified.<sup>91</sup> As one who helped prepare and organize that review of his theory, I can assure him that we took his model very seriously—and found it wanting in virtually every respect. I can also assure him that I have never given a speech or written a paper advocating a Mesoamerican geography, or any other geography. In the interests of disclosure, I will say that my interests have always tended to focus on *internal* models based on the text. I have relatively little interest in placing the setting of the Book of Mormon narrative in a specific real-world site. I have no reputation in the field of Book of Mormon geography and nothing to lose by having the Mesoamerican model (or any other) shown to be false. I would be delighted if DNA evidence confirmed the Book of Mormon account—but at present it does not, and it would be dishonest of me to pretend otherwise.

Meldrum does not want those who study his model to attempt to “discredit and criticize” it, but this is how science is done. Science proceeds by an attempt to *disprove* hypotheses—if significant doubt

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91. See FAIR, “Section 1: DNA Evidence,” in “Reviews of *DNA Evidence for Book of Mormon Geography*,” 1–32, [www.fairlds.org/DNA\\_Evidence\\_for\\_Book\\_of\\_Mormon\\_Geography/DEBMG01F.pdf](http://www.fairlds.org/DNA_Evidence_for_Book_of_Mormon_Geography/DEBMG01F.pdf) (accessed 3 May 2010).

is cast on a claim, it is not accepted. If the claim withstands attempts to disprove it, our confidence in it is strengthened.<sup>92</sup> If Meldrum does not entertain attempts at disproof, he is not doing science. He recognizes this when he later writes that “it is . . . legitimate discourse to question the position and offer counter ideas and suggestions, or even offer information that refutes a particular position” (p. 150). He claims to want others’ “help” to “transform the level of evidence and excitement throughout the membership of the Church” (p. 87), but he balks at that help or feedback if it is negative, despite his “inviting all who find discrepancies to make them known so that they can be corrected” (p. 163). And it is easy to understand why he won’t accept in practice the feedback he welcomes in theory—because he insists that if the Book of Mormon is true, such evidence *must* exist, and he is convinced that he has found it. But if everything that is wrong with his theory were corrected, there would be little left.

Meldrum decries those who “resort to name calling, character assassination and questioning of knowledge, understanding, or motives” (p. 149)—and yet, as we have seen, he questions the motives and knowledge of those who disagree with him. While name calling and character assassination are clearly inappropriate, it does not seem to me that questioning whether someone has an adequate knowledge base or understanding of scientific matters is inappropriate. If a layperson on the street offered to perform surgery on us, wouldn’t a reasonable question be whether that person had the knowledge and understanding to do so? If an analysis of Meldrum’s work—or any other scholar’s—demonstrates unfamiliarity with the necessary material, we must be free to say so without being charged with “character assassination.” (On the other hand, to argue that arguments should be ignored simply because of a lack of formal training is clearly fallacious; but once the arguments themselves are *shown* to be fallacious, this can often be readily explained by a lack of adequate training or understanding.)

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92. The classic exposition of this aspect of science is Karl Popper, *The Logic of Scientific Discovery* (New York: Basic Books, 1959); this book is a reworked version of his original 1934 work, *Logik der Forschung*.

When challenged about his use of the fraudulent “Michigan relics” in his DVD series, Meldrum replied:

Please indicate what non-LDS scholarly journal article you are referencing as relating to the authenticity of the Michigan artifacts? Or are you referring to the Mesoamerican theorists who wrote in a BYU publication that they did their own study and found them to be fakes? What are the chances of any artifact getting an “authentic” label by these pseudo-scientists when doing so would disprove their personal theories attempting to link the Book of Mormon with Mesoamerica? Not likely.<sup>93</sup>

It should be pointed out that those who have concluded that the relics are fraudulent include both Latter-day Saint and non-Latter-day Saint researchers, and many (if not most) have no stake in a Mesoamerican setting for the Book of Mormon. James E. Talmage was among the first of the “pseudo-scientists” to publish a paper debunking the Michigan relics as forgeries;<sup>94</sup> other papers were to follow.<sup>95</sup> The most recent scientific examination of the Michigan relics was reported by Richard B. Stamps in *BYU Studies*.<sup>96</sup> Meldrum’s Web site continues

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93. DNA Truthseeker [Rod Meldrum], “Dna Evidence For Book Of Mormon Geography, What’s your take on this lecture series?” *Mormon Apologetics and Discussion Board*, post #32, 12 May 2008; accessible online at [www.mormonapologetics.org/index.php?showtopic=35020&st=20&p=1208425876&#entry1208425876](http://www.mormonapologetics.org/index.php?showtopic=35020&st=20&p=1208425876&#entry1208425876) (accessed 3 May 2010). Although Meldrum was posting under a pseudonym, participants in the thread knew that it was he. The board operator was able to confirm that “DNA Truthseeker” was, in fact, Rod Meldrum. One wonders why he chose to hide his identity and praise his own work in the third person.

94. Frederick Starr, J. O. Kinnaman, and James E. Talmage, “The Michigan Archaeological Question Settled,” *The American Antiquarian and Oriental Journal* 33 (1911): 160–64.

95. Francis W. Kelsey, “Some Archeological Forgeries from Michigan,” *American Anthropologist* 10/1 (1908): 48–59; Francis W. Kelsey, “A Persistent Forgery,” *The American Antiquarian and Oriental Journal* 33 (1911): 26–31; and Stephen D. Peet, “A ‘Stamp’ Table and Coin Found in a Michigan Mount,” *The American Antiquarian and Oriental Journal* 15 (1894): 313.

96. Richard B. Stamps, “Tools Leave Marks: Material Analysis of the Scotford-Soper-Savage Michigan Relics,” *BYU Studies* 40/3 (2001): 210–38. For a history of the Michigan relics, see Mark Ashurst-McGee, “Mormonism’s Encounter with the Michigan Relics,” *BYU Studies* 40/3 (2001): 182–96.

to sell books that tout the Michigan artifacts as genuine evidence,<sup>97</sup> and in an e-mail he talked about supposed God-inspired plans to build a museum to foster their study.<sup>98</sup>

“No one,” Meldrum tells us, “should condemn nor defend a scholar in taking a position that may not seem to be in accordance with the gospel” (p. 150). This is good advice. It is a pity that he does not take it.

Worry about their pet theories is not the only motive attributed to those who disagree with Meldrum. Some have more base motives:

Nearly 100% of the publications, websites, symposia and tours are steeped in Mesoamerican archaeology, ruins, culture, art and history. . . . 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 eas-

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97. Among these is Edwin G. Goble and Wayne N. May, *This Land: Zarahemla and the Nephite Nation* (Colfax, WI: Ancient American Archaeology Foundation, 2002). Ed Goble has charged Meldrum with plagiarizing from this book in the creation of his own geography, an accusation that Meldrum has denied; see [en.fairmormon.org/Book\\_of\\_Mormon\\_geography/Models/Limited/Meldrum\\_2003](http://en.fairmormon.org/Book_of_Mormon_geography/Models/Limited/Meldrum_2003) (accessed 5 May 2010). For a review of this work and a citation from Goble retracting his support for the Michigan artifacts, see Brant A. Gardner, “This Idea: The ‘This Land’ Series and the U.S.-Centric Reading of the Book of Mormon,” *FARMS Review* 20/2 (2008): 141–62. For a further examination of the Michigan relics and their use in Meldrum’s DVD presentation, see FAIR, “Section 5: Identifying the Nephites,” in “*Evidence for Book of Mormon Geography*,” 10–14, [www.fairlds.org/DNA\\_Evidence\\_for\\_Book\\_of\\_Mormon\\_Geography/DEBMG05F.pdf](http://www.fairlds.org/DNA_Evidence_for_Book_of_Mormon_Geography/DEBMG05F.pdf) (accessed 5 May 2010).

98. The relevant section reads: “They have had many people contact them about donating artifacts and they made contact with the University of Michigan about the possibility of obtaining the Milton R. Hunter collection [i.e., the Michigan relics] for display. They agreed upon verification that the artifacts would be held in a ‘secure’ location, such as a museum. Shawn said that they would like to build the museum in the next 5–7 years. Within 48 hours again the Lord provided another ‘miracle’ as I was talking to Val Killian, world-renowned architect who told me he was working with a group who are building a Conference Center in Nauvoo! He then told me about the 600 seat auditorium, the meeting rooms, the 110 family suites, and . . . the MUSEUM! I asked him ‘What were you planning to put into your museum?’ and he said . . . after a short pause. . . . ‘Your stuff!’ . . . Right then he was prompted and he said ‘We can make it [the basement of the Nauvoo Conference Center] into a research lab/facility to study these artifacts!’ So the Lord is watching out for this project!” [only the last ellipsis reflects removed text; the others are in the original]. Meldrum, promotional e-mail, 9 May 2008, [www.fairblog.org/2008/10/07/the-truth-will-out-at-last](http://www.fairblog.org/2008/10/07/the-truth-will-out-at-last) (accessed 24 March 2010).

ier for the reader to understand why so much acrimony arises when an alternative paradigm is introduced. (p. 153)

Meldrum has here apparently granted himself an exception from his rule that it is “unconscionable” to engage in (among other things) “questioning . . . of motives” (p. 149; see p. 163). But if he truly believes that such financial issues make a difference, how can he be certain that they do not influence *him* as well?

Unlike the PhD geneticists who doubt mtDNA’s ability to provide support for the Book of Mormon, Meldrum makes his living from his Book of Mormon theories. While there is doubtless something that could be labeled a Mesoamerican “industry” in tour groups and the like, PhD geneticists, FAIR, and the *FARMS Review* are not part of it—nor am I. Meldrum, by contrast, wrote that “it was clear that I was going to have to leave [full-time employment] to work on these [Book of Mormon] projects full time, but I wanted more of a ‘sign’ from the Lord. So I had three big projects about to close . . . and I told the Lord that if he wants me to make this project my #1 priority to please cause that none of these jobs go through, but that if I was to stay . . . to let at least one come in.”<sup>99</sup> Since Meldrum’s main source of income is apparently the mtDNA project, which efforts he undertook because of a “sign” from God, it would be inconsistent for him to claim that financial motivations drive those who disagree with him while leaving him untouched.

Meldrum’s coauthor and former business partner, Bruce H. Porter, outlined the reasons for Meldrum’s business split from Porter, Wayne May, and LDS Travel president Brian Mickelsen. Meldrum’s decision to speak at his own conference, rather than the partners’ conference, reportedly foundered on “questions over sharing profits”: “[Meldrum] felt that he needed to pull away from that company [ldspromisedland.com] because he could make more money doing it on his own. And that was a business decision that he made. . . . But it’s what Rod does for a living, and everybody has a right to earn a living.”<sup>100</sup>

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99. Meldrum, promotional e-mail, 9 May 2008, [www.fairblog.org/2008/10/07/the-truth-will-out-at-last](http://www.fairblog.org/2008/10/07/the-truth-will-out-at-last) (accessed 24 March 2010).

100. Bruce H. Porter, as cited in Michael De Groot, “Mormon geography conferences to compete this weekend.” The phrase “questions over sharing profits” is De Groot’s.

By May 2008, Meldrum's Web site was claiming that he had sold eight thousand DVDs—at a unit price of \$19.99 + \$5.00 for shipping.<sup>101</sup> A new five-disc set is now available for \$59.95.<sup>102</sup> Though *Remnant through DNA* discusses how Meldrum began by “sharing his research in free presentations done at his own expense” (p. v), as of November 2009 registration for the “Southeastern Idaho Regional Book of Mormon Archaeology & Prophecies Conference” costs \$10 per person, \$20 per family, with an extra \$5 if one does not preregister.<sup>103</sup> Past conferences, such as one held at the Zermatt resort (\$30 per person, \$155 for two with accommodations),<sup>104</sup> sold out with “over four hundred in attendance.”<sup>105</sup> Meldrum's solo conference in April 2010 upped the cost to \$40 per person.<sup>106</sup>

Blaming disagreement with Meldrum's models on financial motivation is not new. When his North American geography was critiqued via a quote from John L. Lund—an advocate of a Mesoamerican model—Meldrum wrote, “Dr. Lund needs to spend more time on research and less time taking gullible tourists on

101. User “livity111us,” “Dna Evidence For Book Of Mormon Geography, What's your take on this lecture series?” *Mormon Apologetics and Discussion Board*, post nos. 48 and 50, 12 May 2008, [www.mormonapologetics.org/index.php?showtopic=35020&view=findpost&p=1208426324](http://www.mormonapologetics.org/index.php?showtopic=35020&view=findpost&p=1208426324) (accessed 5 May 2010).

102. The Firm Foundation, “Products,” [www.bookofmormonevidence.org/products.php](http://www.bookofmormonevidence.org/products.php) (accessed 5 May 2010). In the interests of disclosure, I note that FAIR also has a DVD on Book of Mormon DNA. I was not involved in its production. Meldrum has charged that FAIR fears competition from his DVD products. I do not think FAIR is much concerned by this; all FAIR videos are also available for free access on YouTube. I have never heard anyone at FAIR worry about DVD sales. Links to all videos are conveniently available at [en.fairmormon.org/Book\\_of\\_Mormon/DNA\\_evidence#Videos](http://en.fairmormon.org/Book_of_Mormon/DNA_evidence#Videos) (accessed 5 May 2010).

103. Rod Meldrum, “Upcoming presentations, seminar series, retreats, symposiums, conferences and tours,” [www.bookofmormonevidence.org/page.php?page=seminars](http://www.bookofmormonevidence.org/page.php?page=seminars) (accessed 5 May 2010).

104. Rod Meldrum and The FIRM Foundation, “Update on Book of Mormon Prophecies National Conference,” bulk e-mail, 29 September 2009, copy in my possession. Also available online at [archive.constantcontact.com/fs022/1102686658457/archive/1102694815728.html](http://archive.constantcontact.com/fs022/1102686658457/archive/1102694815728.html) (accessed 7 May 2010).

105. Rod Meldrum and The FIRM Foundation, “Report on Book of Mormon Prophecies National Conference,” bulk e-mail, 8 October 2009, copy in my possession.

106. Rod Meldrum and The FIRM Foundation, “Why Two Book of Mormon Conferences in April?” bulk e-mail, 20 March 2010, copy in my possession.

‘Book of Mormon’ tours in Mesoamerica it would appear.”<sup>107</sup> Despite this condemnation of such mercenary behavior (which, as we are apparently meant to conclude, blinds Lund and the gullible to his errors), by May 2008 Meldrum’s Web site was offering “The Ultimate LDS Tour,” consisting of church history sites and his proposed North American geography.<sup>108</sup> The cost was \$1,979 per person with double occupancy.<sup>109</sup> Apparently, leading tours is only a problem if one is a Mesoamerican theorist.

Meldrum cannot assert that these facts are inapplicable to *his* case and theory without conceding that he has attempted to poison the well for his readers against those who disagree with him.

### *I.F Summary*

In sum, it is upon two convictions that Meldrum builds his theory: (1) the Book of Mormon is a true historical record, so genetic evidence must eventually come forth to support it; and (2) any science that postulates a creative period greater than seven thousand years, or humans prior to 4000 BC, is unscriptural and false. And any scholar who disputes these claims is uninformed, blinded by convention and false science, or motivated by pride or profit.<sup>110</sup>

## Part II—The Genetic Argument

I believe it is good to investigate and prove all principles that come before me. Prove all things, hold fast that which is good,

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107. DNA Truthseeker [Rod Meldrum], “The River Sidon and the Great Lakes Theory,” Mormon Apologetics and Discussion Board, 13 May 2008, [www.mormonapologetics.org/index.php?showtopic=35553&view=findpost&p=1208426371](http://www.mormonapologetics.org/index.php?showtopic=35553&view=findpost&p=1208426371) (accessed 7 May 2010). The original posting had the word *gullible*, but it was removed sometime after 2 June 2008.

108. Rod Meldrum, “Join us for ‘THE ULTIMATE LDS TOUR,’” [bookofmormon-evidence.org](http://bookofmormon-evidence.org) (update of 14 May 2008), copy in my possession.

109. Clawson Shields Tours, “Sacred Ground The Ultimate LDS Tour,” entry for 6–18 October 2008, [clawsonshields.com/#](http://clawsonshields.com/#) (accessed 7 May 2010), copy in my possession.

110. A similar claim of financial bias is made by Meldrum’s sometime coauthor and business partner, Bruce Porter: “Most of the people fighting it [Meldrum and Porter’s ideas] are people who have something to lose financially or by reputation.” Kristen Moulton, “Book of Mormon geography stirring controversy,” *Salt Lake Tribune*, 25 March 2010, [www.sltrib.com/faith/ci\\_14750506](http://www.sltrib.com/faith/ci_14750506). (accessed 14 June 2010).

and reject that which is evil, no matter what guise it may come in. I think if we, as “Mormons,” hold principles that cannot be sustained by the Scriptures and by good sound reason and philosophy, the quicker we part with them the better, no matter who believes in them or who does not. In every principle presented to us, our first inquiry should be, “Is it true?” “Does it emanate from God?” If He is its Author it can be sustained just as much as any other truth in natural philosophy [i.e., science]; if false it should be opposed and exposed just as much as any other error. Hence upon all such matters we wish to go back to first principles. —John Taylor<sup>111</sup>

I now turn to the core of *Remnant through DNA*'s argument for a genetic signal that supports the Book of Mormon account. Meldrum makes several claims:

- A. Book of Mormon prophecies promise that a detectable genetic signal from Lehi's group would persist to the present day.
- B. The Book of Mormon account presents a scenario under which a small genetic signal from the Middle East would persist and remain detectable.
- C. A DNA marker (haplogroup X2) that ties Amerindians to the Middle East has been found, concentrated among the Algonquin language group.
- D. The genetic evidence actually suggests that the marker originated in Lehi's time (2,600 years ago) rather than over 10,000 years ago as concluded by conventional science.

I will examine each of these claims in turn. Not one is viable.

### *II.A Does the Book of Mormon Require a Detectable Genetic Signature?*

As we saw earlier, Meldrum insists that Latter-day Saint genetics experts have ignored the fact that the Book of Mormon prophesies that a latter-day remnant of Israel would persist in the New World (p. 46).

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111. John Taylor, in *Journal of Discourses*, 13:15.

He extends this claim further, writing that the remnant ought to be genetically detectable (pp. 3, 24). This expectation is fatally flawed and demonstrates a naive and mistaken conflation of two concepts: literal descent and *genetic evidence* of literal descent.

### *II.A.1 The scriptural argument*

Meldrum argues that “*there will be a remnant of the House of Israel left upon the Promised Land in the latter days. . . . This is why an understanding of the prophecies and promises are so incredibly important*” (p. 46, emphasis in original). He appeals to “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” (p. 46). No Latter-day Saint researcher, to my knowledge, denies this theme in the Book of Mormon. But five claims (pp. 46–47, considered below) that Meldrum then makes demonstrate that he understands neither the genetics nor the scriptures he invokes.

**Claim #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?” (p. 46).

**Response:** For the vast majority of the people to whom we are related, we do not carry genetic markers. I am related to all my male ancestors, but I do not carry a single one of their mtDNA markers since these are passed on only by women. Any man will hit a genetic dead end for his Y-chromosome markers if he has only daughters; any woman will lose any mtDNA markers that she gives to her sons. Such evidence disappears forever within a single generation.

If we consider the other genes carried on nuclear chromosomes, the situation is little better. One has a 50 percent chance of getting a somatic nuclear DNA marker<sup>112</sup> from a given parent, and the chance

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112. Somatic DNA refers to all DNA in the nucleus except the sex chromosomes (X and Y). Women receive an X from each parent; men receive an X from their mother and a Y from their father. Despite having two copies of chromosome X, the cells of female mammals (including humans) inactivate one copy of the X chromosome via a process called “lyonization.” Thus, sex chromosomes have patterns of inheritance in both sexes distinct from somatic DNA; pursuing this matter is not necessary for the purposes of this review.

of a marker being passed on to each subsequent generation is likewise 50 percent. Thus, although I am clearly related to my grandfather, I have only a 25 percent chance ( $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ ) of having his marker at a given nuclear DNA site. I am genetically related to him, but this does not mean that I will have a *genetic marker* that proves it. The chance of having a given marker drops with each generation, yet I am just as much a “remnant” of the many from whom I have no markers. This is explained in great detail for the nonexpert in one of Meldrum’s references; its author points out that his own chance of carrying a gene from an ancestor only 30 generations back (about one thousand years ago) is “1 in 10,737,417,000”—and Lehi would be two and half times further back than that. Does this mean, then, that the geneticist is not a “remnant” of all these ancestors? “Not at all! I am a direct lineal descendant [from a given ancestor] as much as I am from any other of my ancestors of that era.”<sup>113</sup>

Thus, we must not make the mistake of assuming (as Meldrum does) that having a direct, lineal connection means there will be any *genetic evidence* of that connection.

**Claim #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?” (p. 46).

**Response:** There is no *genetic marker* at a given site for virtually *all* ancestors. One does not cease to be a direct descendant simply because one has not won the genetic marker lottery. To speak of *genetic* descendants is redundant—all descent is genetic since by definition we pass DNA on to our descendants. But that certainly does not mean that all descendants will show a given genetic marker, especially after many generations. Such evidence is the exception, not the rule. Genes are not “blended”—they are an either-or proposition. Either one passes a given gene on, or one does not. If not, it is gone forever from the lineage.

Meldrum even cites material from John Butler, who points out that “the majority of the people living today in Iceland had ancestors

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113. Meldrum and Stephens, “Who Are the Children of Lehi?” 121 ; note also the chart on p. 41.

living only 150 years ago that could not be detected based on the Y-chromosome and mitochondrial DNA tests being performed,” despite the fact that the ancestors clearly existed.<sup>114</sup> This is an excellent—but not isolated—example of Meldrum’s tendency to quote something that supports one aspect of his argument, only to ignore the same fact and argument elsewhere when it proves inconvenient for his DNA theories.

Current LDS Church leaders are also clear that the religious and theological concern with lineage has little to do with detectable genetic descent and much to do with covenants. Elder Dallin H. Oaks cited the Church’s handbook for patriarchs at a worldwide leadership training meeting during which he discussed “this vital subject” of lineage:

“The patriarch is to discern and declare a person’s lineage through the inspiration of the Holy Ghost. The declaration of lineage is not determined by a person’s race or nationality. Because of the scattering of Israel among all nations of the earth, the lineage of Israel is found in people of most races and nationalities.” Note that the patriarch does not assign lineage. He declares it by inspiration. “In declaring lineage, the patriarch identifies the tribe of Israel through which the person will receive his or her blessings. The patriarch also outlines the special promises and blessings the person may receive through that lineage. . . . Because the tribes of Israel have intermixed with one another, most people are of mixed lineage. Even family members can be of mixed lineage, and occasionally children of the same parents receive patriarchal blessings that declare their lineage to be from different tribes.” *These important teachings clarify that a declaration of lineage is not a scientific pronouncement or an identification of genetic inheritance.* A declaration of lineage is representative of larger and more important things. When a patriarch declares lineage, he is identifying “the

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114. John M. Butler, “Addressing Questions Surrounding the Book of Mormon and DNA Research,” *FARMS Review* 18/1 (2006): 105–6. Meldrum cites Butler on p. 27 of *Remnant through DNA*. In the quotation above, Meldrum’s emphasis has been omitted.

tribe of Israel through which the person will receive his or her blessings.” This declaration concerns the government of the kingdom of God, *not the nature of the blood or the composition of the genes of the person being blessed.*<sup>115</sup>

The scriptures and the church are concerned about “larger and more important things” than genetic markers.

