Patriarchal Life Span Exponential Decay

Charles A. Glatt Jr.*

Abstract

The Biblical patriarchs' longevity from Noah through Joseph declines by logarithmic curve (exponential decay) given by

Lifespan (years) = $6664 \times e^{-dob/\tau}$

where e = 2.718... is nature's constant, and *dob* is the patriarchs' dates of birth since Adam, and

τ = exponential time constant = 563 years.

The equation was obtained by the natural logarithms' linear regression

Ln (lifespan) = 8.804 – 0.00177· *dob*

The logarithmic graph's estimate of the standard deviation (s.d.) is 0.263; the correlation coefficient is (–0.850). Ten (71%) of the data fit within the first standard deviation; the other four within two. The life span equation predicts 68 years of longevity at the time of Moses 1500 years from the flood (2580 years after Adam). The effect of Shem's uncertain date of birth (not Noah's firstborn son) is evaluated for its effect on standard deviation, the time constant τ, and the correlation coefficient, which will be shown to not undermine this paper's compelling reason of using a logarithmic curve, i.e., as the most common curve in nature and, within nature, in engineering systems.

This single correlation between Genesis life spans and the years following the Flood is of interpretable value to report again to review the work that has been done on this subject since 1948, to incorporate RATE project results, present the time-based analysis's correlation coefficient, express the natural (Naperian, base e) curve as part of a family of the universe's most common curve, the logarithmic curve, introduce common knowledge of life span during Joseph's time, explore anomalies in relation to space expansion, and to present more information that discusses the statistical outliers and supports Moses' recorded life spans.

Patriarchal Life Span Exponential Decay

The fourteen biblical patriarchs' empirical longevity data from Noah to Joseph are investigated for the nature or properties of their formerly analyzed decay curve (Vis, 1948, 1950; Whitcomb and Morris, 1961; Armstrong, 1966; Patten, 1966, 1982; Strickling, 1973; Dillow, 1978; Seaver, 1983, 1985; Wieland, 1998; Brown, 2008; Sanford, 2008.) This paper presents details for Glatt's (2014) engineering model tying together this past research, modeling the human body as an engineering system. The numerical and statistical time analysis shows that

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these biblical patriarchs' longevity follows a logarithmic curve (i.e., exponential decay) with tight standard deviation. A tight standard deviation means most of the data fall close to the longevity decay's linear regression (least squares) curve. The statistical analysis can be performed at any base. Brown (2008) calls the longevity decay a "downward declining curve." Vis (1948, 1950) was the first to publish the post–Flood longevity data in a downward declining graph, stating, "The scientific explanation is not evident…. Perhaps future scientific research will cast some light on this." Whitcomb and Morris (1961) launched the suggested scientific research. Strickling (1973), who is a statistician, and Dillow (1978) were the first to present equations, with Dillow the first to present a statistical correlation coefficient. Both Strickling and Dillow used base *e*, where *e* is the natural constant given by the Maclaurin/Taylor series

$$e = \lim_{x \to 0}(1+x)^{1/x}$$

(e = 2.718….) Dillow (1978) found Neugebauer's (1957, pp. 34, 48) archeological research and concluded that the longevity decay probably was not mathematically manufactured because these fourteen patriarchs' life spans have natural variations about a perfect curve. The same reasoning about natural variations about a perfect curve also applies to Hill (2003) and Northcote's (2007) describing the Genesis longevities as biblical pictures or ideas and to Young's (1988, 1990, 2004) quadratic equation exercises 700 years after Moses introduced the recorded life spans into Genesis. None of the three present a graph or mention exponential decay.

Strickling's predecessors Whitcomb and Morris (1961), Armstrong (1966), and Patten (1966) considered it a "biochemical curve" and researched post–Flood radioactivity–induced human defects. Brown (2008) wrote that the Deluge could have introduced what is now the heavy concentration of heavy hydrogen (deuterium) into the oceans (Brown stated, "Only nuclear reactions produce heavy hydrogen"). From water, this radioactive atom accumulated into the food chain over time. Wieland (1998) examined evidence for genetic factors affecting aging and proposed that through loss of genetic information, our bodies are now "programmed" to age and die much more quickly than in the past. Seaver (1983, 1985) twice statistically and mathematically analyzed for gaps in the Genesis 5 and 11 generations, while Niessen (1982) presented historical verification for tight chronology with no gaps. Seaver also evaluated whether the outliers (Shem, Shelah, Eber, and Nahor) could or should be removed, and he presented peculiarities of their post–Flood times that made them statistical outliers. Strickling (1973) and Seaver (1983), both statisticians, statistically contrasted Masoretic (Hebrew) versus Septuagint (Roman) records. Strickling showed the Septuagint more accurate but suggested further analysis. Seaver's further analysis showed tampered data in the Septuagint. Seaver concluded the Genesis 5 and 11 records are accurate as Moses presented them. Sanford (2008) showed that the Genesis life-span data is consistent with accumulated genomic mutation degradation. Hartnett (2010) explores a potential energy drop (i.e., opposite of kinetic energy) anomaly so that during the longevity decline, the life spans' dates of midpoint line up vertically. The above authors altogether have shown the accuracy of the Genesis 11 "downward declining curve" (Brown, 2008).

