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## Abstract

The Biblical patriarchs' longevity from Noah to Joseph declines by base e exponential decay (e=2.718...)

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

date from Adam and

$$\tau = \text{exponential time constant} = 563 \text{ years.}$$

The equation was obtained by the natural logarithms' linear regression

$$\text{Ln}(\text{lifespan}) = 8.804 - 0.00177 \cdot \text{date}$$

The logarithmic graph's estimate of the standard deviation is 0.263; the correlation coefficient is (-0.850). Ten (71%) of the data fit within one standard deviation; the other four within two.

Much of nature including biology follows a base e exponential decay or growth. Moses probably accurately recorded the patriarchs' life spans. He didn't have the natural constant e or natural logarithm function. Moses' data also must agree with millions of his contemporary Jews' common knowledge of the information.

This single correlation is of interpretable value to report since the data has been graphed for over thirty-five years without numerical analysis.

## Patriarchal Life Span Exponential Decay by Base e

“death reigned from the time of Adam to the time of Moses,” Romans 5:14

The fourteen Biblical patriarchs' empirical longevity data from Noah to Joseph are investigated for the nature or properties of their formerly published or commented on declining graph (Brown, 1995; Dillow, 1978; Patten, 1966 & 1982). A numerical analysis shows that these Biblical patriarchs' longevity follows a base e exponential decay with tight standard deviation where e is the natural constant  $e = 2.718\dots$ . In other words these patriarchs' life spans grew shorter by an exponential decay with base e. A base e exponential decay is defined as a natural exponential decay. Much of nature including biology follows the base e exponential curve in decay or growth.

Moses probably accurately recorded the patriarchs' life spans because he didn't have the natural constant e or the natural (base e) logarithm function to falsely document the patriarchs' life spans. Additionally Moses' data needed to match the common knowledge of millions of his contemporary Jews' who were familiar with the information. Something happened about the time of Noah in the earth's biological environment to decrease the patriarchs' life spans.

This paper reports only a single correlation that is yet of interpretable value to report because: the correlation describes the properties of a data graph that has been published for over thirty-five years without analysis; the correlation reinforces current research in related fields such as tooth wear and dinosaur size (P. Abramson, creationism.org, personal communication, April 3, 2002); 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's 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

As a sample the fourteen biblical patriarchs represent their contemporary human populations because they lived in the region and at the time of the cradle of civilization. Given Biblical accuracy (“No archeological evidence has ever overturned a Biblical reference,” Moore, 1992) then it's likely that these men were 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. Both divisions resulted in wide geographic scattering of the human population. Human population is known to have had a global longevity of around 900 years with the first data sample (Noah) and a global longevity of around 100 years is historically recorded in Egypt around the time of Joseph. This analysis looks for evidence that

might impact or stimulate research on human and other species' longevity during the intervening years between Joseph and Noah.

### Design and Procedure

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

The slope is linear of the base e exponential decay's natural (base e) logarithm [natural log, labeled  $\ln(x)$ ] versus time, i.e. log-linear or semi-log graph. The natural logarithm is defined as a logarithmic function with base e.

The analysis begins by discovering that the fourteen patriarchs' life spans' natural 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 base e exponential curve that matches the patriarchal life span decay.

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

### Discussion and Conclusion

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

for 0.05 level of significance

and

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

for 95% confidence interval

together indicate an exponential decay.

Moses recorded empirical data that computes to a base e (natural) 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 which caused a natural (base e) exponential decay in life spans 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 a natural (Euler's or Napier's) exponential decay in lifespan beginning 1656 years from Adam, i.e. when Methuselah died and when Noah was 602 years old and still living.

In the case of Moses' recorded longevity data the match with a base e exponential decay does not indicate that time caused an exponential decay in longevity, i.e. does not indicate a cause-effect relationship between date and life span. Rather it seems to imply that something in earth's biological environment or in nature had an effect on human longevity. Human longevity then

changed in a way that changes commonly occur in nature which is by a base e exponential curve. Moses records a global flood occurring at that time.

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

Moses probably couldn't mathematically create the patriarchs' life spans to falsely produce and record a natural logarithmic decay (i.e. exponential decay with base e.) He didn't have Leonhard Euler's (John Napier's) natural constant e or the natural logarithm function to produce the natural logs. Napier discovered the number e and invented logarithms (including the natural logarithm) sometime between 1550 and 1618 AD or about 3050 to 3118 years after Moses (~1500 BC.)