**Claim #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?” (p. 46).

**Response:** Again, it should be clear that one can be a literal (“according to the flesh”) descendant without carrying DNA markers. “Blood lineage” has no clear genetic analogue—one can be of direct descent from an individual yet share none of the individual’s genetic markers. The more generations that pass, the more this possibility approaches a virtual certainty.

**Claim #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”? (p. 47).

**Response:** This is an extraordinary question. The suggestion seems to be that the truthfulness of the Book of Mormon prophecy hinges on whether we can find “genetic indication[s]” of a tie to Jews.<sup>116</sup> This misses the point spectacularly—Nephi’s claim is that the Book of Mormon itself will provide the evidence and proof needed to convince the scattered seed of Lehi that they are descendants of the Jews. Nephi taught that after the Bible reached the remnant, “I beheld other books, which came forth by the power of the Lamb, from the Gentiles unto them, unto the convincing of the Gentiles and the remnant of the seed

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115. Dallin H. Oaks, “Patriarchal Blessings,” in *Worldwide Leadership Training Meeting: The Patriarch, 8 January 2005* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 2005), 7–8, emphasis added.

116. It is also worth remembering that Lehi was not a Jew, as Meldrum is well aware. Lehi and Ishmael were likely from Manasseh and Ephraim, respectively (p. 12). There should be caution, then, in speaking of “Jews” too loosely.

of my brethren, and also the Jews who were scattered upon all the face of the earth, that the records of the prophets and of the twelve apostles of the Lamb are true” (1 Nephi 13:39). He explained to his confused brothers that “in the latter days, when our seed shall have dwindled in unbelief, . . . then shall the fulness of the gospel of the Messiah come unto the Gentiles, and from the Gentiles unto the remnant of our seed—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” (1 Nephi 15:13–14, emphasis added).

Clearly, once the “fulness of the gospel”—which surely came with the revelation of the Book of Mormon—comes to the remnant, then “in that day” they will “*know* that they are of the house of Israel” (emphasis added). No DNA is required, or expected; and this applies not just for the Lehite remnant “but also of all the house of Israel” (1 Nephi 15:18).

Meldrum invokes these verses later, arguing that they describe “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?” (p. 51). In context, however, it is clear that the preaching of the gospel via the Book of Mormon accomplishes this revelation of covenant ancestry—but Meldrum insists that this cannot be done without “genetic evidence” and that these scriptures “must indicate” genetic links.

**Claim #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?” (p. 47).

**Response:** This is another example of missing the point completely. To the question, I answer: “Yes! There is a population that ‘knows with complete surety.’ It consists of those who have accepted the witness of the Book of Mormon through the power of the Holy Spirit, which is brought to them by ‘the Gentiles.’ These Lehtes did not and do not

need to wait for population genetics to tell them that of which the Book of Mormon bears eloquent witness.” As Elder C. Scott Grow taught in general conference, “The Book of Mormon is *its own witness* to the people of Latin America and of all nations. Its very coming forth in these latter days bears witness that God has once again begun to *gather scattered Israel*.”<sup>117</sup>

Claim #5 is also troubling because Meldrum insists, “I do not claim to know that [my] proposed theory is true” (p. 5) and “no matter how far these ideas progress, they will always remain in the realm of theory until the Lord makes the truth known” (p. 4). Despite this disclaimer, he is here concluding quite forcefully that the production of the Book of Mormon record itself—and, one presumes, the witness that attends it—is not sufficient because there is no population that yet “*knows with complete surety*” about their connection to Israel (emphasis added). His DNA theory is to do what the Book of Mormon itself has not done, since “these scriptures [2 Nephi 9:53; 30:4] seem to indicate that there must be enough of a genetic signature remaining within the remnant or seed of Jacob to positively identify them as being of the house of Israel” (p. 47).

As we have seen, “these scriptures” do nothing of the sort, and the science makes the expectation that they would or could dubious. The verse prior to 2 Nephi 30:4 even gives us the answer: “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.” Meldrum even cites (and italicizes) this verse later, but still the quest for DNA evidence continues. It does not seem that Meldrum regards the Book of Mormon’s production as sufficient, since he concludes the chapter by quoting 2 Nephi 9:53 and then writing the following:

When this happens they will [future tense] simultaneously embrace the restored gospel of Jesus Christ. . . . Surely this

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117. C. Scott Grow, “The Book of Mormon, the Instrument to Gather Scattered Israel,” *Ensign*, November 2005, 35, emphasis in original.

will be [future] 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 [past tense] in the gospel. (p. 58)

Meldrum does not seem to consider that this process *is* and *has been* a glorious time in the lives of those of the remnant who have already accepted the evidence that God promised—the Book of Mormon. One begins to wonder if he believes his book will bring this future about.<sup>118</sup>

He need not wait; modern prophetic witnesses add their voice to the scriptural declaration. For example, members of the First Presidency have offered numerous prayers at temple dedications from Canada to Argentina in which they declare the local Saints to be descendants of Lehi. It does not appear that the leaders of the church regard Lehi's descendants to be restricted to the American Northeast, as Meldrum does.

We can see now why Meldrum considers his theory so important. He is convinced that the Book of Mormon itself virtually requires this type of proof, which up until now has been unavailable, and “these honest questions *must* be addressed if we believe in the truthfulness of prophecy and the Book of Mormon” (p. 47, emphasis added). This is dangerous, fundamentalist ground for his readers, especially if these erroneous expectations cannot be satisfied. And such worries are utterly unnecessary, given what modern prophets and the scriptures tell us.

### *II.A.2 Are there no other options?*

Meldrum then asks, “What other method is available to substantiate the claims of the Book of Mormon?” (p. 47). He offers a

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118. In an e-mail sent to those who purchased his DVD, Meldrum expresses similar views: “[My wife] and I . . . no longer doubt the validity of [the] work in which we are engaged. . . . This information will go out to ‘millions’ who will be touched by the work, and . . . this will ‘embolden’ the saints to open their mouths and **declare anew** the truthfulness of the gospel of Jesus Christ so that millions will find and enter his kingdom!” Meldrum, promotional e-mail, 9 May 2008, [www.fairblog.org/2008/10/07/the-truth-will-out-at-last](http://www.fairblog.org/2008/10/07/the-truth-will-out-at-last) (accessed 24 March 2010).

superficial examination of “archaeology” or “linguistics” as potential evidence but quickly concludes that these methods are of no help for his purposes (pp. 47–48). It is again apparent that he regards the Book of Mormon itself as insufficient for the task. He summarizes his view 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” (p. 48). The goal posts have now been moved, for the connection must be demonstrated to “the Gentiles” instead of the seed or remnant itself. We are again assured that this is not to make things “proven,” but only to make a “good case” (p. 48)—but given what we are told is at stake, we are presumably supposed to hope that Meldrum can deliver since the Gentiles are to “know” with “complete surety.” It is not clear why *any* evidence other than the Holy Spirit might be expected or required, nor are any of the thousands of pages adduced by Latter-day Saint scholars as providing evidence in favor of the Book of Mormon’s antiquity considered. If the Book of Mormon’s antiquity is accepted, then its claims about Lehiite ancestry must also be accepted since Joseph Smith could not have translated an ancient record unaided by God.

### *II.A.3 Pounding the point home*

Meldrum’s erroneous expectations are largely repeated over the next several pages. I will not examine each in detail:

- “Christ himself proclaimed that those still alive at the time of his coming were literal descendants of Jacob. . . . There should be no doubt that there was a genetic remnant left at this point in Book of Mormon history” (p. 32).

- “There should be no question that ‘seed’ in this case [1 Nephi 5:14; Ether 13:6–7] meant a literal genetic remnant based on genealogical records, namely the Brass Plates” (pp. 48–49).

- “What is a literal ‘seed’ except a genetic replica, capable of producing a living organism like unto its parent organism?” (p. 49).

- “‘Thy seed’ being genetic descendants . . .” (p. 50).

- “It appears that some passages [in scripture] are exclusive, as indicated by distinctions made between a literal genetic lineage and those adopted into it” (p. 50).

- “It has been prophesied that the genetic remnant will be the people that build up the New Jerusalem in North America” (p. 88).

All these quotations, and others, betray the basic misunderstanding: Meldrum is convinced that if someone is a direct descendant, there must be genetic evidence of that fact. (He is also mistaken if he thinks “seeds”—of plants, animals, or humans—are usually genetic “replicas.” In sexually reproducing organisms, which include most plants, offspring are not replicas of their parents or anyone else. The loss of genetic markers begins with the first generation.)

And since the scriptures often speak of direct literal descendants, Meldrum insists there must therefore be genetic evidence: “There should be some sort of genetic evidence for this remnant to be found. It has been prophesied not to have been destroyed” (p. 53). The remnant is, of course, not destroyed, but any genetic sign almost certainly has been (see section II.B for further discussion).

Loss of the genetic signal is, for Meldrum, not an option. “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?’” (p. 53). In a word, no. If by “genetically destroyed” one means “lacking genetic evidence,” then certainly if one lacks genetic evidence then one lacks genetic evidence. But the vast majority of lineages exist without genetic proof, just as I remain a guaranteed genetic descendant of my great-grandfather thirty generations ago as surely as of my father. Meldrum repeatedly conflates the scriptural promise of “literal seed” with the idea of “genetically proven link,” when the two are light-years apart.

The confusion then increases:

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 with the prophecies and promises given to the “remnant Lamanites.” (p. 53)

This potential definition is Meldrum’s alone—no geneticist, no genealogist, no prophet, and certainly no scriptural author claims that without a DNA signal, one is no longer a “remnant” or descendant. Indeed, the very idea of a remnant suggests the small, scrappy remains of something that was originally much more robust and intact. And given that Meldrum points out that at least 94 percent of the pre-Columbian inhabitants perished from European disease after contact (p. 41), the remaining 6 percent surely qualify as a “remnant” by any standard.

#### *II.A.4 Conclusion*

Once this key mistake about the nature of ancestry and DNA is made, everything else follows:

The most reasonable interpretation of these prophecies 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. (p. 53)

Far from being “the most reasonable interpretation,” the view in *Remnant Through DNA* is tortured and illogical, and it violates both what we know of population genetics and the scriptural text. We *have* the direct revelation that is the “only other method”—the Book of Mormon itself.

#### *II.B Would Lehi’s Signature Persist?*

Having claimed that we ought to expect a DNA signature, Meldrum attempts to show that Lehi’s genetic signature would have persisted. He notes that “the Book of Mormon gives at least two excellent examples of genetic (or population) bottlenecks,” citing the

destruction of the Jaredites and Nephites (p. 37). His discussion of these implications (pp. 37–44), however, omits an event whose effect on Lehite DNA markers was identical to those caused by bottlenecks, and likely even more severe—the founder effect of the initial Lehite migration.<sup>119</sup> Lehi and his party represented a very small, restricted sample of the Middle Eastern genetics of their day that was placed into a new environment.

Since Meldrum’s evidence all derives from mitochondrial DNA (mtDNA), only female members of the party will leave any genetic trace at all, since mtDNA is inherited by all children from the mother only.<sup>120</sup> Only the mtDNA of Sariah and Ishmael’s wife (and the wives of the sons of Ishmael if they are not Sariah’s children)<sup>121</sup> will provide any evidence. Thus, only two to four individuals provide the genetic “signal” of Lehi’s party relevant to Meldrum’s inquiry. Meldrum argues (p. 62) that there are seven women and thus “seven mtDNA lineages” (p. 123) since he counts the daughters of Lehi and

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119. “A population may descend from only a small number of individuals either because the population is initiated from a small number of individuals, causing a **founder effect**, or because a small number of individuals survived . . . , resulting in a population **bottleneck**” (emphasis in original). Philip W. Hedrick, *Genetics of Populations*, 3rd ed. (Sudbury, MA: Jones and Bartlett Publishers, 2005), 342.

120. For a discussion, see Meldrum and Stephens, “Who Are the Children of Lehi?” 46; and McClellan, “Possible, Probable, or Not?” 74–80.

121. Sidney B. Sperry and John L. Sorenson both opined that Ishmael’s sons were already married to Lehi’s daughters. See Sidney B. Sperry, “Did Father Lehi Have Daughters Who Married the Sons of Ishmael?” *Improvement Era*, September 1952, 642; and John L. Sorenson, “The Composition of Lehi’s Family,” in *By Study and Also by Faith: Essays in Honor of Hugh W. Nibley*, ed. John M. Lundquist and Stephen D. Ricks (Salt Lake City: Deseret Book and FARMS, 1990), 2:174–96. Erastus Snow reported that Joseph Smith had said that the account in which Ishmael’s “sons married into Lehi’s family” was contained in the lost 116 pages of the Book of Mormon translation (in *Journal of Discourses*, 23:184). Sorenson argues that, given their apparent ages, the daughters could not have been the first wives; thus, either (a) they were second wives (despite the prohibition against polygamy in Jacob 2 and the reputation that Lamanites had for monogamy), or (b) they married after the first wives died during the wilderness journey (pp. 190–91, 193). Another option is that they were *older* sisters, perhaps from a previous marriage of Lehi’s. (Sorenson argues that they must have been younger than the brothers to properly account for Sariah’s birth history, but this does not preclude them being from a separate mother. If so, this would have increased the number of potential mtDNA donors, but this is an awfully speculative reed to hang a theory upon.)

Ishmael—but clearly those daughters will inherit only their mothers’ mtDNA signal; they are not independent sources of potential Middle Eastern DNA. This maximum of four people is an enormously tight bottleneck, and Meldrum will go to great—though unpersuasive—lengths to insist that such a tiny signal was not lost.

### *II.B.1 Can all Amerindians be Lehites?*

Meldrum grants that the Lehi party did not arrive in an empty continent (pp. 17–19), agrees that a limited geographical model best matches the Book of Mormon text (pp. 19–22), and knows that genetic markers can disappear in a relatively short time period (p. 27). However, he sees this as part of the problem:

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? (p. 20)

Here again, Meldrum does not demonstrate a grasp of even fairly basic principles of population genetics. The essential concept is not intuitively obvious, but it is well established. The key point is this: over time, one’s descendants either vanish fairly quickly or expand dramatically. After a certain point, if one has *any* descendants, then all (or virtually all) people are descendants. Meldrum discusses the recent change in the Book of Mormon’s modern introduction, which alters the description of Lamanites from, as he quotes it, “principle ancestors” of the Amerindians to “among the ancestors.” “The Church has had no official position” on these matters, Meldrum tells us, “until recently.” He then goes on to tell us that this change “clarifies the position of the [B]rethren and answers the question of whether *all* Native Americans are descendants of the Lamanites. Clearly they are not” (pp. 16–17, emphasis in original). Meldrum claims that this represents the Church’s “official position,” but his presumption reads into the text things that are not there. He makes the erroneous

conclusion that being only *partly* of Lehi ancestry means that some Amerindians do not share Lehi as an ancestor *at all*. But population genetics makes this extraordinarily unlikely, as we will now see.

The issue of historical figures having descendants came to popular attention with the runaway success of Dan Brown's novel *The Da Vinci Code*. In it Brown posits that Jesus was married and had children, with descendants surviving to the present day. The novel provided a springboard for one population geneticist to discuss the question of whether Jesus could have descendants still living:

If anyone living today is descended from Jesus, so are most of us on the planet. That absurd-sounding statement is an inevitable consequence of the strange and marvelous workings of human ancestry. . . . Say you go back 120 generations, to about the year 1000 B.C. According to the results presented in our *Nature* paper,<sup>122</sup> your ancestors then included everyone in the world who has descendants living today. . . . If Jesus had children (a big if, of course) and if those children had children so that Jesus' lineage survived, then Jesus is today the ancestor of almost everyone living on Earth. True, Jesus lived two rather than three millenniums ago, but a person's descendants spread quickly from well-connected parts of the world like the Middle East. . . . In addition to Jesus . . . we're also all descended from Julius Caesar, from Nefertiti, from Confucius . . . and from any other historical figure who left behind lines of descendants and lived earlier than a few thousand years ago. *Genetic tests can't prove this, partly because current tests look at just a small fraction of our DNA.* But if we're descended from someone, we have at least a chance—even if it's a very small chance—of having their DNA in our cells. . . . People may like to think that they're descended from some ancient group while other people are not. But human ancestry doesn't

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122. See Douglas L. T. Rohde, Steve Olson, and Joseph T. Chang, "Modelling the recent common ancestry of all living humans," *Nature* 431 (30 September 2004): 562–66, [www.nature.com/nature/journal/v431/n7008/abs/nature02842.html](http://www.nature.com/nature/journal/v431/n7008/abs/nature02842.html) (accessed 11 May 2010).

work that way, since we all share the same ancestors just a few millenniums ago.<sup>123</sup>

If everyone now alive can share ancestry with someone who lived two thousand years ago, then it becomes plausible—even overwhelmingly likely—that Lehi would be an ancestor to virtually all modern-day Amerindians, given that he lived half a millennium earlier than Christ. Olsen elsewhere notes that all Europeans share a common ancestor who was alive in AD 1400—only six hundred years ago!<sup>124</sup> Lehi need not be the dominant or “principal” ancestor—but if there are *any* Lehi descendants, then the vast majority of the pre-Columbian population shared Lehi as an ancestor prior to contact. Meldrum misunderstands a key distinction and then attributes his own views to “the brethren.”

### *II.B.2 Saving Lehi’s signal—the early years*

It is a great irony that Meldrum has essentially created a problem where one did not exist by insisting that “lineal descent” must mean “shares genetic markers” when it clearly does not. He then claims that a lineage introduced into the new world 2,600 years ago would likely have only a small *part* of the Amerindians as its descendants, not most or all of them. But this too is virtually impossible. And Meldrum also claims that the Book of Mormon promises the eventual revelation of scientifically proven genetic links when it does not. Having dug himself and his reader into a deep hole, he now goes to extreme efforts to get out.

Meldrum is aware that a small group like Lehi’s could disappear into the larger hemisphere’s genetic milieu. But that conclusion is unacceptable to him, and he insists that such a fate does not apply to the Nephites (p. 27). He quotes 2 Nephi 5:5–6 about Nephi’s split from Laman and Lemuel, but he does not accept the reading that “all those

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123. Steve Olson, “Why We’re All Jesus’ Children,” *Slate* (daily Web magazine), 15 March 2006, emphasis added, [www.slate.com/id/2138060](http://www.slate.com/id/2138060) (accessed 11 May 2010).

124. See citation and discussion in Matthew Roper, “Swimming in the Gene Pool: Israelite Kinship Relations, Genes, and Genealogy,” *FARMS Review* 15/2 (2003): 160.

who would go with me” could refer to non-Lehite “others” who had joined the Lehi/Nephi party (p. 27).<sup>125</sup> Instead, he writes:

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 [?] . . . 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? (pp. 27–28)

This is certainly *possible*, but virtually anything is possible in some sense. However, if Nephi leads the families of Zoram, Sam, his sisters, Jacob, Joseph, and parts of the families of Laman, Lemuel, and Ishmael, then he has virtually the entire Lehite party—only eight known individuals remain (Laman, Lemuel, the sons of Ishmael, and four spouses), plus any children who remain Lamanites. Why is Nephi fleeing when he has the majority? Meldrum decides that “they chose to leave the security of the combined group . . . [because] there was either a lack of others [in the area] who may be hostile or there were others, and they were ‘friendly’” (p. 28). But if these others are friendly, then Nephi need not flee, because this will only increase the numbers on Nephi’s side. So we are again back to the question of why someone who has the majority is fleeing. It seems more plausible that there were hostile non-Lehites as well, and so Nephi had to flee both his brothers and the surrounding natives.

But Meldrum, arguing that Laman and Lemuel would not have been able to co-opt the surrounding indigenous peoples, asks, “Why would other people who presumably greatly outnumber Laman’s group determine to take upon themselves the name of the oldest

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125. On this point, Meldrum quotes Matthew Roper, “Nephi’s Neighbors: Book of Mormon Peoples and Pre-Columbian Populations,” *FARMS Review* 15/2 (2003): 91–128. He does not mention the seminal work by John L. Sorenson, “When Lehi’s Party Arrived in the Land Did They Find Others There?” *Journal of Book of Mormon Studies* 1/1 (1993): 1–34. Also important is Sorenson, “The Composition of Lehi’s Family,” 174–96.

brother of this small, rather insignificant group of most likely less than 100 souls?” (p. 28). If this is true, then again we have Nephi holding the majority and still fleeing, which is strange. There is also, we note, no evidence that at this point the putative “others” began calling *themselves* Lamanites, as that was the label that *Nephi* and his group gave to their enemies (2 Nephi 5:14; Jacob 1:13). And, as has long been noted, Lehi’s group may have been able to quickly achieve positions of prominence among the “others” because of their prestigious skills such as metalworking and writing.<sup>126</sup>

Matthew Roper noted that the scripture also indicates that the Lamanites had already begun to mix with others at or near Nephi’s departure:

After explaining how he and his people separated themselves from Laman, Lemuel, the sons of Ishmael, and their people and having told how the people of Nephi became established in the land, Nephi quotes a prophecy of the Lord. “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” (2 Nephi 5:23). This prophecy anticipates future mixing and intermarriage with the Lamanites, but the immediacy of Nephi’s personal observation that “the Lord spake it, and it was done” suggests that the process was already under way at the time Nephi left or very shortly after the separation. That is, unidentified people had, at this early period, already joined with the Lamanites in their opposition to Nephi and his people and had become like them, and Nephi saw this event as a fulfillment of the Lord’s prophecy. Since Nephite dissensions are not explicitly mentioned until several generations later, Nephi’s statement about unidentified peoples intermarrying with the Lamanites seems to indicate the presence of other non-Lehite peoples who had joined or were joining the Lamanites.<sup>127</sup>

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126. Gardner, *Second Witness*, 2:11–13, 91–107.

127. Roper, “Nephi’s Neighbors,” 121–22. This is another example of the answers to Meldrum’s dilemmas being found in material that he cites.