In other words, these patriarchs' life spans grew shorter by an exponential decay, following a logarithmic curve. Maor (1994, 2009) states logarithmic curves are nature's most commonly occurring curves. Logarithmic analysis applied to a graph of the Genesis patriarchs' life spans shows these patriarchs' life spans grew exponentially shorter each generation. This is not to say other equations don't fit the curve (e.g., by numerical analysis, the base translation formula, or with higher or lower correlation coefficients from other curve fits like linear, Ln, power, quadratic, cubic, logistic). Previous authors have suggested capacitive decay analysis, and that is expanded in this paper, i.e., that is the compelling reason to pick the exponential. A logarithmic curve forms the basis of the engineering model pursued in this paper, giving the math for Dillow and Patten's capacitor analogy.

This paper assumes the accuracy of the Genesis data based on the above research and provides references for the accuracy in Joseph and Nahor's cases. Given Moses' data accuracy, the statistically derived equation is presented for date of birth (DOB) versus longevity. The equation's independent variable (abscissa) is based on time (DOB) instead of generation (Vis; Whitcomb & Morris; Dillow; Seaver) and a base *e* equation (Strickling; Dillow; Seaver) is contrasted and recommended against other bases. Base *e* and time both better apply to Dillow and Patten's capacitor analogy than generation or other bases—in this case of longevity decay, we are speaking of the capacity for life instead of the capacity for electronic charge. As Niessen (1982, p. 65) wrote, "What are numbers for except to show dates?" More generally a numerical and statistical analysis versus date (time) opens up the graph's properties to common scientific knowledge of natural, time-decaying phenomenon. Dillow's longevity data versus generation analysis gave a statistical correlation coefficient of 0.95 that is 11% higher than the time analysis's coefficient reported here, and Seaver's goes as high as 0.9783. Sanford's curve for longevity versus century after Noah gives 0.90. Dillow and the author are not statisticians. The author's engineering education required one elementary statistics class using a textbook by Freund (1979.) It helps that previous writers chose generation as the independent variable so that a choice of independent variable can be stated. Strickling (1973) discussed and evaluated other independent variable options instead of DOB versus life span, including dates of maturity or first begetting, midpoint, and expiration. DOB is used here because it takes into account the number of years Noah and Shem lived before the Flood and the number of years Arpachshad, Shelah, and Eber lived before the earth's division at Peleg. The significance of these pre-event's years is borne out by the statistical outliers. The equation's standard deviation draws attention once again, as with previous authors, to the statistical outliers Shem, Shelah, Eber, and Nahor, who fell outside the first standard deviation and inside the second standard deviation. The outliers' reasons are summarized with new supporting information given for these patriarchs' anomalous life spans. Uncertainty is evaluated for Shem not being Noah's firstborn (Hodge, 2012), in Genesis 5:32, 6:10 and 11:10, which would have placed his birth date 100 years before the flood by Genesis 7:11. For the same reason of including pre-Flood years, the statistical evaluation begins with Adam versus beginning with the date of the Flood (Strickling, 1973), even though starting with Adam makes the coefficient A in $A \times e^{-(t/\tau)}$ less obvious, where constant A = 6664 instead of A $\approx$ antediluvian life span $\approx$ 950.

This paper reports only a single correlation that is yet of interpretable value to report for the following reasons. The correlation pulls together the properties of a data graph that have been reported a number of different ways for over sixty years. The analysis expands on the interpretable benefits a time evaluation (Sanford, 2008) gives instead of evaluation versus generation. The time–based correlation coefficient underpins the data's scientific validity and reinforces current research in related fields, such as tooth wear and dinosaur size (Dillow, 1978). Reinforced by Seaver's and Strickling's statistical analyses, the correlation coefficient given here supports further conclusions beyond but including Dillow's. More information is presented concerning Joseph and the statistical outlier Nahor. This paper's engineering model moves Genesis's longevity out of research and into tangible impact on human life span. Finally, the analysis hopefully stimulates further research into this area of science.

There are occasions in science where data trends have an observable curve, and it is sometimes important to know the nature of the curve, whether parabolic, exponential, second–order, third–order, etc. An example is discovering second–order and higher harmonics in electronic information theory (radio waves, etc.) The radio wave harmonics either carry or interfere with information, and the harmonics can be either controlled or have their information extracted.

Method

Participants

(Participants does not mean volunteers in this analysis, but rather this is an analysis of known and previously collected data.) As a sample, the fourteen biblical patriarchs represent their contemporary human populations because they lived near the region of and at the time of the cradle of civilization. All fourteen men were from one lineage, i.e., Noah. Two known macro population divisions took place during their lineage: first with Noah's sons and second at the tower of Babel (earth's division during Peleg's time?). Both divisions resulted in geographic scattering of the human population. Human population had a global longevity of around 900 years with the first data sample (Noah), and Pritchard (1969) reports that human population lived typically 110 years in the days of Joseph.

