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Sincerely,

Rabbi Yehoshua Werde
Director

P.s. Please email me with any comments or questions at Director@torahlp.com

ב"ה

AGE OF THE UNIVERSE

Torah and Science:
Do they conflict? Can they?

TORAH LEARNING PROJECT

Lesson Outline

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» Age of the Universe
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» How does science calculate the age of the universe?
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Age of the Universe

A Jew in Modern Times

As Jews living at time when science has uncovered so many marvellous discoveries about the workings of our universe, it is often difficult not to question and be confronted by basic differences between Torah and science that seem contradictory. How should we view such differences? And what approaches have been taken to resolve them?

What is the Conflict?

The area in which the perceived conflict between Torah and science is the greatest is likely that of the age of the universe.

Science places the age of the universe at between 13 and 18 billion years ago, whereas according to Torah the universe was created 5775 years ago.

Bereishis 1:1

בְּרֵאשִׁית בָּרָא אֱלֹקִים אֵת הַשָּׁמַיִם וְאֵת הָאָרֶץ

In the beginning Hashem created the heavens and the earth.

We know the number of years that has past since creation based on the record of events and years that appears in Seder Olam Raboh written by Rabbi Yosei ben Chalafta over 1200 years ago.

Seder Olam

מאדם ועד המבול אלף ותרנ"ו שנים...

There were one thousand six hundred and sixty six years from Adam until the flood…

This calculation of years was preserved throughout the ages by Jewish tradition and used for calculating various things, including whether the year was a shmita or yovel year (even though the laws of shmita only began after the Jews settled in Eretz Yisroel). For example, in regards to hilchos shmita v'yovel, the Rambam records the number of years that had passed since creation in the year he wrote the Yad Hachazakah.

Rambam Hilchos Shmita V'Yovel 11:4

שנה זו שהיא שנת...שש ושלשים ותשע מאות וארבעת אלפים ליצירה היא שנת שמיטה.

This year, which is…four thousand nine hundred and thirty six years since creation is a shmitah year.

How does science calculate the age of the universe?

While Torah bases its calculation on tradition, science uses other tools to determine the age of the universe. Without relying on a historic account, it studies the state of the universe as it is right now to determine in hindsight how old it must be.

Using the Hubble telescope in outer space, as well as other powerful land-based telescopes, scientists are able to find the oldest stars (smaller stars are older than big ones) and estimate their age. The oldest star clusters they have found measure between 11 and 18 billion years in age.

They also study how fast the universe is expanding (by measuring certain radiation) and calculate backwards to determine how many years it took to expand to its current size.

The current estimate is around 13.8 billion years.

Dinosaur Fossils and Other Ancient Artefacts

Additionally, scientists can date certain findings from ancient times using radiocarbon dating. In a process invented in the 1940s, every living organism contains radiocarbon that decays once the organism dies. By measuring the amount of radiocarbon in an item, scientists can tell how long has passed since it died. The oldest dinosaur fossils scientists measure to about 190-197 million years old. In addition to fossils, archeologists have find human artefacts, the oldest of which measure to almost 100,000 years ago.

So, how do we resolve this apparent conflict?

The Isolationist Approach

Several approaches have been taken to try and resolve this apparent conflict. Some have resorted to isolating their belief in Torah and science, accepting the scientific view as authoritative with regards to all natural phenomena (what is), and the Torah view with regards to matters of morals and ethics (what you should do).

People of such a view would find themselves in conflict trying to explain the literal meaning of the biblical narrative of creation.

In a letter to the Association of Orthodox Jewish Scientists, the Rebbe's responded to this approach, making the following

points:

1) This approach fails to accept Hashem's unity—that Hashem is one in the seven heavens and all directions of the earth—since it places a limitation on Hashem's domain.

2) This approach denies the possibility of a miraculous order (Hashem making miracles)

3) It is contradictory to both pray and maintain an isolationist approach to Torah and science because the fact that we turn to Hashem in prayer to bless the crops, heal the sick etc. are testament to Hashem's ability to intervene and change the natural order.

