Coincidences in the Bible and in Biblical Hebrew (New and Old) and Their Statistical Analysis

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ABSTARCT

An ancient tradition, expressed in numerous examples scattered throughout various Jewish scholarly works, convey that numerical values of Hebrew words often represent major physical characteristics associated with the objects that the words stand for. Simple examples are “Shanah”, Hebrew for year, and “Herayon”, Hebrew for pregnancy, which have numerical values equal to those of the duration (in days) of the lunar-based Hebrew year and human pregnancy, respectively. These examples and many others, all linked to “counts” data, may be perceived as mere anecdotes. However, recent statistical analysis applied to a much larger set of examples, comprising subsets of related words with a common physical trait (measured on a continuous scale), seems to suggest that there might be more to this tradition than meets the naked eye.

We expound the underlying statistical approach that drove the statistical analyses introduced in this paper and present some results. Possible criticism is addressed and discussed.

Keywords: Biblical Hebrew, Chazal, linear transformation, linear regression, Midrash Rabbah, statistical textual analysis

1. INTRODUCTION

An ancient Jewish tradition assumes the existence of hidden linkages between physical properties of “entities” of the real world and respective biblical verses or biblical Hebrew words, related to these entities. This conviction is expressed not merely by general assertions, like “Bezaleel knew how to assemble letters with which heaven and Earth had been created” (Talmud, Berachot, 55a), but also in various detailed examples, often reflecting efforts to extract real (occasionally useful) information about the physical world from analysis of the structure and the numerical values of related words, or verses, in the Hebrew Bible. For example, the numerical value of the Hebrew “Heraion” (pregnancy; Hoshea 9:11) represents the expected duration of human pregnancy (271 days; Midrash Rabbah, Bereshit, 20). Also therein, Rabbi Shmuel relates to a verse from the Bible: “Harbeh arbeh itzvonech ve-heronech” (“I will greatly multiply the pain of thy child bearing”, Gen. 2:16). Since “Harbeh” (“greatly”) is numerically equivalent to 212, an embryo surviving 212 days, thus Rabbi Shmuel, will probably survive the whole pregnancy.

Some further examples, relating to “counts” data, are given in Table 1.

Insert Table 1 about here

While these examples and many others may be perceived as a collection of anecdotes (“cherry picking”, in statistical parlance), recent statistical analysis conducted on a much wider scale, referring to data measured on continuous scales, seems to suggest that this tradition may have deeper roots in reality than initially and intuitively suggested by the documented Jewish oral and written tradition.

A first serious attempt to subject these “facts” of tradition and faith to serious statistical analysis had been carried out in Shore[1], where various sets of related words, bound together by a shared physical trait (or traits), were analyzed. These included, for instance, primary colors and their respective spectral frequencies, metals and their atomic weights and specific heat capacity of the three phases of water (ice, liquid water and steam; refer to Section 3.3). Some of these examples

were made public in an interview given by the author to the Israeli daily The Jerusalem Post (December, 4, 2009[2]).

An innovative aspect of the examples assembled in Shore[1] is the introduction of statistics and statistical hypothesis testing to establish in a rigorous scientifically acceptable fashion existence of a relationship between the numerical values of a set of inter-related biblical Hebrew words and a major physical property shared by all objects that these words stand for. As explained in detail later, existence of a statistically significant *linear* relationship (either on the original scale of the physical trait or on a log scale) may indicate that the numerical values of the words in the set deliver same information as the scientifically proven physical measure (even though the latter is given on a different scale).

In this article, we first explain in Section 2, via a parable, why a linear relationship between two sets of observations, collected by two measuring devices possibly operating on different scales, indicate that the two sets of observations deliver identical information. While this may seem self-evident and redundant to readers trained in the exact sciences, it may not be so for other readers. Therefore a numerical example is introduced, given in the form of a parable. In Section 3 we present four simple preliminary examples for the existence of linear relationships between numerical values of inter-related biblical Hebrew words and a related physical trait. A computer simulation study examines, for one example, how probable are the results obtained if the respective Hebrew words were generated randomly by the computer. Section 4 expounds the major example of this paper, which focus on the nine planets (including Pluto, which has recently been deleted from the list of recognized planets). All biblical Hebrew words that indisputably relate to celestial objects are examined in relation to three physical traits of the planets: diameter, mass and orbital angular momentum (OAM). The main reason for selecting this example is the large number of points in the set (nine). Aligning nine points on a straight line accidentally is highly improbable, and renders it extremely hard to relate to this phenomenon as mere coincidence. This example is followed, in Section 5, by new findings obtained after publication of the book[1], either by us or via comments and suggestions received by e-mail from readers

exposed to the book[1] or to the interview in the Jerusalem Post[2]. Section 6 addresses possible criticism of the validity of the phenomenon presented here and its statistical analysis.

To assist the reader, who may wish to monitor more closely how the numerical examples in this paper have been analyzed, Table 2 presents a list of Hebrew letters and their traditional numerical values.

Insert Table 2 about here

2. A PARABLE (all facts imaginary; conclusions valid)

At the beginning of the twentieth century, an archeological excavating expedition arrived to the Holy Land to carry out some research in the vicinity of the city of Jericho. A while into the beginning of the excavation, a papyrus was exposed that contained a series of twenty numbers. These are given in Table 3a (denoted "First set").

Insert Table 3a about here

No caption explained what the numbers meant so the mysterious papyrus was stored in a secured place and excavation continued. A while later, a second papyrus was revealed, with a second list of numbers (of same size as before; refer to Table 3b).

Insert Table 3b about here

However, this time the caption gave exact details of the nature of these numbers and when they were collected. It read: "Temperatures measured at this site for twenty consecutive days in the year 150 BC". Researchers were delighted and they had no doubt that this is an authentic document; however they were still at loss explaining the numbers in the first document, even after consulting the best available statisticians of the time. Several months later, a young archeologist from the expedition came up with a brilliant idea: Perhaps the numbers in the first document are measurements of same temperatures as specified in the second document. After some scholarly arguments and mutual convincing, the team decided to test this hypothesis statistically.

How could the new hypothesis be tested?

Figure 1 plots the two sets.

Insert Fig. 1 about here

A linear relationship is obvious. Linear regression analysis gave the following equation (F- Fahrenheit, C- Celsius):

$$F^\circ = 32 + 1.8\ C^\circ$$

Data analysis indeed validated the young archeologist's choice of method to resolve the mystery surrounding the first set of numbers.

3. FOUR PRELIMINARY EXAMPLES

In this section we introduce four examples (subsections 3.1-3.4), all sharing two important characteristics: each example addresses a set of three biblical words for which no controversy exists about their true meanings, and nearly all words in these examples are unique in the sense that there are no synonyms in biblical Hebrew that may substitute these words.

In subsection 3.5 we present a computer simulation study, relating to one of the examples, that examines how likely it is for a trio of Hebrew words, generated randomly by the computer, to be aligned in a linear configuration close to that shown in the example.

The appendix details calculation of the numerical values of Hebrew words that appear in the first three examples of this section.

3.1 Cyclic Time-periods: Day, Month, Year ("Yom", "Yerach", "Shanah")

"Periodicity" is a major physical property that differentiates between the time-periods that the words above stand for. To check whether numerical values of Hebrew words represent periodicity affiliated to these words, one has to express periodicity (or frequency) by a common measurement unit. For example, if we chose "Cycles per year", then the periodicity of "Day" would be: (29.53059*12) = 354.37 (the lunar month, on which the Hebrew calendar is based, is on average 29.53059 days); the periodicity of "month" will be 12 and that of "year" 1. If "Day"

served as the measurement unit, then the frequency of “Year” will be 1/354.37 cycles per day. In this example we adopt a unit commonly used in science and engineering to denote frequency of cyclic phenomena, namely, Hertz (1 Hertz is one cycle per second). Note, that in regard to the results derived from the statistical analysis, the actual unit selected is inconsequential provided use of this unit is consistent throughout the statistical analysis.

