

HALACHIC AND HASHKAFIC ISSUES IN CONTEMPORARY SOCIETY 146 - TORAH AND THE AGE OF THE UNIVERSE OU ISRAEL CENTER - FALL 2019

A] INTRODUCTORY ISSUES

- 1) Science and Torah both come from God and, to the extent that they are talking about the same thing, they should not contradict.
- 2) Historically, up to about 600 years ago there was no perceived intrinsic conflict between science and Torah - physics and metaphysics - see Rambam, Ralbag etc. What caused the split? Roger Bacon (13C England) and others placed the scientific emphasis on empiricism - that **science can only deal with observable phenomena in the natural world** - to the exclusion of logic, metaphysics etc. This puts modern science and Torah on two different paths with different agendas.
- 3) If there an apparent clash between science and Torah there are 3 basic approaches on how to deal with this:-
 - (i) Maybe we have misunderstood the science. We must never regard science as an **absolute** against which Torah must be made to fit. Much (although not all) 21C science will be overturned by the end of the 22C!
 - (ii) Maybe we have misunderstood (willfully or not) what science CAN do. This raises the issue of 'scientism' - the almost religious belief in science as the means of understanding ultimate truth¹.
 - (iii) Maybe we have misunderstood the Torah. We must assume that Torah is MUCH more sophisticated than we think!
 - (iv) Maybe they are both correct but are looking at different questions - science is 'how', Torah is 'why'. They work in different realities.

1. Science takes things apart to see how they work. Religion puts things together to see what they mean.

Rabbi Jonathan Sacks, The Great Partnership p. 2

- 4) The basic premise of science - that there are consistent rules of nature and the search to harmonize them and ultimately find a Grand Unified Theory (unifying quantum theory and gravitational theory) - stems from a basic Jewish monotheistic premise - the Unity of God. Polytheism sees the universe as chaotic conflicting forces. Judaism sees conflicts and contradictions as superficial only. Underpinning them are ever simpler foundations, ultimately emanating from one stem - the Etz HaChaim.
- 5) It is remarkable that not only does the universe work in a consistent and predictable way, but its methodology is accessible to the human brain through mathematics. Man and the universe appear to be on the same 'wavelength', such that cracking the code of reality is sufficiently complex to attract the greatest human brains and yet simple enough for them to succeed enough to keep them interested!

B] EVIDENCE FOR AN ANCIENT UNIVERSE

- 1) The Torah states that Adam Harishon was created 5780² years ago and the creation of the rest of the universe took 6 days before that. Thus the age of the universe is 5780 years + 6 days.
- 2) Scientists are unanimous that the universe is much older than that. Current estimates are around 13.799±0.021 billion (10⁹) years. This date is not arrived at through a theoretical construct but by observable evidence from a variety of sources which all validate this estimate.³

1. For more on scientism and Jewish responses to it, see <https://midreshetrachel.com/judaism-vs-scientism-which-religion-is-more-logical-by-rabbi-shaya-karlinsky/> for a shiur by R. Shaya Karlinsky. The debate between Richard Dawkins and Francis Collins in Time Magazine that R. Karlinsky analyzes in that shiur can be found at <http://content.time.com/time/magazine/article/0,9171,1555132-1,00.html>

2. An entirely separate question is how we come to the number 5780 and how this can be substantiated on the basis of a reading of the biblical text and understanding of the chronology of the Second Temple period. For more on this, see <http://rabbimanning.com/wp-content/uploads/2019/02/The-Missing-168-Years-Part-1.pdf> and <http://rabbimanning.com/wp-content/uploads/2019/02/The-Missing-168-Years-Part-2.pdf>. For audio see <https://rabbimanning.com/index.php/audio-shiurim/cji/>

3. See Appendix 1 for a list of the types of evidence brought.

C] RESOLUTIONS TO THE PROBLEM**C1] APPROACH 1 - THE 6 'DAYS' ARE NOT MEANT TO BE CHRONOLOGICAL**

The Rambam in Moreh Nevuchim (2:30) explains that all creation happened in the first instant (which is also the view of Rashi and Ramban) and the 6 days were a process of distinguishing one thing from the other. The Abarbanel (Spain 15C) gives an explanation of the Rambam's view (although he strongly disagrees with it!)

