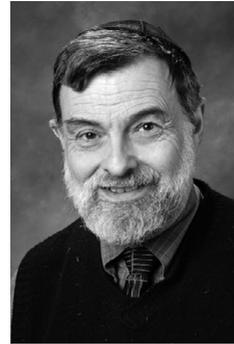


Greenway and the Torah Blueprint for Creation

ROBERT R. APPLESON, PhD

ABOUT THE AUTHOR

ROBERT APPLESON recently retired as a vice president at the Higher Learning Commission, which is based in Chicago and accredits colleges and universities in nineteen states. His doctorate in mathematics from Vanderbilt University in 1975 led him to study structural patterns in the Torah, and his book on this subject is scheduled to be published by Mosaica Press in 2016. He and his wife learn at the Illinois Center for Jewish Studies. They are blessed with three children and their families.



appleson@sbcglobal.net

ABSTRACT

The Zohar and Midrash Rabbah say G-d used the Torah as a blueprint in creating the world. Based on the Torah itself, the Talmud states this creation involved the Hebrew letter ה (hei), as illustrated by its shape presaging tshuvah (repentance) in our environment. Beyond that spiritual contribution are signs of a material aspect involving the iterative structure of the Torah, based on the five shared principles of the Ten Commandments taught in Midrash Mekhilta. In particular, this structure appears in the mathematical constant phi (roughly 1.618) embodied in a regular pentagon, which geometrically represents the number five. Research has shown that our sense of beauty is neurologically sensitive to phi. This confirms G-d's blessing of the gift of aesthetics to Yefet, progenitor of the early Greeks, who discovered this constant. We have long recognized the role of phi in a host of growth phenomena in ways worthy

of a blueprint. Thus, we can read the Zohar and Midrash Rabbah as saying G-d used the Torah's fivefold iterative structure to model phi in creating the world.

INTRODUCTION

Fortunate is the visitor to Memphis, Tennessee, who chances upon Greenway, a short L-shaped street bedecked with stunning foliage. As a boy, I walked its length on Shabbat with my father, who reveled in the trees and plants. Taken by the shape, color, and density of their leaves, he would often observe that the intricate designs could not have come from man, and we must appreciate nature on Shabbat as a Divine gift.

Sadly, I grew up without gaining my father's passion for nature and his eye for its detail. Yet, fifty years after those walks on Greenway, a potential link between Creation and the Torah has kindled his sentiments in me. This link begins with a familiar passage from the midrash GENESIS RABBAH 1:1, and the Zohar on *Trumah* 161a-b: "G-d looked in the Torah and created the world." Explore with me how the Torah could serve as a blueprint for Creation, and we will find our way back to the Greenway landscape.

CREATION EXPRESSLY ASSOCIATED WITH THE HEBREW LETTER HEI

The many recurrent numbers in the Torah (e.g., 2, 5, 7, and 12) may be thought to guide our natural order. In fact, great rabbinic works often suggest such blueprint aspects of the Torah, with an n-part Torah feature linked to an n-part physical condition or property. For example, GENESIS RABBAH 2:4 (Vilna edition) says the four pre-Creation qualities (*tohu*, *vohu*, *hoshkeh*, and *al pnei t'hom*) in Genesis 1:2 presage the four exiles. The Maharal's *Gvurot Ha'Shem* links the three Patriarchs to three points needed for balance (chapter 9) and the first Six Days of Creation to six directions of north, south, east, west, up, and down (chapter 46). The Talmud, however, reads the Torah to specify the Hebrew letter hei — the numerical value of which is 5 — as a component of Creation.

אֵלֶּה תּוֹלְדוֹת הַשָּׁמַיִם וְהָאָרֶץ בַּיּוֹם שֶׁעָשָׂה יְיָ אֱלֹהִים אֶרֶץ וְשָׁמַיִם.

These are the generations of the Heaven and the Earth when they were created in the day that Ha'Shem Elokim made the Earth and the Heavens. (GENESIS 2:4)

In Talmud *Menaḥot* 29b, Rabbi Yehudah bar Rabbi Ilaie interprets the word *behibaram* (when they were created) in Genesis 2:4 as *beheibaram* (with a hei they were created). The Jerusalem Talmud *Hagigah* 2:1 mentions the letter *bet* in Creation, but not in a blueprint role.

With hei so directly identified with Creation, its blueprint strokes need not follow strictly numeric pairings. Indeed, in *Menaḥot* 29b, Rabbi Yehudah illustrates that the shape of the letter hei embodies the process of *tshuvah* (repentance). The open bottom of hei signals people's easy fall from expectations through sin. Only by raising themselves along its left side, can the fallen reach the small gap and reenter the framework. The Torah concept of *tshuvah* (see Deuteronomy chapters 29–30) is part of the design of Creation.