Table 4 displays numerical values of the words in the set and the frequency (in Hz) associated with the “object” that each word stands for.

Insert Table 4 about here

The reader should be reminded that a numerical value can be represented by any system, for example, the decimal system. Alternatively, a number may be expressed as a power value. Thus, "7" can be represented in two modes: $7 = 10^{0.8451}$. The number 0.8451 is denoted “the log of 7 to the base of 10.” In fact, when numerical values in a sample of observations span several orders of magnitude, it is customary in science and engineering to represent these observations, for statistical modeling, by their log values. This is implemented with respect to nearly all examples in this paper (with Example 3 in Section 3.3 as the sole exception, due to the proximity of the values of the response variable).

Figure 2 displays the three points whose values are displayed in Table 4. On the horizontal axis numerical values of the Hebrew words are registered (Duration Numerical Values, or DNV), and the vertical axis displays the respective values of frequency, on a natural log scale (log scale to the basis of “e”).

Insert Fig. 2 about here

We realize that the points align themselves on a straight line with a linear correlation of -0.9992 (a value of -1 would have been expected for an exact (mathematical) decreasing linear relationship). The actual statistical significance level is 2.5%, below the commonly accepted threshold value of 5%.

3.2 Diameters of Moon, Earth, Sun (“Yareach”, “Eretz”, “Shemesh”)

This example examines whether the Hebrew moon, Earth and sun bear any relationship to a major physical trait of these celestial bodies, namely, their equatorial diameters. As in the earlier example, due to variation in orders of magnitude of the diameters they will be registered in the plot on a log scale.

Table 5 introduces the data (diameters taken from NASA site), and Figure 3 displays the data, with numerical values of the Hebrew words (Object Numerical Value, or ONV) on the horizontal axis and the respective diameters, on a log scale, on the vertical axis.

Insert Table 5 about here

Insert Fig. 3 about here

The phenomenon evidenced in the earlier example is repeated: the three points align themselves on a straight line with a linear correlation of 0.999 (a value of 1 would have been expected for an exact (mathematical) increasing linear relationship). The actual significance level obtained is comparable to that of the former example (2.9% vs. 2.5% for the first example). Note that significance values obtained for larger data sets are expected to be smaller, as indeed we may find out in Section 4 (with sample size n=9).

3.3 Specific Heat Capacity of the Three Phases of Water: Ice, liquid water, steam ("Kerach", "Mayim", "Kitor")

Heat capacity, or thermal capacity, is the ability of matter to store heat. The heat capacity of a certain amount of matter is the quantity of heat (measured in joules) required to raise its temperature by one Kelvin. SI denotes the International System of Units. The SI unit for heat capacity is J/K (joule per Kelvin).

Specific heat capacity (SHC) of a substance is defined as heat capacity per unit mass. It is commonly denoted by symbols like c or s, and occasionally called just specific heat.

The SI unit for SHC is joule per kilogram Kelvin, $J \cdot kg^{-1} \cdot K^{-1}$, or $J/(kg \cdot K)$. This is the amount of energy (heat) required to raise the temperature of one kilogram of the substance by one degree Kelvin.

The symbol cp is often used to denote SHC at constant pressure.

Substances with low SHC, such as metals, require less input energy to increase their temperature. Substances with high SHC, such as water, require much more energy to increase their temperature. The specific heat can also be interpreted as a measure of how well a substance preserves its temperature (i.e., “stores” heat—hence the term “heat capacity”).

Water is often used as a basic standard relative to which SHC values are compared. However, the water’s SHC depends on which state it is in. Frozen water (that is, ice), liquid water, and gaseous water (that is, steam) have different SHCs. In fact, this is the major physical trait that differentiates between the three.

Table 6 displays SHC at constant atmospheric pressure for all three states of water, measured in J/(kg·K). SHC for ice and steam were naturally recorded at transition temperature from one phase to another.

Insert Table 6 about here

Insert Fig. 4 about here

The biblical Hebrew words for the three water phases are “kerach” (ice), “mayim” (water) and “kitor” (steam). Their numerical values also appear in Table 6 as WNV (Water Numerical Values; refer to the appendix for how these were calculated).

Linear regression analysis was applied with water’s SHC values as the response (the dependent variable) and WNV values as the regressor (the independent variable).

For sample size n=3, the linear correlation coefficient is 0.9995. The model F-ratio is 917, which at the 5% level is significant ($p<0.0210$).

The original observations with the fitted regression equation and 95% confidence limits are shown in Figure 4. For easy identification, the WNV value is given atop each observation. Predicted values may be easily calculated from the regression equation included in the plot’s caption.

3.4 Velocities

In this subsection we address two sets of Hebrew words, each comprising three words, that are associated with velocities. The first trio of words is {Light, Sound, Standstill}, the second {Rainbow, Thunder, Silence}. Curiously, the last word in the two sets is represented in Hebrew by a single word that delivers both meanings (namely, standstill and silence). Table 7 presents the two sets, with their associated numerical values (VNV-Velocity Numerical Value) and the associated actual velocities (V, in meter/second). For *sound* (and *thunder*) we took the standard sound speed in air at normal atmospheric pressure and 25°C. Other values (suitable for other conditions) can be taken without practically affecting the results of the statistical analysis (since the latter is conducted on response values measured on a log-scale). For *standstill* (*silence*) we took velocity to be 1, so that on the log-scale, in which the statistical analysis is conducted, we obtain for log-V a value of 0.

Figures 5 and 6 show the fitted linear regression models, with the associated 95% confidence intervals. Figure 7 displays plots of the joined points in each set, for both sets. It is indeed unexpected that both sets converge at the same Hebrew word ("Dmamah").

Insert Table 7 about here

Insert Figs. 5-7 about here

3.5 A Computerized Simulation Experiment

In this subsection we examine how likely it is for a trio of Hebrew words to be arranged on a straight line, given the velocities of the previous example. To assess that probability, we used computerized simulation, where ten thousands sets of three words had been randomly generated. In each set the first word comprised four letters (as in Dmamah) and the other two words comprised three letters each. Letters were selected with probabilities proportional to the relative frequencies of the letters in the Hebrew Bible. Also, if a word comprised three or more repetitions of same letter it was discarded and another random word

generated (it is impossible to have a Hebrew word of three or four letters that comprises 3-4 repetitions of same letter). The response variable (the measure subjected to statistical analysis) was the ratio of the slopes (SR) of the two lines that connect two adjacent points, namely:

$$SR = \frac{(Y_3 - Y_2)/(X_3 - X_2)}{(Y_2 - Y_1)/(X_2 - X_1)},$$

where Y_j (j=1,2,3) is the value on the vertical axis of the j-th point and X_j is the value on the horizontal axis of the j-th point (j=1,2,3). It is assumed that the points are sorted according to their Y values in an ascending order. Thus, generated word that represents Dmamah is the first point (j=1) and so on.

Obviously for three points that are arranged on a single line (whether the line has positive or negative slope) we will have (ideally) SR=1. For three-point sets that are arranged near a straight line we will have SR values around 1.

It can be easily established from Table 7 that for the two sets discussed in subsection 3.5 we obtain:

SR_1 =1.550 for {Or, Kol, Dmamah}

SR_2 = 1.056 for {Keshet, Raam, Dmamah}.

Analyzing the sample (N=10000 sets of three words each), we obtain for SR:

Mean = -1.6725 ; Standard Deviation = 69.16

Figure 8 displays a histogram of the sample.

Insert Figure 8 about here

The figure shows that SR is indeed normally distributed. Assuming this distribution, we obtain, with the above estimates of the mean and standard deviation:

Pr[0.4<SR<1.6]= 0.006917 ; Pr[0.9<SR<1.1]= 0.001153 ;

(intervals were selected to be symmetrical around SR=1 and to include SR_1 and SR_2)

Thus, the probability that a randomly generated set of three Hebrew words, with configuration similar to that used in the example, will fall in the intervals specified (where we have obtained SR_1 and SR_2) is less than 1% for both sets of words. Furthermore, these probabilities were calculated without filtering out (excluding) sets of words that do not have any Hebrew meaning. If this would have been done (a prohibitive undertaking for a sample that large) the probabilities would have been even smaller.