Design and Procedure

The fields of mathematics and statistics recommend a log–linear or semi–log test when exponential (logarithmic) change of empirical data is a possibility. Statistics analyzes a population sample's linear log–linear graph with linear regression (or least squares.)

The slope versus time is linear for an exponentially changing log–linear or semi–log graph in any base. The analysis begins by discovering that the fourteen patriarchs' lifespans'-logs-versus-time graph matches a least-squares linear slope with low variance. The least-squares (linear regression) analysis then computes to the graph of a logarithmic curve. The curve matches the patriarchal life-span decay. The regression curve's exponential equation is then translated to base e (by $x^r = y^{r\log_y x} = e^{r\ln x}$) under the assumption of natural phenomenon.

The linear-regression analysis of log-linear data investigative technique clearly relates to the longevity-versus-time variables considered because log-linear analysis applies to and is recommended for exponential change, base e exponential decay frequently occurs in biology, life span is a biological issue, and the technique provides an exponential curve matching Moses' recorded life span decay data.

Discussion and Conclusion

Least squares (linear regression) analysis

The population's true correlation coefficient ρ's 0.05 level of significance,

$$|\rho| = |\text{population's true correlation coefficient}| > 0.64$$

and ρ's 95% confidence interval,

$$0.58 < |\rho| < 0.95$$

together verify a logarithmic curve.

The 0.263 standard deviation shows that most of the data points lie close to the computed curve.

The true slope β's 95% confidence variation of +/–28% gives an equal uncertainty in the base *e*'s exponential time constant τ = 563 years, but that uncertainty has no effect on the correlation coefficient.

The looser standard deviations and different time constants for β's +/–28% variation result in at most four more life spans falling in the second standard deviation and no life spans beyond that; i.e., into third or higher standard deviations. An exponential decline still describes the nature of these patriarchs' life span changes even with +/–28% uncertainty in β.

If Shem's uncertain date of birth is moved to the least likely time, the date of the Flood, with the birthdate of those after him each shifted 100 years into the future, it turns out the fourteen patriarchs remain in their above standard deviations (i.e., the outliers remain the same and they remain in the second s.d.), τ increases by 15.3%, the s.d. increases by 4%, and the correlation coefficient changes from 0.85 to 0.84, which means it is definitely a logarithmic curve either way, with the data points fitting tightly about the curve.

Moses recorded empirical data that computes to an exponential decay in human life span. Human life span was stable at about 900 years for ten generations (with anomalies; i.e., Enoch). Then something happened that caused a decay by logarithmic curve in longevity of the individuals whom Moses recorded.

The close match between the linear least squares' log–linear graph and the actual life spans' log–linear graph implies an exponential decay in lifespan beginning 1656 years from Adam; i.e., when Methuselah died and when Noah was 602 years old and still living. Brown (2008, p. 381) speculates that Methuselah's name means "When he is dead, it shall be sent."

In the case of Moses' recorded longevity data, the match with an exponential decay does not indicate that time caused an exponential decay in longevity; i.e, it does not indicate a cause–effect relationship between date and life span. Rather it might imply that something in the earth's biochemical (Patten, 1966), climatic (Baker, 1980; Vis, 1948, 1950) or radiation (Vardiman, Snelling & Chaffin, 2005; i.e., the RATE Project; Humphreys, 1994; Whitcomb and Morris, 1961) environment, in nature or in human genetics (Sanford, 2008; Wieland, 1998) had an effect on human longevity. Human longevity then changed in a way that changes commonly occur in nature (Maor, 1994)—by logarithmic curve. Moses records a global flood occurring at that time, 1656 years after Adam.

The analysis was solved on the first attempt: Moses' empirical data matches an exponential decay. The analysis required no second order modeling or assumptions to achieve an equation (curve) fitting the data.

The Jews and also the Egyptians knew Joseph lived 110 years (Gen. 50:22), and there were Egyptians living just as long (Pritchard, 1969). Some Egyptians, including Pharaoh, knew Joseph's father Jacob (Gen. 47:9).

Anomalies in the lab are worth noting

A first anomaly is to investigate a link between the perceived age of the universe and exponential life-span decay. Suppose: First, speculate that light speed is slowing down (Brown, 2008, pp. 322, 326; Norman and Setterfield, 1986, 1987; but shown to be incorrect by Chaffin, 1992) by the same exponential time constant (τ = 563 years) by which human longevity decayed from Noah to Moses. Then:

$$SpeedNow = OriginalSpeed \cdot e^{\frac{-t}{\tau}}$$
$$= OriginalSpeed \cdot e^{\frac{-t}{563}}$$

and second that (speculation) the change in speed is inversely proportional to increasing time, then:

$$\frac{OriginalSpeed}{SpeedNow} = \frac{UniformitarianAge}{RealAge}$$

e = 2.718…, t is in years, then:

$$\frac{SpeedNow}{OriginalSpeed} = \frac{RealAge}{UniformitarianAge} = e^{\frac{-t}{\tau}}$$

$$e^{\frac{t}{\tau}} = e^{\frac{RealAge}{\tau}} = \frac{UniformitarianAge}{RealAge}$$

$$UniformitarianAge = RealAge \cdot e^{\frac{RealAge}{\tau}}$$
$$= RealAge \cdot e^{\frac{RealAge}{563}}$$

For *UniformitarianAge* = 4.53 billion years (Earth) then *RealAge* = 7500 years, or for the universe, 13.77 billion years vs. 8078 years. The anomaly is that these work out closely to uniformitarian standard ages.

