

Methuselah: Oldest Myth, or Oldest Man?

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Abstract — The Old Testament records the age at death of 31 men in the lineage from Adam to Jehoiakim. For another 10 men, the Bible gives death ages that can be correlated to generation number. Altogether, the recorded death ages span almost 50 generations. Adam and many of his earlier descendants are recorded to have lived over 900 years, whereas Moses is recorded to have lived 120 years. Death ages between these two change gradually, and individual values are very specific. No serious investigation has been made of claims that Adam, Methuselah, and others lived nearly a millennium, perhaps because conventional knowledge (beliefs) make such life spans seem preposterous — and perhaps also for fear that it would appear to be an endorsement of creationism or theology. However, open-minded examination of the recorded ages now is warranted because (1) recent discoveries related to telomerase and stem cells (see Section 5, Genetics and Aging Studies for explanation) suggest a biological basis for such “immortality,” and (2) the recorded ages appear well correlated by genetic equations describing the effects of inbreeding depression. Close inbreeding was a social and legal custom well documented in the Old Testament.

Keywords: Adam — Methuselah — life spans — genetic inheritance — inbreeding depression — mores — telomerase

1. Introduction

One summer, as a boy, I was sent to a vacation Bible school. There I was told about Adam and Eve and about someone named Methuselah who lived 969 years (Genesis 5:27). The school was not associated with a fundamentalist denomination, so it was explained that Methuselah really did not live that long. It was said that the number was so big because a lunar calendar was used during the Genesis period of the Bible. Hence, Methuselah really lived only a very believable 81 years.

Several decades later while reading through Genesis, I came across the passages that told how old Adam and his immediate descendants were when they died. Upon reaching Methuselah's name, I remembered the vacation Bible school's teaching about lunar calendars. A little later while reading the 11th chapter of Genesis, I was utterly shocked to see death ages of Noah's descendants rapidly declining from 600 years down to 205 years. There can be no gradual change from a lunar based to a solar based calendar!

This research article presents results of a subsequent, multi-year examination of the Bible claims of exceptional life spans. It reviews a variety of candidate explanations as to why the numbers are so specific, and why they change dramatically over the span of 16 generations.

2. Biblical Life Spans

The Bible records the alleged age at death of many males in a lineage from Adam. In fact, there is a record for more than 70% of the 50 generations from Adam to Jehoiakim. In many of these generations, it is the life span of the first born male that is presented. For 19 of the first 21 generations, age when the son was born also is recorded. Table 1 presents all of the recorded names, siring ages, and death ages of males in a direct lineage from Adam; also presented are the referenced Bible passages containing the respective information. Death ages for several males who are brothers or close cousins of those in the main lineage are also presented. Records include only one woman: Sarah, Abraham's wife.

From generation 1 through 8, alleged life spans averaged 926 years. In generations 9 through 22, life spans declined to 147 years. In generations 33 through 47, life spans averaged less than 55 years.

3. Life Spans as Myth

As previously mentioned, some (*e.g.*, Scheinfeld, 1972) have sought to explain the life spans in terms of a different calendar system. However, the comfortable concept of a lunar calendar instead of a solar calendar will not work as an explanation. There is no age discontinuity, and the alleged life spans gradually decline. Also, some of the males were said to be younger than 100 when they sired their firstborn male. Dividing such numbers by 12 makes them unbelievably young to be fathers.

Only religious fundamentalists have believed the Bible claims of exceptional longevity. To others it is totally unbelievable (and even unthinkable) that anyone could have lived so much longer than we do. After all, today's medical technology and comparatively protected lifestyles should make current life spans greater than Old Testament era life spans.

Myths

The possibility must be considered that the claims are mere myths. Perhaps even the names of the early patriarchs might be regarded as mythical, in which case the death ages would also be mythical. However, extra-biblical evidence supports the existence of at least some of the early patriarchs. For example, both the Dead Sea Scrolls and the more recently discovered Eblan tablets support the existence of Lamech, born before the Flood of Noah's time, and Eber who was born after the Flood.