4. PRIMARY EXAMPLE: THE PLANETS

4.1 Planetary Diameters

This example examines existence of a possible link between names for celestial objects that appear in the Bible and known diameters of the planets. This is an outrageous and hard to prove (let alone believe) proposition on two counts. First, the Bible never refers to any particular planet (apart from Earth, which for obvious reasons is never considered in the Bible to be one of a set of planets). Secondly, why should one even conceive of biblical sky-related names to be associated with planets' diameters? Furthermore, given that there is no allusion to planets, how would one link a particular biblical name to a particular planet?

We are unaware of any scholarly interpretation that attributes apparently celestial biblical names to specific planets. However, certain names are traditionally interpreted to be associated with groups of stars or just representing a planet (no attribution attempted). Examples are Ash, Aish, Ksil and Kimah (we will refer to these shortly). The most commonly accepted Even-Shoshan Hebrew concordance[4] interprets Ash to be one of the planets, Aish to be a group of non-moving stars ("Kochvei-Shevet"), Ksil to be the group of stars called Orion, and Kimah as "A group of radiating stars of the sign Taurus".

We now discard these traditional interpretations, and make an initial assumption that all references to celestial objects in biblical Hebrew relate to planets (excluding the sun and the moon, which are also celestial objects denoted by specific Hebrew words). There are five such names: *Kimah* (Amos 5:8; Job 9:9, 38:31), *Ksil* (Isa.13:10; Amos 5:8; Job 9:9, 38:31), *Ash* (Job 9:9, occasionally

also *Aish*, Job 38:32) and *Teman* (Job 9:9). The latter means in biblical Hebrew also south, but from the general context of the verse where it appears Teman obviously relates to a celestial object and so it is interpreted by Jewish biblical scholars. We add to this set *Kochav,* which in biblical Hebrew simply means star. *Kochav* is assumed here to relate also to an unknown planet, though in most places in the Bible it appears in the plural to signify all stars or any star. Such developments, where a specific meaning is later generalized, is often encountered in the evolution of languages (relate, for example, to the words "to xerox" or "fridge"). We assume that same destiny befell *Kochav*.

Two other names added to the set are *Mazar* (only the plural, *Mazarot* or *Mezarim*, appear in the Bible, at Job, 38:32 and Job 38:9, respectively), and "Shachar". The first (*Mazar*) is interpreted in Even-Shoshan[4] as *Mazal* (a planet, in both ancient and modern Hebrew). The second is often interpreted by Jewish scholars as "a morning star" (relate, for example, to SofS. 6:10, and how Jewish commentators interpret it). As elaborated on at some length in Shore[1], these names probably represented originally the two most luminary stars in the sky, after the sun and the moon, namely, Venus (probably named *Mazar* in Hebrew) and Jupiter (probably named *Shachar* in Hebrew). As we shall later demonstrate, the statistical analysis indeed corroborates this interpretation for the two names.

We now have nine biblical names for celestial objects (including Earth). Apart from the latter, which planets do these names possibly allude to?

For no obvious alternative method to assign names to planets, we sort in an ascending order the numerical values of the biblical Hebrew names (denoted ONV for "Object Numerical Values"), and likewise for the nine planets' equatorial diameters (as given by NASA site, including also Pluto that had recently being omitted from the list of planets). Table 8 displays the results.

Insert Table 8 about here

The most surprising finding in this table is that the words *Mazar* and *Shachar* indeed occupies in the sorted list same ordinal positions as the very same planets that these names have formerly been attributed to from altogether non-

statistical arguments (refer to Shore[1], sections 8.3.4 and 8.3.5). Also Earth occupies same positions in both of the sorted lists. We conclude that this convergence to identical ordinal positions, emanating from two different modes of analysis, corroborates the validity of the analysis on which this table rests.

Plotting the planets' diameters on the vertical axis and ONV values on the horizontal axis, Figure 9 is obtained.

Insert Figure 9 about here

A nonlinear relationship is evidenced by the plotted points. Proceeding as in the previous example (namely, plotting diameters on a log scale) we obtain Figure 10.

Insert Figure 10 about here

A linear relationship surfaces, unexpectedly and with no logical explanation. Statistical linear regression analysis was applied to the entire sample of nine points to ascertain whether the linear relationship is significant. For the present analysis (n=9), we have obtained a correlation value of 0.9825. The model F-ratio is 195.2, which is highly significant ($p<0.000002$).

Confidence interval limits (at 95% confidence) are also plotted in Figure 10. We realize that Earth (ONV=291) resides somewhat below the lower confidence limit. Therefore the previous analysis is re-run, excluding Earth. Results are plotted in Figure 11.

Insert Figure 11 about here

With n=8, the R value is now 0.9919, the model F-ratio has jumped to 367 (formerly 195.2), which is highly significant ($p<0.000001$).

4.2 Planets' Orbital Angular Momentum (OAM)

The idea for this analysis was forwarded to me by Dr. Howard Sharpe of Canada. Assembling of data and analyses performed are the author's.

One of the most significant characteristics of a planet's orbit is its orbital angular momentum (OAM). The latter is defined as the product of the planet's mass

times the planet's average distance from the sun times the planet's average orbital speed:

$$L = M*R*V = M(2\pi R^2) / T$$

where M is the planet's mass (kg), R its average orbital radius (meters), V its orbital linear speed (meters per second) and T its orbital period (in seconds).

Table 9 displays Hebrew words' numerical values (ONVs, as in Table 8) together with planets' OAM values (kg*m^2/sec; m is "meter"), both in their original and their log values.

Insert Table 9 about here

On comparison of Tables 8 and 9 we realize that only Neptune and Uranius could not have maintained their original ordinal positions (as given in Table 8) if sorted according to their OAM values. The mass density of Neptune (1.76 g/cm^3) is larger than that of Uranius (1.30 g/cm^3), however the equatorial radius of the latter (25,559 km) is larger than that of the former (24,764 km). Both equatorial radius and mass density affect OAM (as evidenced by the formula above). It is therefore not necessary that nearly all planets in Table 9 (with Uranius and Neptune excepted) should have preserved their sorted positions both with respect to equatorial diameter and to OAM. Due to the proximity in both size and OAM of Neptune and Uranius we have decided to preserve in Table 9 same ordinal positions for all planets as given in Table 8.

Figure 12 displays the results (the vertical axis presents log-OAM).

Insert Figure 12 about here

We realize that all nine points align themselves on a straight line. The adjusted ρ-squared (ρ is correlation) is 0.958. The model F-ratio is 181.8, which, for n=9, is highly significant ($p<0.000003$). Since Earth point is somewhat deviant (below the confidence interval lower limit) it is removed from the sample, and linear regression analysis is re-run for a sample of n=8. The adjusted ρ-squared is 0.977. The model F-ratio is 294.3, which, for n=8, is highly significant ($p<0.000003$). The results are presented (with Earth excluded) in Figure 13.

Insert Figure 13 about here

4.3 Planets' Mass

Planets' diameters and planets' masses, both measured on a log scale, should be linearly inter-related if their mass densities were equal. However, we know that average mass densities of planets differ (relate to Table 8). Therefore, values of planets' masses are added to Table 9, and we explore the relationship between ONV values and the respective planetary mass for all nine planets.

Figure 14 displays the results.

Insert Figure 14 about here

A linear relationship is evidenced by the plot. Applying linear regression analysis, the adjusted ρ-squared is 0.953. The model F-ratio is 161.8, which, for n=9, is highly significant ($p<0.000004$).