But regardless of how one resolves the conundrums of Meldrum's reading of the Nephi/Laman split, it is clear that he has not engaged the fundamental issue behind the belief that there were "others" present. The textual clue in 2 Nephi 5 is part of the evidence, but it is not the only bit, or the most important. John Sorenson set out the parameters with which we must contend:

Let us at least start to bracket the possible growth in numbers [of Lehite populations] by setting an upper limit that is at the edge of absurdity. Assume a birth rate twice as high as in today's "less developed countries," a rate perhaps not even attainable by any population. Let us also suppose no deaths at all! Under those conditions, if the initial Nephite group was comprised of twenty-four persons, as I calculate generously, by the time of Jacob 2, they would have reached a population of 330, of whom perhaps seventy would be adult males and the same number adult females. Of course the unreality of that number means we must work downward. Using a more reasonable figure for the birth rate and factoring in deaths, we see that the actual number of adults would be unlikely to exceed half of what we first calculated—say, thirty-five males and thirty-five females. Even that is far too large to satisfy experts on the history of population growth.<sup>128</sup>

Even if, to accommodate Meldrum's reconstruction, we add a few additional people to Nephi's party while deducting them from Laman's, it will make little difference. Meldrum offers us what seems an offhand suggestion that Lehi's group made up "most likely less than 100 souls," but this demonstrates that he has not given this matter much thought. One hundred is far too many; Nephi would be lucky to leave with twenty-five people from the Lehite party, and that is a most rosy estimate.

Sorenson also points out that by twenty-five years later there were "wars" between the Lamanites and Nephites. Yet population growth rates mean that without "others" added to the mix, Lehi would have

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128. Sorenson, "When Lehi's Party Arrived," 3.

had around twenty adult male descendants.<sup>129</sup> Any deaths from these “wars” would have curtailed future population levels even further, worsening the problem. (It is also difficult to see battles between ten men on a side as a “war.”)

As often happens, Meldrum cites an author in one vein but fails to mention other aspects of the author’s work that would provide much of the information that readers of *Remnant through DNA* need. James Smith’s article on Nephite demographics makes these same points. For example, computer modeling suggests that by the time of Nephi’s death, there was an average of twenty-five to thirty-five living descendants from the initial Lehi group. The most optimistic projections still provide only fifty to sixty-five people, and these must be split between the Lamanites and Nephites.<sup>130</sup> My own calculations show that if we double the known numbers in Nephi’s initial party to twenty (probably too high), then at twenty years per generation with a 1 percent annual growth rate (likely much too high),<sup>131</sup> there would still be no more than about one hundred people by the tenth generation, circa 420 BC. Yet by 400 BC Jarom reported that the Nephites had “multiplied exceedingly, and spread upon the face of the land,” having resisted the Lamanites “many times” and “fortified [their] cities” (Jarom 1:7–8). It is hard to see fifty males doing all this, or having even a single city to fortify.

Nephi also doesn’t seem to think that it is incongruous—not to mention slightly ridiculous—that a few dozen of his people want him

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129. Sorenson, “When Lehi’s Party Arrived,” 4, citing 2 Nephi 5:34. See also Sorenson’s later estimate that Nephi’s party consisted of about eleven adults and thirteen children from the original Lehite party. John L. Sorenson, *Nephite Culture and Society*, ed. Matthew Sorenson (Salt Lake City: New Sage Books, 1997), 66; cited in Gardner, *Second Witness*, 2:88.

130. Smith, “Nephi’s Descendants?” 286.

131. The highest rate of world population growth ever seen was 2.2 percent in 1963. I find it difficult to believe that premoderns like the Nephites could sustain even a 1 percent rate in the long term. This rate thus represents a reasonable “upper bound.” See “World population,” [en.wikipedia.org/wiki/World\\_population](http://en.wikipedia.org/wiki/World_population) (accessed 11 May 2010). Sorenson, “When Lehi’s Party Arrived,” note 3, suggests that rates even as high as 6–7 per thousand per year (0.6–0.7 percent) would have been exceptional and not long maintained. James Smith’s computer model simulations are a more sophisticated approach to this issue.

to be their king (2 Nephi 5:18). Enos describes “exceedingly many prophets among us” (Enos 1:22). How many prophets can a population of under a hundred produce, much less require?

It is the harsh realities of these figures that make it virtually certain that the “Nephite” *and* “Lamanite” societies almost immediately included members outside Lehi’s founding group. There are other textual clues, some that Meldrum notes and others that he ignores, but even without such clues the presence of a large pool of “others” is a virtual necessity. And that necessity almost immediately would have led to a severe dilution of any Middle Eastern mtDNA markers carried by the Lehite party’s women.

Meldrum’s argument is muddled at this juncture because he concedes that even by the time of the events recorded in 2 Nephi 5 (between 588 and 559 BC), “Lamanites were already mixing their ‘seed’ with others” (p. 29). If this is so, then it seems implausible to argue (as Meldrum does) that there were no groups around who could have been hostile to Nephi or friendly to Laman. Meldrum sees the introduction of “others” into Lamanite circles as being required by the Book of Jarom. He reasons that “the outnumbering by the Lamanites was due to being either more prolific in child bearing, or . . . their numbers were being bolstered through an influx of other peoples” (p. 30; see p. 33). He then rules out greater Lamanite reproduction as a cause on the grounds that “righteous people tend to place higher priority on families and children, rather than personal pursuits” (p. 30). This claim is presentist. In the premodern period, infant and maternal mortality were high. Birth control was primitive or nonexistent and life expectancy short. More children meant more laborers. They also served as insurance against disease, acted as providers in their parents’ old age, and at worst provided more fodder for military action. I too doubt that Lamanites were more prolific than Nephites, but this would be due to the cold realities of premodern life, not to the Nephite embrace of a twenty-first-century Mormon family-centered ethic. (Meldrum’s theory also ignores the prophetic praise given to Lamanite husbands, wives, and children for their healthy family life; see Jacob 3:7.) As Sorenson noted, “Unlike in modern times, anciently it was

not birth *prevention* that occupied couples' minds but anxiety *for* the bearing and rearing of children."<sup>132</sup> This is one of many examples in which Meldrum's analysis is not grounded in the ancient world; he merely plucks out what seems plausible to him, a modern reader.

Furthermore, Meldrum's confidence is misplaced when he argues that because "no mention of such a demographic discrepancy [between Lamanites and Nephites as described in Jarom 1:6] was given in the text at the time of their initial separation" (p. 30), this means that the imbalance in numbers was a later development. As we previously saw, if Nephi's group was not outnumbered at the outset, their flight makes little sense. Our information about Nephite history is most sketchy at precisely this period since we have only the small plates. Two hundred and ninety years of history is covered in fewer than five modern printed pages, and the authors are clear that their focus is almost exclusively religious, not political or military (Jacob 1:2). Most of 2 Nephi following Nephi's departure is dedicated to scriptural commentary or prophecy, not history. Nephi himself notes that his record of "wars and contentions" is found on his large plates, which we again recall presents major demographic challenges to Meldrum's model (1 Nephi 9:4). Textual silence on these points therefore tells us very little, especially since Nephi makes it clear what made him leave: the Lord commanded him to do so (2 Nephi 5:5; compare 1 Nephi 3:7).

Genetics itself provides perhaps the greatest rebuke to Meldrum's theory—how do we overcome the problem of inbreeding? The initial Lehi party provides genetic material from, at most, seven people: Lehi and Sariah, Ishmael and his wife, Zoram, and potentially two Ishmaelite wives. Yet Meldrum would have us believe that this tiny genetic pool stayed isolated and homogeneous until the Nephites' migration to Zarahemla, "for as many as 458 (588 BC to 130 BC) years this group seems to have honored their . . . commandments not to mix themselves with others, thereby maintaining a very homogeneous population" (p. 31). If we use a very conservative thirty years per generation, this means that for at least fifteen generations, the genes of three males and at most four females were relentlessly crossbred.

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132. Sorenson, "Composition of Lehi's Family," 181, emphasis in original.

If we use a more standard twenty years, this represents twenty-three generations. In conservation biology, animals with fewer than fifty “effective members of the population” suffer “short-term inbreeding depression,”<sup>133</sup> as recessive genes accumulate in the offspring; at least five hundred “effective” members are needed for long-term variability, which for humans translates into a total population size between fifteen hundred and twenty-five hundred people.<sup>134</sup> The famously inbred Spanish Hapsburg dynasty (with a much more extensive gene pool and the chance for outside marriage partners) did very poorly over only sixteen generations in about half the time for which Meldrum isolates his Nephites (AD 1516–1700), with the last heir dying impotent and mentally retarded in 1700.<sup>135</sup> This does not seem a strategy that would help the Nephites “prosper in the land.”

In Meldrum’s reconstruction, “once a substantial imbalance of population and thus power had occurred, . . . the believing Nephites move[d] out of the land of Nephi to the land of Zarahemla” (p. 30). He believes, however, that prior to mixing with the more numerous Mulekites, “the Nephite genetic group would have remained relatively intact and would have retained to a large extent its genetic signatures” (p. 31). This is the reason for Meldrum’s insistence on all these points, but his solution does nothing to resolve the central demographic issues in the early part of Nephite history or the catastrophic medical consequences of sustained inbreeding, to say nothing of the archaeological evidence that suggests that avoiding “others” would

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133. I. R. Franklin, “Evolutionary Change in Small Populations,” in *Conservation Biology, an Evolutionary-Ecological Perspective*, ed. Michael E. Soulé and Bruce A. Wilcox (Sunderland, MA: Sinauer Associates, 1980), 135–49; cited in Leonard Nunney and Kathleen A. Campbell, “Assessing Minimum Viable Population Size: Demography Meets Population Genetics,” *Trends in Ecology and Evolution* 8/7 (1 July 1993): 236, [www.cell.com/trends/ecology-evolution/abstract/0169-5347%2893%2990197-W](http://www.cell.com/trends/ecology-evolution/abstract/0169-5347%2893%2990197-W) (accessed 12 May 2010).

134. Nunney and Campbell, “Minimum Viable Population Size,” 236. See also John Hawks et al., “Population Bottlenecks and Pleistocene Human Evolution,” *Molecular Biology and Evolution* 17/1 (2000): 12, [mbe.oxfordjournals.org/cgi/reprint/17/1/2](http://mbe.oxfordjournals.org/cgi/reprint/17/1/2) (accessed 12 May 2010), who suggest a 1:3 ratio (i.e., ~1,500 in this case).

135. Gonzalo Alvarez, Francisco C. Ceballos, and Celsa Quinteiro, “The Role of Inbreeding in the Extinction of a European Royal Dynasty,” *PLoS ONE* 4/4 (2009): 1–4, [tinyurl.com/34vhhmm](http://tinyurl.com/34vhhmm) (accessed 12 May 2010).

have been virtually impossible anyway.<sup>136</sup> To be plausible on these points, *Remnant through DNA* needed to address *all* of the arguments raised by Sorenson and Smith and provide a more appealing solution to them individually and collectively.<sup>137</sup>

### *II.B.3 Saving Lehi's signal—prohibition against intermarriage*

Meldrum repeatedly insists that the covenant prohibition against intermarriage would prevent the Nephites from mingling with the “others” (pp. 28–30). In doing so, he leaves unmentioned the possibility of conversion: there is no prohibition against marriage to a stranger who joins the covenant. Matthew Roper has argued persuasively that Jacob and Nephi invoke Isaiah (2 Nephi 6–10) precisely because there are just such (non-Lehite) converts.<sup>138</sup> Furthermore, although Meldrum appeals to Israelite practice as justification for its ideas about Nephite exclusivity, he ignores what the cited sources say about actual Israelite marriage behavior. Roper illustrates the extensive intermixture of various peoples and races in and around Israel, citing an author who concludes that “the presence of so many foreign men could not help but lead to interbreeding with the Israelite women. . . . Toward the end of this period, the mixed origin of the Judaites must have been common knowledge.”<sup>139</sup> Roper also cites John Bright:

We are not to suppose that the entity we call Israel was formed and held together in the face of adversity exclusively, or even primarily, through ties of blood kinship. True, the Bible traces the descent of all the tribes to the ancestor Jacob (Israel), and this might lead one to suppose that Israel was in fact a kinship unit. But kinship terminology is often employed in the Bible to express a social solidarity, a feeling of closeness, that actually

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136. Sorenson, “When Lehi’s Party Arrived,” 8.

137. We could doubtless invoke divine miracle to overcome all these issues, but in doing so we leave science behind and anything goes. We might as well claim that God magicked the DNA into its present configuration.

138. Roper, “Nephi’s Neighbors,” 120–27.

139. Raphael Patai, *The Myth of the Jewish Race*, rev. ed. (Detroit: Wayne State University Press, 1989), 96–97; cited in Roper, “Swimming in the Gene Pool,” 138 (see extensive discussion on pp. 132–42).

arose from other factors. Seldom in all of history has blood kinship, or common racial stock or language, been the determinative factor in the formation and preservation of larger social and political units. What is more to the point, there is abundant evidence that not all Israelites were in fact related one to another by blood. . . . Speaking theologically, one might with justice call Israel a family; but from a historical point of view neither her first appearance nor her continued existence can be accounted for in terms of blood kinship.<sup>140</sup>

Meldrum sources Roper's article (p. 17), but he does not engage these points, and simply insists that the tiny Nephite band (with its even tinier pool of genetic donors) persisted in essential genetic isolation over nearly five hundred years, a feat that the much more numerous Israelites did not accomplish.

It should not escape us that Roper's suggestions—while perfectly plausible, in keeping with Israelite history, and far more attractive than the attendant demographic problems coupled with severe inbreeding required by Meldrum's model—cause exactly the problem that Meldrum's theory must avoid at all costs: rapid intermixture, dilution, and probable loss of the precious Nephite genetic signal. And so they are not options.

#### *II.B.4 Saving Lehi's signal—later Nephite history*

Meldrum allows the Nephites to intermarry with the Mulekites by 130 BC, but this does not help his model much. We are almost completely ignorant of the composition of the Mulekite party. Given that they were fleeing a military rout with a son of King Zedekiah, it is not even clear that the Mulekite immigrants included any women to contribute mtDNA. By the time they contact the Nephites (having fled at almost the same time as Lehi), they have been well assimilated into the milieu of the Western Hemisphere and are more than twice as numerous as the Nephites. Given that they have abandoned their Old World texts and religion (Omni 1:17), it seems foolish to think

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140. John Bright, *A History of Israel*, 3rd ed. (Philadelphia: Westminster, 1981), 163; cited in Roper, "Swimming the Gene Pool," 139–40.

that their genetic signal would not likewise have been swamped by intermarriage prior to meeting the Nephites.

Meldrum claims that the Mulekite submission to Mosiah's kingship indicates that "no wars or vying for leadership seems to have occurred, but rather a simple acknowledgement of Mosiah's right to be king" (pp. 34–35). Unfortunately, the record contains numerous indications that this was not the case; others have argued that ongoing Mulekite dissatisfaction with Nephite rule was a potent cause of war and unrest.<sup>141</sup>

As for the Lamanites, though "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" (p. 35). Yet Meldrum has quoted John Butler (p. 27) as illustrating that exactly this type of "case" occurred in Iceland over a period of only 150 years. Once again, data are invoked when useful and then ignored elsewhere.

With the coming of Christ, Meldrum notes that the two groups began to mingle, but despite there being no "Lamanites, nor any manner of -ites" (4 Nephi 1:17), he argues that "it is not clear if this also included intermarriage between groups or not" (p. 38). Meldrum has insisted that it was religious prohibitions that kept the Nephites from mingling with "others," even to the point of effectively restricting themselves to seven gene donors for nearly five hundred years. Yet, with the people united in Christ with no distinctions, he still is not ready to concede intermarriage even without the religious prohibition—despite the fact that Christ's fulfillment of the law of Moses would have also removed many of these putative marriage restrictions. "It will be assumed," we are told, "that some limited intermixing did occur; however[,] wholesale mixing is thought to have still been unlikely" (p. 38). Assumptions cannot replace evidence and analysis.

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141. John A. Tvedtnes, "Book of Mormon Tribal Affiliation and Military Castes," in *Warfare in the Book of Mormon*, ed. Stephen D. Ricks and William J. Hamblin (Salt Lake City: Deseret Book and FARMS, 1990), 298–99.

With the disintegration of the 150 years of peace following Christ's coming, Meldrum notes that the titles "Nephite" and "Lamanite" may refer more to their state as believers, but he still argues that

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. . . . 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. (pp. 38–39)

Thus, even now, Meldrum keeps the Nephites generally isolated genetically from the Lamanites, and everyone else. (He also assumes without warrant that ethnic labels will correlate well with genetic markers.)<sup>142</sup> Strangely, his decision to isolate the later Nephites does little to help his theory since he declares that "the final battles . . . then involved to a larger degree the extermination of a higher percentage of the 'Nephite' genetic markers than the 'Lamanite' ones" (p. 39). So Meldrum is claiming that the Nephites remained generally intact through their entire history and were decimated at Cumorah—none of which strengthens his case for persisting Nephite genetic markers, since he has kept them as isolated as he can manage throughout their history and then has exterminated the majority.

It is also strange that Meldrum argues that mutations within each lineage had become "fixed" (p. 39). I suspect Meldrum is misusing the term *fixed*, which in population genetics describes a situation in which a group previously had multiple varieties (alleles) of a gene but now has lost all of the varieties but one. Every member of the population now shares the same gene. His terminology implies that within only one thousand years, the Nephites and Lamanites had managed to develop genetic markers that distinguish them from each other—and each group has one and only one allele at that site. It is not clear how

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142. See the introduction, section B, "Scientific races?" for discussion of the difficulties with this view.

he knows this or how he has derived a rate of fixation that is only 20 percent of the predicted value.<sup>143</sup>

But, once again, if this claim is accepted, it still does not help his case. The Nephite “fixed” allele will be almost exterminated and will not be widespread in others because of the strict lack of interbreeding that has been insisted upon at every turn. As we have seen, Meldrum concedes that the Lamanites mixed early with the “others,” leading to their skin curse and population explosion (pp. 29–30, 33)—but we must not forget that in all likelihood this scenario eliminates any Middle Eastern Lamanite-specific DNA markers.

Meldrum has thus succeeded in largely confining the putative markers of interest to a line destined for near eradication. Even if the supposed Nephite marker had survived (a proposition bordering on absurdity given the scenario outlined), it now undergoes yet another extreme bottleneck effect, and any survivors are (once again) in a sea of others and Lamanites, without even an Israelite religious prohibition to confine them to their own genetic clan.

### *II.B.5 A real world test*

Fortunately, we need not merely trust our intuition that the practical problems are insurmountable for Meldrum’s model. The real world has provided us with a beautiful test case, in Tristan da Cunha,<sup>144</sup> an isolated island in the south Atlantic, located approximately midway between Buenos Aires and Africa’s Cape of Good Hope. First discovered in 1506, the island was used as a garrison site until 1817, when it acquired its first permanent residents—William Glass and his wife. The 38-square-mile island contains only about three square miles of habitable and arable land. Other donors to the gene pool arrived between 1827 and 1908.

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143. The “predicted time to fixation for a neutral, mitochondrial, heteroplasmic variant in humans . . . [is] approximately 200 generations,” which would require around twenty-five years times two hundred, or five thousand years—far too long for the thousand-year history of the Nephites. Daniel James White et al., “Revealing the Hidden Complexities of mtDNA Inheritance,” *Molecular Ecology* 17/23 (2008): 4930.

144. Himla Soodyall et al., “The Founding Mitochondrial DNA lineages of Tristan da Cunha Islanders,” *American Journal of Physical Anthropology* 104/2 (1997): 157–66. My thanks to James Stutz for helping me track down this and other papers.

By historical records it is known that fifteen men and fifteen women were potential contributors to the island's DNA pool. Despite this, today mtDNA and nuclear DNA are found only from seven women, while all fifteen males have modern descendants. The other eight women or their descendants have either "died or left the island," leaving no genetic trace.<sup>145</sup> (We are here reminded of the numerous "dissensions" [e.g., Jarom 1:13] to the Lamanites, which would have the same effect, in Meldrum's model, of people departing Tristan da Cunha.) The implications of this finding are clear: despite a total of fifteen women with the opportunity to leave DNA markers behind, *less than half did so*.<sup>146</sup> This occurred over a period of less than two centuries and, like the study of Iceland cited by Butler (and referenced by Meldrum, p. 27), illustrates the significant loss of mtDNA information that can occur in short time frames.<sup>147</sup> Finally, Tristan da Cunha islanders did not have to cope with *any* "others" diluting their signal, while the Lehites would have been surrounded by tens of thousands at least.

### *II.B.6 Conclusion*

This portion of Meldrum's argument is a troubling mix of misinformation, supposition, and special pleading. The author does not appear to have a realistic idea about the likelihood of his genetic scenarios, and he ironically makes his case *worse* by some of the special pleading. From the coming of Christ onward, for example, he apparently thinks that he has helped his case by continuing to confine the Nephites to themselves as much as possible, when in fact

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145. Soodyall et al., "DNA Lineages of Tristan da Cunha," 158.

146. A later analysis showed seven Y-chromosome markers from the potential fifteen male donors; one of these markers is likely a new mutation (Himla Soodyall et al., "Genealogy and genes: tracing the founding fathers of Tristan da Cunha," *European Journal of Human Genetics* 11 (2003): 705–9, [www.nature.com/ejhg/journal/v11/n9/pdf/5201022a.pdf](http://www.nature.com/ejhg/journal/v11/n9/pdf/5201022a.pdf) (accessed 13 May 2010)).

147. Agnar Helgason et al., "A Populationwide Coalescent Analysis of Icelandic Matrilineal and Patrilineal Genealogies: Evidence for a Faster Evolutionary Rate of mtDNA Lineages than Y Chromosomes," *American Journal of Human Genetics* 72/6 (June 2003): 1370–88, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1180299/pdf/AJHGv72p1370.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1180299/pdf/AJHGv72p1370.pdf) (accessed 13 May 2010); see reference in Butler, "Addressing Questions," 105–6.

it would be far better to admit to a complete mixing, thus spreading the Nephite marker as widely as possible to ensure its survival after Cumorah. Even that adjustment, however, could not save his model.