Another angle to consider is that the names of the early patriarchs represent

a family dynasty rather than a person. This possibility is significantly weakened by the list of “begats” that include ages when the various patriarchs became fathers. Furthermore, tracing the blood lineage from Adam to Jesus is an important theme of the Bible.

Kenyon (1960) concluded that the ages are a symbolic tribute to the ancient patriarchs; but several factors make symbolism an unsatisfactory explanation. If symbolic tribute was the basis for the claims, then Adam should have been attributed with the longest life span. He was the first in the lineage, and his life is the basis of much in the Bible. However, two of his descendants are credited with the longest life spans; and these two merited no comments other than they each lived more than 960 years and had a son. Jared is said to have died at age 962 (Genesis 5:18–20), and Methuselah is said to have died at age 969 (Genesis 5:25–27).

Others (Sarna, 1966; Vawter, 1956) also have regarded the numbers as symbolic, involving numerology; but explanations based on numerology are equally difficult. Birth and death ages are very specific, varied, and without discernible numeric symbolism. Absence of any story about most of the early patriarchs further weakens numeric symbolism.

Invention

Another candidate explanation is that the Old Testament authors invented the numbers, either accidentally or purposefully. If invented, it almost certainly was not an accident due to random selection of numbers. The probability of the observed decreasing biblical sequence occurring completely at random is only about 2×10^{-23} . Therefore, the only serious possibility is purposeful invention, for whatever motive.

Probability of purposeful invention cannot be quantified by normal statistical methods. However, there are several factors which are relevant to a gross assessment of such a possibility.

First, there is the character of the numbers. If fabricated, then one might reasonably expect the ages to smoothly follow some decay pattern. Thus, each age would have a specific relationship to its contiguous values, and each would be smaller than that of the predecessor. However, no apparent point-to-point relationship exists, and there is little statistical evidence that the values are distributed other than normally.

To assume that the author(s) intentionally built in a statistical distribution of data would require some sophistication in statistical processes. To generate a coherent non-linear decay pattern would also require some mathematical sophistication.

Mathematical sophistication was not a characteristic of the period when Genesis was compiled, *ca.* 500 B.C. In this pre-Hellenistic period, the Babylonians were among the mathematically most advanced. Forms of algebra including quadratic equations were known, and there is slight evidence of some knowledge regarding series progressions. The Egyptians were somewhat less

TABLE 1
Old Testament Lineage Records

<i>t</i>	Name	A_b	A_d	Name	A_b	A_d	Biblical Reference
1	Adam	130	930				Genesis 5
2	Seth	105	912				
3	Enosh	90	905				
4	Kenan	70	910				
5	Mahalalel	65	895				
6	Jared	162	962				
7	Enoch ^a	65					
8	Methuselah	187	969				
9	Lamech	182	777				
10	Noah		950				Genesis 9
11	Shem	100	600				Genesis 11
12	Arpachshad	35	438				
13	Shelah	30	433				
14	Eber	34	464				
15	Peleg	30	239				
16	Reu	32	239				
17	Serug	30	230				
18	Nahor	29	148				
19	Terah		205				
20	Abraham	100	175	Sarah ^b	90	127	Genesis 16–25
21	Isaac	60	180	Ishmael		137	Genesis 25–35
22	Jacob		147				Genesis 47
23	Judah			Levi ^c		137	Genesis 50
24	Perez			Kohath		133	Exodus 6
25	Hezron			Anram		137	

Notes

t = Generation number.

A_b = Age at son's birth.

A_d = Age at death.

^a Enoch disappeared at Age 365.

^b Sarah was Abraham's half-sister.

^c Levi's brother Joseph died at age 110.

advanced, however. According to Neugebauer (1957), "The role of Egyptian mathematics is probably best described as a retarding force upon numerical procedures." Since the Hebrews had experienced hundreds of years of Egyptian influence, their mathematical knowledge was undoubtedly similar to that of the Egyptians. Roughly 2000 years passed before sophisticated non-linear mathematics began to be introduced by persons such as Bernoulli, Descartes, Fermat, and Napier. Viewed in this light, purposeful invention of a non-linear, statistically distributed decay pattern would seem somewhat less probable.