Unlike Rabbi Yehudah, the Maharal (*Gvurot Ha'Shem*, chapter 61) reads *beheibaram* numerically, seeing the value of hei embodied in five supernatural events (including the Splitting of the Sea) included in the design of Creation. I take a third approach to *beheibaram*. I suggest firstly that hei signals the structural quality of “fiveness” found in the Torah, as explained in the following section. Secondly, I suggest a correspondence of the structure of the Torah with that of the mathematical constant phi through a shared iterative basis in five. Following this line of thought, I suggest a new meaning of the Midrash Rabbah and Zohar: G-d looked in the Torah and used its structure to model phi in Creation. This interpretation accords with neuroscientific findings on the role of phi in human aesthetics and may be suggested by numerical values found in the Hebrew language.

THE FUNDAMENTAL STRUCTURE OF TORAH AS BASED ON THE NUMBER FIVE

While the Five Books of Moses compose the Torah, its fivefold structure runs far deeper than that composition. A midrash in the *Mekhilta* describes the format of the Ten Commandments in Exodus 20 as being

two parallel tablets of five Commandments. The first tablet contains five Commandments concerning the relationship between G-d and humankind; the second tablet contains five Commandments concerning human relationships. A common theme unites each pair of adjacent Commandments (the First with the Sixth, the Second with the Seventh, and so on). I call these common themes Shared Principles, as listed in the table below for paired adjacent Commandments.

The adjacent pairs of the Ten Commandments
and their Shared Principles

First Tablet Commandments between G-d and humankind	Second Tablet Commandments concern- ing human relationships	Shared Principles (for Commandments 1 and 6 and so on)
1. Believe in G-d	6. Do not murder	A. Respect for Creation
2. Do not have other gods	7. Do not commit adultery	B. Loyalty to primary relationships
3. Do not take G-d's Name in vain	8. Do not steal	C. Proscribed access to spiritual and physi- cal resources
4. Remember the Sabbath	9. Do not testify falsely	D. Duties of testimony/ community
5. Honor your parents	10. Do not covet	E. Accept your place

In matching the pairs of Commandments to the Shared Principles, Commandments 1 and 6 clearly fit respecting Creation (A) and so, too, Commandments 2 and 7 with loyalty to a primary relationship (B). Furthermore, Commandments 8, 9, and 10 also fit Shared Principles C, D, and E, respectively, without difficulty. However, the corresponding fit of Commandments 3, 4, and 5 requires explanation.

Commandment 3 (Do not take G-d's Name in vain) means not using G-d's Name in unnecessary oaths, which corresponds to spiritual misappropriation — in violation of Shared Principle C. Jews fulfill Commandment 4 (Remember the Sabbath) by reciting Kiddush, which includes the text of Genesis 2:1–3, thereby testifying to G-d's creation of the world — in line with Shared Principle D. (Notably, *ēdut*, the

Hebrew word for “testimony,” comes from the same root as does *edah* [congregation], thus illustrating that testimony is a communal duty. Lastly, Commandment 5 (Honor your parents) demands obedience and responsibility to them regardless of our wishes — that is, to accept your place (Shared Principle E).

Although the *Mekhilta* dates back some two millennia, the role of the Shared Principles in structuring the entire Torah was recognized only recently by Rabbi Yehoshua Honigwachs (HONIGWACHS 1991). This structure operates through the Torah’s 295 *parshiyot* (paragraphs), each delineated on a scroll by open spacing to the left margin at the end of the *parshah* (paragraph). A *parshah* may be as short as a few *psukim* (verses) or as long as several hundred *psukim*, and should not be confused with the similar sounding *parashah* of the week, which refers to the weekly Torah portion. Each Book closes at the end of a paragraph, and blank lines follow the end of the first four Books, before the next Book. In this format, the Five Books align in order with the Shared Principles: Genesis with Shared Principle A, Exodus with Shared Principle B, Leviticus with Shared Principle C, Numbers with Shared Principle D, and Deuteronomy with Shared Principle E:

- A. Respecting Creation: context of Genesis via Creation and the violence before the Flood
- B. Loyalty to relationship: enslavement to a master other than G-d and the Exodus
- C. Proscribed access to sanctity/resources: context of Leviticus via offerings, priestly service
- D. Duties of testimony/community: context of Numbers via preparations for conquest
- E. Accepting one’s place: Moses’ final addresses in Deuteronomy to the Jewish people before they enter the Promised Land to fulfill their destiny