Second, by the base translation formula ($x^r = y^{r(\log_y x)}$), this paper's exponential time constant τ = 563 years, by which human longevity decayed from Noah to Moses, equals within 7% of 365/Ln2 (527 years), i.e., $e^{\frac{-t}{563}} \cong 2^{\frac{-t}{365}}$, that is to say, life span decreased by a half-life of every 365 years (that is easy to remember, from 365 days in a year.) Half-life suggests radioactivity influenced Genesis human longevity decline, which brings to mind accumulation of heavy hydrogen into the food supply, coming from the ocean's heavy concentration of deuterium.

Finally, using data from the Supernova Cosmology Project (Knop et al. 2003), the Hubble Constant vs. distance (by stretched space red shift) has an exponentially varying change by τ_H = 534 years. These are presented as anomalies.

Recommendations

Parameters controlling human longevity

A logarithmic curve by exponential decay equates to a solution of certain differential equations. The natural constant *e*'s defining property is that the differential rate of change of e^x at any time *t* is directly proportional to the quantity of *x* at that particular time. The biological connection is:

> the instantaneous rate of growth of something being proportional to the amount of the something. That something can be a population of bacteria in a culture, or a population of cockroaches in a garbage dump. [For y = e^x then the rate of change of y with respect to x is given by] $dy/dx = a \cdot y$, with initial conditions y = 1 when x = 0, is e^{ax} … Here, 'a' represents the fraction of them reproducing at any given time x. If 'a' is negative, it could represent the fraction of organisms dying at any given time. This is the model for radioactive decay of radium, uranium, and so on. (Drexel University, 1998)

In the case of human life span decay, the variable *y* is time duration or range in years of human life span. The variable *y* is not some physical substance like uranium or a biological population like bacteria. The obvious physical connection is that the human being dies exponentially sooner than earlier generations. Another physical connection is that during any five-year period every atom in the human body is replaced with a new atom (Swenson, 2000). This might be related to a change in the mix of air pressure and oxygen (Dillow, 1978), elements introduced that may have been harmful to us (Dillow, 1978), a stronger cosmic-ray period lasting until now (Whitcomb and Morris, 1961), or the effect on a population of losing rare alleles due to genetic drift following a genetic bottleneck (Wieland, 1998). Wieland (1998) proposed that alleles for longevity were lost in the small post-Deluge population, and new mutations accumulated. Kondalenko (1993) discusses research suggesting that there is/may be somatic cell genome programming that controls the number of their cell divisions. He did a literature review, not the actual lab research in this area. Hayflick (1965) researched the connection between finite diploid cell lifetimes to aging. Azbel′ (1997, pp. 566–567) writes that every animal metabolizes approximately 20 oxygen molecules' covalent bond energy for every body atom over the course of the animal's lifetime—"the universality is remarkable," he says. Azbel′ states that oxygen's metabolized energy exceeds an animal's needed energy. This could be related to Dillow's post-Flood change in the mix of air pressure and oxygen; i.e., Azbel′ speculates the excess oxygen-bond energy irreparably and vitally damages every animal's atoms, and the accumulated atomic damage causes natural death. Azbel′ further speculates that not all animals have a genetically coded life span, noting that few other species have been monitored for their natural death longevities. Per Azbel′, more body atoms (bigger animals) leads to greater life span. Work in these areas should focus on quantifying and identifying any increase in life–harming and life–destroying elements with one goal being to explain the dynamics behind the exponential nature of the longevity decay.

Human longevity analogous to capacitive circuit elements: Capacity for life instead of capacity for electronic charge

Dillow (1978) gave the example of a capacitor that discharges by the same exponential curve with different coefficients and time constants:

Electronic charge as a
function of time = q(t) = Initial charge $e^{-t/\tau} = Q_o\, e^{-t/\tau}$

where τ = exponential time constant = R·C in a resistive–capacitive network (no inductance L), R = resistance in ohms, and C = capacitance (capacity to store charge) in Farads. A capacitor's electronic charge decays by leaking through a resistive path to ground. Cosmic rays, additional harmful elements, and change of air pressure–versus–oxygen mix could all three reduce the "resistance to ground" or reduce the capacity for life by damaging biochemical components. Perhaps a speculation is appropriate that animals, including humans, are evaporating by nonreplacement of stored atoms that have moved on (i.e. from Swenson, 2000; during any five-year period every atom in the human body is supposed to be swapped out with a new atom). In electronics, instead of atoms but by analogy, the elements reducing electrons' electronic charge "resistance to ground" are leaky capacitors, resistors, and inductors. In the case of life, atoms do not move on to a ground that is a strong conductor like a metal surface but instead to the dust to which we return (although electronics can take advantage of earth ground for electrons moving on), and the leaky components are the items that accelerate the extinguishing of life: cosmic rays, additional harmful elements, change of air pressure-versus-oxygen mix, oxygen-metabolism's atom-damaging extra energy, telomere shortening, genetic entropy, a genetic bottleneck, and program limits on the number of cell divisions.