In addition, one must consider that there were at least three authors of the data, writing over a period of time. Therefore, a perpetuated motive and methodology would have been required to assure smooth blending of the various segments.

Authorship is even more of a problem if one accepts one of the modern views that the Pentateuch was compiled from the "J," "E," "P," and "D" sources rather than written by Moses. All of the early genealogical informa-

TABLE 1 (continued)
Old Testament Lineage Records

<i>t</i>	Name	<i>A_b</i>	<i>A_d</i>	Name	<i>A_b</i>	<i>A_d</i>	Biblical Reference
26	Ram			Moses ^d		120	Deut. 34; Num. 33
27	Amminadab			Joshua ^e		110	Josh. 24; Judg. 2
28	Nashon						1 Chronicles 2
29	Salma						
30	Boaz						
31	Obed						
32	Jesse						
33	David		70				2 Sam. 5; Kings 2
34	Solomon						2 Chronicles 1–9
35	Rehoboam		58				2 Chronicles 11–12
36	Abijah						2 Chronicles 13
37	Asa						2 Chronicles 14–16
38	Jehoshaphat		60				1 Kings 22; 2 Chr. 20
39	Jehoram		40	Jehoiada ^f		130	2 Chronicles 21 & 24
40	Ahaziah						2 Chronicles 22
41	Joash						2 Chronicles 24
42	Amziah		54				2 Chronicles 25
43	Uzziah		68				2 Chronicles 26
44	Jotham		40				2 Chronicles 27
45	Ahaz		36				2 Chronicles 28
46	Hezekiah		54				2 Chronicles 29
47	Manasseh		67				2 Chronicles 33
48	Amon						2 Chronicles 33
49	Josiah						2 Chronicles 34–36
50	Jehoiakim						2 Chronicles 34–36

Notes (continued)

^d Moses' brother Aaron died at age 123.

^e Joshua was not in Isaac's lineage.

^f Jehoiada the Priest was not in direct lineage.

tion is attributed to the "P" or Priestly code.¹ However, the most common assumption is that "P" was not an individual or even a group of like-minded contemporaries, but a sect or school (Speiser, 1964).

Thus, the character of the data, the lack of mathematical sophistication at time of authorship, and problems of multiple authors all lessen the probability of purposeful invention. Invention cannot be entirely dismissed, but it must be acknowledged to be a less satisfactory possibility than suggested by casual consideration.

¹These sources refer to various schools of priests, which contributed strands of narrative based on oral traditions. These strands were combined into a composite work. "J" and "E" refer to schools or sects that preceded "P." "D" represents a still later school associated with text in Samuel, Kings, and Chronicles.

Corroborative Data

Myth, symbolism, and invention all seem to be weak approaches to explaining the exceptional life spans. Despite the difficulties in these approaches, the alternate idea that ancient people could have lived for hundreds of years is difficult to accept. Today's well-fed, modern society should offer much greater advantages toward longevity. The first century A.D. historian, Flavius Josephus (trans. 1902), reported the Old Testament genealogy and life spans. He followed this report with a paragraph which indicates that 2000 years ago it was hard to believe millennial life spans — even though Josephus appears to have read many older records of exceptional longevity. After reporting the Old Testament genealogy and life spans, he concluded with the following:

Now I have for witnesses to what I have said, all those that have written Antiquities, both among the Greeks and barbarians; for even Manetho, who wrote Egyptian History, and Berossos, who collected Chaldean Monuments, and Mochus, and Hesticeus, and, besides these, Hieronymus the Egyptian, and those who composed the Phoenician History, agree to what I here say: Hesiod also, and Hecatæus, Hellanicus, and Acusilaus; and, besides these, Ephorus and Nicolaus relate that the ancients lived a thousand years. But as to these matters, let every one look upon them as he thinks fit.

Indeed, a review of earliest historians, tablets, and fragments confirms that claims of exceptional longevity were common for the period prior to and just after the Great Flood. Some of these claims have been translated and well reviewed by Verbrugge and Wickersham (1996).