*II.C Is There an mtDNA Link between the Middle East and the Americas?*

Meldrum proceeds next to establish what we should be “looking for” to meet the expectations that he has created. In an apparent effort to discredit Mesoamerican models, he claims that “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?” (p. 61) The question betrays two misconceptions. We have already addressed the first with the observation that population genetics tells us that virtually all Amerindians of Joseph Smith’s day would have been descendants of Lehi (see section II.B). The second misconception revolves around Joseph Smith’s view of such matters. In Joseph’s day, Amerindians were thought of as a single discrete group. The idea that the Maya, Apaches, and Blackfoot were different, distinct cultures or populations would likely not have occurred to Joseph or his contemporaries. Given that all Amerindians would have been Lehi’s descendants by Joseph’s day, there was likewise no need for Joseph to make such a distinction, or for the Lord to inspire him to do so. Angelic messengers likewise would have had no need to make any such distinction—all Amerindians, including those who lived near Joseph, shared Lehi as an ancestor. “The notion that ‘the Indians’ constituted a single ethnic entity,” notes Sorenson, “is a totally outdated one which neither scholars nor lay people can justifiably believe nowadays.”<sup>148</sup> But in Joseph’s day this was the popular and scientific orthodoxy, as Dan Vogel (no friend of the church) noted:

Only a few early nineteenth-century writers suggested multiple origins for the American Indians. The very term “Indian,”

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148. Sorenson, “When Lehi’s Party Arrived,” 8.

as Robert F. Berkhofer, Jr., has pointed out, embodied a unitary concept of the native inhabitants of the Americas invented by Europeans. “By classifying all these many peoples as Indians,” writes Berkhofer, “whites categorized the variety of cultures and societies as a single entity for the purposes of description and analysis, thereby neglecting or playing down the social and cultural diversity of Native Americans then—and now—for the convenience of simplified understanding.”<sup>149</sup>

Joseph had neither cultural nor genetic reasons to make the distinction that Meldrum feels he should have made. But the point that Joseph’s local Amerindians were Lehitese tells us nothing about their original location or geography two and a half millennia earlier.

Undeterred by these considerations, Meldrum sets out to prove that the mtDNA X2 marker is found in the Amerindians of the modern northeastern United States. He then argues that this X2 marker is related to the Middle East and that it thus represents the Lehitese in their original location.

### *II.C.1 The discovery of X2 in America*

The term *haplogroup* denotes a group of people sharing a similar set of mutations on their mtDNA profile (called *haplotype*). These mutations accumulated gradually over time and independently across the different mtDNA lineages found around the world. Therefore, a haplogroup can be used to identify both a specific group of humans who share a common ancestor, as well as a particular geographic origin where these ancestors lived thousands of years ago. Most Amerindians are descendants of the ancestral haplogroups A, B, C, and D, which ancestry is also shared with some people from northern and eastern Asia (not all Asians descend from these four haplogroups). This provides support for the theory that the principal colonization of the Americas was likely the result of a human expansion that took place across the now submerged Bering Strait land bridge. Developments in

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149. Dan Vogel, *Indian Origins and the Book of Mormon: Religious Solutions from Columbus to Joseph Smith* (Salt Lake City: Signature Books, 1986), 8–9.

this area are described by Meldrum on pages 72–80. I will here briefly summarize the story from my reading of the relevant papers.<sup>150</sup>

Haplogroup X was first classified as one of the Native American lineages in 1996, and at the time it was still unknown in northeast Asia.<sup>151</sup> Various sources for this marker were proposed. In 2001 pre-Columbian human remains (as determined by carbon dating) were found that included haplogroup X2.<sup>152</sup> This finding confirmed X2 as a genuine Native American haplogroup that could not be attributed to post-contact admixture with European lineages. In that same year, X2 was also located among the Altaian people of Central Asia, leading some to conclude that this was indeed the source population for X2 in America through another Beringian expansion.<sup>153</sup>

### *II.C.2 Are all X2 created equal?*

The matter did not, however, rest there. As Meldrum tells us, “In the prestigious *American Journal of Human Genetics*” (p. 76), Reidla and colleagues determined that X2 consisted of several subgroups. That is, the descendants who shared X2 later split off from each other, forming smaller sub-families,<sup>154</sup> designated as X2a, X2b, and so on. Reidla designated Amerindian members of the X2 haplogroup the

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150. For more details, see the section titled “Brief History of Haplogroup X Research” on the FAIR Web site, “Section 1: DNA Evidence,” in “Reviews of *DNA Evidence for Book of Mormon Geography*,” [www.fairlds.org/DNA\\_Evidence\\_for\\_Book\\_of\\_Mormon\\_Geography/DEBMG01F.pdf](http://www.fairlds.org/DNA_Evidence_for_Book_of_Mormon_Geography/DEBMG01F.pdf) (accessed 5 May 2010). My thanks to Ugo Perego for tutoring and clarification on these points.

151. Peter Forster et al., “Origin and Evolution of Native American mtDNA Variation: A Reappraisal,” *American Journal of Human Genetics* 59/4 (1996): 935–45, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1914796/pdf/ajhg00023-0194.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1914796/pdf/ajhg00023-0194.pdf) (accessed 13 May 2010). The presence of haplogroup X in America (the Nuu-Chah-Nulth tribal group of British Columbia, Canada) was reported in the scientific literature as early as 1991, but it was not yet called haplogroup X. See Richard H. Ward et al., “Extensive Mitochondrial Diversity within a Single Amerindian Tribe,” *Proceedings of the National Academy of Sciences of the United States of America* 88 (1991): 8720–24.

152. Ripan S. Malhi, “Investigating Prehistoric Population Movements in North America with Ancient and Modern mtDNA” (PhD diss., University of California, 2001).

153. Miroslava V. Derenko et al., “The Presence of Mitochondrial Haplogroup X in Altaians from South Siberia,” *American Journal of Human Genetics* 69/1 (July 2001): 237–41, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1226041](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1226041) (accessed 13 May 2010).

154. Sometimes called “clades,” indicating that they are groups that consist of all descendants (and only such descendants) of a common ancestor.

X2a subfamily. Altaians in Siberia were all in X2e.<sup>155</sup> This means that the source of the Amerindian mtDNA marker had split off into its own “family” well before the Altaians formed their own subfamily. The Altaians could not be the source of X2 in North America.

Unmentioned at this stage are other conclusions from the *American Journal of Human Genetics*, including that X2a’s arrival in the Americas was “not later than 11,000” years ago.<sup>156</sup> Meldrum refrains from discussing these issues at all. Even when his in-text citations include such phrases as “might be indicative of an Upper Paleolithic” (i.e., 40,000–10,000 years ago) or “around, or after, the LGM (Last Glacial Maximum [i.e., approx. 18,000 years ago]),” his discussion ignores these completely (pp. 76–77).<sup>157</sup> The snippets that prove the point he wishes to make are used; the other matters are left to one side. Issues of dating are placed in a later chapter and are separated from the DNA discussion by a chapter on Meldrum’s preferred geography. By the time dating is discussed, it is made to seem a minor point only blocked by scientific dogmatism. (I treat the dating issue below in section II.D.)

### *II.C.3 Some pre-Lehite remains may contain haplotype X*

Meldrum is right to emphasize that since carbon-dated remains from before Columbus contain haplogroup X, the presence of haplogroup X in the Americas cannot be attributed to later European

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155. Maere Reidla et al., “Origin and Diffusion of mtDNA Haplogroup X,” *American Journal of Human Genetics* 73/5 (November 2003): 1178–90, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1180497/pdf/AJHGv73p1178.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1180497/pdf/AJHGv73p1178.pdf) (accessed 13 May 2010).

156. Reidla et al., “Origin and Diffusion,” 1188.

157. In his DVD presentation, Meldrum uses a slide that completely omits the phrase about the “Last Glacial Maximum” (Meldrum, *DNA Evidence*, section 1, “DNA Evidence”). He now includes the phrase, which is an improvement, though the data from these papers are never discussed in his section on “DNA Dating” (pp. 93–128). On the DVD’s misleading citation and slide, see FAIR, “Review: Section 1, DNA,” 24–25.

influence (p. 90). He ignores, however, that there may be similar evidence<sup>158</sup> of haplogroup X from remains that date *before Lehi*.<sup>159</sup>

#### *II.C.4 Is X2a evidence of Lehi?*

Meldrum concludes his discussion of X2 with a table that purports to show all the things that are “verified” about the DNA evidence he presents. The only aspect that is labeled as “not yet” verified is the presence of “European/Mediterranean DNA arriving . . . near 600 bc” (p. 91). How well do these claims match the evidence they claim to summarize? We will examine each of the following claims: (a) X2 is “European DNA” and “correlates with Mediterranean lineages,” (b) X2 is “verified to be ancient and existing at the time Lehi left Jerusalem,” and (c) X2 is “DNA lineage from a Semitic population that is associated with Native North American populations” and is “DNA stemming from Jewish populations that is associated with Native North American populations” (p. 91).

#### *II.C.4.a Is X2 “European DNA” that “correlates with Mediterranean lineages”?*

Is the Amerindian marker “European”? Does it “correlate” with the Mediterranean area? The answers depend on one’s definition. An example may be helpful. Let us imagine that there are still a few native speakers of Latin alive today in isolated pockets of Europe. But most Europeans have since adopted the Romance languages descended from Latin—French, Spanish, Italian, and so on. X2 plays the same role in population genetics as Latin in this example. X2’s subfamilies (X2a, X2b, X2c, and so forth) are the Romance languages. X2 is an

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158. William W. Hauswirth et al., “Inter- and Intrapopulation Studies of Ancient Humans,” *Cellular and Molecular Life Sciences* 50/6 (1994): 585–91; Forster et al., “Origin and Evolution of Native American mtDNA Variation,” 939; and Jason A. Eshleman, Ripan S. Malhi, and David Glenn Smith, “Mitochondrial DNA Studies of Native Americans: Conceptions and Misconceptions of the Population Prehistory of the Americas,” *Evolutionary Anthropology* 12 (2003): 13.

159. For a discussion of some of the difficulties and uncertainties associated with these data, as well as an excellent review of the entire Book of Mormon/DNA issue, see Ugo A. Perego, “The Book of Mormon and the Origin of Native Americans from a Maternally Inherited DNA Standpoint,” in this issue of the *FARMS Review*.

*ancestral* marker that has since developed into a variety of separate subfamilies, though it is possible for a present-day person to have the initial X2 mutation and none of the subsequent mutations that make a subfamily.<sup>160</sup> Members of the X1 haplogroup share an ever earlier ancestor with X2.

There are some clear similarities between the Romance languages—they are obviously much more closely related to each other than French is to, say, Mandarin Chinese. But it would be fundamentally misleading to say that a French speaker has a language that “correlates with Italy” simply because French is descended from Latin, which got its start in the Italian peninsula. There is a link to Rome, if one goes back far enough in time and space, but this does not make French the equivalent of Italian or Latin.

Meldrum makes a similar mistake with the X2 lineages. It is true that X2 is thought to have begun in the Mediterranean area. But the X2a lineage is found only in Amerindians. Meldrum emphasizes X2a’s uniqueness when he cites Latter-day Saint geneticist Ugo Perego’s “very latest results in mtDNA research [that] reaffirm that haplogroup X2a continues to be restricted to North America” (p. 78). Meldrum emphasizes North America’s possession of X2a (pp. 79–80) because he is determined to exclude Mesoamerica from the prize of having Lehiite descendants, the better to support his geographical theories. Meldrum ignores, however, that if X2a is restricted to North America, then it is not found in the Mediterranean or in Europe.<sup>161</sup> (See section II.B.1 above for a discussion of the genetic difficulties in restricting Lehi’s modern-day descendants to a limited area of the hemisphere.)

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160. Unclassified individuals or new subgroups are also sometimes placed in the X2\* “paragroup.” By analogy, one might categorize a newly discovered speaker as a “Latin-related speaker” pending formal classification of the language as either Latin, a known Romance language, or a new tongue.

161. Certainty about X2a being found only in the Americas may be premature. Perego points out that recent work has identified “a small number of haplotypes carrying the same diagnostic coding region mutation shared by the Native American X2a samples” (Martina Kujanová et al., “Near Eastern Neolithic Genetic Input in a Small Oasis of the Egyptian Western Desert,” *American Journal of Physical Anthropology* 140/12 [2009]: 336–46; cited in Ugo A. Perego, “Origin of Native Americans”). The sample is currently placed in the X2\* paragroup.

Furthermore, Meldrum emphasizes that the Siberian Altaians are not X2a but X2e (p. 77). He rightly draws the reader's attention to this fact and does so because he does not want the Altaians to be mistaken for a potential source of Amerindian X2 via the Beringian land bridge.

Meldrum then discards this very sensible caution when he discusses the Druze. The Druze religious sect is highly endogamous (its adherents tend to marry among themselves) and does not proselyte. A 2008 study by Shlush and others found that approximately 7.7 percent of Druze were part of the X2 group.<sup>162</sup> Meldrum reinforces the link between the Druze and X2 by citing an article from 2007 that studied Saudi Arabian populations, including Druze.<sup>163</sup> His citation notes that 27 percent of the Druze “belong[ed] to the minority haplogroup X” (p. 81).<sup>164</sup> By now we should be suspicious when only “haplogroup X” is referred to, since we are interested in something more specific: Are these lineages X1 or X2? And if they are X2, are they X2a or something else? As it turns out, “only two X1 and X2” haplotypes were found among the Arabian Druze, which may reflect a founder effect.<sup>165</sup> So some of these examples are not even necessarily X2, much less X2a. The Israeli Druze also had members from X1a and X1b, so an X1 group in Saudi Arabia is not surprising, but worth little in establishing Meldrum's claims.<sup>166</sup>

Meldrum discusses the Druze matter extensively and quotes several paragraphs from the 2008 article (pp. 80–82). He never tells his readers, however, that the X2 groups to which the Druze belong do not include X2a—they are X2b, X2e, X2f, and X2\*.<sup>167</sup> So we are presented

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162. Liran I. Shlush et al., “The Druze: A Population Genetic Refugium of the Near East,” *PLoS ONE* 3/5 (2008): 3, [www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0002105](http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0002105) (accessed 14 May 2010).

163. Khaled K. Abu-Amero et al., “Eurasian and African Mitochondrial DNA influences in the Saudi Arabian population,” *BMC Evolutionary Biology* 7 (1 March 2007), [www.biomedcentral.com/content/pdf/1471-2148-7-32.pdf](http://www.biomedcentral.com/content/pdf/1471-2148-7-32.pdf) (accessed 14 May 2010).

164. The precise citation is Khaled K. Abu-Amero et al., “Eurasian and African Mitochondrial DNA influences,” 8.

165. Abu-Amero et al., “Eurasian and African mitochondrial DNA influences,” 8. The data in table 1 (p. 5) do not distinguish X haplotype subgroups by identity or percentage.

166. Shlush et al., “Druze,” 3.

167. Shlush et al., “Druze,” 3, 4 (fig. 1A, 1B). Note that the X2\* paragroup indicates samples that do not match any currently known or designated haplogroup (including X2a).

with the curious spectacle of Meldrum insisting that X2e in Siberians is “not . . . directly related to the Native American Haplogroup X groups” (p. 77), while simultaneously invoking the present-day Druze as evidence about Amerindians and Lehi—even though the Druze are *also* X2e and other non-X2a groups.

The closest we come to being informed is when Meldrum argues that “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” (p. 81). Meldrum’s reader has no context for understanding this claim because the author has never explained that different subfamilies of haplogroup X exist in the Middle East when compared with America. Meldrum apparently *knows* there are subtype differences but dismisses them quickly and moves on, without the reader even knowing about them. Does he fairly represent the quotation? Unfortunately not:

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. (p. 81)<sup>168</sup>

In fact, the authors do not say that the Druze “may have been” (Meldrum’s words, p. 81) enriched in diversity, but that they clearly *are* so enriched. The authors claim that the Druze may represent “a contemporary refugium of this past genetic landscape”<sup>169</sup>—that is, they are, in a sense, living “genetic fossils.” The claim is not, then, that the Druze were somehow unique, but that they represent the type of X2 diversity that *used* to fill the Middle East. But this in no way solves Meldrum’s problem of Amerindian X2a differing from the Middle Eastern X2 groups he cites.

*Remnant through DNA* saves the worst treatment of the Shlush et al. study for last. The authors claim that the Druze offer “a sample snapshot of the genetic landscape of the Near East prior to the *modern*

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168. The citation is from Shlush et al., “Druze,” 7. I have omitted Meldrum’s extensive italics. The emphasis here is my own.

169. Shlush et al., “Druze,” 7.

age.”<sup>170</sup> Meldrum inserts an interpretive note for his readers: “[1400 AD]” (p. 81). He repeats the error by claiming that “it has been proposed that this population be used . . . as the ‘sample’ genetic population of the Near East . . . prior to the modern age (roughly 1400 AD)” (p. 82).

The “modern age” mentioned by Shlush et al. is surely not the last six hundred years! Population geneticists think in much longer spans of time. The article discusses how the estimated times of the X1 and X2 groups’ separation from their mother X haplogroup are “ $42,900 \pm 18,100$  and  $17,900 \pm 2,900$  [years] respectively.”<sup>171</sup> They go even further in providing a preemptive rebuke for Meldrum’s interpretation:

Mutation rates for the mtDNA coding region . . . are not consistent with the possibility that this number of different coding region defined lineages within haplogroup X could have resulted from the recent expansion of a . . . clade *within the past 1000 years*. Rather this combination . . . reflects the prevailing Near East genetic landscape . . . antedating the establishment of the Druze religion in [AD] 1017.<sup>172</sup>

They also note that the mathematical models used to make such estimates assume continued gene flow between populations, which the Druze clearly do not have. Thus, they caution, such models “would tend to overestimate the migration rate, and underestimate the divergence time”—which would push the time frame back even further.<sup>173</sup> They conclude by arguing that “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”<sup>174</sup>—that is, 80,000–150,000 years ago.<sup>175</sup> I

170. Shlush et al., “Druze,” 1, emphasis added.

171. Shlush et al., “Druze,” 6.

172. Shlush et al., “Druze,” 6, emphasis added.

173. Shlush et al., “Druze,” 7.

174. Shlush et al., “Druze,” 7.

175. The authors cite Alan R. Templeton, “Out of Africa again and again,” *Nature* 416 (7 March 2002): 45–51, [www.nature.com/nature/journal/v416/n6876/pdf/416045a.pdf](http://www.nature.com/nature/journal/v416/n6876/pdf/416045a.pdf) (accessed 14 May 2010). The values are from p. 48, fig. 1.

am not claiming that these figures must be accepted, but we simply cannot cull snippets of text about genetic relationships and ignore the implications that the data bring with them. The figures would have to be revised downward by a factor of at least *thirty* before a match with Lehi becomes plausible.

Meldrum quotes the remark in the Shlush study about an “out of Africa” expansion (migration) in the distant past but does not address it (reference no. 40, p. 81). There is no discussion of what it means in the paper’s argument, and the reader is told that the “modern age” referred to began only six hundred years ago. The inexperienced reader may be buried under a mountain of impressive-sounding conclusions from “detailed documentation in peer reviewed scientific journals” (p. iii) and feel that this is both rigorous and unassailable (as some of the book’s endorsements claim). Small wonder that it all seems so convincing, because anything that doesn’t fit the model just isn’t brought to the reader’s attention and properly contextualized.

*II.C.4.b X2 is “ancient and existing at the time Lehi left”?*

The foregoing discussion equips us to answer this question easily: the X2 group was certainly ancient, and it certainly existed by Lehi’s time. The difficulty, however, is that it is much too ancient. The divergence into separate X2 subfamilies (X2a, X2b, etc.) began long before Lehi. Lehi might have matched the modern Druze, but the modern Druze do not match ancient or modern Amerindians. By this point in Meldrum’s book, the dating issue has hardly been mentioned, much less resolved. Yet it is listed as a successful “hit” for the model all the same. (I take up *Remnant through DNA*’s treatment of the dating issue in II.D below.)

*II.C.4.c X2 is “from a Semitic population” or “from a Jewish population”?*

Having examined Meldrum’s treatment of the Druze, I was briefly encouraged when he wrote that “there is one aspect of the Druze population that may, however, be a little unsettling. They are not Jewish” (p. 82). But my hopes were soon dashed. “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 . . . ? The answer to this is as yet unknown” (p. 82). This is wrong; we can answer the question immediately—of course Jacob and Joseph are Druze ancestors! If Jacob and Joseph have any descendants at all, then everyone on earth shares them as an ancestor by now (see section II.B.1). But this does not mean that they are the source of haplogroup X or that we have discovered an Israelite marker. Everyone on earth is by now a descendant of Abraham, so clearly mtDNA haplogroups cannot be used to identify Israel, since Abrahamic descendants are found among all haplogroups.

Meldrum quotes a study on type II diabetes in Ashkenazi Jews, in which X is “one of the 12 most prevalent mtDNA haplogroups.”<sup>176</sup> We must remember that the presence of mere X is useless for our purposes, but Meldrum regards it as further evidence supporting his theories. He goes on to cite two more studies and notes that “the haplogroup X lineage has been identified in Moroccan, Libyan and Tunisian Jewish populations, *albeit with differing sub-lineages* represented by X2b and X2e. . . . [Fifty percent] of Libyan Jews were reported to have haplogroup X2e” (p. 83, emphasis added). Once more the reader is not told about the clear implications. The statement proves nothing about a connection to Lehi. Meldrum’s use of the word *albeit* implies that it is a minor matter when it is at the crux. Siberians with X2e are certainly not connected to Amerindians; Jews and Druze with X2e apparently are, in Meldrum’s telling.

#### *II.C.4 Conclusion*

We are told in closing that “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

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176. Jeanette Feder et al., “Differences in mtDNA haplogroup distribution among 3 Jewish populations alter susceptibility to T2dm complications,” *BMC Genomics* 9 (29 April 2008): 198, [www.biomedcentral.com/content/pdf/1471-2164-9-198.pdf](http://www.biomedcentral.com/content/pdf/1471-2164-9-198.pdf) (accessed 12 May 2010); cited in Meldrum, *Remnant through DNA*, 83.

an understanding of the Book of Mormon history” (p. 85). This is, as we have seen, simply not the case.

Meldrum concludes the chapter by finally mentioning that “Native American haplogroup X2a is unique in that to date no matching lineage in the Old World has been found” (p. 85). But he then appeals to Latter-day Saint geneticist Ugo Perego in support of the claim that “the Native American lineage is considered to be associated with the Old World ‘branches’” (p. 85). Perego has been taken out of context. As he explained to me,

There is no doubt that X2 has an “Old World” origin, just as A, B, C, and D do. Every mtDNA lineage in the world today has “Old World” origins. They then spread to the four corners of the earth developing their own unique mutational motifs. Everyone involved with population genetic studies accepts that X2 has Ancient Near East origins, but X2a (and the newly proposed X2g subbranch) have their own unique set of mutations that are not shared with any of the known Old World X2 lineages. That is why I stated clearly that they *do not cluster* with any Old World lineages.<sup>177</sup>

Perego also notes that X2a’s entry into the Americas dates to 15,000–17,000 years ago (and believes his work has succeeded in narrowing this range from the broader 13,500–19,000 years ago based on archaeological, geologic, linguistic, and genetic data).<sup>178</sup> Had Meldrum’s quotation of Perego continued to the end of the paragraph, we would also have learned that “X2a was [likely] the founder sequence” (i.e., the autochthonous form of the X2 sublineage)<sup>179</sup> for all X2a mtDNAs found among North American peoples—but knowing

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177. Ugo A. Perego, e-mail to author, 28 February 2010, emphasis in original.