5. SOME FURTHER NUMERICAL EXAMPLES

Examples in this section, though numerical, are not accompanied by statistical analysis. Since they lend support to the main claim of this article, they are added here as further instances for the realization of the characterization delineated in the Introduction.

5.1 How Long is Human Pregnancy?

The data below were forwarded to me by an American Obstetrician/Gynecologist, living and working in Mali, West Africa. Permission was granted to publicize excerpts from his e-mails, as given below. However he preferred to remain anonymous and therefore we will refer to him as Dr. X.

His e-mail to me regards the duration of human pregnancy. In my book I quote the numerical value of 271 days for "Herayon" (pregnancy), as indicative of expected duration of human pregnancy (Shore[1], p.49). However I quote two commonly accepted methods to calculate duration of human pregnancy: "One method is to measure human pregnancy from fertilization time, which is commonly accepted to be, on average, 266 days. Another method is to measure

human pregnancy from the last menstrual period, which is commonly accepted as 280 days. The simple average (midpoint) between these two figures is 273 days (about nine months)."

Thus write Dr. X in his e-mail:

"Dr Nagele, a physician in the 1850's or so, created a rule for estimating the due date of a human pregnancy based on the first day of the last menstrual period. At this point, no one even knew that ovulation and therefore conception was taking place at approximately day 14 of the ovulatory cycle, so the only fixed point was the first day of the last menstrual cycle, and of course, one is not pregnant at this point, as one is actively sloughing the endometrial contents. Nevertheless, this is the one fixed point by which to date a pregnancy, and in his study of patients, he determined that the due date is 280 days after the first day of the woman's last menstrual cycle. He invented a rule by which to estimate this for patients. It is still used today ─ Nagele's rule[5]. Take the first day of the last cycle and then subtract three calendar months and add 7 days─ the resulting day (about 280 days later) will be the patient's approximate due date.

Later, in the 1930's or 40's it was determined[6] that ovulation, and therefore conception, was taking place approximately 14 days after the first day of the last menstrual period. Thus the classic length of human gestation of 266 days after ovulation (and therefore conception, plus or minus one day, as both the sperm and the egg can live in the female genital tract for about one day in the unfertilized state, before dying) was established.

These two numbers have been used ever since, and you refer to them in your book. However, in 1990, Dr Robert Mittendorf *et al.* published a comprehensive study of estimated delivery dates of American women[7]. As far as I know, this is the most recent scholarship done on this question. Interestingly he found that for women who had never had a child before, the average length of pregnancy was 274 days after conception, while for women who have had at least one baby before, the average length of gestation was 269 days. I find it fascinating that the

average of these two is 271.5!! It is remarkable to me that 271 is found to be so near the center of the distribution by the most recent scholarship.

Thus Dr Mittendorf's data show average gestation to be about 5 days longer on average than Dr Nagele's data, and this only serves to further tighten the biblical evidence for 271. I suspect a true picture of the data would show a bell shaped curve centered directly on 271."

5.2 What Percentage of Human Blood is Cellular?

In the same message, Dr. X refers to the fact that blood in Hebrew ("Dam") is numerically equivalent to 44. I refer to this fact in my book, drawing attention that whenever a numerical value of a biblical Hebrew word amounts to a repeated appearance of a single digit (like "Sheleg", snow, equaling 333), this number indicates a major physical property of the object that the word refers to. Relating to human blood, I have interpreted the repeated "4" as signaling the number of human blood varieties that exist (Shore[1], p. 61 and 146). Dr. X believes that the number "44" conveys an even deeper meaning, signaling the proportion of cellular blood (all the rest is liquid) in the human blood:

"One other thing that strengthens your case is the fact that one standard measure of human blood is called the hematocrit. This is the percentage of blood that is cellular (the rest being liquid- the plasma). The hematocrit normal values vary between males and females, but normally they are cited to be 42 - 50% for men and between 35 - 47% for women. Consult any laboratory manual and you will see that the norms cited for male and female hemoglobins always contain the number 44 for both, and a simple average of the male and female norms will always center around 44!!! I looked at several different limits of normal according to different texts and sites, and found my averages to always be between 42.5 and 45. So…this is astounding, eh?? 44 is definitely a key number for human blood."

6. POSSIBLE CRITICISM AND A DISCUSSION

In this paper we have demonstrated a certain phenomenon, rooted in Jewish culture and tradition, namely, that traditional numerical values of Hebrew words store information that directly relates to a major physical trait of the objects that the words are linked to. Few of the examples given here are a subset of a wider sample given in Shore[1], though with no statistical detail as expounded here. In this section we elaborate on some possible criticism that may be raised regarding the main claim of the paper, both in terms of the plausibility of the claim and the supportive evidence.

A first argument is that human language, being human, cannot include information unknown to generations past, and therefore this phenomenon is a mirage. People of faith would respond that not all human languages are of human origin, and if Hebrew, the original language of the Old Testament, is of divine origin– then this phenomenon is possible. Attempting to avoid arguments of a religious nature, we believe that such debate should be averted and only the data, supported by adequate statistical analysis, should be the basis for a proper assessment of the phenomenon addressed in this article.

A second argument relates to the fact that not all Hebrew words succumb to the characterization given in this article, namely, they are not all connected to some related major physical trait. A good example is the link between colors' names and color wave frequencies, an analysis that was addressed in the Jerusalem Post interview (alluded to earlier). In this example, I have shown that biblical Hebrew names of a subset of five colors have sorted numerical values that preserve same order as their respective wave frequencies, a finding that has low probability (1/120) of occurring by chance. In my book I enumerate 24 names of colors in the Hebrew language, most of which appear also in the Bible. Why were only five colors selected? The answer is twofold: first, with a single exception only primary colors were selected for the sample (explanation why only primary colors could be analyzed and why an exception to this rule was included in the analysis is given in Shore[1]); of the seven primary colors only four are mentioned

in the Bible and they were all included in the sample. Secondly, Hebrew being an ancient language, not all words in the Bible have meanings that are known to us today or that cannot be debated. Therefore, only words that have obvious and unchallenged meanings could be included in the sample. Considerations like these may apply to other analyses. Another argument raised is that the phenomenon addressed in this article (and in my book) is not all-inclusive, namely, a linear relationship cannot be established for all sets of Hebrew words with a common physical trait. The response to this argument is that human languages evolve overtime and in the process they absorb words from other languages, where the phenomenon simply does not exist. Furthermore, one cannot impose his, or her, desire on how pervasive the studied phenomenon should be. One should accept this phenomenon as it is and make do, regarding its validity, with the extremely small probability of its occurring randomly (as shown in this article and elsewhere). No theoretical argument can condition the reality of an observed phenomenon on its being all inclusive, “or else it does not exist”.

A third argument relates to the examples as “cherry picking”. This argument is serious and cannot be dismissed. To repudiate it, a certain critical mass of examples, with a large enough sample size (as shown in Section 4) and corroborated by proper statistical analysis, should exist that provides ample cumulative evidence that renders the phenomenon real even to the eye of the most skeptic.

We believe that such a threshold has been surpassed. Others may disagree.

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Appendix

Calculation of numerical values of Hebrew words for the examples in Section 3.