Engineering model

Human longevity-analogous elements that allow life to escape "to ground" can be analyzed in the form of an engineering circuit (Table 1). An example of a simple transfer function *T* (i.e.. cause-effect or input-output) based on compound interest is $T(s) = T(n) = {}^{\text{debt}}/_{\text{principal}} = D(n)/P(n) = [1+\text{r}(\text{n})]^{\text{n}}$ (n = years). The intent of such a capacitive circuit would be first to draw

Parameter	Known parameters	Speculations	Needed information
Supply Limit	Genome coding for number of cell divisions, telomere shortening, atomic and chemical decay rates		
Proportional (resistive/conductive, damping) factors	Life-sustaining factors but also Vitality leaks like: damage rate *b* & damage time *1/b* against vital bonds by energy metabolism & oxygen consumption rate (Azbel′ 1997:567,568); Cosmic rays, radiation, additional harmful elements; & Change of air pressure-vs.-oxygen mix		
Integral (capacitive, mass) factors	tissue health, ozone layer		psychological factors
Differential (inductive, spring) factors	genetic bottleneck; genetic entropy; genetic factors that 'program' our bodies for shorter longevity	human stress & relief	
System inputs	food, air, companionship	tree of life; stellar influence on Earth's ambient environment	
Transfer function T(s)	five-year atomic replacement rate; cell division rate	entropy difference between 2.7°K outerspace and 98.6°F (37°C)	

Table 1. Engineering analysis model of human life as a system

the picture accurately and from that to analyze and make predictions of how the system can be modified or improved.

Take for example our universe's radius at one time equaled 10^{20} meters (Guth and Steinhardt, 1984). Assume it remained 10^{20} meters in size from Creation Day 4 until the Flood, and at the Flood the universe was unleashed to expand a million times in radius, to 10^{26} meters (13.77 billion light-years). Danny Faulkner (personal correspondence, 2014) calculated how the universe's temperature (constant today within 5 decimal places, just below the temperature of liquid helium everywhere) would change, if Eddington's (see Wright, 2006) *1000 equivalent stars* were moved one million times closer to the Earth; i.e., from today's universe of 10^{26} meter radius down to 10^{20} meters radius:

> That is relatively simple. The energy density would go as the square of the distance of the stars, so the energy density would change by a factor of a trillion. The energy density goes as the fourth power of the effective temperature, so the temperature would go as the 0.25 power of that trillion, so that ought to change by a factor of 1,000. Therefore, if I understand what you're asking, the Eddington temperature would have been 3,180 K, not 3.18 K. But, as I said, the problem isn't well defined in my estimation.

Not being *well defined* means the exceptions need to be worked out. Working out the exceptions provides avenues for further research. For example, Maxwell's transverse infinite phase velocity (Balanis, 1989, p. 176, problem 4.15d; as opposed to frontal or forward propagation, or energy phase velocity) for Lenz's law acting on universal (LANL, 2012; Vallée, 1990; Courtois et al. 2013) magnetic flux, may explain universally constant microwave background temperature (2.7°K constant to five decimal places in every direction for as far as can be detected), i.e., everywhere is in touch with everywhere by magnetic fields everywhere throughout the universe. The possibility of universal magnetic flux also addresses the horizon problem, aka light travel time across an extremely large universe, by Lenz's law creating light that travels perpendicular to a magnetic field line, i.e., a line of magnetic flux that crosses between galaxies — by Maxwell, the entire line moves together at any frequency, e.g. light frequencies included. Research should be initiated to understand any effect on the earth's crust (Brown, 1993, 2003) of 100 billion galaxies each with a hundred billion stars all moving a million times further away from earth, e.g., reducing gravitational tug on the planet.