4) The first-principle of Shulchan Aruch is to not be ashamed of what you believe when you are amongst those who ridicule you. (Those who maintain the isolationist view do so because they are embarrassed to maintain the Torah view among their nonbeliever peers)

5) The isolationist approach might have made sense decades ago when science dealt in absolute truths. Nowadays, however, science deals in probabilities; so there is no reason to be ashamed of maintaining the possibility of a Torah viewpoint.

In the Rebbe's words:

Letter of the Rebbe to the Association of Orthodox Jewish Scientists

...To put it bluntly, some orthodox scientists seem to be ashamed to declare openly their adherence to such basic tenets of the Torah as, e.g. that G-d created Adam and Chava, or the possibility of a

miracle (Ness) in the present day and age, as a Ness is defined in Torah, namely, an occurrence in defiance of the (so-called) laws of nature. When I asked them, squarely, how do they reconcile this lack of conviction in basic Torah-matters with what every believing Jew believes and professes, the answer was that they have managed to 'departmentalize' their day—Tefila [prayer] and Torah, etc., being one 'department,' science—another.

Needless to say, such an attitude is untenable. For, when a Jew declares daily, Hashem hu ha'elokim, ein od milvado [G-d is the Lord, there is nothing but Him], it is plainly meant that this is the whole day, not part of the day. Moreover, a scientist with such a split personality is a contradiction also to the concept of Hashem ehod [G-d is one], as the Hazal [sages] interprets 'ehod'—aleph, hes, dales—that aleph, i.e. alupho shel olom, rules not only in the seven heavens but also on earth (hes – 'eight'), and in all the four directions (dales).

As for the matter of miracles, as it affects the daily life, the Torah view is clear: It rules that "one should not rely on a miracle," but at the same time it requires every Jew to be permeated with complete faith that G-d acts through nature, and also 'above' nature. This is also the plain meaning of the posuk

[verse]: "And G-d, your G-d, will bless you in all that you do". It is necessary to do (not to rely on miracles), yet ultimately the blessing comes from G-d. To think otherwise would also be contradictory to the three daily Tefilos [prayers]. The blessings of Shemone-esrai [prayer of 18 blessings] are clearly based on the conviction that G-d can interfere with nature, e.g. heal the sick and bless the crops, etc., even where the natural factors are unfavorable. Unless one believes in G-d's omnipotence and personal interest in every individual's daily life, there is no sense in praying to Him, and asking Him, for His blessings.

Of course, when a Jew finds himself in an environment of non-believers, it is difficult to be different and face possible ridicule. But this too has already been forewarned by the Shulchan Aruch. At the beginning of the very first volume, the Shulchan Aruch lays down the basic principle for the fulfilment of all the four volumes: "And let him not be ashamed in the face of men who may scoff at him in his service to G-d."

What is even more surprising—and as yet I have not received any answer from those with whom I had occasion to speak on the matter—is that the said apologetic attitude is completely out of harmony with the view of contemporary science. If

a century ago, when scientists still spoke in terms of absolute truths, it was understandable why a person who wished to adhere to his faith might have been embarrassed to challenge 'scientific' claims, this is no longer the case in our day and age. Contemporary science no longer lays claim to absolutes; the principle of probability now reigns supreme, even in practical science as applied in common daily experiences.

Apologetic Approach (Torah and Science Agree)

Gerald Schroeder, an MIT physicist, introduced a novel approach in his book *Genesis and the Big Bang* that seeks to explain how the Torah and scientific views are one and the same.

While his explanation deals with complex concepts in physics that are beyond the scope of this booklet, the gist of his argument is that Hashem initially created just one speck and over the course of billions of years that expanded and evolved to become the universe we know today. However, just as the space of the universe expanded, the "time" of the universe expanded too (to the extent that one day in today's time contained within it billions of years at the beginning of creation). This explains how, condensed in the six days of creation, there were really billions of years of evolution.

This concept of there being different perspectives on time is apparent in the following posuk:

Tehilim 90:4

כִּי אֶלֶף שָׁנִים בְּעֵינֶיךָ כְּיוֹם אֶתְמוֹל כִּי יַעֲבֹר וְאַשְׁמוּרָה בַלָּיְלָה.