The Sumerian King List, for example, presents the reigns of kings for various kingdoms; these listings were neither well ordered nor in clear genealogical sequence. Nonetheless, it is clear that some of the claimed life spans immediately after the Great Flood were on the order of a millennium. However, life spans declined quickly, as indicated by a subsequent average length of king's reigns of under 200 years — still well above today's life spans.

Also, the Greek historian, Berossos, listed kings and the durations of their reigns; again these were not genealogically sequenced. Taking the sum of durations of claimed reigns and dividing by the number of listed kings yields an average reign duration of 385 years. If one takes the sum of all the years listed in the Sumerian King List, through the Sargonid Dynasty, and divides by the total number of claimed kings, an average reign duration of 345 years results. Manetho, another Greek historian cited by Josephus, also recorded claims of exceptional longevity. Unfortunately, neither his, Berossos', nor any other source of antiquities contains the genealogical sequencing and level of detail contained in the Bible.

Perhaps one more skilled in the esoteric arts might mount a better campaign to discredit these sources through mythical or symbolic rationalization. Even so, it would be nonetheless difficult to explain the rapid initial decline in

claimed life spans, followed by a more gradual rate of decline toward levels compatible with current anthropological and archaeological beliefs.

4. Life Spans As Fact

When only the impossible remains, it should be openly considered. If these life spans were factual recordings, then how might they be explained, and how might the decline in life spans be described?

The key to this puzzle may rest in the laws of Moses. Many specific laws were provided by Moses, and many of them dealt specifically with a prohibition on marriage among close relatives — what we now call incest (Living Bible, Leviticus 18).

Laws are not passed unless there is behavior that needs to be changed. At the 26th generation, it would have become obvious that life spans were much shorter than those of earlier generations. If it were concluded that marrying close blood relatives was causing shorter life spans, then there would have been a sound basis for new laws limiting blood marriages.

Inbreeding Depression

Ranchers and breeders of show dogs, horses, and other animals know that there are deleterious genetic effects of inbreeding. Vitality and a variety of desired characteristics can be depressed by continuous inbreeding. Comfort (1964) cautioned that inbreeding depression can markedly shorten the lifetimes of succeeding generations in duration-of-life experiments.

Inbreeding depression is the gradual reduction of fitness, expressed by some quantitative character, which occurs over a number of generations of successive consanguineous (blood) matings. It results from the increased phenotypic expression of recessive genes during the resulting approach to homozygosity. The quantitative decline in the affected character (in this case, longevity) follows a linear relationship (Falconer, 1960):

$$A_t = A_\infty - (A_0 - A_\infty)F_t \quad (1)$$

where

A_t = age at generation number t ,

A_0 = mean age of population before inbreeding,

A_∞ = age at completion of inbreeding effects,

F_t = inbreeding coefficient at generation number t .

The value of F_t represents the probability that the two genes at a particular locus are identical by descent from the individual's ancestors. More generally, it can be regarded as the expected value of the correlation between the genetic values of two uniting gametes, regardless of the number of loci and alleles under consideration (Crow & Kimura 1970). The inbreeding coefficient,

itself, is non-linear with respect to generation number. Also, its value at a given generation depends upon the closeness of relationships between the ancestors.

For regular systems of mating, Falconer (1960) showed the inbreeding coefficient at a given generation can be expressed in terms of its rate of increase per generation, ΔF , and its value in the preceding generation, $F_{(t-1)}$:

$$F_t = \Delta F + (1 - \Delta F)F_{(t-1)} \tag{2}$$

Figure 1 shows the biblical data with a theoretical curve for inbreeding depression of longevity. The curve is calculated from Equations (1) and (2) with