178. Ugo A. Perego et al., “Distinctive Paleo-Indian Migration Routes from Beringia Marked by Two Rare mtDNA Haplogroups,” *Current Biology* 19/1 (13 January 2009): 1, [download.cell.com/current-biology/pdf/PIIS0960982208016187.pdf](http://download.cell.com/current-biology/pdf/PIIS0960982208016187.pdf) (accessed 17 May 2010).

179. “Autochthonous” lineages are those native to the area in which they are now found (*American Heritage Dictionary of the English Language*, 4th ed., s.v. “autochthonous.”)

that would show all the Druze and Jewish data to be useless for Meldrum's purposes.

At a FAIR conference, Perego addressed the issue of haplogroup X as a Nephite marker:

- Does [haplogroup X] provide evidence to support a pre-Columbian Israelite migration to the Western Hemisphere? No.
- Some argue that X shows the arrival of Lehi and so on, but this explanation is too easy. The data seem to indicate that X was from an ancient group twelve thousand years ago and that Lehi's mtDNA has disappeared.<sup>180</sup>

Meldrum has heard all this because he attended Perego's presentation. I know because I saw him there. But his readers will not know, nor does he make any effort to inform them.

#### *II.D Does the mtDNA Marker Date from Lehi's Era or Much Earlier?*

Before tackling the dating issue, Meldrum detours into a discussion of "a suitable location" for his Nephite DNA by discussing the Hopewell Mound Builders. He finishes with the chart of impressive "hits" that I have analyzed in section II.C (pp. 87–91). He seems aware that the dating issue could be the Achilles' heel—"the primary remaining obstruction" (p. 93)—for his model, though as we have seen his theory fails on multiple grounds even when we defer a discussion of dates. This chapter is the book's longest, and the most disorganized. I have here tried to collect the various arguments scattered throughout and address them in a more logical and accessible sequence. We should note that Meldrum regards this as the only potential point of contention for his theory, and thus he believes that if he can cast significant doubt on the dating issue, he will have established his case firmly. But we must remember that the model is untenable on multiple scriptural and scientific grounds regardless of the dating problem.

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180. Ugo Perego, "Haplogroup X in Light of Recent Book of Mormon Claims," 2009 FAIR Conference, Sandy, Utah, 6 August 2009, per notes in my possession; see notes at [www.lifeongoldplates.com/2009/08/ugo-perego-halogroup-x-in-light-of.html](http://www.lifeongoldplates.com/2009/08/ugo-perego-halogroup-x-in-light-of.html) (accessed 17 May 2010).

To prepare the way for his views, Meldrum attempts to rule out the type of answer that all the scientific publications he has cited will provide. He does this by attacking evolution, the ice age, and an old earth on religious grounds, then by dismissing, in a quasi-scientific way, various aspects of the sciences he regards as heretical (pp. 93–105). (I discussed these issues in section I.E.) The rhetorical ground has thus been scorched—the reader may feel that any alternative is better than accepting the experts’ standard methodology because Meldrum has portrayed it as religiously unacceptable. But we cannot reject data simply because they are unpalatable.

#### *II.D.1 Theory, fact, and confirmation*

Meldrum is keen to embrace the findings of genetics when they serve his goals. He does not, however, want to accept everything that goes with those findings. He therefore creates a naive dichotomy between “empirical, experimental science” and “theories” (pp. 104–5). “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” (p. 104). When claims cannot be directly tested because of “the tremendous time-frames thought necessary,” this “places [them] into the realm of philosophy, not empirical, experimental science” (p. 104). We look for substantiation of these remarkable claims but are told that they (like others) will have to wait: “The previous non-referenced comments will not be covered in detail until the release of a future work by colleagues titled *The Universal Model*” (p. 104). One guesses that this is Meldrum’s twelve-hundred-page research project of the last seven years (p. v). For now, we are apparently to accept his claims on faith.

What Meldrum is offering us here is not science but a philosophy of science—*neopositivism*. He refuses to regard as “science” anything that will not meet his standard of what might be called “conclusive

verifiability,”<sup>181</sup> which essentially requires laboratory reproduction or “observation in reality” (p. 106; see discussion below). Meldrum betrays his positivistic leanings when he presumes that science is about “certainty”—“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” (p. 106, emphasis added; compare p. 104). Further positivist ideas are on display when he labels anything that doesn’t meet his standard as “philosophy,” the “*a priori* assumptions of men” (p. 104). The neopositivists of the Vienna Circle likewise had little time for nonscience, which they classed as “metaphysics”—mere philosophizing, and not very good philosophy at that.

The problem, as we now know, is that positivism and its offspring contain the seeds of their own demise. One cannot verify or prove that this standard of proof is an appropriate standard, which by the same arguments means that the standard itself is invalid. In the same way, Meldrum presumes that if something cannot be shown to happen “in a laboratory,” then it is not science but just a “theory” (p. 104). A knowledge of geochemistry is useless and mere theory if one cannot demonstrate fossilization in the lab in real time. By this argument, Meldrum’s DNA theory is not science but philosophy. A past Israelite migration to the New World cannot be shown in a laboratory or directly observed. Nor has the spread of mtDNA from a single, genetically limited founder group of four women spreading through the Americas at 600 BC been seen in a petri dish. And so, by his reasoning, we ought to throw it out.

Such a claim is, of course, absurd. If we cannot see or touch (or even visualize) an electron and must rely instead on indirect evidence and inference, ought we to abandon chemistry? Thermodynamics cannot be a science under this standard because it relies heavily on a mathematical construct—entropy—that cannot be directly measured or observed.<sup>182</sup>

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181. See *The Stanford Encyclopedia of Philosophy*, s.v. “Vienna Circle,” plato.stanford.edu/archives/fall2008/entries/vienna-circle (accessed 17 May 2010).

182. “A new, purely mathematical function—the entropy— . . . had to be introduced into physics.” Lloyd Motz and Jefferson Hane Weaver, *The Story of Mathematics* (New

The quest for certainty is likewise misguided and unattainable (p. 104). Science can at best provide only the most plausible explanation(s) given all known data, and those explanations will likely change as more data become available: “To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact, it never does, explain all the facts with which it can be confronted.”<sup>183</sup> Meldrum wants genetics to convince Amerindians about the Book of Mormon’s promise that they are of Israel, so nothing less than certainty will do. It is “critical to base *all* research” (p. 106, emphasis added) on the known, we are told, but even Alma did not require people engaged in the most important research project of their lives to begin with something “known to be true”—they only had to “desire to believe” (Alma 32:27).

Meldrum does not, to be sure, strictly follow these principles. Most of his claims in *Remnant through DNA* are either already falsified or can be salvaged only with extensive supposition and special pleading. Positivism is not the author’s entire worldview; it is simply a plausible-sounding reason for rejecting some science while keeping what he wants. Your “science” is mere philosophy and supposition; my science is the real thing.

The false science is even made to admit it on the sly since Meldrum frequently points out the tentative nature of its claims as if this were a bad thing or an admission of inadequacy:

- “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’” (p. 107).
- 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?” (p. 107).
- “It would appear that this is in reality more of a ‘suggestion’ than a ‘finding’” (p. 107).

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York: HarperPerennial, 1995), 330; see pp. 256–60.

183. Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970), 17–18.

• “The admittedly ‘assumed’ theory of the evolution-based phylogenetic rate . . .” (p. 109).

In science, though, one ought not to make claims beyond the evidence. This may mean enormous ranges of dates, but one can be relatively confident that the evidence supports those ranges.

Meldrum is also mistaken in thinking that theories can be separated from data. He asks,

Does comparison . . . 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, any-more than a lie can be substantiated by another lie to create truth. (p. 106)

Note the rhetorical comparison of “theory” to a lie and the use of mutually supporting “theories” as one lie supporting another. What Meldrum calls “non-empirical” theories are thus not based in physical experiment or observation; they still require the positivists’ verification, or they remain unsupported. They require grounding “in reality.” He only wants science that is “experiment- or observation-based,” not “more theory based” (p. 101).

In fact, there is a complex relationship between the things we observe (the external world) and the theories we make about them. One cannot simply go looking for “facts”—we cannot escape “the cloven hoofprint of theory” as we determine what facts we will consider significant.<sup>184</sup> It seems unlikely that Meldrum would have found mtDNA to support the Book of Mormon had he not started with the belief—or certainty—that such evidence existed and could be

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184. The expression is from philosopher of science N. R. Hanson, quoted with discussion in Stephen Jay Gould, *The Hedgehog, the Fox, and the Magister's Pox: Mending the Gap Between Science and the Humanities* (New York: Three Rivers Press, 2003), 34–35, see also pp. 108–12.

found.<sup>185</sup> Likewise, the facts he gathers are then given meaning by a preexisting theory; the theory does not somehow spontaneously arise out of random data collected in dispassionate disregard for what they may or may not mean. No one attempts science like that—Meldrum least of all. All science involves both theory and observation, from which inferences are drawn.

Meldrum’s metric for good science is thereafter used on an as-needed basis to portray the science of mtDNA dating as chaotic and arbitrary. The way is smoothed by his repeated reminders to the reader that the older date suggested by the science “is again inconsistent with and contrary to the teachings of the Lord through his scriptures and the prophets” (p. 105).<sup>186</sup> And readers can congratulate themselves at seeing through the smokescreen that protects the scientists’ “dogma” “by disallowing honest challenge”: “You, the reader, are about to embark on a profound example of what happens when just such condition occurs. . . . 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” (p. 102). It is not simply that the science is mistaken—dogma and prejudice blind scientists to the answers that are right in front of them all the time.

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185. Meldrum’s functional certainty should be self-evident for anyone who reads even part of *Remnant through DNA*, though he begins by insisting that he is not claiming “proof” (pp. 5, 45). See introduction, section C, above.

186. Other examples include the following statements: “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” (p. 102); “Any theory of man that is not built on the firm foundation of the scriptures and the prophets should be likened to this [great and spacious] building” (p. 102); “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’ [citing 2 Nephi 28:30–31]” (p. 103); “Those who seek God’s truth will find happiness in new information that is founded on and conforms to it” (p. 103); “[Consider] 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. . . . Then a young farm boy went into a grove of trees . . . 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” (p. 106).

*II.D.2 Why are scientists so blind?*

We are promised a textbook example of this process in action since “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” (p. 102). Why would this happen? For the same reasons offered for Latter-day Saint geneticists’ failure to embrace Meldrum’s theories: power, money, or a lack of proper belief. We return, then, to the alleged atheist conspiracy that controls scientific inquiry at the American Association for the Advancement of Science, the National Science Foundation, and the National Association of Sciences (see introduction, section A, above).

“To deny evolution would be to an evolutionist the same as denying God to a Christian,” we are told (p. 118). Meldrum’s mental world is apparently uncluttered by such devout Christians as Teilhard de Chardin, Theodosius Dobzhansky, Pope John Paul II, Kenneth B. Miller, Simon Conway Morris, and Francis S. Collins—all of whom are essentially untroubled by evolution.

The closest I have come to finding a source for Meldrum’s claim about the atheists’ control of science is a letter to *Nature* that reports a survey about God delivered to members of the National Academy of Sciences (NAS).<sup>187</sup> Seven percent expressed belief in a personal God who answers prayer, while 72.2 percent expressed disbelief in that idea. The specific question asked was based on a 1914 survey. As one nonbelieving author observed, the form of the question may have influenced how it was answered. The question was stated as follows:

1. I believe in a God in intellectual and effective communication with humankind, i.e., a God to whom one might pray in expectation of receiving an answer. By “answer”, I mean more than the subjective psychological effects of prayer. . . . Consider how specific this question is. To answer “yes” to this question, one would have to believe that God is

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187. Edward J. Larson and Larry Witham, “Leading scientists still reject God,” *Nature* 394 (23 July 1998): 313.

not only in communication with humankind, which many religious people do believe, but that God is in both *intellectual* and *effective* communication. What is the meaning of “intellectual” communication? “Effective” communication? Someone who believes that God communicated with humankind but not “intellectually” (whatever that means) would have to answer “no.” Is “effective” used in the modern sense of the word meaning “something that works well”, or in the more archaic (1914) use of the term meaning “to bring about”? . . . Experienced pollsters simply do not ask paragraph-long questions anymore because they *know* that they elicit contingent (and therefore difficult to interpret) answers!<sup>188</sup>

In addition to the potential difficulties caused by the question, 20.8 percent expressed “doubt or agnosticism,” not committing themselves one way or the other. To have doubt or agnosticism is not to be an atheist. Nor is disbelief in a personal God who answers prayer necessarily consistent with atheism in all cases. Those who view God as a distant “first mover” or “prime cause” or in a Deist sense are not properly regarded as atheists either. Given that only about half the members surveyed replied, it is also difficult to judge whether those who did not reply might have different views. Other studies of scientists generally have found about 45 percent to be atheists, 40 percent to be believers, and 15 percent to be agnostic.<sup>189</sup>

I also asked Dr. Michael Whiting, director of BYU’s DNA Sequencing Center and a National Science Foundation reviewer, for his reaction to these claims. He described them as “inaccurate, paranoid, overblown, and ignorant.” He elaborated:

NSF has never stated that they refuse to fund anything that challenges evolution. I have served on many evolutionary

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188. Eugenie C. Scott, “Do Scientists Really Reject God?” *Reports of the National Center for Science Education* 18/2 (March–April 1998): 24–25, [ncse.com/rncse/18/2/do-scientists-really-reject-god](http://ncse.com/rncse/18/2/do-scientists-really-reject-god) (accessed 18 May 2010), emphasis in the original.

189. See discussion in Alister McGrath and Joanna Collicutt McGrath, *The Dawkins Delusion? Atheist Fundamentalism and the Denial of the Divine* (Downers Grove, IL: InterVarsity Press, 2007), 42–43.

biology panels and that instruction or even discussion has never emerged. [Some have] for years now tried to promote themselves as a viable alternative to evolutionary theory, but they have yet to design an experiment to test their claims, and have consequently never received funding from NSF. But if someone were to come up with a compelling experiment that would test the fundamental claims of evolution, then there is no reason built into the funding agencies why it cannot be funded.

It seems to be only those on the periphery of the field who make claims about a funding conspiracy that controls the direction of research. Those of us who spend a good deal of our academic lives pursuing funding know that it is not a rigged system nor a system that forces us into conventional thinking. In fact, the proposals that tend to get funded are the ones that challenge convention, so if anything, a person who designs a compelling experiment to disprove evolution would likely see that proposal rise to the top of the funding pile.<sup>190</sup>

Whiting's reaction matches my own more limited experience as an undergraduate research assistant. The burden of proof lies on the claimant, and Meldrum has presented no proof at all. Yet Meldrum's explanation of an atheist conspiracy at the highest levels of American science is seriously offered as the reason that his views regarding evolution have not been accepted. Latter-day Saints are charged with contributing to this problem: "[For] many faithful LDS scholars and scientists . . . 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" (p. 120). So Latter-day Saint scientists supposedly risk the souls of Latter-day Saint children for worldly advancement and money? This is apparently more of the "respect" Meldrum has for those who differ with him.

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190. Michael Whiting, e-mail to author, 9 December 2009.

### *II.D.3 Two roads?*

Meldrum portrays the dating issue as a fundamental conflict between “two distinctive groups within the LDS community.” “There are,” he tells us, “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” (p. 141).

While I’m sure that members of both groups exist, the two positions they represent are not the only options. For example, I would not classify myself in either group. I do not “accept the dating as [my] reality” (whatever that means), but I do acknowledge that the scientific data do not point to ages in the range that Meldrum’s model demands. There are a host of reasons why this could be so: (a) Meldrum could be right but the data inadequate or misunderstood; (b) the greater ages could be right; (c) there is a compromise “middle range,” so both are wrong; and so on. I simply reject the idea that the science says what Meldrum claims, and I have concluded that at present one is either misinformed or dishonest to claim otherwise. In any such case, I am much happier indicating that I do not know the answer than claiming that I have found an answer that doesn’t work.<sup>191</sup> I do not require a solution to all the issues of dating and evolution to be confident that Meldrum’s theory is nonsense, given the current state of the data—which is all we have to go on.

But those who disagree with Meldrum are portrayed in a Manichaean light since those who don’t follow his dating ideas are

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191. Meldrum notes that John Tvedtnes’s section of a video on DNA prepared by FAIR discussed haplogroup X as a potential Lehiite marker. He then incorrectly concludes that “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” (p. 152). FAIR has no position on the dating of haplogroup X but realizes that the science at present does not permit dating haplogroup X to Lehi’s time (see [en.fairmormon.org/Book\\_of\\_Mormon\\_and\\_DNA\\_evidence/Geography\\_issues/Haplotype\\_X2a](http://en.fairmormon.org/Book_of_Mormon_and_DNA_evidence/Geography_issues/Haplotype_X2a) [accessed 18 May 2010]). I am informed by Tyler Livingston, the DVD’s producer, that an errata page was made for the video at *Tvedtnes’s* request because *he* realized that the evidence would not support the initial remark as phrased (Tyler Livingston, e-mail to author, 28 December 2009). See [en.fairmormon.org/FAIR\\_Errata](http://en.fairmormon.org/FAIR_Errata) (accessed 18 May 2010).

the “same individuals [who] are also accepting of the phylogenetic dating methods and the basis from whence they spring (Evolution theory)” (p. 149). This analysis is likewise far too simplistic; all use of DNA for dating and the study of populations requires some aspects of evolutionary theory (mutation, selection, genetic drift, fixation, descent with modification, etc.). To reject them is to torpedo any use of genetics in studying ancient human populations. And one need not embrace evolution to conclude that Meldrum’s use of the dating data has serious problems. I wish he were right about the dates. But he isn’t.

#### *II.D.4 The first clue*

The initial use of mtDNA for dating presumed a clocklike rate of mutation. If changes in the DNA sequence accumulate at a constant rate (say, one mutation per thousand years), then if mtDNA samples differ from each other in three places, they last shared an ancestor three thousand years ago. Given the cost and time required to sequence DNA, in the early 1990s a small region of mtDNA was often used—the “control region,” or “D-loop.”<sup>192</sup>

The control region was used because it does not encode any proteins. Much DNA provides a code or “template” that enables the cell to synthesize various proteins. A mutation in a protein-coding section of DNA might have negative consequences; for example, a vital protein might not function, and this could mean disease or death for the mitochondria unlucky enough to carry it. Without functioning mitochondria, cells die, and dead cells lead to dead animals and humans. It was thought that mutations in the noncoding “control region” of DNA would accumulate at a “neutral” rate and wouldn’t be particularly helpful or harmful, so they wouldn’t promote either the survival or death of the mitochondria who got them. This would render their accumulation of mutation relatively steady and constant.

While this was a reasonable working assumption, further work raised questions. And it is here that Meldrum’s tale begins. He discusses

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192. For a discussion of dating via DNA mutations for the nonspecialist, see the FAIR Web site, “Section 1: DNA Evidence,” in “Reviews of *DNA Evidence for Book of Mormon Geography*,” 8–14, [www.fairlds.org/DNA\\_Evidence\\_for\\_Book\\_of\\_Mormon\\_Geography/DEBMG01F.pdf](http://www.fairlds.org/DNA_Evidence_for_Book_of_Mormon_Geography/DEBMG01F.pdf) (accessed 18 May 2010).

“a very important article” in *Nature Genetics* by Thomas Parsons and others (p. 107), who compared the frequency of mutations expected in the mtDNA control region assuming a neutral rate of change back to a theoretical human ancestor. This rate was compared to the *observed* rate of mtDNA mutation in historic time. The historic rate of change was twenty times as high as the “theoretical” rate.<sup>193</sup> The implications are obvious: if the mutation rate is not constant, or if the predicted rates do not match observed rates, then such rates cannot be simply extrapolated backward and used to date prehistoric events.

Parson then makes a remark upon which Meldrum seizes:

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 [about] 6,500 y.a., clearly incompatible with the known age of modern humans.

“This figure is so unbelievably low,” editorializes Meldrum, “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” (p. 109).

Having made it clear that any belief in an earth older than seven thousand years or humans before 4000 BC is unscriptural and unfaithful to prophetic teaching, Meldrum insists that Parsons’s conclusion is mere dogmatism. Actually, it is anything but. Parsons must confront (as must Meldrum) a host of data from many fields suggesting that modern humans existed before 4000 BC. From pedigree studies there are *other* mutation rates that differ from Parsons’s rate, though Meldrum does not even mention them. These differing rates use the same part of the mtDNA molecule that Parsons used. If different areas of the mtDNA molecule are examined, we get still other rates (see table 1).

Parsons’s values are also interesting in another way since tests done on blood showed a much higher mutation rate ( $4.3 \times 10^{-6}$ , or 1

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193. Thomas J. Parsons et al., “A high observed substitution rate in the human mitochondrial DNA control region,” *Nature Genetics* 15/4 (1997): 363, [www.nature.com/ng/journal/v15/n4/abs/ng0497-363.html](http://www.nature.com/ng/journal/v15/n4/abs/ng0497-363.html) (accessed 18 May 2010).

mutation every 381 years) when compared to tests on cell lines ( $0.94 \times 10^{-6}$ , or 1 mutation every 1,744 years). Which of these rates is the “true” rate? Why do they differ so greatly? Is averaging them the best way to approximate the true rate? (Meldrum also does not tell us that as a forensic geneticist, Parsons intentionally focused his work on mtDNA sites that are highly variable, because they are most useful for identifying modern individuals. Most of Parsons’s mutations were found around base position 309, one of multiple “extreme mutational hotspots” in the mtDNA control loop, whose high mutation rate is not matched by most other mtDNA sites.)<sup>194</sup>

There are more examples and nuances that we will consider later, but table 1 is sufficient to make the point that there are *many* pedigree studies. No empirical rate matches any other rate, and there is a wide variation—and Meldrum has picked almost the highest rate (that of Parsons) upon which to focus our attention. He cites many of the papers listed above, so he cannot be unaware of these other rates, but instead he chooses an extreme example among equally “empirical” measurements.