Example 1 (Section 3.1)**:** Values of DNV (Table 4)

***Yom* (day):**

$$56 = (40 = \text{ם}) + (6 = \text{ו}) + (10 = \text{י})$$

***Yerach* (month):**

$$218 = (8 = \text{ח}) + (200 = \text{ר}) + (10 = \text{י})$$

***Shanah* (year):**

$$355 = (5 = \text{ה}) + (50 = \text{נ}) + (300 = \text{ש})$$

Example 2 (Section 3.2)**:** Values of ONV (Table 5)

Y*areach (m*oon):

$$218 = (8 = \text{ח}) + (200 = \text{ר}) + (10 = \text{י})$$

***Eretz (*Earth):**

$$291 = (90 = \text{ץ}) + (200 = \text{ר}) + (1 = \text{א})$$

***Shemesh (*sun):**

$$640 = (300 = \text{ש}) + (40 = \text{מ}) + (300 = \text{ש})$$

Example 3 (Section 3.3)**:** Values of WNV (Table 6)

Kerach (ice)

$$308 = (8 = \text{ח}) + (200 = \text{ר}) + (100 = \text{ק})$$

Mayim (water)

$$90 = (40 = \text{ם}) + (10 = \text{י}) + (40 = \text{מ})$$

Kitor (steam)

$$325 = (200 = \text{ר}) + (6 = \text{ו}) + (9 = \text{ט}) + (10 = \text{י}) + (100 = \text{ק})$$

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Table 1. Numerical examples (with “counts” data) for matches between numerical values of biblical Hebrew words and corresponding values of related major physical traits

No.	Biblical Hebrew word (English)	Num. value of Hebrew word	Associated physical trait	Num. Value of physical Trait	Source	Example quoted in:
1	"ש.נ.ה" (“Shanah”, Year)	**355**	Duration (number of days) of lunar-based year	29.530589X12 = **354.3671**	Average lunar month (from NASA site)	Ref. 1, p. 241
2	"י.ד" (“Yad”,hand)	**14**	Number of bones in human hand	**14**	Common knowledge	Ref. 1, p.149
3	"ה.ר.י.ו.ן" (“Heraion”, pregnancy)	**271**	Duration (number of days) of Human Pregnancy	273 or **271.5**	Refer to Section 6.1 in this paper	Midrash Rabbah (Ref. 1, p. 49)
4*	"א.ד.ם" (“Adam”, human being)	**45**	Number of chromosomes common to all human beings	**45** (23 pairs, one sex chrom. different for male and female)	Common knowledge	No prior reference
5*	"ג.מ.ל" (“Gamal”, camel)	**73**	Number of chromosomes common to all camels	**73** (37 pairs, possibly one sex chrom. different for male and female)	Site: Answer.com	No prior reference
6*	"ח.ל.ד" (“Choled”, rat)	**42**	Number of chromosomes	**42** (21 pairs)	Site: wikipedia.org	No prior reference

***** These examples are a small set from a larger sample; however, not all names in biblical Hebrew succumb to this linkage, mainly because only rarely does a single number of chromosomes characterize all branches of a given species.

Table 2. Hebrew letters and their traditional numerical values (letters in brackets appear only at the end of the word and occasionally given different numerical values; not here).

Letter	Numerical value	Name (English)	Name (Hebrew)	Pronounced as
א	1	alef	אלף	A
ב	2	bet	בית	B or V
ג	3	gimmel	גימל	G
ד	4	dalet	דלת	D
ה	5	hei	הא	H
ו	6	vav	וו	V
ז	7	zayin	זין	Z
ח	8	chet	חית	German Ch
ט	9	tet	טית	T
י	10	yod	יוד	Y (I)
כ (ך)	20	kaf	כף	K or German Ch
ל	30	lamed	למד	L
מ (ם)	40	mem	מם	M
נ (ן)	50	nun	נון	N
ס	60	samech	סמך	S
ע	70	ayin	עין	A
פ (ף)	80	peh	פה	P, Ph or F
צ (ץ)	90	tzadi	צדי	Tz
ק	100	kof	קוף	K or Q
ר	200	resh	רישׁ	R
ש	300	shin	שין	Sh or S
ת	400	tav	תו	T

Table 3. Two sets of measurements reported by the excavation delegation (Section 2).

3a. First set

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
80.6	87.8	68	57.2	62.6	78.8	50	57.2	80.6	55.4
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
62.6	71.6	80.6	93.2	59	53.6	62.6	71.6	86	91.4

3b. Second set

Temperatures measured at this site for 20 days in the year 150 BC										
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Tem.	27	31	20	14	17	26	10	14	27	13
No.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Tem.	17	22	27	31	15	12	17	22	31	33

Table 4. Data for analysis of frequencies (in Hz, cycle per second) for “day, month, year”.

Name	DNV	Frequency	Log frequency
Day (*“Yom”*)	56	1.1574E-05	–11.3667
Month (“Yerach”)	218	3.9194E-07	–14.7521
Year (*“Shanah*”)	355	3.2661E-08	–17.2371

Table 5. Actual and predicted diameters of the moon, Earth and the sun (based on ONV, the numerical value of the Hebrew names).

Name	Diameter (actual, km)	Log-diameter	ONV (Object Numerical Value)	Diameter (predicted)	Error (%)
Moon	3474.8	8.153292	218	3946.75	13.6
Earth	12756.28	9.453779	291	10935.84	–14.3
Sun	1 391 000	14.14553	640	1 428 577.8	2.70

Table 6. Specific heat capacity, C_p (at constant atmospheric pressure) for water in its various phases (in joule per kilogram per 1 degree Kelvin) with respective numerical values of the biblical Hebrew names, WNV (water numerical values).

Source: http://www.engineeringtoolbox.com/

Phase	Heat capacity J / (kg-Kelvin)	WNV
Ice ("Kerach") at 0C°	2050	308
Water ("Mayim") at 25C°	4181	90
Steam ("Kitor") at 100C°	1970	325

Table 7. Data for two sets of Hebrew words: {Or, Kol, Dmamah} (light, sound, standstill) and {Keshet, Raam, Dmamah} (Rainbow, thunder, silence). Response variable is velocity (in meter/second, on a log scale), associated with these words. For "Dmamah" a value of 1 is selected so that it becomes zero on the log-scale.

Hebrew (English)	**VNV (V Numer. Val.)**	**V Velocity (m/sec.)**	**Log-V**
Or (Light)	207	299792458	19.52
Keshet (Rainbow)	800	299792458	19.52
Kol (Sound)	136	343	5.84
Raam (Thunder)	310	343	5.84
Dmamah (Silence, Standstill)	89	1	0

Table 8. Data for equatorial diameters and mass densities of planets with their assumed biblical names and their numerical values ("Object Numerical Values"-ONV)

Name	Hebrew name	ONV	Equatorial Diameter* (km)	Log(diameter)	Mass Density* (g/cm^3)
Pluto	*Kochav*	48	2302	7.7415	2.00
Mercury	*Kimah*	75	4879	8.4928	5.43
Mars	*Ksil*	120	6794	8.8238	3.94
Venus	*Mazar*	247	12104	9.4013	5.24
Earth	*Eretz*	291	12756	9.4538	5.51
Neptune	*Ash*	370	49528	10.8103	1.76
Uranus	*Aish*	*380*	51118	10.8419	1.30
Saturn	*Teman*	490	120536	11.6997	0.70
Jupiter	*Shachar*	508	142984	11.8705	1.33

*** Source:** **http://solarsystem.jpl.nasa.gov/planets/charchart.cfm**

Table 9. Data for planetary orbital angular momentum (OAM) with assumed biblical names and their numerical values (ONV).

Name	Hebrew name	Object Numerical Value (ONV)	Angular Orbital Momentum (OAM; kg*m/sec)	Log(OAM)	Mass (M; kg)	Log(M)
Pluto	*Kochav*	43	3.6E+38	88.78	1.310E22	50.89589
Mercury	*Kimah*	75	9.1E+38	89.71	3.302E23	54.15338
Mars	*Ksil*	120	3.5E+39	91.05	6.418E23	54.81888
Venus	*Mazar*	247	1.8E+40	92.69	4.868E24	56.84514
Earth	*Eretz*	291	2.7E+40	93.10	5.974E24	57.04879
Neptune*	*Ash*	370	2.5E+42	97.62	1.024E26	59.88702
Uranus*	*Aish*	380	1.7E+42	97.24	8.685E25	59.72565
Saturn	*Teman*	490	7.8E+42	98.76	5.685E26	61.60416
Jupiter	*Shachar*	508	1.9E+43	99.65	1.899E27	62.81165

***** Ordinal positions of these two planets were determined in Table 7 according to their equatorial diameters; these positions are preserved here even though sorting according to OAM or M should lead to swapping of these positions.