For a thousand years are in Your eyes like yesterday, which passed, and a watch in the night.

While this approach does seem tempting, it requires us to change the simple meaning of the pesukim, and as a rule:

Talmud Bavli, Shabbos 63a

אין מקרא יוצא מידי פשוטו

A posuk never leaves its plain meaning.

Besides for the problem of distorting the literal meaning of the posuk, the problem with this apologetic approach lies in the motivation for its inception. The need to interpret Torah in a manner that is consistent with science stems from a fundamental difficulty believing in the existence of supernatural occurrences—a most basic foundation of our faith!

Scientific Guessing: Try telling an accurate story when all you know is the ending!

In a letter to a certain scientist struggling with the Torah view on age of the universe, the Rebbe emphasizes that, given the process used to arrive at their conclusions, the scientific view cannot be considered as fact and its basis is in fact rather weak.

The Rebbe explains that there are two ways to figure out something you do not already know. Both involve guessing what you don't know based on information that you do know:

1) Interpolation: If you know what happened before and after, you can fill in some of the missing information about what happened in the middle.

2) Extrapolation: You know what happened later on and try to use that information to determine what happened earlier.

Obviously, when you know what happened before and after your chances of guessing wrong are much less than when you only know what happened later on.

This is why trying to guess the age of the universe (where the universe came from and how it got here) from the way the universe is right now, is at best a weak guess.

Particularly since the same reality we now observe could have been arrived at through an infinite number of possibilities and it is impossible to know for certain which one it actually was.

The Rebbe illustrates this using a very simple example. If you know the sum is 1+1, you can figure out that the result is two. However, if you only know the result (i.e., 2) there are an infinite number of possibilities that could have led to that result: 4-2, or 912,345,456,344-912,345,456,342 or any other equation that equals 2.

This is why any scientific view on the age of the world should not be considered absolute truth (since they are all based on extrapolation).

Moreover, writes the Rebbe, extrapolation only works when there are no other factors in existence that might have changed the course that led to the known outcome. However, if there is a possibility of other factors existing outside of the known range, conclusions based on this method are

"valueless" since there might be other unknown variables that explain the outcome. And with regards to the age of the universe, there are certainly many unknown variables that scientists are unaware of.

In the Rebbe's words:

Letter of the Rebbe December 25, 1961

...It was quite a surprise to me to learn that you are still troubled by the problem of the age of the world as suggested by various scientific theories which cannot be reconciled with the Torah view that the world is 5722 years old...

At best, science can only speak in terms of theories inferred from certain known facts and applied in the realm of the unknown. Here science has two general methods of inference;

(a) The method of interpolation (as distinguished from extrapolation), whereby, knowing the reaction under two extremes, we attempt to infer what the reaction might be at any point between the two.

(b) The method of extrapolation, whereby inferences are made beyond a known range, on the basis of certain variables within the known range. For example, suppose we know the variables of a certain element within a temperature range of 0 to 100, and on the basis of this we estimate what the reaction might be at 101, 200, or 2000.

Of the two methods, the second (extrapolation) is clearly the more uncertain. Moreover, the uncertainty increases with the distance away from the known range and with the decrease of this range....

Let us note at once, that all speculation regarding the origin and age of the world comes within the second and weaker method, that of extrapolation. The weakness becomes more apparent if we bear in mind that a generalization inferred from a known consequent to an unknown antecedent is more speculative than an inference from an antecedent to consequent.

That an inference from consequent to antecedent is more speculative than an inference from antecedent to consequent can be demonstrated very simply:

Four divided by two equals two. Here the antecedent is represented by the divided and divisor, and the consequent - by the quotient. Knowing the antecedent in this case, gives us one possible result - the quotient (the number 2).

However, if we know only the end result, namely, the number 2, and we ask ourselves, how can we arrive at the number 2, The answer permits several possibilities, arrived at by means of different methods: (a) 1 plus 1 equals 2; (b) 4-2 equals 2;

(c) 1 x 2 equals 2; (d) 4 2 equals 2. Note that if other numbers are to come into play, the number of possibilities giving us the same result is infinite (since 5 - 3 also equals 2; 6 3 equals 2 etc. ad infinitum).