#### *II.D.5 Enter the conspiracy theory*

Meldrum insists that all geological and fossil data are based on “several primary assumptions,” and one of these “primary assumptions is that evolution is the basis for life on earth” (p. 109). This is plainly false. Carbon dating, for example, makes no assumptions about evolution at all. Fossils were known and used for dating long before Darwin and Wallace produced evolutionary theory. Not one of these evidences is engaged by Meldrum, and he does not really regard such a discussion as being of any importance:

According to modern revelation, and actual genealogical records from human history in the Bible, the infinitely better

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194. Hans-Jürgen Bandelt et al., “Estimation of Mutation Rates and Coalescence Times: Some Caveats,” in *Human Mitochondrial DNA and the Evolution of Homo Sapiens*, ed. Hans-Jürgen Bandelt, Vincent Macaulay, and Martin Richards, vol. 18 of *Nucleic Acids and Molecular Biology* (Berlin: Springer-Verlag, 2006), 50; see pp. 59–63, 69–73 for discussion.

defined “known” age of modern humans is approximately 6000 years, a figure that appears to have been demonstrated as accurate by mtDNA empirical data. (p. 109)

Meldrum decries Parsons’s supposed dogmatism but here provides us with a stunning example of his own dogmatic tendencies. Despite Meldrum’s claims, we do not know how long mankind has been on the earth (see section I.E above). But he still regards his figure of six thousand years as “infinitely better known” since

members of the Church [have] . . . absolute calibration points that non-members do not have. These are the [scriptures] . . . and the words of the 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. (p. 125)

If something truly is infinitely better known with absolute data points, then no data can counteract it, no matter how compelling. If Meldrum is so certain, fine—but let us abandon the pretense that this exercise is about science. He has a conviction that is unshakable, and he is therefore doing nothing but proof-texting the scientific literature, searching for snippets and quotes that he can use to support what he already knows but does not analyze in context or present fairly.

Meldrum further thinks his figure of six thousand years for humans on earth “appears to have been demonstrated as accurate” by Parsons’s study. This verges on the absurd. Let us grant, for a moment, that he is correct and all living humans share a common mitochondrial DNA ancestor that lived six thousand years ago (“mitochondrial Eve”). This does not mean that mitochondrial Eve was the first woman. It simply means that only her mtDNA has survived into the present. Others who lived before her (or at the same time as her) simply don’t have any descendants left.<sup>195</sup> In another context, Meldrum observes of those who make this sort of error, “One of the assumptions made by

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195. The Iceland study referenced by Butler (cited on p. 27 of Meldrum, *Remnant through DNA*) illustrates this same phenomenon. Most people in Iceland are descended from a few individuals. But many other individuals also lived at the same time in Iceland

those inexperienced with the field of genetics is that the coalescence date is the same as the arrival date” (p. 127). I could not agree more. The putative 4000 BC date would only be the coalescence date and can tell us nothing about the arrival date of humanity on the earth. To claim otherwise betrays inexperience.<sup>196</sup>

A most recent common ancestor provides a boundary in only one direction, telling us that humans were around *at least* six thousand years ago. It says absolutely nothing about how long they existed beforehand. (The next citation provided by Meldrum makes precisely these points, though he does not explain them to the reader.)<sup>197</sup> And given that there appears to be vast evidence of humans living on every continent well before 4000 BC, Parsons knows that they cannot all share a common mtDNA ancestor with these rates of mutation; they cannot all interbreed because of distance. He thus knows that *his* rate cannot be correct over longer time spans, and “evolution” need have nothing to do with Parson’s skepticism. As we have seen in our discussion of all Amerindians sharing Lehi as an ancestor, current thinking puts the most recent ancestor<sup>198</sup> of all living humans much closer to the present day than six thousand years ago, the date Meldrum is so fond of (see section II.B.1). Clearly, evolutionary biologists do not feel threatened

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(and even much earlier) and yet left no trace of descendants. Finding an ancestor of everyone tells us nothing about *that person’s* ancestors or how far back they go.

196. Brigitte Pakendorf and Mark Stoneking, “Mitochondrial DNA and Human Evolution,” *Annual Review of Genomics and Human Genetics* 6 (2005): 171; Jody Hey, “On the Number of New World Founders: A Population Genetic Portrait of the Peopling of the Americas,” *PLoS Biology* 3/6 (2005): 0971, [www.plosbiology.org/article/info:doi%2F10.1371%2Fjournal.pbio.0030193](http://www.plosbiology.org/article/info:doi%2F10.1371%2Fjournal.pbio.0030193) (accessed 18 May 2010); and J. H. Relethford, “Genetic Evidence and the Modern Human Origins Debate,” *Heredity* 100/6 (2008): 557.

197. Laurence Loewe and Siegfried Scherer, “Mitochondrial Eve: The Plot Thickens,” *Trends in Ecology and Evolution* 12/11 (November 1997): 422–23.

198. As opposed to the most recent *mtDNA* ancestor, which current data date to approximately two hundred thousand years ago.

**Table 1: mtDNA mutation rate according to various pedigree studies**

Author	Date	Mutation rate/ site/year	Years per mutation	mtDNA area studied*
Soodyall (observed) <sup>200</sup>	1997	None	None	CR
Soodyall (95% CI)†	1997	$\leq 1.01 \times 10^{-6}$	$\geq 893$	CR
Parsons (cited by Meldrum)	1997	$2.50 \times 10^{-6}$	656	CR
Jazin <sup>201</sup>	1998	None	None	HVR-1, -2
Jazin (95% CI) †	1998	$\leq 1.52 \times 10^{-6}$	$\geq 1,783$	HVR-1, -2
Jazin (all pooled pedigree studies to 1998, 95% CI)†	1998	$\leq 2.20 \times 10^{-6}$	$\geq 1,232$	HVR-1, -2
Sigurðardóttir <sup>202</sup>	2000	$4.14 \times 10^{-7}$	3,017	Various
All pedigree studies to 2000	2000	$3.20 \times 10^{-7}$	2,815	CR
Howell <sup>203</sup>	2003	$1.00 \times 10^{-6}$	1,639	CR‡
Combined studies	2003	$9.80 \times 10^{-7}$	1,673	CR‡
Average all pedigree studies to 2003	2003	$4.75 \times 10^{-7}$	3,451	CR
Pakendorf (average all pedigree studies to 2005)	2005	$4.70 \times 10^{-7}$	1,917	HVR-1, -2
Pakendorf (all pedigree studies to 2005, 95% CI)†	2005	$0.00 - 1.46 \times 10^{-6}$	$\geq 617$	HVR-1, -2

\* = HVR-1, -2 = Hypervariable region -1 and -2, which make up part of the control region (CR or D-loop). The coding region is that part of the mtDNA that codes for proteins, i.e., the rest of the molecule not in the CR.

† 95% CI = 95 percent confidence interval (statistically, the chance is 95 percent that the true range lies between the two values)

‡ = in hereditary optic neuropathy

199. Himla Soodyall et al., “The founding mitochondrial DNA lineages of Tristan da Cunha Islanders,” *American Journal of Physical Anthropology* 104/2 (1997): 157–66. This pedigree study found no mutations at all. The next line of the table gives the 95 percent confidence interval for these data; there is a 95 percent chance that Soodyall’s observed data reflect an actual pedigree mutation rate between the ranges given.

200. Elena Jazin et al., “Mitochondrial mutation rate revisited: hot spots and polymorphism,” *Nature Genetics* 18 (1998): 109–10.

201. Sigrún Sigurðardóttir et al., “The Mutation Rate in the Human mtDNA Control Region,” *American Journal of Human Genetics* 66/5 (May 2000): 1599–1609, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1378010/pdf/10756141.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1378010/pdf/10756141.pdf) (accessed 18 May 2010).

202. Neil Howell et al., “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* 72/3 (March 2003): 659–70, [www.ncbi.nlm.nih.gov/pmc/articles/PMC1180241/pdf/AJHGv72p659.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1180241/pdf/AJHGv72p659.pdf) (accessed 18 May 2010).

by a most recent common ancestor in even historical time. It is nonsensical to insist that Parsons made the decision on that basis.<sup>203</sup>

Parsons concluded, wisely, that the assumption of a clocklike regular change of the mtDNA control region must be called into question. Meldrum, on the other hand, takes the opportunity to provide another two-page exposition about the evolutionist conspiracy, contrasted with the selective yet imposing archaeological backing for his reading of the Bible (pp. 109–10).

Meldrum then discusses a similar study with a similar outcome: the observed mutation rate would place the most recent mtDNA ancestor about six thousand years ago. Meldrum is triumphant since “again Parsons’ study is vindicated” (p. 111). He does not quote the actual study but relies on a news summary in *Science* by Ann Gibbons. Concerning the mitochondrial Eve of six thousand years ago, Gibbons observes, “No one thinks that’s the case.”<sup>204</sup> “Why is such a statement made?” demands Meldrum. Perhaps the evolutionists have mistakenly tipped their hand. “Why is the empirical finding so easily dismissed as faulty?” (p. 111).

The “empirical finding” is not dismissed at all. The observed mutation rate in the descendants over *historical time* is a fact. Indeed, various pedigree mutation rates have been observed, all of which are “empirical findings,” and some showed no mutations at all (see table 1). One cannot simply latch onto the single rate that one finds appealing and then declare that all other rates are irrelevant or corrupt.

The measured rates are not being disputed or dismissed. The point at issue is another *theoretical* construct: the idea that this mutation rate is constant and continues to be so back to 4000 BC. Insisting that mutation rates are constant to 4000 BC is as much a “theoretical” presumption as the one Meldrum blames evolutionists for holding. No one has directly measured the mutation rate of mtDNA back to 4000 BC or 200,000 BC. The rate(s) must instead be inferred and

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203. Other authors note that if mutation rates were as high as some have argued, some observed mtDNA sequence patterns would be obliterated due to recurrent mutation within less than a thousand years. See Bandelt et al., “Mutation Rates and Coalescence,” 67.

204. Ann Gibbons, “Calibrating the Mitochondrial Clock,” *Science* 279/5347 (1998): 29.

deduced based on the facts available in the here and now. Since the assumption of a clocklike rate of mutation led to what one author called “apparently silly conclusions,”<sup>205</sup> it is worthwhile to question it. Since all the empirical rates are not identical, it hardly makes sense to claim that the mtDNA rate is both constant and known but being ignored.

Meldrum presumes to know why someone would not think it was the case: “None of the atheists at the head of these scientific organizations thinks Eve lived 6,000 years ago [note his conflation of the biblical Eve with mitochondrial Eve], 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” (p. 111). What “a lot of people” think is, of course, irrelevant to the truth or the facts.<sup>206</sup>

Meldrum doesn’t bother to tell us one of the reasons that Gibbons gives for questioning the mitochondrial Eve of six thousand years ago: “The oldest non-controversial archaeological sites [in the Americas] are 12,500 years old.” Again, this has nothing whatever to do with evolution. There is simply a great deal of evidence suggesting that humans were around before 4000 BC. Meldrum is trying to make a case based on the DNA, but the DNA scenario he presents is not plausible. It is as if he wishes to deny gravity while using Newton’s equations to predict the planets’ orbits.

#### *II.D.6 Why do we have different pedigree rates?*

Gibbons also points out that the theory is where most people were already focusing their attention, wondering “if the noncoding DNA in the control region is not entirely immune to selection.”<sup>207</sup> Remember, the control region was chosen because it was hoped that mutations there would not help or hinder the chance of survival, so that mutations would be regular *and* not disappear when they happened. If mutations

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205. Sigurðardóttir et al., “Mutation Rate in the Human mtDNA Control Region,” 1608.

206. This is a classic example of the *argumentum ad populum*, an appeal to the popularity or widespread nature of a belief as an argument for its truth. Meldrum realizes this since he elsewhere argues that “acceptance of a theory or achieving a consensus among a group does not make something true” (p. 127). Indeed.

207. Gibbons, “Calibrating the Mitochondrial Clock,” 29.

in the control region affect survival, then we cannot assume that its rate of mutation is constant, and its utility as a clock fades. *This* is why scientists in the field were worried, not because they feared they had stumbled onto a proof that the Bible was really true after all and evolutionary theory was about to come crashing down. And, as it turned out, control region mutations *do* have an effect on survival since they “exhibit variation that affects mitochondrial transcription and replication in significant ways.”<sup>208</sup> Furthermore, since mtDNA does not generally recombine or have two copies of each gene (as all nuclear DNA except sex chromosomes have), selection against any part of the mtDNA molecule will select against all of it.<sup>209</sup>

We do not, however, get the whole story from *Remnant through DNA*. Within two years of Parsons’s study, Max Ingman and colleagues pointed out that almost all work on humans had been done using just the control region, “which constitutes less than 7% of the mitochondrial” DNA.<sup>210</sup> They used the entire mtDNA molecule and compared its mutation rates to those found in a noncoding region of the X chromosome.<sup>211</sup> When the control region was excluded, these values correlated as expected, strongly suggesting that the control region was an inappropriate site for a reliable molecular clock. Any use of mtDNA for dating would have to rely on examining the entire molecule and would have to compensate for the different rates of mutation exhibited by different parts of the mtDNA chromosome.<sup>212</sup>

Meldrum then provides a lengthy and confusing discussion of “phylogenetic” (i.e., evolutionary-based) and “pedigree” (in historical

208. Cristina Santos et al., “Mutation patterns of mtDNA: Empirical inferences for the coding region,” *BMC Evolutionary Biology* 8/167 (2008): 2, [www.ncbi.nlm.nih.gov/pmc/articles/PMC2438339/pdf/1471-2148-8-167.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2438339/pdf/1471-2148-8-167.pdf) (accessed 19 May 2010).

209. Hawks, “Population Bottlenecks,” 10.

210. Max Ingman et al., “Mitochondrial genome variation and the origin of modern humans,” *Nature* 408/6813 (2000): 708.

211. Henrik Kaessmann et al., “DNA sequence variation in a non-coding region of low recombination on the human X chromosome,” *Nature Genetics* 22/1 (1999): 78–81.

212. An illustration of the variation in observed mutation rate for the entire mtDNA genome is found in Phillip Endicott et al., “Evaluating the mitochondrial timescale of human evolution,” *Trends in Ecology and Evolution* 24/9 (13 August 2009): 516, fig. 511, [download.cell.com/trends/ecology-evolution/pdf/PIIS0169534709001852.pdf](http://download.cell.com/trends/ecology-evolution/pdf/PIIS0169534709001852.pdf) (accessed 19 May 2010).

time) dating (pp. 112–18). The presentation is tedious, and it is difficult to follow because of his tendency to quote snippets from studies without properly contextualizing them. His material repeats what we have already learned above—studies on historical individuals (“pedigree” studies that use known humans in recent time) often show much higher mutation rates than longer-term analyses—and so we will not consider it in detail here. His argument portrays the pedigree rates as “based on experimental factual evidence” and the studies of deeper time as relying only on “nebulous theories” (p. 113). In truth, however, both types of study use experimental evidence, and both require theoretical presuppositions, such as a constant mutation rate. The only certainty about the pedigree studies is the differing rates. Once we try to extrapolate a chosen rate back in time (as Meldrum must, to get his 4000 BC mitochondrial Eve), we are again *assuming* that the rate is constant.

Mitochondrial DNA sites with a high rate of mutation are also vulnerable to “back mutation.” A base pair could mutate and then mutate back to the original configuration. The scientist is left with no clue that multiple mutations have occurred, since the mtDNA’s final state is identical with its original form.

Meldrum’s tendency to employ double standards manifests itself here. He asks, “How do we know if any rate changing has actually occurred,” making the evolutionary rate slower and the pedigree rate faster? (p. 122). This is a good question, but Meldrum should ask it of himself (as others have done).<sup>213</sup> How do we know that the *control region* mutation rate is constant for six thousand years? We don’t. And we now know that it almost certainly isn’t.

Why might the “evolutionary rate” be slower? We must not get confused here, as Meldrum does when he asks, “At what point in time did this supposed ‘shift’ [in rate] occur?” (p. 122). The point is not that the rate of mutation suddenly changed or “sped up” at some moment in the past. In fact, one study cautions against precisely this error:

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213. Perego tells me that he personally explained this to Meldrum (Perego to Smith, 28 February 2010).

Importantly, the decrease in molecular rate . . . does not require the invocation of a novel mechanism of “rate acceleration” towards the present. It is merely an observed decrease in molecular rate, the end result of mutation on the one side and purifying selection and saturation on the other.<sup>214</sup>

We must realize that changes to mtDNA are not often “neutral.” When DNA changes, this may threaten the survival of the organism. Thus, in the short term (e.g., within human life spans) mutations might well appear relatively rapidly (as they did in some pedigree studies, such as those cited by Meldrum). But we cannot see into the future; we do not know whether all those mutations will survive, especially when *further* mutations are added to them. Mitochondrial DNA that accumulates enough harmful mutations will simply die out, and no descendants will remain to be studied later. This is called purifying selection and has been directly observed in mammalian mtDNA.<sup>215</sup> Thus, these mutations have simply *disappeared* from the present-day collection of mtDNA that is available for study in living people. Some mutations have thereby been taken out of the pool available for study. And so, since there is no hint that these mutations existed (because they left no descendants), the longer-term rate appears lower than it really was. If we could wait long enough with the pedigree rates we see today, we would see that most of these mutations will not survive. They happened, but they will someday be gone from the living pool of mtDNAs available to future researchers. Thus, *our* present-day “mutation rate” would also appear lower to people alive thousands of years from now, just as long-past rates appear lower to us.

The impact of purifying selection increases the further back in time one goes. The most recent work suggests that there is not a single

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214. Simon Y. W. Ho and Greger Larson, “Molecular clocks: when times are a-changin’,” *Trends in Genetics* 22/2 (February 2006): 80.

215. James Bruce Stewart et al., “Strong Purifying Selection in Transmission of Mammalian Mitochondrial DNA,” *PLoS Biology* 6/1 (January 2008): 1–15, [plosbiology.org/article/info:doi%2F10.1371%2Fjournal.pbio.0060010](http://plosbiology.org/article/info:doi%2F10.1371%2Fjournal.pbio.0060010) (accessed 19 May 2010). For a general discussion, see David M. Rand, “Mitigating Mutational Meltdown in Mammalian Mitochondria,” *PLoS Biology* 6/2 (February 2008): 0229–0232, [www.ncbi.nlm.nih.gov/pmc/articles/PMC2245988](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2245988) (accessed 19 May 2010).

“point” at which the rate suddenly jumps, but simply a smooth curve with high recent rates and a decreasing rate of *persisting* mutations as we go back in time.<sup>216</sup>

As one study reported in 2006:

In order to infer divergence rates [i.e., time since a common ancestor], it is convenient to assume a constant rate of evolution throughout the tree. This practice has been regularly challenged by results . . . showing considerable departures from clocklike evolution, and rate variation among lineages that can seriously mislead. . . .

Such problems with the molecular clock hypothesis have resulted in it being abandoned almost entirely for phylogenetic inference in favor of a model that assumes that *every branch has an independent rate of molecular evolution* [i.e., mutation].<sup>217</sup>

#### *II.D.7 What pedigree mutations do we care about?*

It should also be clear that not all mtDNA mutations seen in a pedigree study will be relevant to longer-term mutation rates. The following steps must *all* arise for a mutation to occur *and remain to be detected* later in phylogenetic studies:

1. A mutation must occur.
2. The mutation must occur in a female (male mutations could be measured in a pedigree study, but none of them will be passed on).
3. The mutation must occur in germinal cells (i.e., in the egg cell—a mitochondrial mutation in a muscle cell might affect the muscle cell

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216. Pedro Soares et al., “Correcting for Purifying Selection: An Improved Human Mitochondrial Molecular Clock,” *American Journal of Human Genetics* 84/6 (12 June 2009): 740–59; see especially the curve in fig. 4, p. 748, [www.cell.com/AJHG/abstract/S0002-9297%2809%2900163-3](http://www.cell.com/AJHG/abstract/S0002-9297%2809%2900163-3) (accessed 19 May 2010). See also discussion in Bandelt et al., “Mutation Rates and Coalescence Times,” 73–84, for another perspective.

217. Alexei J. Drummond et al., “Relaxed Phylogenetics and Dating with Confidence,” *PLoS Biology* 4/5 (2006): 0699, [www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0040088](http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0040088) (accessed 19 May 2010), emphasis added.

but will not be passed on; only mitochondria in the fertilized egg have a chance to be passed on).<sup>218</sup>

4. The mutation must become “fixed” in the population (i.e., the mutation must not be so harmful to the survival or reproduction of those who have it that they are “selected out”).

What happens if we recalculate pedigree rates as we account for these various factors? In every case, one can determine objectively or empirically whether the mutation occurred, whether it occurred in a woman, and whether it affected germinal cells. We see in table 2 how the pedigree rates drop as each factor is accounted for, and how they then correlate with phylogenetic rates calculated by the same authors:

For simplicity’s sake, I have not included the final step of the analysis, which would be to determine if a mutation in a woman’s egg would go on to become fixed. This determination requires consideration of whether the mutation is neutral or subject to selection. Such a conclusion is perhaps arguably less “objective,” but in either case it will reduce the mutation rate even further than the rate of female germinal cell mutations. These numbers are thus *conservative* indicators of how inappropriate Meldrum’s use of Parsons’s figure is. The real-world situation is actually worse for *Remnant through DNA* than it appears from table 2. Small wonder that a recent review remarked that “although the pedigree approach might seem promising at first (or even second) sight, in reality it is fraught with problems that seem insurmountable.”<sup>219</sup>

#### *II.D.8 Meldrum’s table of data*

*Remnant through DNA* presents its own table of mutation rates, which is offered as an example of the evolutionists “desperately holding onto the theory rather than embracing the evidence” (p. 119). The table is misleading and confusing because (a) it does not proceed in chronological order, making it difficult to see how the proposed

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218. An alternative scenario has a mutation occurring early in embryogenesis following fertilization; some cells would contain the original mtDNA and others would contain the mutant form, resulting in “heteroplasmy.”

219. Bandelt et al., “Mutation Rates and Coalescence Times,” 77.

dating has changed over time; (b) it uses some inaccurate figures;<sup>220</sup> and (c) the units used to express the mutation rates are not the same in all cases.

Imagine trying to compare distances between cities using a similar table, but some distances in the table are given in miles and others in seconds. How easy would it be to compare the distance *or* travel times, especially if one doesn't know how fast the car is traveling? Meldrum creates an analogous situation for the reader. At times, he quotes the rate as the chance of a mutation per mtDNA site per million years. In order to know how long to wait for one mutation, the reader must know how many mtDNA bases are used in each study (i.e., how “fast the car is going”), and this is not the same for all the studies cited. In other cases, Meldrum reports how many years must pass before one mutation occurs. This has the effect of making such values seem much larger than the others, just as if travel times were reported in seconds. (Which sounds longer—a drive of one hundred miles or a drive of 360,000 seconds? In fact, they are identical, though this is not obvious unless we know the car is traveling sixty miles per hour and can do the math for ourselves.) It is perhaps no coincidence that all the studies so reported are of the maligned “phylogenetic” type. On the other hand, it could be that Meldrum copied exactly what each paper reported, without converting the figures from one form to another. It is not clear whether he knows that this is necessary to make meaningful comparisons.

