

**Meditations on Eyn Sof and the Mathematical Concept of Infinity**  
**DC Beit Midrash May 17, 2004 – 26 Iyar 5764 (Parshah Bemidbar)**

**Matt Mercurio**

This is reflected in the Hebrew word for “count”, *pakod*, which also means “remember” and “be concerned with.”

(Nachmanides, reflecting on Parshah Bemidbar)

[טו ע"א] בראשית.

בריש הורמנותא דמלכא גליף גלופי בטהירו עלאה. בוצינא דקרדינותא נפיק גו סתים דסתימו מרישא דאין סוף. קוטרא בגולמא נעיץ בעזקא, לא חוור ולא אוכם ולא סומק ולא ירוק ולא גוון כלל. כד מדיד משיחא עביד גוונין לאנהרא. לגו בגו בוצינא נפיק חד נביעו דמניה אצטבעו גוונין לתתא, סתים גו סתימין דרזא דאין סוף. בקע ולא בקע אוירא דיליה. לא אתיידע כלל עד דמגו דחיקו דבקיעותיה נהיר נקודה הדא סתימא עלאה. בתר ההיא נקודה לא אתיידע כלל, ובגין כך אקרי ראשית, מאמר קדמאה דכלא.

(דניאל י"ב) והמשכילים יזהירו כזהר הרקיע ומצדיקי הרבים כככבים לעולם ועד. זהר סתימא דסתימין בטש אוירא דיליה דמטי ולא מטי בהאי נקודה, וכדין אתפשט האי ראשית ועביד ליה היכלא ליקריה לתושבחתיה. תמן זרע זרעא לאולדא לתועלתא דעלמין ורזא דא (ישעיה ו') זרע קדש מצבתה.

זהר, דזרע זרעא ליקריה כהאי זרעא דמשי דארגוון טב דאתחפי לגו ועביד ליה היכלא דאיהו תושבחתא דיליה ותועלתא דכלא. בהאי ראשית ברא ההוא סתימא דלא אתיידע להיכלא דא. היכלא דא אקרי אלהים ורזא דא בראשית

ברא אלהים.

When the King conceived ordaining he engraved engravings in the luster on high. A blinding spark flashed within the Concealed of the Concealed from the mystery of the Eyn Sof, a cluster of vapor in formlessness, set in a ring, not white, not black, not red, not green, no color at all. When a band spanned, it yielded radiant colors. Deep within the spark gushed a flow imbuing colors below, concealed within the concealed of the

mystery of the Eyn Sof. The flow broke through and did not break through its aura. It was not known at all until, under the impact of breaking through, one high and hidden point shone. Beyond that point, nothing is known. So it is called Beginning, the first command of all. "The enlightened shall shine like the Radiance of the sky, and those who make the masses righteous will shine like the stars forever and ever." Radiance, concealed of the concealed, struck its aura. The aura touched and did not touch this point. Then this Beginning emanated and made itself a palace for its glory and its praise. There it sowed the seed of holiness to give birth for the benefit of the universe. The secret is: "Her stock is a holy seed."

Radiance, sowing a seed of glory like the seed of fine purple silk. The silkworm wraps itself within and makes itself a palace. This palace is its praise and a benefit to all.

With the Beginning the Concealed One who is not known created the palace. The palace is called Elohim.

The secret is: "With Beginning, \_\_\_\_\_ created Elohim."

**(The Zohar, Parshah Bereshit 1:1)**

As long as the ark stood in its place in the Holy of Holies, it had no need for coverings. But when the time came for it to journey on, G-d commanded that it be "swallowed up" by its three-fold vestment. The same applies to the soul. A "spark of G-dliness," the soul is perfect and complete unto itself. But to journey on--to advance further in the infinite journey toward union with its Infinite Source--it must undergo on a "descent for the sake of ascent." It must be subjected to the three-fold concealment of human nature, physicality and worldliness, to discover, in the lowliest reaches of creation, the key for even greater connection with G-d.

**(The Lubavitcher Rebbe)**

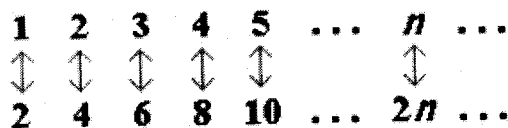
**Azriel Ben Menachem** may have been the first to define G-d by emphasizing G-d as the negation of any and all attributes.

## I. Early Ruminations on Infinity

Sometime between the fifth and sixth centuries BCE, the Greeks “discovered” infinity. Aristotle distinguished between the *potential* infinite, and the *actual* infinite. Potential infinity was a useful mathematical tool (for example, calculus). Actual infinity was best left to the philosophers and to religion.

But then Galileo began to unravel the thread . . .