Coincidences in the Bible and in Biblical Hebrew (New and Old) and Their Statistical Analysis

Haim Shore

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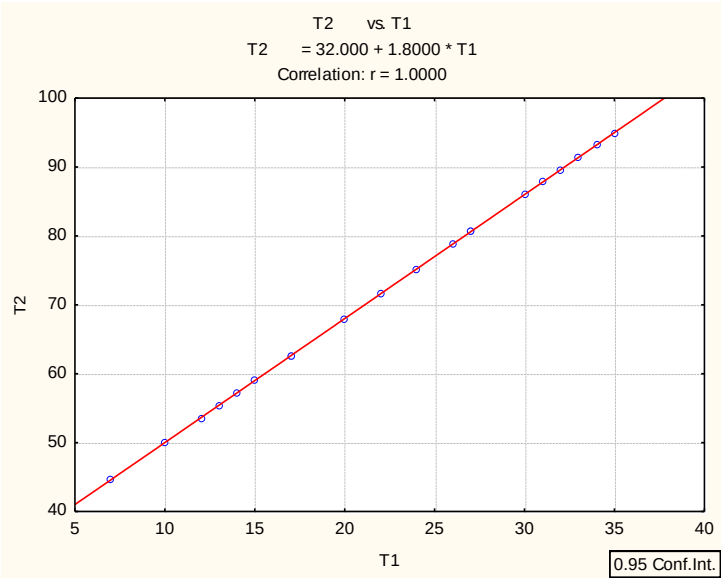

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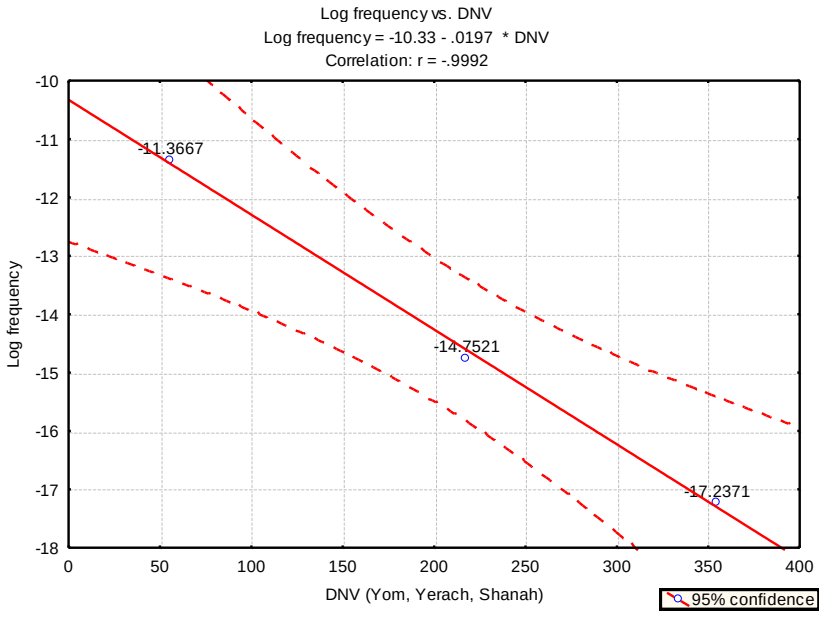

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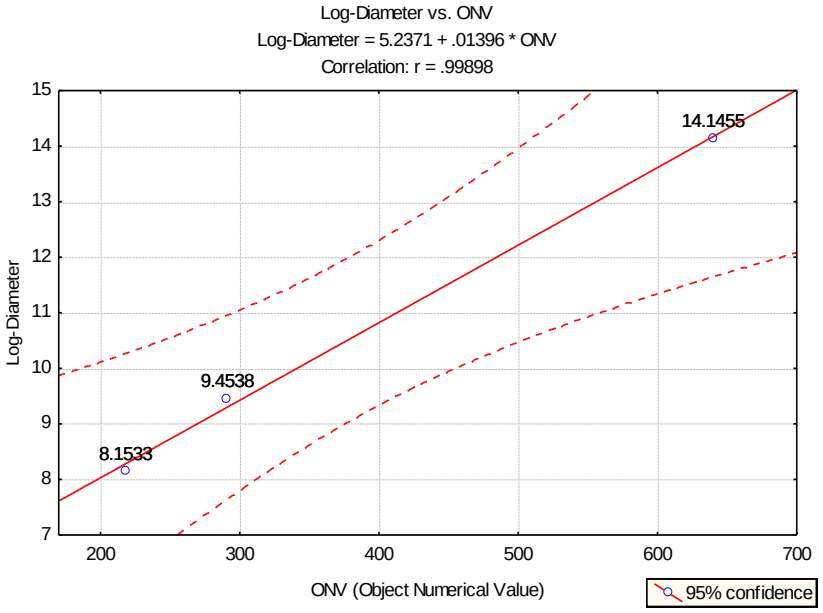

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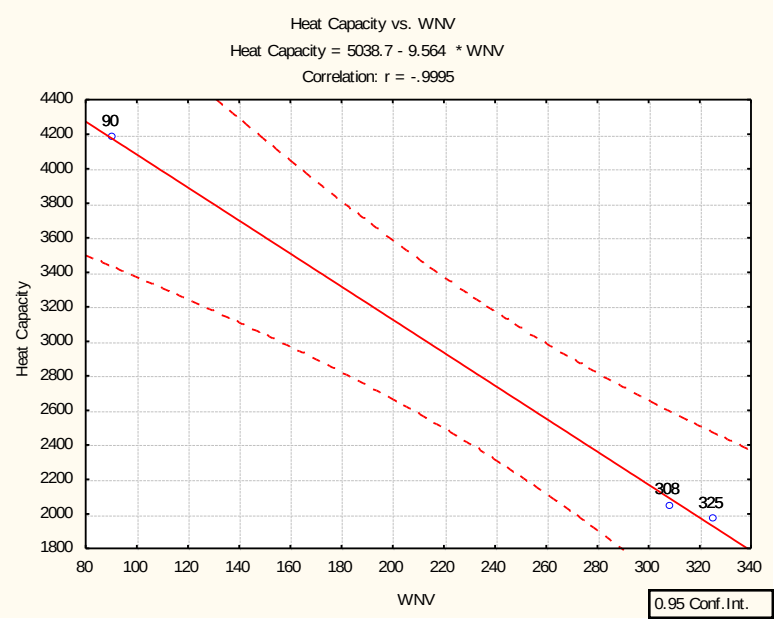

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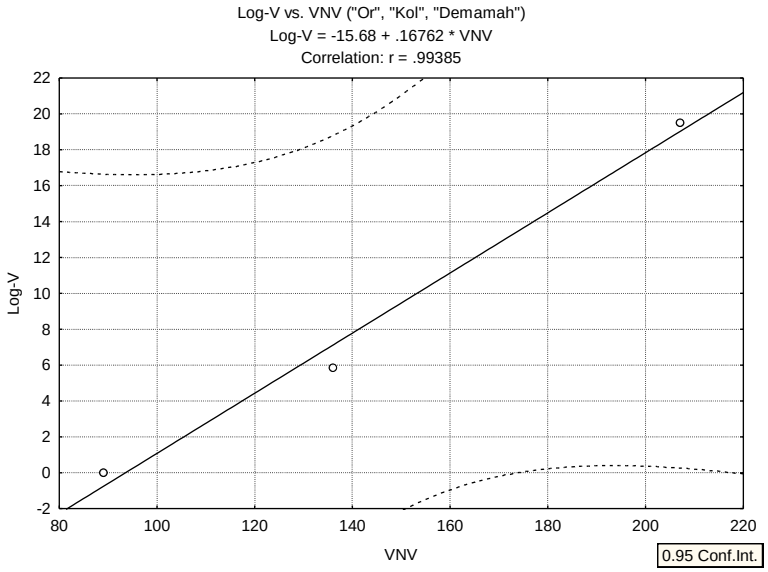


Figure 5. Velocity (on log scale) for {Or, Kol, Dmamah} (light, sound, standstill or silence) as function of their Hebrew names' VNV (velocity numerical values).