In the first four Books, the dominant themes align in order with the Shared Principles, but no single Shared Principle dominates in Deuteronomy. Rabbi Honigwachs ties this difference to the arrested development of the Jewish people in Numbers in fulfilling the Shared Principles. Because of the many major transgressions narrated in

Numbers, e.g., the improper testimony of the Spies and the mutiny of Korah, in Deuteronomy Moses saw the need to review and amplify a wide range of previous laws. Thus, each Shared Principle appears substantially in Deuteronomy, with none dominant. In tying the need for review and amplification of previous laws to earlier transgressions, Rabbi Honigwachs follows Nahmanides' introduction to Deuteronomy.

The ordered linkage of dominant themes to the Shared Principles continues *within* the Books themselves. Specifically, each Book can be divided into five parts with breaks at the ends of parshiyot, and these parts align with the Shared Principles. In particular, Genesis splits into Creation/universal history (Shared Principle A), focus on Abraham (Shared Principle B), focus on Isaac (Shared Principle C), focus on Jacob (Shared Principle D), and focus on Joseph and his brothers (Shared Principle E). For example, the focus on Jacob runs from 25:19 to 35:22, its narrative rife with oral deceit linked to Shared Principle D, the duties of testimony/community. Some of the major cases of deceit are: Jacob deceiving Isaac in order to receive the blessing of the firstborn; Lavan deceiving Jacob over whom he is marrying; and Jacob's sons deceiving Shkhem over access to their sister, Dinah.

Moreover, this pattern then recurs within each part. For the first Four Books, each part with at least five parshiyot subdivides into five sections that further break at the end of parshiyot and align in order with the five Shared Principles. This highly synchronized and intricate pattern produces a Torah structure iteratively based on five, which confounds the Documentary Hypothesis, the familiar secular theory that the Torah was compiled from different sources with different authors. The ordering of the paragraphs of the Torah through "what is between the Commandments" may also be suggested by the Midrash Rabbah 5:14 on the Song of Songs (APPLESON 2008).

THE MATHEMATICAL CONSTANT PHI (WRITTEN AS Φ) IN RELATION TO THE TORAH'S STRUCTURE

The mathematical constant $\phi = \frac{1}{2}(1 + \sqrt{5})$ occurs throughout nature, especially in growth phenomena, such as the human body and plant life. Euclid first identified this number in his classic *Elements* (ca. 300 BCE), constructing it from a geometric embodiment of the number five.

However, his search for ϕ was purely aesthetic, without material regard for natural phenomena. To appreciate ϕ 's relationship to the Torah's structure, Euclid's search objective bears review.

The early Greeks believed the most visually pleasing relationship of the lengths of two lines (say, one longer and horizontal and one shorter and vertical) inhered in a certain equation:

$$\frac{\text{length of longer line}}{\text{length of shorter line}} = \frac{\text{combined lengths}}{\text{length of longer line}}$$

If L represents the longer line and S the shorter, this equation would be written $L/S=(L+S)/L$. Setting $S=1$ and multiplying both sides by L, we get $L^2=L+1$, which Euclid solved using the quadratic formula. Reflecting its assumed role in beauty, the solution $\phi=\frac{1}{2}(1+\sqrt{5})$, roughly 1.618, is called the Golden Ratio. Euclid constructed this ratio in a regular pentagon, where the longer line is an internal diagonal from point A to point C, and the shorter line is one side from point B to point C.

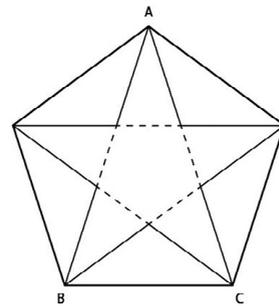


Figure 1. Euclid's Golden Ratio constructed in a regular pentagon.

Thus, line $AC/\text{line } BC=\phi$ characterizes a regular pentagon and thereby reflects the number five.

In fact, ϕ shares with the structure of the Torah not only a basis in the number five, but also an iterative character. If one draws all five internal diagonals of a regular pentagon, the central region of the resulting five-pointed star in Figure 1 is a reduced mirror image of the initial pentagon formed by connecting its five points as a perimeter. Mathematicians have long recognized the special role of five in symmetry and recursion (WEYL 1952).

This shared iterative character also emerges in representing the Torah structure by the pentagonal form of the Sierpinski gasket, prototypal of fractal design (MANDELBROT 1982). In Figure 2, each of the five pentagons bounding the blank central pentagon denotes one of the Five Books.