What does it really mean to count? In mathematical terms, it means to place the items in a set into a one-to-one correspondence with the counting numbers  $\{1,2,3,4,5 \dots\}$ . This is simple enough with finite sets, but strange results ensue when we turn to infinite sets of objects:



## II. The Kabbalists

At the heart of the Kabbalah lie the ten Sefirot or countings. The sefirot are a series of primal emanations, stages in which the divine Self proceeds forth from the absolute hiddenness of Eyn Sof and emerges as the complex male-and-female personal G-d who, in turn, creates all the lower worlds. With the appearance of the Sefirot and the Eyn Sof early in the thirteenth century, the Kabbalists were charged with polytheism. How could G-d be both infinite and ten Sefirot? The Kabbalists responded that G-d is infinite, the Eyn Sof, but the Sefirot are parts of that Eyn Sof, forming a unity “like a flame joined to a coal.” While the Sefirot appear to have multiple existence, all of them are one and form part of the Infinite.

## III. Georg Cantor

The actual infinite arises in three contexts: first when it is realized in the most complete form, in a fully independent otherworldly being, *in Deo*, where I call it the Absolute Infinite or simply Absolute; second when it occurs in the contingent, created world; third when the mind grasps it *in abstracto* as a mathematical magnitude, number or order type.

(Georg Cantor)

We have a special name for the “size” of a set: *cardinality*. We say that the set of natural numbers and the set of even numbers, for instance, have the same cardinality. Also, whenever a set has the same cardinality as the natural numbers, we say that the set in question is *countable*, since it can be put into a one-to-one correspondence with the counting numbers (i.e., the set of natural numbers).

The paradox of the Grand hotel – Infinity ( $\infty$ ) is not as infinite as it seems!

$$\Rightarrow |\infty + 1| = |\infty|$$

$$\Rightarrow |\infty + n| = |\infty|$$

$$\Rightarrow |\infty + \infty| = |\infty|$$

$$\Rightarrow |\infty \cdot \infty| = |\infty|$$

Now, between *any two* rational numbers on the real number line we can find *infinitely more* rational numbers. This suggests to our intuition that the set of rational numbers may be, in some sense, “bigger” than the set of natural numbers. However, it turns out that the rational numbers are indeed countable, as may be seen by examining the following table:

$\frac{1}{1}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	...
$\frac{2}{1}$	$\frac{2}{2}$	$\frac{2}{3}$	$\frac{2}{4}$	$\frac{2}{5}$	...
$\frac{3}{1}$	$\frac{3}{2}$	$\frac{3}{3}$	$\frac{3}{4}$	$\frac{3}{5}$	...
$\frac{4}{1}$	$\frac{4}{2}$	$\frac{4}{3}$	$\frac{4}{4}$	$\frac{4}{5}$	...
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\ddots$

This table, if completed down and across (an infinite process!) contains *all* the rational numbers. (It contains many duplicates, of course. All the fractions on the main diagonal, for instance, are really just the same number – one – but that won't affect our argument.) Now, we can “count” the rational numbers by just following the crisscrossing line. Thus, the rational numbers really are countable – that is, there are just as many natural numbers as there are rational numbers. Given how the set of rational numbers seems to contain infinities within infinities, this is an astounding result.

#### IV. The Real Numbers and Transfinite Infinities

Cantor relabeled the countable infinity ( $\infty$ ) of earlier mathematicians  $\aleph_0$  and labeled the first transfinite number  $\aleph_1$ . He then proved the remarkable result that  $|\aleph_1| > |\aleph_0|$ .

#### IV. On the Impossibility of the Greatest Infinity

Cantor's final hurrah was to show that for any set  $S$ ,  $|P(S)| > |S|$ .

# Bemidbar @ the DC Beit Midrash

Monday, May 17, 2004; Yom Sheini, 26 Iyar 5764

---

## Welcome to the DC Beit Midrash!

The Chumash (Five Books of Moses) is divided into 54 portions, which Jews read sequentially each week in services. On a regular evening, a member of our community will lead us in a text-study of this portion, or *parasha*. The voices of both past and contemporary interpreters will inform our discussion. Every week, a sheet summarizing the Torah portion of the week and the other sources the teacher will use will be provided to aid you in your study.

## This Week's Parasha (Torah Portion):

Bemidbar (Numbers), Chapter 1: Verse 1 to Chapter 4: Verse 20

Like the book of Leviticus, Numbers contains little 'narrative.' As its English name suggests, it contains several lists; each census of the Israelites. The Hebrew name comes from the first significant words: On the first day of the second month, in the second year following the exodus from the land of Egypt, *bemidbar Sinai* – in the wilderness of Sinai. The Israelites' journey through the desert concludes, and they get ready to enter the Promised Land. The Book of Numbers is 36 chapters long, divided into ten parashot. The first portion of the Book of Bemidbar is also called Bemidbar; it begins with a census of the adult men of each tribe, and a description of the order of the Israelite camp by tribes. The descendants of Levi are not included with the others, as they are responsible for the Mishkan, and thus have a special status within the nation. Within the tribe of Levi, the family of Kehat have certain unique duties pertaining to the vessels in the Mishkan.