It appears that Moses (Ps. 90:10) and the apostle Paul (Ro. 5:14) knew that life span decay had tailed off to 70 or 80 years which would be prophetic. Life span dropped to as low as 20 years on average globally (Swenson, 1999) at the time of Christ but today life span to 70 or 80 can be expected.

Moses succeeded in getting at least this one thing - life span decay data - from his time through 3500 years to today that could be operated on with modern scientific tools and found to have statistical significance. The scientific tool used here is the field of statistics also known as engineering analysis. The significance should point to the accuracy of Moses' other recorded information of which Noah's flood is the closest in chronological proximity to the life span decay.

#### Recommendations

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. Base e exponential decay  $e^{-x}$  and growth  $e^x$  are common in biology and life span is a biological issue. The biological connection is described as:

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]

$\frac{dy}{dx} = a \cdot y$ , with initial conditions  $y = 1$  when  $x = 0$ , is  $e^{a \cdot x}$ .... 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" (Fornwalt, 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 nor 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 (Abramson, 2002); elements introduced that may

have been harmful to us (Abramson, 2002); or a stronger cosmic ray period lasting until now (R. D. Winter, personal communication, February 5, 2002).

Abramson (2002) gives the example of a capacitor which discharges by the same exponential equation with different coefficients and time constants. 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" for the forces behind human longevity. In electronics the elements for "resistance to ground" are capacitors, resistors and inductors. It is recommended that the human longevity analogous elements be identified.

Self (B. W. Self to L. Dolphin forwarded to author, personal communication, April 6, 2002) presented a paradigm shift to the author of considering the increase in the reign of death instead of a decrease in longevity. Self says this reign of death is quantifiable and Winter (Winter, 2000) and Myhrvold (Myhrvold & Andrews, 2002) give specific examples of the quantifiable reign of death.

An entrepreneur, Myhrvold claims that all of human disease has from 10,000 to 30,000 agents and that all these agents' identities may be unmasked within two years or outward of ten years. Winter founded the Institute for the Study of the Origins of Disease (Pasadena, California, 1995) to awaken the church to conduct a global war to wipe out the sources of disease [while the secular world makes a mint off the field – author.] "10,000 to 30,000" gives one example of quantifiable reign of death.

Winter goes on to say that in pre-Cambrian rock there are no predators. Suddenly at a well-defined "juncture" destructive life forms "appeared at all levels" including under the microscope and on up to the big animals (Winter, 2000) – this equates to another example of quantifiable reign of death.

Winter (R. D. Winter, personal communication, January 6, 2002) continues quantifying the reign of death (Self's terminology, 2002) by speculating that this predator-versus-no predator juncture occurred when Satan fell to earth and began adding his works of evil, again a quantifiable statement by at least the mathematical operation of addition.

Self (2002) has in-depth comments to make about the "extension of the reign of death" and his entire correspondence is worth reviewing before continuing:

"Much of nature including biology follows the base e exponential curve in decay or growth."

This prompts a line of thought which, if not new for me, at least is making an impression for the first time

We're accustomed to think of the process described as a decrease in the amount of life span for the patriarchs. What if, rather, it is an increase of what might be called their "death-span"? In one of the few Biblical summaries of

this entire period, we are informed that "death reigned from Adam to Moses" [Ro. 5:14.] This views the process of declining ages for the patriarchs to be an increase of the power as rule of Death – whose dominion has a distinct and quantifiable nature. They experienced an extension of the reign of death, which resulted in a shortened life span.

Of course, "life span" is not a quantifiable substance, but simply a measurement of time. Perhaps, though, the lessening of the amount of earthly time available for making eternal choices is in inverse proportion to the growth of "the mystery of iniquity." It sure seems that we're on another "entropy plateau" at present, but with Biblical indications of our soon entering into a dramatic increase of entropy for the last few years of this age.

While some of the side-effects are quantifiable (life span / death span), this is essentially a \*moral\* phenomenon. Chapters 1-4 of Genesis shows that the physical universe was created for mankind, that mankind was created to be morally responsible to God, and that abdication of that responsibility has thus affected the physical operations of the universe as well as shortened people's life spans.

The great qualifying feature of the new heavens and earth is that it will be one "in which righteousness dwells." This shows that rectifying of the disjunctive and malfunctioning processes of our present physical universe will be a \*moral\* process -- therefore, the source of changes in the order/entropy equation in our cosmos (with all of the consequences that entails for physics as well as ethics) must be sought in the human moral condition of sin versus righteousness.