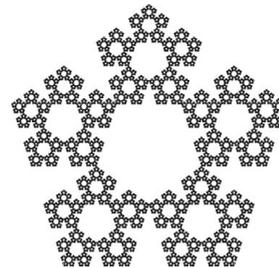


Figure 2. The pentagonal form of the Sierpinski gasket.

Then, for the blank core of each such pentagon, each of the surrounding smaller pentagons denotes one of the parts of that Book, as explained in the previous unit. In turn, for any part subject to fivefold division, the smallest pentagons about the blank core of that part denote sections. The fractal structure of the Torah was recognized earlier and illustrated through repeated fivefold tree branching (SLIFKIN 2001), but without express connection to ϕ .

Φ AS AN OBJECTIVE STANDARD OF BEAUTY AND AS LINKED TO THE TORAH AND HEBREW LANGUAGE

The early Greeks applied ϕ ratios for beauty to architecture and sculpture of the human body. Buildings were often designed with ϕ as the ratio of length to height. In sculpture, key anatomical proportions in the ratios of the middle part of the body (knees to navel), to the upper part (navel to top of the head), and to the lower part (knees to soles) reflected ϕ . While adherence to ϕ in architecture has faded with time, the role of ϕ in human aesthetics endures.

Neuroscientists (DI DIO, MACALUSO, and RIZZOLATTI 2007) have now confirmed that role in perceptions of body proportions. While undergoing MRI imaging, subjects viewed photos of Classic and Renaissance sculptures and photoshopped modifications. In each actual sculpture, the ratio of the middle to the upper part and the ratio of the middle to the lower part measured ϕ . Modified versions varied the upper or the lower distances slightly, leaving the middle unchanged, thus causing the two ratios to differ modestly from ϕ , while reflecting body types within a normal range. Researchers found that viewing the actual sculptures consistently activated the brain's insula (linked to emotion), while viewing the modified versions did not. The subjects, all chosen for their unfamiliarity with art and sculpture, were much more likely to rate the originals beautiful and the other versions ugly. While their responses also showed some subjectivity not fully aligned with insula activity, the study clearly suggests neurological sensitivity to ϕ in our aesthetic sense.

Human ratings of facial beauty have also long confirmed ϕ in standards. Under many protocols, perceived attractiveness depends on closeness of key ratios, e.g., length to width of head, to ϕ (cf. PANCHERZ

et al. 2010), though other factors like symmetry play a role. Plastic surgeons have found the Marquardt Mask, a comprehensive facial template incorporating dozens of such ratios, useful in analysis (KIM 2007). While some consider the mask ethnically biased (HOLLAND 2008), selected ϕ -ratio analysis by racial group is well accepted (PACKIRISWAMY et al. 2012).

Evidence linking beauty to the Greeks would not surprise those familiar with Talmud *Megillah* 9b (KARSENTY 2013). There, the Talmud explains why the Torah can be translated into Greek, in preference to other languages. This preference hinges on an interpretation of Noah's blessing to his oldest son, Yefet, in Genesis 9:27, that Yefet (the progenitor of the Greeks) will be given the capacity for beauty, including beauty in language. In fact, the name Yefet suggests the Hebrew word *yafyut* (beauty). It has been argued (NAVON 2010) that ϕ even helps guide the standards in beautifying *tsitsit* (fringes).

Let us summarize the ideas so far:

1. The Torah is structured iteratively according to the Five Shared Principles of the Ten Commandments, and ϕ is constructed from a regular pentagon, sharing an iterative character.
2. The early Greeks first identified ϕ as the most beautiful ratio of one line to another, and our brains seem neurologically sensitive to anatomical proportions of ϕ .
3. The Talmud interprets the Torah as saying that Yefet, the progenitor of the Greeks, was blessed with a special capacity for beauty.

Here is one way to interpret this summary. In using the Torah as a blueprint for Creation, G-d used its iterative structure of five to form the constant ϕ . Through the blessing given to Yefet, the early Greeks sought beauty and found this constant, thus calibrating the human aesthetic sense.

While not provable, my interpretation may be suggested by the *gematria* (numerical value) of the Hebrew word *behibaram* found in Genesis 2:4. Remember that the Talmud gave the variant reading *behebaram* (with the letter *hei*, they [the heavens and Earth] were created). No matter how you pronounce this word, its *gematria* of 250 equals that of the Hebrew for the phrase *b'alahson la'gvul ha'hei*

(“with the diagonal for a five-sided border”). Borrowed from Greek, the Aramaic counterpart of *alakhson* (diagonal) occurs several times in the Talmud, including *Bava Batra* 101b. In other words, the equivalent gematria may suggest creation with a hei involved the diagonal in a pentagon.