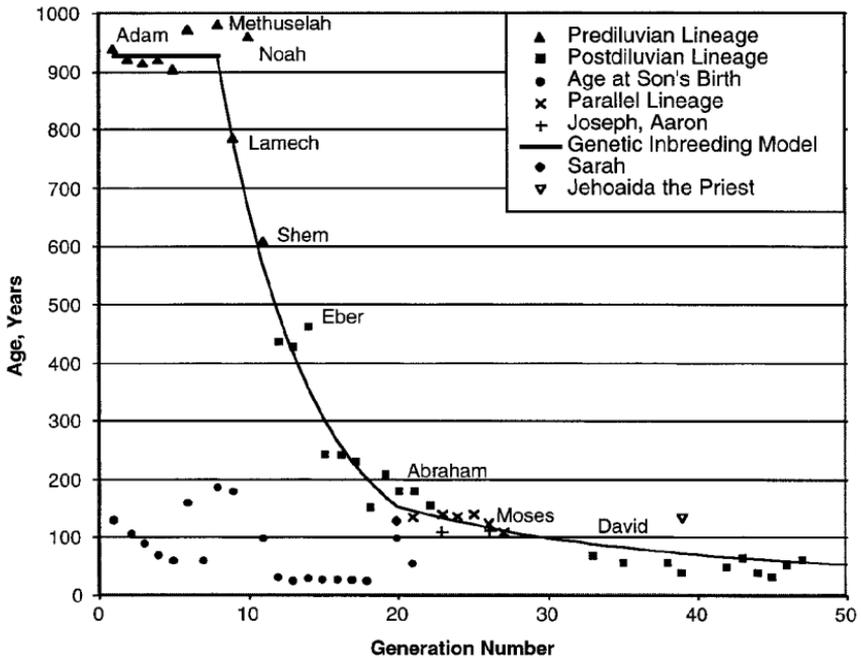


Fig. 1. Relationships of biblical life spans to generation number. Life spans, generation numbers, and their sources are identified in Table 1. Ages of prediluvians are represented by triangles. Noah and his son, Shem, are treated as prediluvians because both were born before the Flood. The life span of only one woman is given (Abraham's wife, Sarah) and is represented by the solid diamond. The age of Jehoiada, the priest who was outside of the recorded lineage, is represented by the inverted triangle. The computer drawn curve represents the theoretical ages resulting from inbreeding (calculated from Equations (1) and (2)). It assumes no inbreeding effects for generations 1 through 8. A_0 is 926, the mean age for $t = 1$ through 8, omitting Enoch's age of disappearance. $A_\infty = 35$, a life span more like that suggested by current archaeological opinion of early humans. For $t = 9$ through 20, the inbreeding rate is $\Delta F = 0.160$; for $t = 21$ through 50, $\Delta F = 0.060$.

the effects of inbreeding assumed to begin with Noah's father, Lamech, at Generation 9. Although Noah appears to have been unaffected, his father and son both had reduced life spans. Information is insufficient to explain why these effects had been unseen for the previous eight generations.

As shown in Figure 1, the biblical data have a continuous character that is striking and that challenges common explanations. Equally striking is the precipitous and extensive decline in life spans. The extent of the decline amounts to roughly 9.5% per 10% increment of the inbreeding coefficient, F_t . Although large, this decline is similar to examples cited by Falconer (1960) for other characters in mice and fruit flies. Of more concern is the precipitous rate of decline. Roughly 90% of the total decline occurs within a dozen generations. Such rapid changes are not observed in animal populations; however, they are common in controlled laboratory inbreeding experiments. For this to occur in a human population, some extreme selection pressure would have been required to similarly subvert natural selection.

Over these first dozen generations of decline, the value of the inbreeding rate, ΔF , is 0.160. For a dioecious population, the fastest rate of approach to a totally inbred population ($F_t = 1$) is through full-sib matings. For such brother-sister marriages, the value of the inbreeding coefficient is calculated from the recurrence equation (Crow & Kimura, 1970):

$$F_t = 1/4 \left(1 + 2F_{(t-1)} + F_{(t-2)} \right) \quad (3)$$

where $F_{(t-1)}$ and $F_{(t-2)}$ are the inbreeding coefficients of the preceding one and two generations, respectively. The equilibrium inbreeding rate, ΔF , for this relationship, calculated from Equation (2), is 0.191. This is greater than the rate describing the biblical data.