2. The Rambam believed that there were not separate creative acts on 6 days but rather everything was created on one day in a single instant. In the work of Creation there is mention of '6 days' to indicate the different levels of created beings according to their natural hierarchy; not that there were actual days, nor that there was a chronological sequence to that which was created in the acts of Genesis This is the view of the Rambam which he considered as one of the major secrets of the Creation. He tried to conceal this view but other commentators uncovered his secret and publicized his view.

Abarbanel, Commentary on Bereishit, pp10-11

The Rambam and the Ralbag explain Bereishit not as a physical description of the creation of the universe but as a theological description of the relative orders of species and creations in the spiritual world.

3. ודע, כי הימים הנזכרים במעשה בראשית היו בבריאת השמים והארץ ימים ממש - מחוברים משעות ורגעים. והיו ששה כששת ימי המעשה כפשוטו של מקרא. ובפנימיות הענין יקראו 'ימים' הספירות האצולות מעליון. כי כל מאמר פועל הויה תקרא 'יום'. והיו ששה, כי לה' הגדולה והגבורה והמאמרים עשרה. כי הראשונות אין שם 'יום' נתפס בהם. והפירוש בסדור הכתובים בזה נשגב ונעלם, ודעתינו בו פחות מטפה מן היס הגדול.

רמב"ן בראשית פרק א פסוק ג

After explaining that the 6 days are 6 real 24-hour days (see source 18 below), the Ramban then goes on to explain that what is being described in Bereishit is an incredibly deep mystical idea, not a physical act.

4. All that the Torah recounts of matters relating to the period before the completion of creation is conveyed to us by Moshe from the mouth of God in terms of concepts which we can grasp. Just as one attempts to give a blind man some idea of that which he cannot see by making use of analogies with the sense of touch and so forth, so does the Torah present to us that which is essentially spiritual in a material guise, with some points of similarity and analogy to the spiritual message, so that we may be able to grasp it to the best of our ability

We see from this [explanation of the Ramban] that in the simple meaning of the text - that which is conveyed to us in accordance with our own conceptual capacity - we are to understand actual days made up of hours and minutes. But in its real essence, that is to say in its inner meaning, the text has quite a different connotation. It refers to the 6 sefiros, which are modes of revelation of the divine conduct of the world. Only for our benefit does Scripture present them to us in the form of 6 days. As for the relevance of the six days in their allusion to the six modes of revelation - this is something sublime and concealed from us, as the Ramban says

Michtav Me'Eliyahu Vol II p151

Ma'aseh Bereishit is a deep mystical concept. To trivialize it by trying to fit it with science is, ultimately, a futile exercise.

5. Creation, by definition, is outside our world and outside our frame of thought. If time exists only as a mode of our thought, then the act of creation is necessarily non-temporal - "above time". Every non-temporal act is interpreted in our frame of thought as an infinite time-sequence. This is the reason why creation is interpreted by scientists as a process of evolution extending over vast aeons of time.

Since creation does not take place in time, we must ask why the Torah describes it as taking 6 days. The answer is that the Torah wishes to teach us a lesson in **relative values**. Everything has value only in relation to its spiritual content. Vast physical masses and vast expanses of space and time are of little significance if their spiritual content is small. The whole physical universe exists as an environment to the spiritual life of the human being; this is its spiritual content. When interpreting non-temporal creation in temporal terms, the Torah deliberately contracts the time-scale compared with that which presents itself to the scientist, in order to convey to us the relative insignificance of the material creation compared with the spiritual stature of man.

Rav Dessler, Collected Essays and Notes, London 5719 n.33

6. Everyone knows that here, if anywhere, is the realm of parable, allegory and allusion⁴. In these most profound matters people are willing to accept that the true meaning lies on the mystical plane, far above what is apparent to the superficial eye. ... People do find difficulty however in holding within one spiritual context two apparently conflicting approaches to creation. On the one hand, there are their previous simpler, and in a sense less demanding, thought-patterns, in which creation is characterised by sudden discontinuities. On the other, there is the unfamiliar but increasingly popular conception of the gradual unfolding of all things within an evolutionary context. ... The essential need of the hour is therefore an educational effort to propagate the broader view, the grander and more refined conception that we have alluded to above. The coarser-textured faith, in the unrefined form in which it is so often presented, can no longer maintain its position.