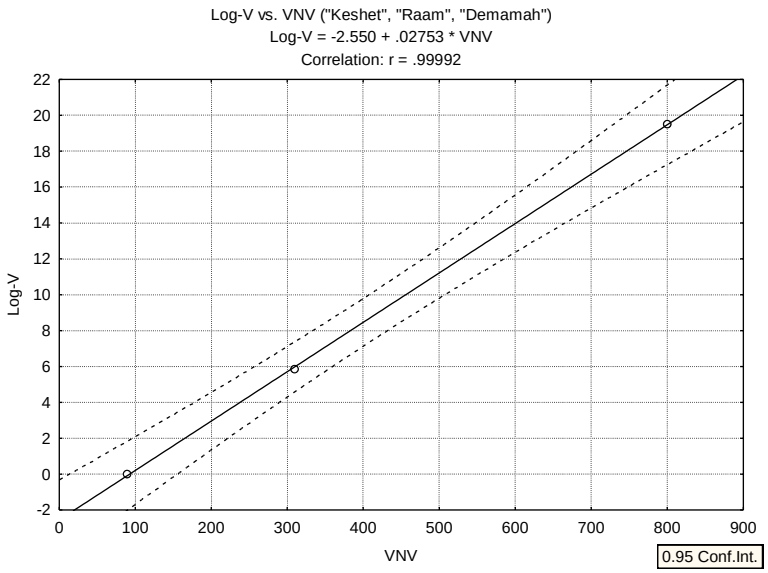
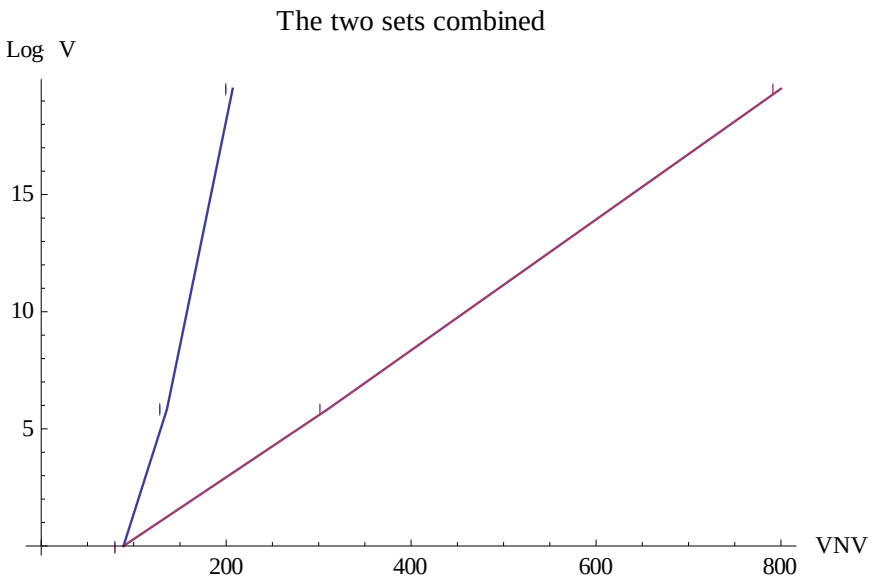


Figure 6. Velocity (on log scale) for {Keshet, Raam, Dmamah} (Rainbow, thunder, standstill or silence) as function of their Hebrew names' VNV (velocity numerical values).



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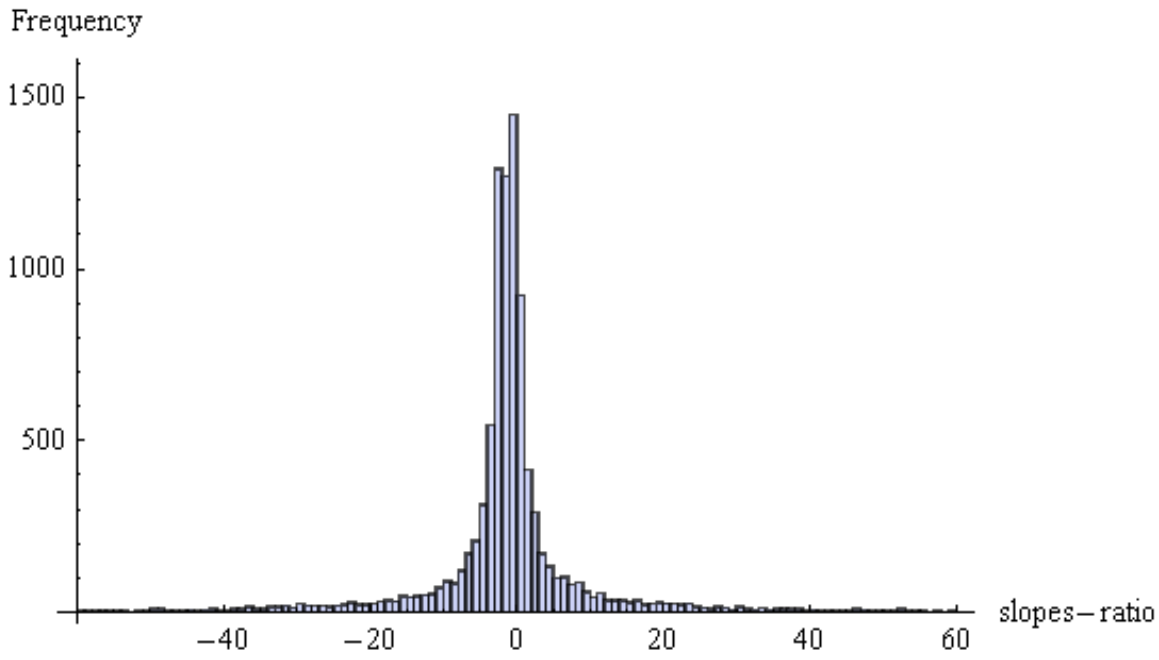

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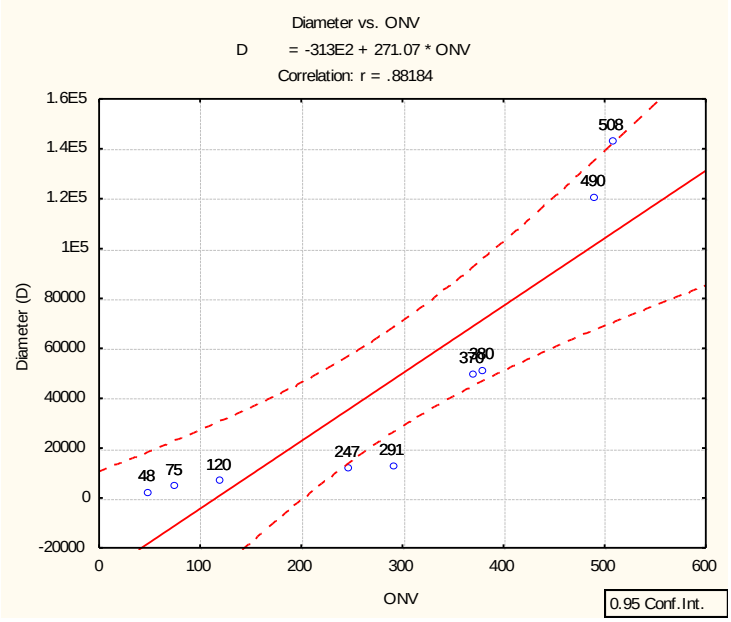