Reeve (1955) showed that mild selection against the less fit homozygote reduces the effective inbreeding rate, but does not prevent fixation. One might expect selection to be absent when considering longevity, which has its expression following propagation. However, pleiotropy with sex ratio and other characters could result in mild selection. Thus, the 0.160 inbreeding rate could represent a full-sib mating pattern with selection coefficient of about 0.14.

The Inbreeding Patriarchs

The ages of Noah's father and son indicate that inbreeding depression began before the Flood. If one assumes there really was a Flood that covered the "world" of the patriarchs, then it could have forced inbreeding upon the lineage following Noah. However, even this drastic reduction in mating choices would not lead to continued full-sib matings. Therefore, the credibility of this hypothesis does not depend entirely upon the Flood. Rather, it depends upon whether the patriarchal society was endogamous — *i.e.*, whether custom or law required close blood marriages.

There is little direct evidence to support a full-sib mating pattern. However, there is a great deal of evidence to support endogamy, and by inference, some measure of full-sib matings. Indeed, endogamy was a natural concomitant of each patriarch's desire to sire a great nation. Offspring, both male and female, were infixed with the importance of perpetuating family lines. Keeping bloodlines pure was equally important, both as a source of pride and as a means to maintain property ownership.

One of the first lengthy accounts in the Bible is about Abraham, who married his half-sister, Sarah (Genesis 11:29–32 and 20:11–12). Plagued by infertility and seemingly desperate to continue the family line, Abraham finally had a son by his wife's maid, Hagar. Eventually Sarah bore Isaac, but not until she was 90 and Abraham was 100. In a society emphasizing family perpetuation, such deliverance from barrenness would have justified this first lengthy account. Table 1 shows that Abraham was well beyond the age of parenthood that became typical seven generations before him. Sarah undoubtedly was past the age that had become typical for the female menopause. The earlier maturation of their day would be an expected concomitant of the life shortening caused by inbreeding.

Two other well-recognized results of close inbreeding are infertility and changes in sex ratio. If mores enforced sib mating for 10 or more generations, then such effects would be expected around the time of Abraham. These effects would represent a cultural crisis. Such a crisis is evident in the story of Abraham's nephew, Lot. When Lot's daughters realized there were no local men their father would approve for marriage (assumed to mean no brothers or close relatives), they became concerned about continuing the family line. Both daughters chose incest with their father rather than disapproved relations with local men, thereby perpetuating the family while maintaining the purity of the bloodline (Genesis 19:30–38).

Endogamous practices are further evident in the response to the sex ratio crisis in Abraham's line. Neither Abraham's son, Isaac, nor his grandsons, Esau and Jacob, had sisters whom they could marry. To keep the bloodline pure, each was urged by his family to seek a cousin as his wife. Isaac, and later his son, Jacob, did this. However, Esau married two Hittite girls, upsetting his parents. Subsequently, he married two cousins to appease his family (Genesis 24:3–4; 26:34–35; 28:1–9; and 29:14–19).

Moses and the Crisis

Undoubtedly, these were among the first of a spreading and worsening crisis. Around Moses' time the cause could have become clear through study of the extensive histories and genealogical records that were available. A crisis caused by mating mores could be stemmed only by a new law of supreme authority. Such a law was delivered by Moses (Living Bible, Leviticus 18).

The new moral law specifically forbade all forms of incest except cousin marriages. It was intended to change future mating patterns, and carried with it

no retroactive condemnations. Therefore, Abraham's exalted position as a patriarchal ancestor was not diminished, even though his marriage to a half-sister violated the precept of the new law.

Excepting cousin marriages from the incest prohibition may have been in deference to the centuries long laws of family inheritance. Moses made it plain that cousin marriages were required, at least in certain cases, as a means to maintain family ownership of property (Numbers 36). As cited in II Chronicles 11:18, cousin matings still occurred at the time of Rehoboam (the 35th generation).