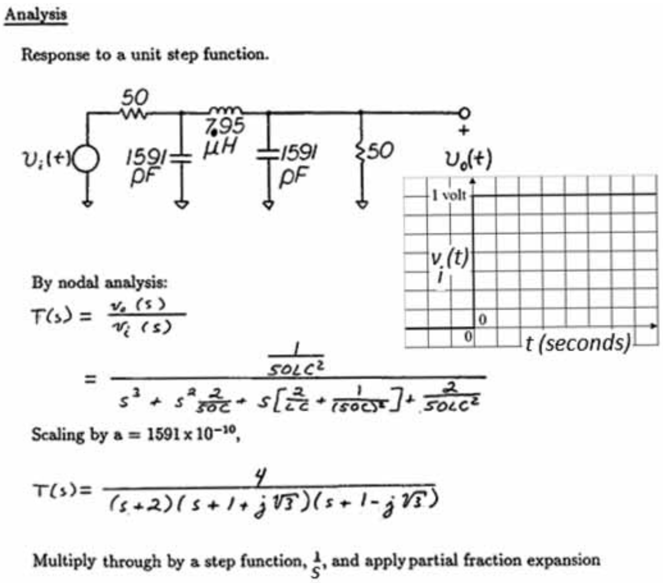

Figure 1. Analysis: Impulse response of low-pass filter

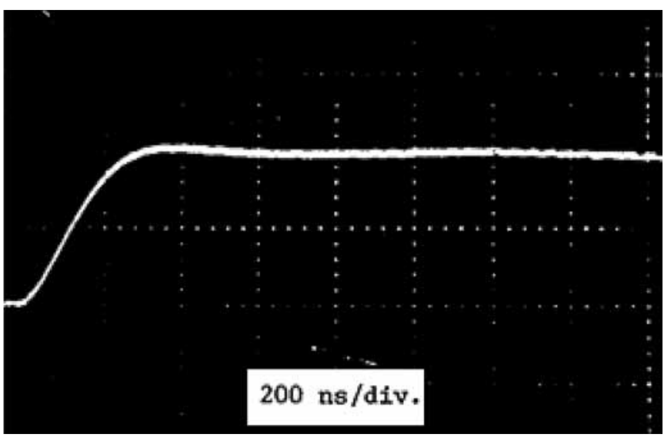

Figure 2. Large step in phase to the low-pass filter

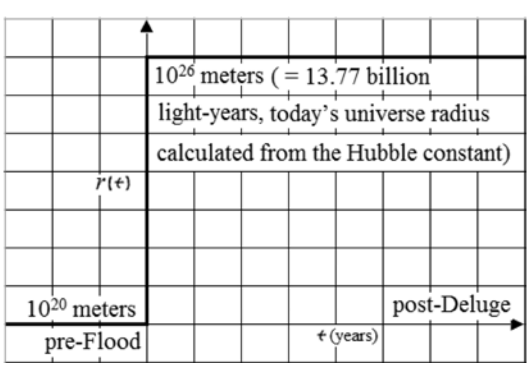

Figure 3. Step increase in Universe's radius

The effect of a stepwise change in universe diameter (Glatt, 2014, referencing Samec, 2013: the universe's expansion rate is unlimited) on human longevity gives an opportunity to evaluate Dillow's capacitor model suggestion. Figure 1 gives an example capacitor model, responding to a step function. Genesis records human life spans from Noah to Joseph that changed in the same manner as the capacitor circuit model changes to a step change in voltage (figures 1–5). Glatt (2014) laid out a scenario for a step increase in the universe's radius, based on graphs by Guth and Steinhardt (1984) and Steinhardt (2011), with Guth's (1981) math, i.e., $\cong 10^{15}$m/s space expansion rate. Working with reduced quality factor *Q*, i.e., low energy loss defines high *Q*, Hartnett (2010) speculates that near the time of the Deluge some decay process increased our bodies' losses, decreasing life span. Hartnett postulated an increase in entropy (or decay) at the time of the Flood based on plots of ages of patriarchs and mentions loss of a body's ability to efficiently generate heat with age may be a factor. Hartnett references genetic entropy (cf. Sanford, 2008). This paper poses the universe as an engineering system, where chemical entropy, i.e., dS/dT (temperature vs. entropy) accelerates where there's a difference in chemical equilibrium. Humphreys (1994, 2005, 2008b) speculated three times a space expansion at the Flood. Move a hundred billion galaxies, at the Deluge, each holding a hundred billion stars, a million times further away, and we receive less heat from them. Moving the stars (galaxies) 90,000 times closer (Figure 4) creates an 80°F universe, i.e., Caribbean. Animals live longer when they burn less energy (Mattson, 2015), so the author speculates that in a Caribbean universe, e.g., of 10^{21} meters radius, human life span increased to 900 years. Adams (1871), Brown (2008), and Hodge (2012) all present a bar-chart way of graphing human longevity decline coincident with the Deluge.

Analysis

The fourteen biblical patriarchs' birth dates from Adam versus lifespan (regression equation's life spans in brackets) occurred as follows: Noah (1056, 950 [1023]); Shem (1558, 600 [420]); Arpachshad (1659, 438 [351]); Shelah (1694, 433 [330]); Eber (1724, 464 [313]); Peleg (1758, 239 [294]); Reu (1788, 239 [279]); Serug (1820, 230 [264]); Nahor (1850, 148 [250]); Terah (1879, 205 [237]); Abraham (2009, 175 [188]); Isaac (2109, 180 [158]); Jacob (2169, 147 [142]); and Joseph (2260, 110 [121]), with Noah's Flood occurring 1656 years after Adam (Brown, 2008; Adams, 1871).