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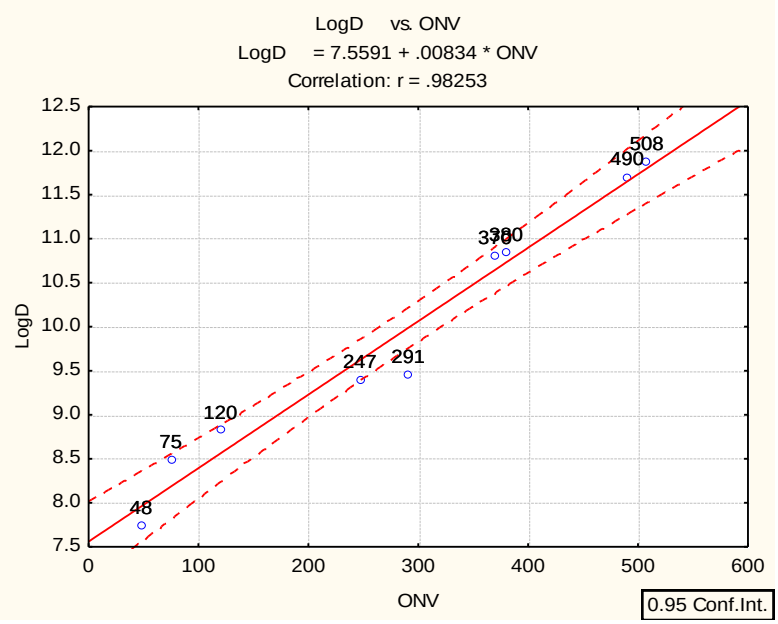

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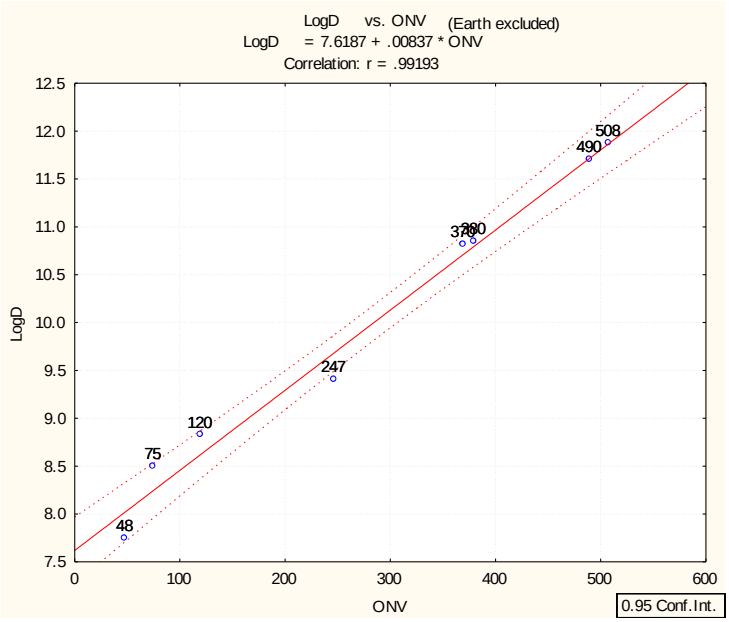

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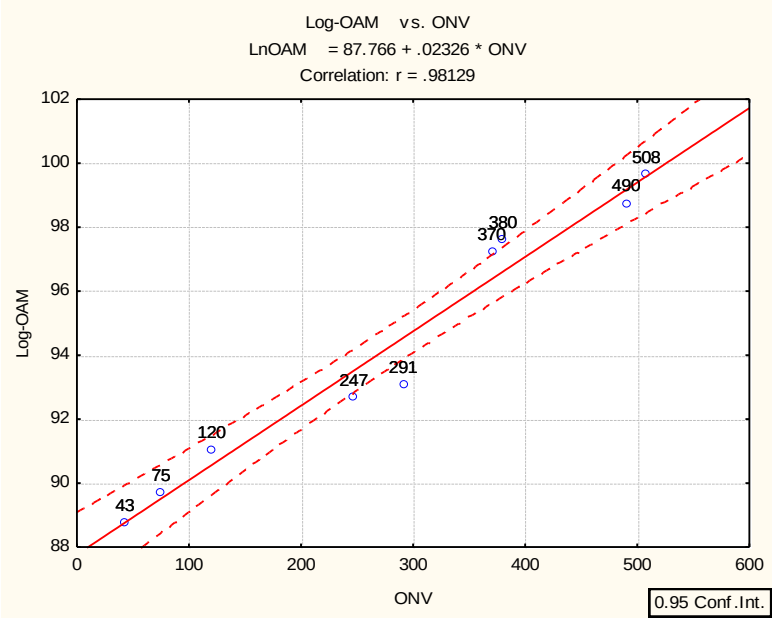

Figure 12. Planetary log orbital angular momentum (log-OAM, n=9) as function of ONV.

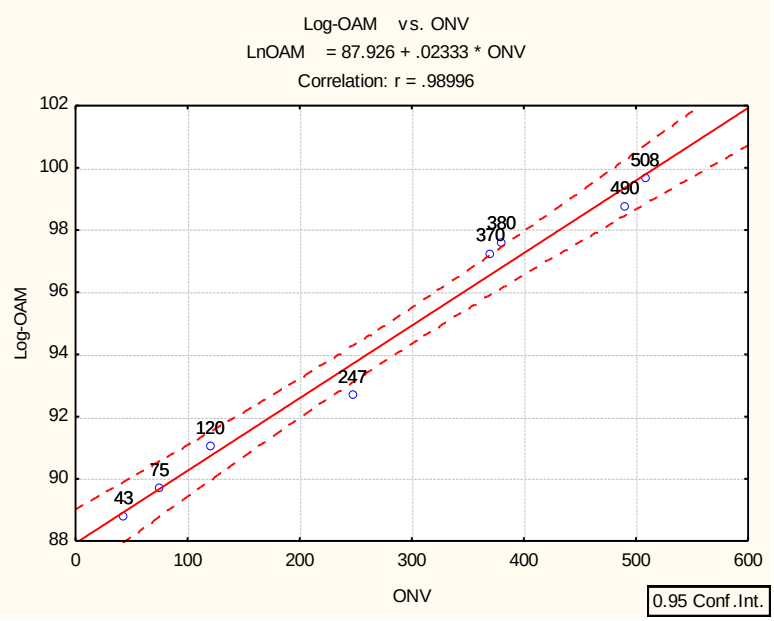

Figure 13. Planetary log-OAM (log orbital angular momentum) as function of ONV (n=8, with Earth excluded)

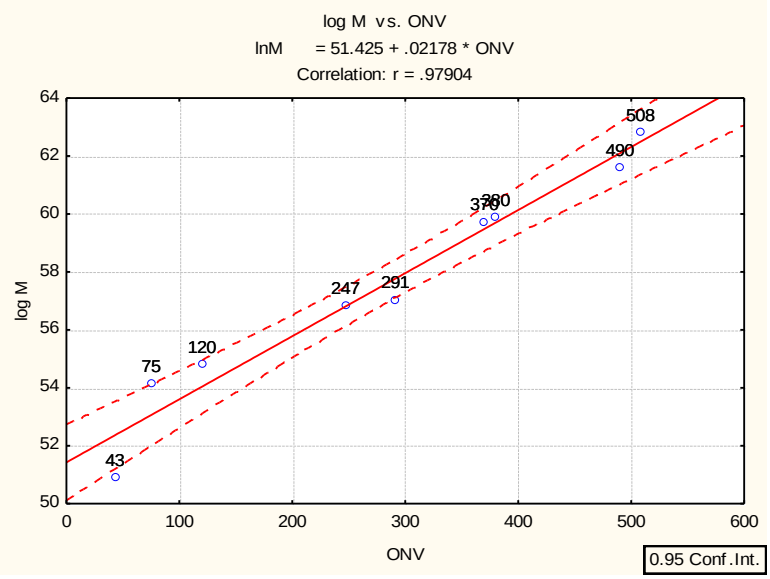

Figure 14. Planetary log-M (Mass, in Kg; n=9) as function of ONV