For double first cousin matings, the inbreeding coefficient is calculated from:

$$F_t = 1/8 \left(1 + 4F_{(t-1)} + 2F_{(t-2)} + F_{(t-3)} \right) \quad (4)$$

where $F_{(t-3)}$ is the value of F_t in the third preceding generation (Crow & Kimura, 1970). After allowing for mild selection retardation, this provides an equilibrium inbreeding rate of 0.060. Beginning with Isaac, $t = 21$, the curve in Figure 1 is formed with this value of ΔF .

By today's standards, blood marriage by the early biblical figures is startling. However, such relationships were not uncommon in early societies. In Egypt, for example, full-sib marriages were quite common (Levi-Strauss, 1969). In comparatively recent times, inbreeding in European royal families also was common.

Routine marriages of close relatives would have had an observable genetic impact on the patriarchal population. For mores to require blood marriages rather than merely permitting them would have created a selection pressure sufficient to subvert natural selection. The effects would have been calamitous.

Even so, acceptance of these points does not explain the apparently total loss of the exceptional longevity. In part, this loss may have resulted from founding the post-diluvian society with few breeding couples. According to Genesis 7, the males were all brothers, and the females might have been Noah's offspring also. At best, the resulting gene pool was not fully representative of the pre-diluvian population.

Further, several generations might have passed before the breeding population exceeded several hundred individuals. Wright (1931) showed that such small populations approach genetic homogeneity due to accidental gene loss. By such mechanisms, therefore, the loss of the exceptional life spans appears to be possible.

Longevity Experiments

Several classic experiments with fruit flies show that longevity is genetically determined. Pearl and Parker (1921, 1922) found genetic differences with respect to longevity among various populations of *Drosophila melanogaster*.

One strain had a mean life span roughly three times that of another. Pearl *et al.* (1923) also showed Mendelian inheritance of longevity. During this experiment, a strain was produced which had a mean lifetime less than one-eighth that of the original strain! Subsequently, Gonzales (1923) worked with five mutant strains of *Drosophila melanogaster* to show that definite degrees of longevity were associated with extreme precision with the presence or absence of certain genes. These genes were pleiotropic for longevity and for the morphological characters identifying the mutant strains. Much later, Clarke and Maynard Smith (1955) reported a doubling of imaginal life span for the reciprocal hybrids of two inbred strains of *Drosophila Subobscura*.

Working with mice, Chai (1959) also found evidence that longevity is genetically controlled. Chai suggested that superior physiological versatility in hybrids leads to a reduction of early mortality, but that other genetic factors control the onset and rate of aging.

Understandably, controlled experimental data is not available to show inheritance of longevity in humans. However, during the 1930s Pearl and Pearl (1934) attempted *a posteriori* correlations which are well known. They concluded that the summed ages at death of the parents and grandparents of persons over 90 are significantly greater than similar ancestral sums for individuals with shorter life spans. Unfortunately, there were drawbacks and data biases in their design which have long been known. More recently, however, offspring of Pearl and Pearl's subjects were traced in a new examination of human inheritance. These new studies confirmed a weak positive familial correlation with longevity, though the genetic mechanism remains uncertain (Abbott *et al.*, 1974; Zauber *et al.*, 1975).

5. Questions and Implications

The coherent nature of the claimed biblical life spans and the cited genetic inheritance studies call to question whether some humans actually enjoyed exceptionally long life spans. If so, did the greed and stupidity evidenced by close inbreeding contribute to its loss? The character of the biblical data is clearly remarkable and thought provoking. If factuality is seriously considered, then there are other important questions and implications to consider.

Genetics and Aging Studies

The recorded loss of Old Testament longevity was most certainly extensive. However, Moses' new moral law, applied to subsequent population growth, could have allowed some fractions of the exceptional longevity to survive. Extra-biblical records of people living 130–170 years date at least to the time of the Roman Empire, but typically are dismissed as incredible (MacDonell, 1913). The relatively recent death of a Russian at the age of 168 was reported but similarly dismissed (*Time*, p. 78, August 12, 1974; Medvedev, 1974).

Absence of confirming birth records in such cases tempts but does not justi-

fy the *a priori* dismissal of the claimed life spans. If biblical data are factual and some genetic fractions of exceptional longevity survived, then individuals such as the Russian actually may have been very aged. If so, undoubtedly it is because their genetic clocks are different from ours.