Paul, especially, in the NT tends to objectify sin in various ways -- as a noxious plant, as a venomous stinging insect, etc. -- so we have a pretty fair base to build an understanding of sin as an objective moral entity. Throughout the Scriptures such entities as Death, the Grave, Sheol/Hades, and so forth as presented to us as more than poetical metaphors, but as actual moral entities with powers of volition and action akin to our own.

Few theologians have taken their Bibles seriously enough to even begin developing a coherent Biblical theology which incorporates what we actually know from God's revelation about the spiritual realm of "the heavenlies" (and the entities who inhabit that realm), not to mention the organic interpenetration of the heavenlies and our earthly cosmos of time/space/matter. It is the heavens and the earth together which constitute the created order. Neither half of creation can be properly understood without the other, and none of it, even taken together, can be understood without reference to the moral condition of humanity.

In his quote above Self quantifies at least for other agents in the reign of death: Death itself, “the Grave, Sheol/Hades”, and entropy all of which may need separate attention in combating death’s reign.

Tangibly Self, Myhrvold and Winter’s comments seem to recommend attempting not to just measure or count and identify but now more for the church as Christ’s agent to destroy identified works of Satan’s evil. Myhrvold, Self, and Winter’s combined research suggests ways of fighting works of evil: increased moral responsibility (dominion or care versus domination in Ge. 1:26,28); identification and elimination of disease sources; and identification and at least control or management of predators at all size levels (“overcome evil with good”, Ro. 12:21.)

The author recommends additional actions as follows.

The actual cause and effect continue to be researched and identified which caused: (1) the increase in death span and; (2) the decay of human life span. It is then recommended that it be explained why the identified culprit physical connection caused the exponential decay in the “forces controlling human longevity” (author’s terminology.)

Missing in the data is a large representative population for statistical analysis. Researchers should continue focusing and expanding research on other evidence of longevity decay in the human and other populations during the same time period around the world in order to search for large data samples for population statistical analysis.

#### Analysis

The fourteen biblical patriarchs’ birth dates from Adam versus lifespan occurred as follows: Noah (1056, 950); Shem (1558, 600); Arpachshad (1659, 438); Shelah (1694, 433); Eber (1724, 464); Peleg (1758, 239); Reu (1788, 239); Serug (1820, 230); Nahor (1850, 148); Terah (1879, 205); Abraham (2009, 175); Isaac (2109, 180); Jacob (2169, 147); Joseph (2260, 110.)

Figure 1’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:

$$\text{Ln}(\text{lifespan}) = 8.804 - 0.00177 \cdot \text{date}$$

where

$$8.804 = a = \text{estimate of the true y-axis intercept } \alpha;$$

$$0.00177 = b = \text{estimate of the true slope } \beta;$$

$$\text{d.f.} = \text{degrees of freedom} = 14 - 2 = 12 \text{ (n-2 d.f. because estimates are made of both } \alpha \text{ and } \beta);$$

$$r = -0.850 = \text{estimate of the population correlation coefficient } \rho.$$

The z statistic for  $\rho$  inferences indicates that:

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

and  $\rho$ ’s 95% confidence interval is:

$$-0.58 < \rho < -0.95$$

The t test for  $\beta$  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  $\beta$  there's a +/-28% variation mainly due to small sample size and a few large variations.) The range of  $\alpha$  is not critical (y-axis intercept.)

The normal distribution statistics are:

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

$s_e$  = estimate of the common standard deviation = 0.263 (that is, the normal linear regression analysis' 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.)

Figure 1's squares give the graph (Ln Life span) of these patriarchs' actual life spans' natural logarithms.

Figure 2 graphs the life spans from Noah to Joseph recomputed by the least squares (e raised to the least squares value):

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

$$\text{Lifespan} = 6664 \cdot e^{-\text{date}/\tau}$$

where date is the number of years since Adam and:

$$\tau = \text{exponential time constant} = 563 \text{ years.}$$

The least squares graph in Figure 2 is exponential but appears skewed because of the compressed date axis.

The equation is not good all the way to today 3500 years after Moses but does fit the data for the 1500 years from the flood to Moses as follows. Moses lived in the year 2580 after Adam for which the equation gives 68 years of longevity. In Ps. 90 the Psalm of Moses, verse ten Moses wrote "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."

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Figure Captions

Figure 1. Least Squares of Life Span decay (Noah to Joseph) – versus – Date since Adam

Figure 2. Lifespan versus Date since Adam