There is another factor, however, that distorts the impression: most of these figures are *only for the control region* of the mtDNA. And there is broad consensus that the control region alone is not a useful genetic clock. All the entries in Meldrum's table for dates up to and including

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220. Meldrum, *Remnant through DNA*, p. 125, cites Perego (2009) as providing rates of 5,140 years/mutation and 6,760 years/mutation and includes these in his table under “2009” (p. 119, rows 10–11). He has misread the paper—these are rates provided by Mishmar (2003) and Kivisild (2006). Perego provides adjusted rates not included in Meldrum's table; these were derived by Dr. Hans-Jürgen Bandelt, a mathematician, to adjust for the Mishmar and Kivisild rates. This blunder is further evidence that Meldrum does not really understand the material he is citing—he reproduces the text that describes the origin of these figures but fails to cite (or use) Perego's actual figures. He includes Kivisild's figures under 2006, but I do not see the inclusion of Mishmar's for 2003.

2005 (with one exception) are only for the control region.<sup>221</sup> Since researchers have realized that a single rate for this region alone is not suitable for dating, these figures are now irrelevant—the high pedigree rates do not reflect the longer-term rate of mutations that remain and spread (see II.D.7), some of the phylogenetic rates are likely too low, and neither rate can be assumed to be constant throughout time.

What is more, these now-obsolete control region figures are in no way related to the remaining four mutation rates in the table, which are of the *entire coding region* of mtDNA—a region that was excluded from the earlier analyses. Furthermore, two of these rates are for *synonymous* mutations (a change in the DNA code that does not alter the protein it makes) and two are for *all* coding mutations (including those that change proteins and so risk the early death of any mitochondria so afflicted). The rates over time of synonymous versus all coding mutations are not expected to be the same; they measure quite different things.<sup>222</sup> Although a new rate based on the complete mtDNA genome has recently been proposed, Meldrum does not mention it at all.<sup>223</sup>

#### II.D.9 *The end of the first story*

It is important to realize, then, that Meldrum is actually telling us *two* different stories and that, until now, we have seen only the first. Meldrum has played heavily on the first story, likely because it is the first example of mtDNA mutation rates being called into question *and*

221. The papers from which the numbers in Meldrum's table (p. 119) derive are as follows, in the order presented: (1) Parsons (1997), for several studies from 1991 to 1995, not the year 2000 as indicated; (2) Parsons (1997), not from the year 2000; (3) Pakendorf (2005), summarizing phylogenetic data; (4) Pakendorf (2005), summarizing pedigree data (note that the wide error interval makes it "possible" that no mutation is happening at all!); (5) Pakendorf (2005), average of pedigree data; (6) Howell (2005), data from hereditary optic neuropathy pedigree; and (7) Howell (2005), data from unrelated pedigree studies.

222. The synonymous mutations are reported in Meldrum's table (p. 119), lines 9 and 11. Both are from Kivisild (2006), though the latter is Perego's (2009) account of Kivisild's results, reported by Meldrum as if it is Perego's result. The whole coding region is cited in lines 8 and 10, from Ho (2005) and Mishmar (2003), respectively; the latter is again Perego's (2009) report, mistakenly attributed to him by Meldrum.

223. Soares et al., "Correcting for Purifying Selection," 740–59.

because the reader has now been told that DNA science has provided “empirical finding[s]” that support a recent appearance of humans and a hyperliteral reading of Genesis. Supposedly, “this same debate,” Meldrum tells us, “continues to rage after 11 years of wrangling” (p. 111). The implication is that the use of the mtDNA control region and its supposed support for Meldrum’s fundamentalist reading of the Bible are still going concerns. This is false.

A recent review of mtDNA dating pointed out that even in the late 1990s, most complete published mtDNA sequences “suffered from missequencing and misreading.” It was not until 2000 that “the first (fairly) reliable set of complete DNA sequences” was available.<sup>224</sup> And many studies (such as those chosen by Meldrum) that rely on the control region alone “also have a high error rate, which to some extent disguises the real mutational process.”<sup>225</sup> The “continuous stream of technical flaws and biases” permit “end users’ [like Meldrum] . . . simply to pick out the ages that serve the story they wish to tell, no matter how technically wrong the dating method might be.”<sup>226</sup> Of Meldrum’s claim about higher pedigree rates, the authors note:

Calibrating the molecular clock has been the subject of a great deal of controversy, to the extent that in the mid-1990s concerns were raised that the clock for the first hypervariable segment of the mtDNA control region might have been misestimated by a factor of 10 or more. Subsequent discussions emphasized the numerous approaches to dating, such as calibration against the fossil record, calibration against and comparisons with the archaeological record, and comparison with other systems such as coding-region restriction fragment length polymorphisms (RFLPs) for which further approaches were available. These considerations suggested that those concerns, which were based on estimates from pedigree studies,

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224. Bandelt et al., “Mutation Rates and Coalescence Times,” 48.

225. Bandelt et al., “Mutation Rates and Coalescence Times,” 53. For a discussion of how pedigree studies are uniquely vulnerable to sequencing errors that can exaggerate the true mutation rate by at least six times, see p. 78.

226. Bandelt et al., “Mutation Rates and Coalescence Times,” 85.

**Table 2: mtDNA mutation rate in pedigree studies  
(By type of mutation compared to phylogenetic rates)**

Author	Date	Which mutations?	Mutation rate/ site/year	Years per mutation
Parsons	1997	All control region (CR)	$2.50 \times 10^{-6}$	656
Santos <sup>228</sup>	2005	All CR	$1.40 \times 10^{-6}$	1,164
		CR—women only	$5.12 \times 10^{-7}$	3,200
		CR—germinal cells only	$7.68 \times 10^{-7}$	2,133
		CR—women + germinal only	$1.68 \times 10^{-7}$	9,786
		Compare phylogenetic <sup>229</sup>	$2.00 \times 10^{-8}$	3,237
Santos <sup>230</sup>	2008	All CR	$3.50 \times 10^{-7}$	2,593
		CR—women only*	$3.50 \times 10^{-7}$	2,593
		CR—germinal cells only	$2.34 \times 10^{-7}$	3,885
		CR—women* + germinal only	$2.34 \times 10^{-7}$	3,885
		Compare phylogenetic†	$0.58 - 2.86 \times 10^{-7}$	5,732–28,510

\* Note that all mutations were in females in this pedigree study.

† When the chances of being fixed are added to this pedigree analysis, the highest rate is  $4.12 \times 10^{-7}$ , which represents one mutation every 22,025 years—well within the phylogenetic rate. Lower rates produce results even worse for Meldrum’s theory.

were largely unwarranted. . . . We nevertheless still see the old arguments recycled about a tenfold higher “pedigree rate.”<sup>230</sup>

*Remnant through DNA* is, quite simply, more than a decade out of date.

#### II.D.10 *The second story*

It is here, then, that the first story ends: the mtDNA control region is not a suitable molecular clock. It cannot be used in isolation to

227. Cristina Santos et al., “Understanding Differences between Phylogenetic and Pedigree-Derived mtDNA Mutation Rate: A Model Using Families from the Azores Islands (Portugal),” *Molecular Biology and Evolution* 22/6 (2005): 1490–1505, mbe.oxfordjournals.org/cgi/reprint/22/6/1490 (accessed 20 May 2010).

228. The phylogenetic rate per site is lower than the pedigree rates, but it results in more frequent mutations because the phylogenetic rate is here calculated on the coding region (15,446 sites) instead of on the control region (1,110 sites). It thus has more “chances” to have mutations, so they happen more frequently. This demonstrates why converting to a single standard measurement is often necessary to produce figures that can be easily compared (see discussion in II.D.8 as it applies to Meldrum’s data table).

229. Santos et al., “Mutation patterns of mtDNA,” 1–12.

230. Bandelt et al., “Mutation Rates and Coalescence Times,” 48.

accurately date past events, including Meldrum's claim that humans appeared six thousand years ago. And until *Remnant through DNA's* publication, this is where Meldrum's argument ended—his 2007 DVD said little about the second story, to which we now turn.

Nothing in the science of the second story supports Meldrum's hope for a 4000 BC origin for humans either. But he blurs the discussion, and so the reader may suspect that the *current* disagreement about the precise dates obtained from molecular data still has a bearing on the *past* discussion about the use of the mtDNA control region alone. It does not. No current researcher believes or argues that the coding region alone provides an adequate "clock" for reliably dating events.

The second story's conclusion has yet to be written, but the plot is clear—it seeks to answer the question, can mtDNA be used to reliably date any events in the past that we do not directly observe? And, if it can, which events can be dated, and for what time period(s) can reliable dates be obtained?

Meldrum does nothing to help his audience understand ongoing efforts to reconcile all the available data. Since he wants his chosen "pedigree rate" to be accepted (hoping, one suspects, that this means that dating Adam and Eve to six thousand years ago will remain "proven" or at least accepted by his readers), he dismisses any efforts to calibrate the data. He describes this as "massaging" the data and describes it as "rather suspiciously similar to 'cooking the books' done by crooked accountants. If it doesn't fit, keep working with it until it does" (pp. 123–24). Again, we see the author condemning those who disagree with him as dishonest.

Meldrum concludes his dating argument by again confusing the rates calculated for the control region with rates derived from the entire mtDNA molecule:

The primary purpose for this section . . . 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. . . . The proposed arrival times have ranged from 12,000 to 36,000 years ago based on very broad phylogenetic rates of mutation. Using conservative

empirical estimates, this rate could just as well be 1,200 to 3,000. . . . This is most certainly within the realm of possibility based on all the dating problems reviewed. (p. 128)

The “conservative empirical estimates” that Meldrum clings to all rely on the control region—which does not mutate at a constant rate and is subject to selection and recurrent back mutations. It therefore cannot be used alone for dating—whether to 2600, 4000, or 14,000 BC. As we saw in table 2, even pedigree rates do not meet Meldrum’s needs when we consider (as we must) only those mutations that could spread to descendants.

#### *II.D.11 Software aids and abets*

Some researchers avoid using evolutionary events to calibrate their mtDNA timescales. Instead, they feed the *observed* mtDNA sequences into computer programs that use statistical methods to determine relationships and the distance between them. This allows each mutation rate to vary independently. Unlike some dating methods, such as the “phylogenetic” approach dismissed by Meldrum, these “results are not contingent on a prespecified parametric growth model”<sup>231</sup>—or, in less jargon, the results do not assume a smooth, regular, clocklike rate of mutation throughout the entire time period being considered.

Meldrum tries to condemn and dismiss this approach by noting that the computer tools used are called “phylogenetic software” (p. 124). Since he associates “phylogenetic” with evolution, and evolution with atheism, one suspects this is intended to be a telling admission on the part of the scientists. Meldrum’s argument demonstrates that he does not understand the terminology. Here the term *phylogeny* simply refers to *any* ancestor-descendant relationship between two or more organisms.<sup>232</sup> I could, if I wished, speak of the

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231. Quentin D. Atkinson, Russell D. Gray, and Alexei J. Drummond, “mtDNA Variation Predicts Population Size in Humans and Reveals a Major Southern Asian Chapter in Human Prehistory,” *Molecular Biology and Evolution* 25/2 (2008): 468–69, [mbe.oxfordjournals.org/cgi/reprint/25/2/468.pdf](http://mbe.oxfordjournals.org/cgi/reprint/25/2/468.pdf) (accessed 24 May 2010).

232. Phylogeny is “the development *or* evolution of a particular group of organisms”—it need not imply interspecies evolution, as when one considers development of the gene

phylogenetic relationship between me and my son, who is only one generation removed, and clearly of the same species (he is not yet a teenager). I could also speak about a proposed phylogeny between me and an ancestor from 2600 BC. A phylogenetic software analysis does not imply or require interspecies evolution—it only implies a genetic relationship of some sort.

Under evolutionary theory, all organisms have a single phylogeny because all are believed to be related, if only distantly. But “phylogenetic software” can also be used to determine the relationships between a group containing only modern humans living in historical time. The only “evolution” being considered is the mutation and selection of mtDNA variants, which is the whole point. When one is dealing with hundreds of mtDNA samples, each consisting of thousands of base pairs, no unaided human could determine how each sample should be most plausibly connected in a single gigantic family tree. This kind of massive data analysis requires a computer.

Meldrum is clearly unable to critique or even describe the complex statistical modeling that such programs use. It is doubtful that most of his audience could either—I certainly cannot. He resorts, by default, to a tried-and-true technique:

[These computer programs] 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. (p. 124)

Attorneys who wish to appear “just simple country lawyers” have used this tactic repeatedly to persuade a salt-of-the-earth jury to ignore some bit of evidence. This ploy flatters the audience, implying that even though they don’t understand the fancy science and math, this is no defect. In fact, not being seduced by the arcane material is a positive virtue; the simplicity and common sense of the religiously enlightened man-or-woman-in-the-street can see through the

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pool of a single species. *Random House Dictionary*, 2010, s.v. “phylogeny,” emphasis added, <http://dictionary.reference.com/browse/phylogeny> (accessed 24 May 2010).

obfuscation of corrupt or hopelessly addled scientists. The tools are disparaged as hiding their deception and desperation behind fancy-pants nomenclature and technical jargon, and their claims need not, therefore, even be seriously addressed because they are unworthy of consideration: “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” (p. 133).

I trust the reader will not succumb to this bit of sophistry and will recognize that this line of evidence has gone unanswered by *Remnant through DNA*.

#### *II.D.12 Not so far apart*

Meldrum insists that Parsons’s mitochondrial Eve of six thousand years ago is the only proper answer. But we now know that this analysis used an improper assumption: clocklike change in the control region. When other methods—pedigree, phylogenetic, *and* those that do not presume any evolutionary relationship between humans and other species—produce varying answers, this is offered as evidence of confusion and dissembling. But, in fact, the various methods provide results that are roughly comparable. Scientists are not happy with the disagreement in dates that still exists, but it is not the ten- to twentyfold difference that Meldrum makes it out to be (pp. 108, 128).

A recent study discusses the issue of human entry into the Americas.<sup>233</sup> One of the authors of the study, Simon Ho, has been among the fiercest critics of the phylogenetic calibration, and Meldrum has quoted his previous work with enthusiasm throughout *Remnant through DNA* (see references 66, 77, 83). Yet Ho’s study provides the date ranges for entry into the Americas based on various models—including those he has criticized. They appear in table 3, with some additions from other sources.

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233. Table 3 is based in part on Phillip Endicott et al., “Evaluating the mitochondrial timescale of human evolution,” *Trends in Ecology and Evolution* 24/9 (13 August 2009): 518–19, figs. 511, 512, [www.simonho.org/papers/tree09\\_endicott.pdf](http://www.simonho.org/papers/tree09_endicott.pdf) (accessed 24 May 2010).

Clearly, even if the most conservative of these dating schemes currently under consideration are precisely true, they are millennia away from 4000 BC. We see, in fact, that the proposed ages between the two methods have been narrowed to within a few thousand years of each other, but Meldrum is still convinced that Parsons's 1997 rate is accurate for all time frames and constant throughout them all. This gives him a common ancestor at 4000 BC that represents the biblical Adam and Eve, and so he considers all further discussion merely an attempt to protect evolution. In this case, Meldrum has done his work too well by demonstrating that the control region mutation rates are not reliable clocks. Yet he still wants to appeal to at least *one* rate based on the control region because it will support his model, though it is no more viable when extrapolated for his purposes than the “evolutionary” rates he dismisses.

#### *II.D.13 The bottom line*

Meldrum has attempted to paint a picture of chaos and utter disagreement about dating via mtDNA. In doing this, he hopes to persuade us that (a) science tells us that modern humans appeared on the scene six thousand years ago and (b) X2's arrival in the Americas could well date from Lehi's time and that this is persuasive evidence in favor of the Book of Mormon. The reader is further led to think that only ideology and bias blind the scientists—or other Latter-day Saint researchers—to these possibilities.

Regardless of which “faction” wins out in the scientific debate about the best way to use mtDNA to date distant events, Meldrum's case has no support whatever. “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,” we are confidently assured (p. 128). As we have seen, this is false. None of the evidence supports Meldrum's model; whichever dating scheme one chooses to use, the model cannot at present accommodate a 600 BC entry of Lehitites into the Americas as the founding source of X2a. None of the current scientific debate about precise dating using mtDNA can save this theory.

*II.D.14 Meldrum's scientific revolution?*

For those who are persuaded by Meldrum's barrage of data, the picture painted is a heady one. "Such a dramatic paradigm shift would," we are told, "require rethinking the basis of archaeology, anthropology, and many other scientific fields" (p. 111). And maybe it would. That many fields would require massive readjustment is an important realization, though not for the reasons that the author believes. It could be possible—anything is, after all—that the vast majority of natural scientists in a host of disciplines are colluding to avoid accepting or admitting the truth that stares Meldrum in the face. But I think a more prosaic explanation warrants consideration.

For example, Western science did not abandon the concept of a young earth simply because scientists wanted to discard the Bible or because they wanted to salvage Darwin's theory of natural selection. Rather, long before Darwin, the earth's great age was something that thinkers of the 1700s came to almost reluctantly, leaving even the most avant-garde natural historians "astounded by 'the dark abyss of time'"—the idea was that foreign. By the 1780s, "new theories which took for granted a long timescale were becoming commonplace."<sup>234</sup> In fact,

surprising as it may seem in today's world of revived biblical literalism, there was little opposition to Darwin's book on the grounds that it challenged the Genesis account of creation. The geological controversies in the early decades of the [nineteenth] century had convinced most educated people that the text of Genesis must be understood in a non-literal way that would be consistent with the development of the earth over a vast period of time.<sup>235</sup>

These changing beliefs were largely driven, and then embraced, by scientists who were believing Christians—many of them clergymen.

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234. Bowler, *Evolution: The History of an Idea*, 57–58.

235. Bowler, *Evolution: The History of an Idea*, 202.

They came to these views because the evidence, as they saw it, compelled them.<sup>236</sup> Such ideas were neither comforting nor natural.

Despite the caricature presented by *Remnant through DNA*, genetic science is not a rickety scaffold of unfounded theories with no basis in experience or empirical data. Meldrum dismisses the idea that one “non-empirical theory” can confirm another (p. 106). “It is interesting to note,” he tells us, “. . . that the cross-checking being done . . . is to check one theory against another theory. . . . Is it any coincidence that they are consistent with each other?” (p. 105). Well, it all depends. Two theories may share similar hypothetical notions and thus provide little independent proof. But many theories start from quite different realms, involve quite different mechanisms, and yet arrive at similar conclusions. For example, the existence of modern humans prior to 4000 BC is suggested by the carbon dating of organic remains. A second line of evidence derives from mtDNA, and a third from Y-chromosome data. And yet a great age for modern humans was advocated in the 1800s—well before the discovery of radioisotopes or the double helix—simply on the basis of paleontology. Carbon dating did not have to match the theory built from fossils; mtDNA did not have to accord with carbon dating—but they did. It is hard to see this intersection of theory and data as only coincidence, the product of wishful thinking, or withholding grant funding from those who differed.

Thus, when Meldrum insists that population genetics, archaeology, anthropology, and other fields might be revolutionized, this is a tall order. It amounts to claiming that a vast amount of data from disparate fields has been completely misinterpreted for decades by thousands of generally honorable men and women.

If we are to dispense with dating the earth via radiochemistry, for example, we might also need to completely revamp our view of atomic theory since the decay of radioactive isotopes is among one of the most regular processes known. To alter that process might require a total recasting of nuclear physics, a field for which we have extraordinarily robust evidence, the envy of any biologist. To restrict

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236. For an extensive discussion, see Bowler, *Monkey Trials and Gorilla Sermons*, 30–78.

the earth's age to seven thousand years would send ripples, waves, or tsunamis through virtually every natural science. Is it any wonder, then, that when a discrepancy arises in a new field (population genetics) based on data amenable to multiple interpretations, and when new data are constantly refining and changing the picture, few researchers are eager to risk tossing the baby out with the slightly murky bathwater—especially when the bath basin offered in exchange is bone dry?

Meldrum obviously feels, as I do, that there is profound evidence for the Book of Mormon in many domains. When a new bit of evidence appears that purports to utterly destroy the foundations of Mormonism, critics are repeatedly disappointed that believers do not suddenly abandon the ramparts and stay home on Sunday. Meldrum and I would reply, I suspect, that every eddy in the ever-changing data is not sufficient for us to abandon something for which we believe we have profound and broad spiritual *and* secular evidence. As Neal A. Maxwell observed:

By not being actively involved in the process of faith, doubters simply do not receive reinforcing rewards. They also resent the lack of sympathetic vibrations from the faithful each time doubters themselves oscillate in response to what they suppose is some “new evidence” to the contrary. C. S. Lewis made the point that those without faith are entitled to dispute with those who have faith about the grounds of their “original assent,” but doubters should not be surprised if “after the assent has been given, our adherence to it is no longer proportioned to every fluctuation of the apparent evidence.”<sup>237</sup>

And, I venture to say, that given how alienated Meldrum finds himself from much of modern science—and given that he has obviously never participated in either the frustrations or the thrills of doing actual science—he simply cannot understand why population geneticists are not abandoning an interlocking model that has proved enormously powerful (at both predicting future observations and explaining them) simply because the mtDNA data presented them an

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237. Neal A. Maxwell, *Lord, Increase Our Faith* (Salt Lake City: Bookcraft, 1994), 89–90.

**Table 3: Current Dating Estimates—Various Authors and Methods**

Model author (date)	Method	Calibration	Entry to Americas (ybp) †
Mishmar (2003) <sup>239</sup>	Entire mtDNA coding region, all mutations	Human-chimp split at 6.5 mya*	18,000
Kivisild (2006)	Entire mtDNA coding region, substitution mutations only	Human-chimp split at 6.5 mya	14,000
Achilli (2008) <sup>240</sup>	Entire mtDNA using Mishmar rate	Human-chimp split at 6.5 mya	18–21,000
Kitchen (2008)	Entire mtDNA coding region, all mutations + combination of 8 other autosomal sites	Bayesian analysis and archaeology	15,000
Endicott, Ho (2009)	Entire mtDNA coding region, all mutations	Bayesian analysis and multiple points of archaeology	14,000
Perego (2009)	Archaeological, geologic, linguistic, and phylogenetic data	Multiple	13,500–19,000
Archaeology of the Americas	None	Carbon dating, stratigraphy, etc.	15,000
Schroeder (2009) <sup>241</sup>	9-repeat allele at microsatellite D9S1120	Statistical modeling	12,825

\* mya = million years ago

† ybp = years before present

anomaly. To the scientist, such anomalies are expected, and part of the fun. Scientists—good ones, at least—expect to have their expectations overturned, and the intellectual fight can often be vicious since the process demands that everyone advance their best efforts.<sup>241</sup> The

238. Dan Mishmar et al., “Natural selection shaped regional mtDNA variation in humans,” *Proceedings of the National Academy of Sciences* 100/1 (7 January 2003): 171–76, [www.pnas.org/content/100/1/171.full.pdf+html](http://www.pnas.org/content/100/1/171.full.pdf+html) (accessed 24 May 2010).