Figure 6's diamonds graph (Least Square) is linear but appears distorted because of x–axis compression. The diamond graph's equation is the computed least squares approximation to the fourteen patriarchs' life spans' natural logarithms from Noah to Joseph:

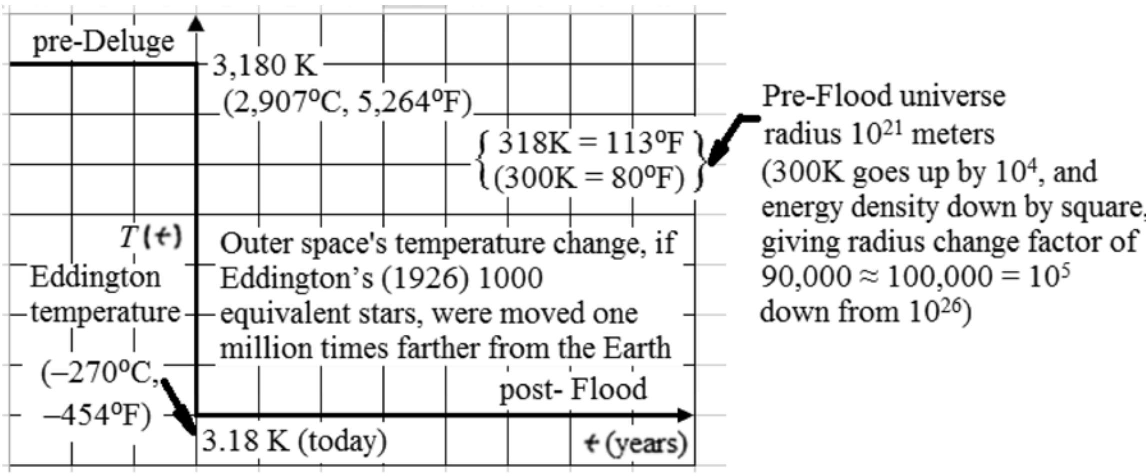

Figure 4. 80°F Pre-Flood universe—shrinking the universe radius by a factor of 10^5 to 10^{21}m gives Caribbean ambient environment

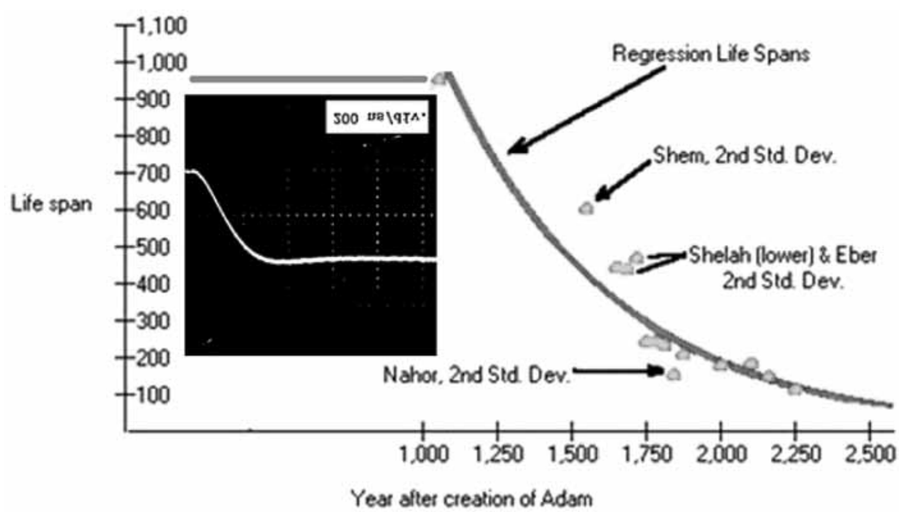

Figure 5. Life span versus date since Adam — Flood-date cosmic expansion evidence by patriarchal post-Deluge longevity exponential decay. (Insert: step decrease to capacitor model. Note the capacitive circuit produces the same shape curve, i.e., same time constant in response to either a step increase as for a step decrease.)

Ln(lifespan) = 8.804 – 0.00177 · *dob*

where

8.804 = a = estimate of the true y–axis intercept α;

0.00177 = b = estimate of the true slope β;

d.f. = degrees of freedom = 14–2 = 12 (n–2 d.f. because estimates are made of both α and β);

r = –0.850= estimate of the population correlation coefficient ρ

dob is the date of birth in years since Adam.