Only recently have biologists and geneticists discovered that a powerful clock controlling agent does exist within eukaryotic cells. Telomerase, a ribonucleoprotein enzyme that is active in germline cells within the human body, has been shown to inhibit the progressive loss of telomeres — the nucleotide sequences that cap the ends of chromosomes (Bodner *et al.*, 1998). During each replication, most human somatic cells lose telomeres — snippets of nucleotides containing certain genetic codes. Progressive shortening of the telomere chains eventually leads to chromosome instability, resulting in cell senescence. The work of Bodner *et al.* showed that introduction of telomerase into normal human cells dramatically increases cell life spans. Based upon this finding, they have suggested that multiple afflictions in aging humans might be remedied by using telomerase to achieve *in-situ* cell life span extension.

Even more recently, Thomson *et al.* (1998) have reported that human embryonic stem cells express high levels of telomerase activity. Citing Bodner *et al.*, they noted that telomerase expression is highly correlated with immortality in human cell lines. Their studies of embryonic stem cells showed differential potential after 4–5 months of undifferentiated proliferation *in vitro*.

Thus, the biological basis for exceptionally long life spans is inherent within the human body. Scientists eventually may be able to impart a significant measure of improved longevity.

Creationism vs. Evolution

Despite the importance of this hypothesis, peripheral issues will inevitably be raised that might deflect proper attention from the genetic implications. Probably foremost among these peripheral issues is the continuing creationist–evolutionist conflict. The acceptance of Adam as “first man” would seem implicit in the acceptance of the patriarchal life spans and the reduction of those life spans. Until recently, the mere existence of a single most recent common ancestor (MRCA) did not seem well regarded as a credible scientific possibility. Rather, multiple and simultaneous devolvement of human lineages was regarded as the appropriate model — a phylogenetic assumption that, to me, seems contrary to reason for either evolution or creation based development.

Rather recently, evidence of a female MRCA, an “Eve,” was posed based on analysis of mitochondrial DNA collected from persons around the globe (Cann *et al.*, 1987). Even more recently, evidence supporting a male MRCA, an “Adam,” has been reported based upon analysis of the ZFY locus on the human Y chromosome (Dorit *et al.*, 1995). In both cases, the time when the MRCA existed was estimated to be as little as 100,000 to 270,000 years. This estimated period is so much more recent than previously indicated by

archeological and paleontological conclusions that fierce debate has resulted regarding its credibility.

Several investigators have found fault with the analysis methods used to estimate these recent dates. The methods of Dorit *et al.* particularly have been challenged by a number of others in the same field (see “Estimating the Age of the Common Ancestor of Men from the ZFY Intron,” *Science*, Vol. 272, 31 May 1996, pp. 1356–1362). In this, 11 persons challenged the estimates, showing in the process that there remains considerable disagreement regarding the appropriate method of making such estimates. Nonetheless, in all cases the counter estimates indicated existence of the male MRCA to be much more recent than thought prior to the work of Cann *et al.* and Dorit *et al.*

These estimates appear to have been based on assumptions such as of mutation rates and original effective population size. Estimates more recent than 100,000 years ago tended to have been rejected as scientifically implausible—which well they may be. Nevertheless, based on the coherence of the biblical data and the apparent extra-biblical support for exceptional longevity from ancient historians, it would seem appropriate to make new estimates based upon modeling assumptions derived from the biblical information and tested for coherence with the biblical era information. I leave this to those more skilled in this aspect of the science.

Concluding Comments

This paper's purpose is neither to support nor to attack either the creationist or evolutionist viewpoint. Neither is it to reconcile creationist and evolutionist viewpoints. Rather, the purpose is to call attention to a clearly remarkable record of human life spans, and to the need for open-minded examination.

The biblical ages should not be dismissed solely because they raise currently unanswerable, or philosophically uncomfortable questions. Neither should conflicts with established theories of archeology, anthropology, and paleontology stop evaluation of these possibilities. The biblical claim of exceptional longevity exists, and it is intriguingly coherent when genetically interpreted.

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