([http://www.kolel.org/pages/parasha/bemidbar\\_summary.html](http://www.kolel.org/pages/parasha/bemidbar_summary.html))

## Zohar

The Zohar [radiance] is the greatest classic of Jewish mysticism. It is a mystical commentary on the Torah, written in Aramaic, and is purported to be the teachings of the 2nd century Palestinian Rabbi Shimon ben Yohai. Legend relates that during a time of Roman persecution, Rabbi Shimon hid in a cave for 13 years, studying Torah with his son; During this time he is said to have been inspired by God to write the Zohar. However, there is no real mention of this book in any Jewish literature until the 13th century. In the 13th century, a Spanish Jew by the name of Moshe de Leon claimed to discover the text of the Zohar, and the text was subsequently published and distributed throughout the Jewish world. However, there is a school of thought (based on the writings of historian Gershom Scholem) that de Leon himself was the most likely author of the Zohar.

(Adapted from <http://www.faq.s.org/faqs/judaism/FAQ/03-Torah-Halacha/section-34.html>)

## Azriel Ben Menachem

1160-1238

A student of Isaac the Blind, a famous Kabbalist in the 12<sup>th</sup> century, Azriel Ben Menachem moved to Genoa with a fellow student, Asher Ben David, and started a Kabbalistic study center there. He is the author of *The Commentary on the Ten Sefirot* which may be the first reference to the concept of Ein-Sof, God as absolute infinity. According to Azriel, the world & all of its manifestations was contained in God, the absolute & infinite being, the 'En-Sof'. But because of the imperfections & finite state of the world, the world cannot be thought of as having directly come into being out of the perfection of the Absolute.

(Adapted from <http://www.jewishhistory.org.il/1100.htm>)

## Ramban (Nachmanides)

1194-1270

Ramban (Nachmanides) was the foremost *halakhist* (Jewish legal scholar) of his age. Like *Rambam* (Maimonides) before him, Ramban was a Spaniard who was both a physician and a great Torah scholar. However, unlike the rationalist Rambam, Ramban had a strong mystical bent. His biblical commentaries are the first ones to incorporate the mystical teachings of *kabbalah* (Jewish mysticism). He was well-known for his aggressive refutations of Christianity, most notably, his debate with Pablo Christiani, a converted Jew, before King Jaime I of Spain in 1263.

(Adapted from [www.us-israel.org/jsource/biography/Nachmanides.html](http://www.us-israel.org/jsource/biography/Nachmanides.html))

## **Georg Cantor**

**1845-1918**

Georg Cantor was a German mathematician who is best known as the creator of modern set theory. He is recognized by mathematicians for having extended set theory to the concept of transfinite numbers, including the cardinal and ordinal number classes. He was born in Saint Petersburg Russia, the son of a Danish merchant, George Waldemar Cantor, and a Russian musician, Maria Anna Böhm. In 1856 the family moved to Germany and he continued his education in German schools, earning his doctorate from the University of Berlin in 1867. Cantor's innovative mathematics faced significant resistance during his lifetime. Modern mathematics completely accepts Cantor's work on transfinite sets and recognizes it as a paradigm shift of major importance.

*(Adapted from [http://en.wikipedia.org/wiki/Georg\\_Cantor](http://en.wikipedia.org/wiki/Georg_Cantor))*

## **This Week's Teacher**

Matt Mercurio is a consulting economist at a private firm in DC. He specializes in the field of commercial litigation and economic disputes. Matt is currently in the process of converting to Judaism and is thus very thankful for the DC Beit Midrash. He can be reached at [matthew.mercurio@fticonsulting.com](mailto:matthew.mercurio@fticonsulting.com)

## **This Week's Food Sponsor**

Shana Starobin is sponsoring to say goodbye as she heads off to spend the summer in California, and to acknowledge her appreciation of the learning and beer that she has been enjoying these many Monday evenings.

---

*Wanna teach, think about teaching, or suggest a teacher? [teachers@dcbeitmidrash.org](mailto:teachers@dcbeitmidrash.org)*

*Wanna sponsor food? [dcbeitmidrash.org](mailto:dcbeitmidrash.org)*

*Questions, feedback, wanna join our email list? Anything else? Email [DCBeitMidrash@hotmail.com](mailto:DCBeitMidrash@hotmail.com)*

**WWW.DCBEITMIDRASH.ORG**