239. Alessandro Achilli et al., “The Phylogeny of the Four Pan-American mtDNA Haplogroups: Implications for Evolutionary and Disease Studies,” *PLoS ONE* 3/3 (2009): e1764, [www.plosone.org/article/info:doi/10.1371/journal.pone.0001764](http://www.plosone.org/article/info:doi/10.1371/journal.pone.0001764) (accessed 24 May 2010).

240. Kari B. Schroeder et al., “Haplotypic Background of a Private Allele at High Frequency in the Americas,” *Molecular Biology & Evolution* 26/5 (2009): 995–1016, [mbe.oxfordjournals.org/cgi/reprint/msp024v2](http://mbe.oxfordjournals.org/cgi/reprint/msp024v2) (accessed 24 May 2010).

241. To those outside scientific or scholarly circles, the way in which arguments and counterarguments are presented can appear, at times, personal or over the top, leading

struggle to resolve a problem often reveals the problem to be only apparent. What was initially an anomaly becomes further evidence that one was on the right track all along, albeit with a less profound and nuanced understanding—after all, “if any and every failure [for a theory] to fit [an observation] were ground for theory rejection, all theories ought to be rejected at all times” because no observation or theory is perfect.<sup>242</sup> “The most exciting phrase to hear in science,” wrote Isaac Asimov, “the one that heralds new discoveries, is not ‘Eureka!’ but ‘That’s funny.’”<sup>243</sup> One is unwise if one’s first reaction (or second or third) to such a cry is to overturn most of science to fix “the problem.”

### Part III—The Broader Significance

In leaders undue impatience and a gloomy mind are almost unpardonable, and it sometimes takes almost as much courage to wait as to act. It is to be hoped, then, that the leaders of God’s people, and the people themselves, will not feel that they must have at once a solution of every question that arises to disturb the even tenor of their way. —Joseph F. Smith<sup>244</sup>

Meldrum is frustrated by the scientists’ intransigence on the issue of dating:

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

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some onlookers to mistakenly conclude that “intellectual heat must breed emotional fire” (Gould, *Magister’s Pox*, 204). But to complain solely about the perceived tone is to miss the point—the “style over substance” fallacy. One can say that Meldrum is wrong either politely or rudely, but factually wrong he remains. And it is that uncomfortable truth that he must confront with more than complaining about someone’s tone or the biases and vested interests that he intuits behind their disagreement.

242. Kuhn, *The Structure of Scientific Revolutions*, 146.

243. Isaac Asimov, as cited in Scott Kenneth Parks, “Cellular mechanisms of ion and acid-base transport in aquatic animals” (PhD diss., University of Alberta, 2009).

244. Joseph F. Smith, *Gospel Doctrine* (Salt Lake City: Deseret Book, 1939), 156.

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. (p. 110)

Once again, we are promised “verification” of spiritual matters if only we would look at the scientific evidence right before us. If Meldrum’s view of science were accepted, we would know the Amerindians are descendants of Israel, and the skeptic would almost *have* to believe, albeit reluctantly, in the Bible and Christ’s reality. It would lead to an “admission,” a grudging concession, but one that any intellectually honest person would be almost compelled to make. And this single admission could revolutionize much of the scientific enterprise with one stroke.

While the promise of such intellectually compelling evidence is seductive, it is also a trap. As the stock of science rose in the West, thinkers were anxious to tie their religious beliefs into this new way of knowing. In a masterful study of the rise of atheism as a viable worldview in America, historian James Turner noted:

Historically the dominant sense of “believe” [in Christianity] has been confidence in a person, not credence in a statement. Yet if “belief in God” continued to include both connotations of the word, their relative weight did not remain constant. Theological warfare during the sixteenth and seventeenth centuries fostered an obsession with doctrinal distinctions. . . . This ingenuity of church leaders magnified the intellectual aspects of “believing,” pushed belief closer to the new objectifying, logical, demonstrating cast of mind [typified by science]. Belief in God by no means lost its footing in personal trust, but it came to depend more heavily on cognition and intellectual assent.<sup>245</sup>

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245. James Turner, *Without God, Without Creed: The Origins of Unbelief in America* (Baltimore: Johns Hopkins University Press, 1985), 24.

Latter-day Saints continue to suffer from the legacy of this focus on doctrinal niceties. Sectarian critics have long insisted that the Saints' trust and belief in Jesus as Christ, Lord, and God is not sufficient for either salvation or the label "Christian" because of supposedly erroneous theological opinions (e.g., a belief in divine embodiment, a rejection of Nicea, a belief in *theosis*, new scripture, and so forth).<sup>246</sup>

But believers in the creedal denominations were to ultimately suffer for this shift as well. "Just as religion had become more a matter of creedal assent, so belief had become more an intellectual proposition subject to logical proof—like the propositions of natural philosophy. . . . By the seventeenth century the rationalization of belief had gone rather far."<sup>247</sup>

The new sciences were soon co-opted into the service of Christian belief and apologetic, "for natural laws themselves presupposed a divine Lawgiver. . . . Theology was subjected to the Newtonian revolution long before many branches of science. This use of science soon became a phenomenally popular apologetic tool. . . . If science and rationalism had raised questions about God and unsettled belief, then what more logical response than to shore up religion by remodeling it in the image of science and rationality?"<sup>248</sup>

In the same way, the supposed "threat" to the Book of Mormon from DNA has led Meldrum not merely to argue that such threats are chimeras (which they are), but rather to insist that the science can actually support and reinforce the faith. In fact, the Book of Mormon promises are made to almost *require* some type of DNA proof. For, if the Bible is true, archaeology must support it. "If the Book of Mormon is true, then genetic truths and evidence will eventually bear out those truths" (p. 3). "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

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246. For a book-length treatment of these themes, see Daniel C. Peterson and Stephen David Ricks, *Offenders for a Word* (Provo, UT: Foundation for Ancient Research and Mormon Studies, 1998).

247. Turner, *Without God, Without Creed*, 25.

248. Turner, *Without God, Without Creed*, 27, 30, 49.

come from these lineages?” (p. 47). Like the Enlightenment clergymen before him,

so easy was it [for Meldrum, we could say] to slip into this way of thinking that many of the rationalizers of belief only half-realized that they had in fact made a choice—and never really stopped to consider its implications. . . . Divines increasingly treated Scripture itself as a kind of historical data, analogous to the facts of nature, rather than as the living voice of God. The Bible in such hands imparted proofs rather than personal faith, words rather than the Word.<sup>249</sup>

It is one thing to defend against or defuse science-based attacks upon the faith. It is quite another to insist that we ought to expect positive proofs from science *and* that without such proofs scripture or prophecy is in trouble.

The 1600s and 1700s started down this path, but only the 1800s would realize where it would lead. “By linking belief in God with the methods and discoveries of science, the argument from design simply carried to a natural conclusion the tendency to rationalize the foundations of belief. This linkage was consciously forged in the conviction that faith would be strengthened by making it clear and rational.”<sup>250</sup> I am not arguing, of course, that the gospel as taught by the Church of Jesus Christ is unclear or that faith is irrational. But it is a dangerous and fundamental error to make rationality the prime criterion by which it is judged or to expect science—the primary tool of rationality—to either rescue or be required by that faith. Rationality requires no faith, no trust; its demonstrations are public and plain.

This is, of course, the great attraction of rationality. If Meldrum can only convince us that mtDNA dating is wrong, then this will almost force an admission that his reading of the biblical account of creation is literally true in all respects, which will require even the wicked to grant that its witness of Christ must be seriously entertained. Without an old earth, there is no other logical means for its existence, save divine fiat—a

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249. Turner, *Without God, Without Creed*, 49–50.

250. Turner, *Without God, Without Creed*, 57.

guaranteed proof for God. Meldrum risks being like the churchmen who “did not want to confess that belief might lie outside the purview of logical analysis and empirical observation, for to do so would have meant sacrificing the prestige of science and the comforting assurance that hard-headed men could establish God as surely as they could tote up the day’s receipts in their counting houses.”<sup>251</sup>

By the mid-1800s, “[Christian] Church leaders had so long trumpeted the absolute security of knowledge of God and pointed to science as its guarantor that the now apparent insecurity of that knowledge—the victim of that very science—could well leave a thoughtful believer trembling on a reed.”<sup>252</sup> If Meldrum convinces his audience that genetic proof ought to exist, where are they left when they learn that he can only offer junk science?<sup>253</sup> The theologians tied their proofs of God ever closer to the argument from design, insisting that nothing save God could possibly account for the diversity of the living world. The arrival of Darwin’s theory was a terrible shock. “Simply by offering a plausible alternative explanation, Darwin had destroyed the proof value of design.”<sup>254</sup> Like Meldrum, young earth

251. Turner, *Without God, Without Creed*, 108–9.

252. Turner, *Without God, Without Creed*, 179.

253. Non-Latter-day Saint Christians have noted the same risk from their crop of “creation scientists”: “The maintenance of modern creationism and Flood geology not only is useless apologetically with unbelieving scientists, it is harmful. Although many who have no scientific training have been swayed by creationist arguments, the unbelieving scientist will reason that a Christianity that believes in such nonsense must be a religion not worthy of his interest. . . . Modern creationism in this sense is apologetically and evangelistically ineffective. It could even be a hindrance to the gospel. Another possible danger is that in presenting the gospel to the lost and in defending God’s truth we ourselves will seem to be false. It is time for Christian people to recognize that the defense of this modern, young-Earth, Flood-geology creationism is simply not truthful. It is simply not in accord with the facts that God has given. Creationism must be abandoned by Christians before harm is done. The persistent attempts of the creationist movement to get their points of view established in educational institutions can only bring harm to the Christian cause. Can we seriously expect non-Christian educational leaders to develop a respect for Christianity if we insist on teaching the brand of science that creationism brings with it? Will not the forcing of modern creationism on the public simply lend credence to the idea already entertained by so many intellectual leaders that Christianity, at least in its modern form, is sheer anti-intellectual obscurantism? I fear that it will.” Davis A. Young, *Christianity and the Age of the Earth* (Grand Rapids, MI: Zondervan, 1982), 163.

254. Turner, *Without God, Without Creed*, 184.

creationists have been trying to recover that lost certainty ever since. “Recent scholarship . . . has suggested . . . seeing fundamentalism as an attempt to secure for biblical truth the same certainty that science enjoyed according to the Newtonian and positivist paradigm.”<sup>255</sup> And the consequences of that effort in Christendom generally were severe:

The loss of scientific knowledge of God would not necessarily have proved devastating, save for one fact. Religious leaders had, since Newton, insisted on linking science and God. . . . The feebleness [of alternative accounts of faith] was the ultimate consequence of a longstanding preference among churchmen for proof that looked scientific. . . . This lust for empirical proof proved, in the end, nothing less than disastrous for belief. After science separated itself from God, doubting Victorians had left, not a subtle and firmly grounded alternative, but stunted arguments and evocations of heartfulness.<sup>256</sup>

Thus, if one is convinced (even if unconsciously) that there is “no effectual model of knowledge except science,”<sup>257</sup> then one will do one of two things: one will either capitulate to science (as Meldrum charges those who disagree with him), or one will try to seize science and remake it (however roughly) into an instrument of conviction and faith. Meldrum has chosen the latter option. This requires, sadly, that he distort the science, cite church leaders selectively, propose conspiracy theories, disparage those who disagree, market his materials beneath a veneer of spiritual claims, and propose strained readings of scripture. Such defects may not be intentional, but they are pervasive. This is a bad book on virtually every level—neither its content nor its reasoning can bear the expectations placed on it. Those who lean on it risk a shipwreck of faith at worst or an impoverished view of the natural world at best.

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255. Massimo Introvigne, “The Book of Mormon Wars: A Non-Mormon Perspective,” *Journal of Book of Mormon Studies* 5/2 (1996): 2.

256. Turner, *Without God, Without Creed*, 187–89.

257. Turner, *Without God, Without Creed*, 193.

Ironically, even if Meldrum had a better grasp of both the science and scripture, I do not think his project would be feasible. Moral agency is a core gospel doctrine. God simply will not compel us to anything, including belief in him. Boyd K. Packer emphasized this fact when he pointed out, “If all things were known, man’s creativity would be stifled. There could be no further discovery, no growth, nothing to decide—no agency. All things not only *are not* known but *must not* be so convincingly clear as to eliminate the need for faith.”<sup>258</sup>

A full examination of the scientific data would, Meldrum tells us, lead an honest observer to conclude that the earth is only seven thousand years old, that humanity has existed only since 4000 BC, and that the Book of Mormon migrations happened. But if the physical world could be seen only in this way while remaining true to rationality and the evidence, then it would provide an intellectually compelling—even compulsive—argument for God’s existence. This is, of course, the great appeal of such claims: science can be shown to *require* God.

The idea tantalizes. For sectarian fundamentalists who are wedded to biblical inerrancy, the point is vital. If their reading of the Bible on creation is mistaken, then one cannot trust it about *anything*. One must stand and fight on every hill; to defend a young earth is to defend the deity of Christ. Latter-day Saints are not prophetic or scriptural inerrantists, though some among us seem anxious to ape them on this point. Ironically, most of those who insist upon these matters in the sectarian world are equally vociferous against our inclusion in the “club” of Christianity.

We do not rely exclusively on scriptural exegesis for our doctrine, but instead upon modern prophetic guidance. And yet some still find the promise of putting others over a scientific barrel terribly attractive.

But if we are to be free to choose, belief in God’s existence cannot be made logically irresistible, and the answer to questions of his existence and his participation in the creation must remain open for the honest, sincere investigator. (It is not enough to say that one can

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258. Packer, “Law and the Light,” 8, emphasis in original.

disbelieve if one wishes—if such disbelief is intellectually perverse, it is a much less viable option.) As Terryl Givens noted:

The call to faith is a summons to engage the heart, to attune it to resonate in sympathy with principles and values and ideals that we devoutly hope are true, and to have reasonable but not certain grounds for believing them to be true. I am convinced that there must be grounds for doubt as well as belief in order to render the choice more truly a choice—and, therefore, the more deliberate and laden with personal vulnerability and investment. The option to believe must appear on our personal horizon like the fruit of paradise, perched precariously between sets of demands held in dynamic tension. One is, it would seem, always provided with sufficient materials out of which to fashion a life of credible conviction or dismissive denial. We are acted upon, in other words, by appeals to our personal values, our yearnings, our fears, our appetites, and our egos. What we choose to embrace, to be responsive to, is the purest reflection of who we are and what we love. That is why faith, the choice to believe, is, in the final analysis, an action that is positively laden with moral significance. . . .

. . . Men and women are confronted with a world in which there are appealing arguments for God as a childish projection, for modern prophets as scheming or deluded impostors, and for modern scriptures as so much fabulous fiction. But there is also compelling evidence that a glorious divinity presides over the cosmos, that God calls and anoints prophets, and that His word and will are made manifest through a sacred canon that is never definitively closed.<sup>259</sup>

It is, therefore, unsurprising from a Latter-day Saint point of view that the physical evidence may be credibly and honestly interpreted as not requiring God's participation in the creative process. Were it otherwise, God's existence would be a foregone intellectual conclusion.

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259. Terryl L. Givens, "Like Lightning out of Heaven: Joseph Smith and the Forging of Community," *BYU Studies* 45/1 (Winter 2006): 18.

This means that the believer need not and should not spend time railing against either the blindness or perfidy of men and women of science. Without revelation, we would likely see the data much as they do. Given what we know, we may choose to interpret parts—or all—of the science differently, with equal intellectual honesty. But that is a *result* of what God has revealed to us. It cannot be used or offered as a *cause* or ground for such belief. We cannot prove God by syllogism; we can but encounter him.

This is not to say that the glories and miracles of creation cannot inspire the search for God. They do and have—even for Joseph Smith.<sup>260</sup> But they are at best goads and spurs to revelation; they cannot ultimately substitute for it. “In order to present this part of the subject in a clear and conspicuous point of light,” reads *Lectures on Faith*, “it is necessary to go back and show the evidences which mankind have had to believe in the existence of a God and also to show the foundation on which these evidences are and have been based since the creation.” And what were these evidences? Not the natural world: “We *do not mean* those evidences which are manifested by the *works of creation* which we daily behold with our natural eyes. We are sensible that, *after* a revelation of Jesus Christ, the works of creation clearly exhibit his eternal power and Godhead throughout

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260. In Joseph’s earliest account of his spiritual quest, he wrote: “For I looked upon the sun the glorious luminary of the earth and also the moon rolling in their majesty through the heavens and also the stars shining in their courses and the earth also upon which I stood and the beast of the field and the fowls of heaven and the fish of the waters and also man walking forth upon the face of the earth in majesty and in the strength of beauty whose power and intelligence in governing the things which are so exceeding great and [p. 2] marvilous even in the likeness of him who created him <them> and when I considred upon these things my heart exclaimed well hath the wise man said the <it is a> fool <that> saith in his heart there is no God my heart exclaimed all all these bear testimony and bespeak an omnipotent and omnipreasant power a being who makith Laws and decreeth and bindeth all things in their bounds who filleth Eternity.” Joseph Smith History, 1832, in Joseph Smith Letterbook 1, MS, 1–2, Joseph Smith Collection, Church Archives, The Church of Jesus Christ of Latter-day Saints, Salt Lake City, Utah; reproduced in Dean C. Jessee, “The Earliest Documented Accounts of Joseph Smith’s First Vision,” in *Opening the Heavens: Accounts of Divine Manifestations, 1820–1844*, ed. John W. Welch and Erick B. Carlson (Provo, UT: Brigham Young University Press, 2005), 5. An earlier version is available in *BYU Studies* 9/3 (1969): 275–94.

their vast forms and varieties.” But such things are only compelling afterward. The initial ground for belief lies elsewhere:

The way by which mankind were first made acquainted with the existence of a God was by a manifestation of God to man.

It was by reason of the manifestation which God first made to our father Adam, when he stood in his presence and conversed with him face to face at the time of his creation, that the first thought ever existed in the mind of any individual that there was such a being as a God who had created and did uphold all things.

God became an object of faith for rational beings, and . . . [the] foundation the testimony was based [on] which excited the inquiry and diligent search of the ancient Saints to seek after and obtain a knowledge of the glory of God . . . *was human testimony, and human testimony only*. . . . It was the credence they gave to the testimony of their fathers, it having aroused their minds to inquire after the knowledge of God . . . [that] always terminated when rightly pursued, in the most glorious discoveries and eternal certainty.<sup>261</sup>

Meldrum might well reply that he has such revelatory knowledge. I do not seek to question that. But to argue that secular evidence in support of the scriptures ought to be expected, and must be of a certain type, is to threaten that knowledge in one’s audience, especially if the failure of others to see that evidence is blamed on pride, a lack of faith, or financial motives.<sup>262</sup> This is doubly true when one’s command of the

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261. Larry E. Dahl and Charles D. Tate, *The Lectures on Faith in Historical Perspective* (Provo, UT: BYU Religious Studies Center, 1990), pp. 45, 50–51, emphasis added.

262. Meldrum repeatedly implies that FAIR’s objection to his work was due to financial competition since FAIR’s DVD was released for sale “about the same time as [his DVD] was released” (p. 152); compare Bruce H. Porter and Rod L. Meldrum, *Prophecies and Promises: The Book of Mormon and the United States of America* (New York: Digital Legend, 2009), 180, for almost identical text on the same issue. It has already been pointed out to Meldrum that FAIR also posted its entire video for free on YouTube (Greg Smith, comment #5428 on FAIR blog, “Examining the Secular Side,” 6 September 2008, [www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5428](http://www.fairblog.org/2008/09/03/examining-the-secular-side/#comment-5428) [accessed 24

historical, scientific, and scriptural data is shaky. His demonstration—marketed as both necessary and persuasive—soon comes to seem essential. Who will then supply its lack when the collapse comes, especially when false expectations have been generated?

## Conclusion

In 1820, a young woman wrote her brother in the midst of her era's intellectual challenges to belief, "I wish I could find some religion in which my heart and understanding could unite." She was not to find what she sought.<sup>263</sup> But in that same year a young man entered a grove and came away with exactly such a union of heart and understanding. "I feel like shouting hallelujah, all the time," enthused the not-easily-excited Brigham Young, "when I think that I ever knew Joseph Smith, the Prophet whom the Lord raised up and ordained, and to whom He gave keys and power to build up the kingdom of God on earth and sustain it."<sup>264</sup> "I wanted to know the truth," said Brigham of his early days, "that I might not be fooled—children and young men got religion, but I could not."<sup>265</sup> But "when I saw Joseph Smith, he took heaven, figuratively speaking, and brought it down to earth; and he took the earth, brought it up, and opened up in plainness and simplicity, the things of God; and that is the beauty of his mission."<sup>266</sup>

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May 2010]), suggesting that financial considerations do not loom large (for all videos, see [en.fairmormon.org/Book\\_of\\_Mormon\\_and\\_DNA\\_evidence#Videos](http://en.fairmormon.org/Book_of_Mormon_and_DNA_evidence#Videos) [accessed 24 May 2010]). Meldrum seems unable to understand that objections to his theories could be based on other than financial motives.

263. Turner, *Without God, Without Creed*, 139, citing Lydia Maria Francis to Reverend Convers Francis (31 May 1820), in *Lydia Maria Child: Selected Letters, 1817–1880*, ed. Milton Meltzer and Patricia Holland (Amherst: University Press of Massachusetts, 1981), 2, and (27 February 1856) in *Letters of Lydia Maria Child* (Boston: Houghton, Mifflin and Co., 1883), 7 (quotation), 74–75, [quod.lib.umich.edu/cgi/t/text/text-idx?c=moa;idno=AFW4585.0001.001](http://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa;idno=AFW4585.0001.001) (accessed 25 May 2010).

264. Brigham Young, in *Journal of Discourses*, 3:51.

265. Brigham Young Papers, Minutes, 8 January 1845; cited in Ronald K. Esplin, "Discipleship: Brigham Young and Joseph Smith," in *Joseph Smith, the Prophet, the Man*, ed. Susan Easton Black and Charles D. Tate, *Religious Studies Center Monograph Series* (Provo, UT: BYU Religious Studies Center, 1993), 242.

266. Brigham Young, in *Journal of Discourses*, 5:332.

God has been gracious—never has more material been available that supports and illuminates the Book of Mormon. But we ought never to expect that such support will come in the forms or ways we wish. Such evidences will be confirmatory, not foundational or compulsory. They will usually defend, while providing little that can launch an assault. Others may disagree without being unfaithful or fools. And they will never require us to misrepresent the learning of the world. The Book of Mormon, the Latter-day Saints, and the Church of Jesus Christ deserve far better than Meldrum’s pseudoscientific snake oil and strained proof-texting.