This suggestion is reinforced by the gematria ratio of a Hebrew formulation of ϕ :

numerator = the diagonal in the 5-sided border (*ha'alakhson ba'gvul ha'hei*)

denominator = an edge in the 5-sided border (*peah ba'gvul ha'hei*)

The gematria of the numerator and denominator are 225 and 139, respectively, giving the ratio 1.6187 to four decimal places. This differs from ϕ 's actual value by less than .001.

Of course, one might manipulate gematria in the choice of Hebrew words. Even without such manipulation, equations in gematria may be just coincidence without meaning. At the same time, regression analysis of words in the Torah for certain natural phenomena, notably color and metals, demonstrates high correlations of intrinsic properties (respectively wave frequencies and reciprocal atomic weight) with gematria (SHORE 2008). In contrast, the present gematria can just allude to the ϕ -based structure of nature, which we know through the language of mathematics.

RETURN TO GREENWAY WITH Φ IN HAND

The leaf arrangements on Greenway strikingly illustrate ϕ 's role in the beauty of nature. Yet, grasping the structure of even the simplest arrangements means recognizing ϕ in different garb from its geometric construction. Single-stem plants have the simplest leaf arrangements, in which leaves extend from the stem directly. From the lowest such extension, we next identify the second lowest extension, forming a certain horizontal angle with the first. Then the third lowest extension forms the same angle with the second, and so on. In other words, as we climb the stem, the angle formed by a leaf extension with the one below it remains constant. Furthermore, the fixed angle stays constant within

the same kind of plant, but different kinds of plants may have different angles.

With the fixed angle of each plant, two numbers totally define its leaf arrangement. The first number is the count of turns about the stem until a leaf extends from the stem directly over the lowest extension. The second number counts the extensions after the lowest one through the next one directly over the lowest one, as shown in Figure 3. For nearly two hundred years, botanists have recognized these numbers from the numeric sequence called the Fibonacci series (LIVIO 2002). We shall define this sequence and explain its relationship to ϕ .

The Fibonacci series begins with the number 1 entered twice, with each further entry formed as the sum of the two previous entries. In other words, from the third entry on, we have

$$2=1+1, \quad 3=2+1, \quad 5=2+3, \quad 8=3+5, \quad 13=5+8, \\ 21=8+13\dots$$

Recall the two counts from our plant:

1. The count of turns about the stem until a leaf extends directly over the lowest one
2. The count of all leaf extensions above the lowest one through the next one directly over it

To say both of these counts must be Fibonacci entries excludes other numbers, but there is even more restriction. Not only must these two counts be Fibonacci entries, but also the first must occur two entries before the second (e.g., two turns about the stem for five-leaf extensions or three turns for eight extensions).

The Fibonacci series suggests nothing like a regular pentagon. Its relation to ϕ was unknown until the seventeenth century when the astronomer Johannes Kepler showed that the ratios of successive Fibonacci entries approach ϕ . However, because the extensions and

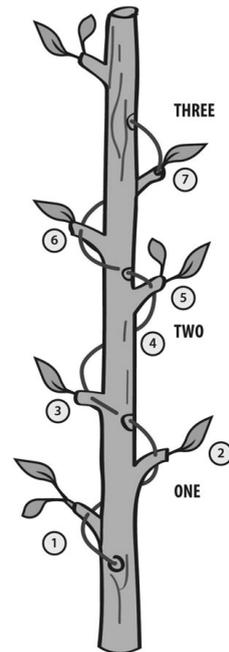


Figure 3. The fixed angles of leaves extending from a single stem of a plant are described by the Fibonacci series. Drawing by Osnat Sheiner.

turns defining single-stem leaf arrangement are two entries apart, their ratio approaches ϕ^2 as numbers increase. Normalizing for the 360 degrees of a circle, we have $360/\phi^2$, about 137.5 degrees. At this angle (known as “the Golden Angle”), our eyes discern a characteristic double spiral, as in the giant sunflower. My father caught the visual feature of this angle that allows leaves optimal access to sun and moisture by minimizing blockage from other leaves (LIVIO 2002). Perhaps Greenway’s perfect melding of natural beauty and function reflects the Torah’s structure.

CONCLUSION

Human aesthetic perception and the simultaneous beauty and function of nature arise through the pervasive constant ϕ , which resembles the Torah’s fivefold iterative structure. This is one way to understand the Torah as a blueprint for Creation.

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