Add to this another difficulty, which is prevalent in all methods of induction. Conclusions based on certain known data, when they are ampliative in nature, i.e. when they are extended to unknown areas, can have any validity at all on the assumption of everything else being equal, that is to say on an identity of prevailing conditions, and their action and counter-action upon each other. If we cannot be sure that the variations or changes would bear at least a close relationship to the existing variables in degree; if we cannot be sure that the changes would bear any resemblance in kind; if, furthermore, we cannot be sure that there were not other factors involved - such conclusions of inferences are absolutely valueless!

Remnants of Previous Worlds

Another novel explanation brought to explain the finding of fossils such as that of dinosaurs and other creatures that date back to before creation is that they are remnants of previous worlds that were destroyed before Hashem created this world.

Bereishis Rabboh 3:7

היה בורא עולמות ומחריבן, עד שברא את אלו

Hashem would create worlds and destroy them until he created these

Created with Age

Bereishis Rabboh 14

אמר רבי יוחנן: אדם וחוה כבני עשרים שנה נבראו.

Rabbi Yochanan said: Adam and Chava were created as twenty-year-olds

Why would Hashem hide dinosaur fossils in creation?

It is one thing to say that Hashem created the people and trees to look like they have been around long enough to mature, but why would Hashem create fossils and remnants of things that never existed?

To answer this question, we must first examine the underlying dynamic of creation and the reason why Hashem wanted to create the universe in the first instance.

The Hebrew word for "world" "olam" comes from the word "he'elem" which means concealment. This world was created to conceal Hashem's presence:

Likutei Torah, Shelach 37d

בריבוי ההשתלשלות נתהווה מזה צמצום גמור והעלם גדול שנתעלם בחי' כח האלקי המחיה את העולם ונתלבש בלבושים רבים ועצומים

כי עולם הוא מלשון העלם כנודע...שמזה הוא הגורם שבריבוי ההשתלשלות יהיה בחינת העלם גמור שיתעלם הכח האלקות ויתלבש בלבושים רבים עד שיהיה נראה כאלו העולם הוא יש ודבר בפ"ע

Through many sequences of degradation [of Hashem's light] a complete diminishing and great concealment was created in which the G-dly force that enlivens the world was hidden and enclothed within a tremendous number of layers of garments, for the word "olam" (world) is from the expression of "he'elem" (concealment) as is known... This is the cause for their being a complete concealment of the Divine force through many sequences of diminishing (the Divine force) to become enclothed in many garments until it appears as if the world is an independent entity.

Hashem created this world to hide His presence so that 1) The world could exist as what appears to be a distinct entity to Hashem. 2) So man, by his own choosing, will decide to abandon his personal, indulgant pursuits and dedicate himself to the service of Hashem without being forced by Hashem's overwhelming presence in the world. For this reason, Hashem deliberately made His presence indiscernible in the world.

Imagine if the world was dated to be exactly 5775 years old, there would be little room to doubt or deny creation and Hashem's existence in the world. It therefore makes sense that Hashem would create the world with cues in the form of fossils (and even human remains and creations) to mislead us to appear much older than it really is.

While this may seem surprising, it's important to remember

that creation itself is miraculous, so to create a world in mid-process with dinosaur fossils and the appearance of being billions of years old is no different and surprising than creating a world in its infancy (they are both equally as miraculous and surprising).

Conclusion: A Torah View of Science

Whichever answer we accept as true, Torah and science cannot contradict each other. Torah provides a version of reality as it truly is, whereas science provides a picture of reality as we observe it. Both are necessarily true (the truth and what we observe). In fact, the Rambam considers scientific observation something that we can rely upon for Torah:

Rambam, Hilchos Kiddush Hachodesh 17:24

מאחר שכל אלו הדברים בראיות ברורות הם שאין בהם דופי ואי אפשר לאדם להרהר אחריהם, אין חוששין למחבר בין שחברו אותם נביאים בין שחברו אותם האומות שכל דבר שנתגלה טעמו ונודעה אמיתתו בראיות שאין בהם דופי אנו סומכין על זה האיש שאמרו או שלמדו על הראיה שנתגלתה והטעם שנודע.