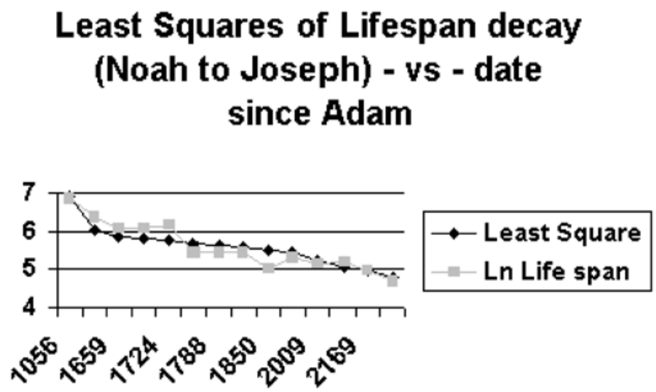

Figure 6. Least squares of life span decay (Noah to Joseph) versus date since Adam. The diamonds graph (least square) is linear but appears distorted because of x–axis compression.

The z statistic for ρ inferences indicates that:

$\rho < -0.64$ (0.05 level of significance; or $|\rho| > 0.64$)

and ρ's 95% confidence interval is:

$-0.58 > \rho > -0.95$

$(0.58 < |\rho| < 0.95)$

The *t* test for β (where β is the true slope which equals $1/\tau$ and where τ is the exponential time constant in years as given later below) with a 0.05 level of significance and twelve degrees of freedom gives

$0.00127 < \beta < 0.00227$

with

$t_{0.025} = 2.179$

(or for 95% confidence in β there is a +/–28% variation mainly due to small sample size and a few large variations). The range of α is not critical (y–axis intercept.)

The normal distribution statistics are:

$s_e^{\,2}$ = estimate of variance = 0.0690;

s_e = estimate of the common standard deviation = 0.263

(that is, the normal linear regression analysis's normal distribution standard deviation, or standard error of estimate.)

Ten of the fourteen longevity data points (71%) lay within one estimate of the standard deviation; the other four fit within two standard deviations (Shem, Shelah, Eber, Nahor).

Shem lived slightly longer than the curve would predict (he falls in the second standard deviation above the curve), and he lived part of his life before the Flood. Shelah and Eber also lived slightly longer than the curve would predict (they fall in the second standard deviation from the curve), and they lived before the earth's division during the time of Eber's son (Shelah's grandson) Peleg (Gen. 10:25). Nahor lived slightly fewer years than the curve would predict (he falls in the second standard deviation below the curve), and his was the first generation after the Flood to live entirely in a sin-immersed culture, which was brought by his father Serug (Charles, 1913; Charlesworth, 1983–1985; Davis, 1836–37; Epiphanius, 1987, 1994; Gibson, 1901; Ginzberg, 1913; Glycas, 1836; Hyde, 1700, 1760; Suda online, 2000–2016) The remaining 10 Genesis patriarchs' life spans fall in the curve's first standard deviation.

A +28% variation in β (= $1/\tau$) gives a standard deviation of 1.011 resulting in seven life spans instead of ten falling in the first standard deviation and the remaining seven in the second. A negative 28% variation in β gives a standard deviation of 1.024 with six life spans falling in the first standard deviation and eight in the second.

Figure 6's square boxes give the graph (Ln Life span) of these patriarchs' actual life spans' natural logarithms.

Figure 5 graphs the life spans from Noah to Joseph recomputed by the least squares (*e* raised to the least squares value):

$$\text{Lifespan (years)} = e^{(8.804 - 0.00177 \cdot \text{dob})}$$

$$\text{Lifespan (years)} = 6664 \cdot e^{-\text{dob}/\tau}$$

where *dob* is the date of birth in years since Adam and:

τ = exponential time constant = 563 years

The life span equation is not good all the way to today 3500 years after Moses but does predict accurately out to 1500 years from the Flood at Moses' time as follows. Moses lived in the year 2580 after Adam for which the equation gives 68 years of longevity. In Psalm 90, the Psalm of Moses, Moses wrote in verse 10, "The days of our lives are seventy years; and if by reason of strength they are eighty years, yet their boast is only labor and sorrow" (NKJV).

Summary

On one hand, the statistical regression equation does two things a statistical model should do: it correctly predicts a 68-year life span by the time of Moses, and it fits the fourteen post–Flood patriarchs' life spans within understandable standard deviations. On the other hand, the statistical regression equation identified three anomalies, all tied to the longevity decay time constant. There are different time constants before and after Peleg, but these have no effect on the overall time constant. Before Peleg longevity was declining toward 120 years (Gen. 6:3). After Peleg life spans decayed to 70 years, as noted in the text.

The present analysis springboarded off the work of researchers since 1948, as listed in the introduction, with the following: additional correlation analysis of the outliers; post-Flood genetic bottleneck; genetic entropy, gigantisms; radioactivity and cosmic radiation; climate; tooth wear, common longevity knowledge at time of Joseph; and instead of generational-based, another (besides Sanford's) time-based correlation coefficient. Human life was modeled as an engineering system to support and encourage predictive research, analysis, and engineering control.

This paper hopefully encourages and promotes more participants and further research into how to proceed to find, or perhaps predict, a particular regression model for the cumulative effects on life span over the course of generations, from things like (1) radioactivity; (2) cosmic radiation; (3) genetic bottlenecks; (4) genetic entropy; (5) chemical entropy; and (6) climate.

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Author's Note

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