Since these concepts can be proven in an unshakable manner, leaving no room for question, the identity of the author, be he a prophet or a gentile, is of no concern. For a matter whose rationale has been revealed and has proven truthful in an unshakable manner, we do not rely on [the personal authority of] the individual who made these statements or taught these concepts, but on the proofs he presented and the reasons he made known.

The Rambam is referring to the calculations of the various positions and movements of the moon and constalations needed for the laws of kidush hachodesh. These were lost over the centuries and forgotten by the chachomim, so the Rambam "borrowed" these calculations from the observations of Greek astronomers. The Rambam explains that since these observations are observable and undeniable, they are acceptable for Torah as well.

Elsewhere, the Rambam takes a different position:

Rambam, Laws of Shechita 10:13

וכן אלו שמנו ואמרו שהן טריפה אף על פי שיראה בדרכי הרפואה שבידינו שמקצתן אינן ממיתין ואפשר שתחיה מהן אין לך אלא מה שמנו חכמים שנאמר על פי התורה אשר יורוך:

Similarly, with regard to those [conditions] which [our Sages] listed as [causing an animal to be] deemed treif even though it appears from the medical knowledge we possess that some of them will not kill and it is possible for the animal to live - we follow only what the Torah says, as [Deuteronomy 17:11] states: "According to the Torah in which they will instruct you."

A "treifa" is an animal that is injured that will not live for more than 12 months. Halachah has specific guidelines to determine what injuries constitute a treifa. But what happens when modern medicine disagrees with Torah? Which do you follow?

The assumption here is that when there is a difference between Torah and science, we follow Torah. The Rambam's

position seems to be that when we have no knowledge from Torah (as in the case of kidush hachodesh), then we follow science. But when there are conflicts between Torah and science, we follow Torah.

Torah as the Blueprint of Nature

Zohar Vol. 2 161a

כד ברא קוב"ה עלמא אסתכל בה באורייתא וברא עלמא

When Hashem created the world, he looked into Torah and [from it He] created the world.

Torah is the blueprint of the universe. And while some worldly phenomena may appear to contradict Torah, that is only because we do not fully understand what it says in Torah or our interpretation of what we are observing in the world is incorrect.

Ultimately, when moshiach comes, the two perspectives on reality will merge, and the Torah view will be apparent in the world, for then the "knowledge of Hashem" will permeate all of reality as the water covers the seabed.

Take-aways

- Of the biggest perceived conflicts between Torah and science is that of the age of the universe, according to Torah the universe was created 5775 years ago, whereas according to scientific observation of radiation and the oldest stars, it appears to have been around for over 13 billion years
- Some are ashamed of Torah's view and choose to follow

science for natural phenomena (what is), and follow Torah only as a moral/ethical guide (what you should do). Among the problems with this approach is that it denies the existence of Hashem's dominion in all realms and doesn't accept the literal version of the creation narrative.

- Others take an apologetic approach, attempting to equate the Torah and scientific view, explaining that the six days of creation contained all 13 billion years of evolution due to the expanding nature of time and space of the universe. The problem with this approach is that requires a partial distortion of the simple reading of the biblical verses.
- The Rebbe explains that there are fundamental problems with the system used by science to calculate the age of the universe as they use a small sampling to extrapolate and guess what may have been. This system is at best unreliable and does not take into consideration all sorts of possible variables that would render this system valueless.
- A possible explanation for the finding of ancient fossils is that they are remnants of previous worlds that were destroyed before the creation of this world.
- The most simple explanation is that the universe was created with age and with the many fossils embedded within nature to give the impression of age. One reason for this may be to conceal Hashem's presence within the creation.
- Torah is the blueprint of creation and cannot possibly contradict reality. This explains why according to the Rambam Torah accepts scientific observation so long as it doesn't disagree with Torah.