Rav Avraham Isaac Hacohen Kook - Orot Hakodesh p559

7. **בראשית** - אמר רבי יצחק: לא היה לריך להתחיל את התורה אלא (שמות יב:3) **מחודש הזה לכם**, שהיה מלמד ראשונה שנלטו צב ישראל. ומה טעם פתח צ'בראשית? משום (תהלים קיא:ו) **כה מעשיו הגיד לעמו לתת להם נחלת גוים**. שאם יאמרו אומות העולם לישראל לסטים אתם, שכבשתם ארצות שצבעה גוים, הם אומרים להם כל הארץ של הקצ"ה היא. הוא צרחה ונתנה לאשר ישר צעיונו. צרלונו נתנה להם וצרלונו נטלה מהם ונתנה לנו

רש"י בראשית פרק א פסוק א

Rashi asks why bother to include the story of Creation at all!? The Torah should have started with the first mitzvah. He is clearly assuming that the Torah is NOT meant to be a historical account.

8. Before we open the Torah however, let us consider how to read it. As a subject of philological or antiquarian research? As corroboration for antediluvian or geological hypotheses? In the expectation of finding revelations of esoteric mysteries? Certainly not! As Jews we will read this book - as a book tendered to us by God in order that we learn from it about what we are and what we should be during our earthly existence. We will read it as 'Torah' - literally instruction - directing and guiding us within God's world and among humanity, making our inner self come alive.

Rav S.R. Hirsch - 19 Letters, Letter 2

Questions on this approach

- (i) What are the authentic limits of non-literal interpretation of Chumash⁵?
 (ii) Should there be a different approach to the analysis of Bereishit and Noach than later narratives in Chumash and Tanach?
 (iii) What are the hashkafic dangers of promoting non-literal reading of texts, or even (at least in some circles) of opening up the question?

C2] APPROACH 2 - THE WORLD WAS MADE LOOKING OLD

This accepts the scientific analysis but claims that God created the world in a mature state, whereas in fact it is only 5780 years old.

9. דאמר רבי יהושע בן לוי: כל מעשה בראשית בקומתן נבראו (רש"י - וביינו 'עץ פרי'. רלוי כיב לטעון פרי מיד)

ראש השנה יא.

The Gemara states that the creation was made in a fully mature state. The tree had mature fruit and, presumably, pre-existing tree rings.

10. וַיֵּצֵר ה' אֱלֹקִים אֶת-הָאָדָם עֶפְרָיִם מִן-הָאֲדָמָה ... עפר, ר"י בר סימון אומר 'עופר' - עולם על מליאתו נברא. אר"א בר שמעון אף חוה על מליאתה נבראת. אמר רבי יוחנן אדם וחווה כבני עשרים שנה נבראו

בראשית רבה פרשה יז:

The Midrash learns from the word 'afar' ('ofer' is a poetic expression for a young man) that Adam and Chava were created as adults aged 20.

This argument has been put by R. Avigdor Miller and the last Lubavitcher Rebbe. If Adam was created with a non-existent past, so too the universe was created with a billions of year-old non-existent past, including fossils of animals that never existed.

4. I hope to cover this iy'H in more detail in the next few shiurim. For further reading on the legitimate limits of non-literal reading of Torah in general and Bereishit in particular, see:
 • On the Limits of Non-Literal Interpretation of Scripture from an Orthodox Perspective - Joshua L. Golding - Torah Umadda Journal (10/2001) pp 37-59.
 • The Biblical Stories of Creation, Garden of Eden and the Flood: History or Metaphor - Shubert Spero - Tradition 33:2 (1999) pp 5-18.
 5. Clearly, both fully literal and fully non-literal approaches are illegitimate from a traditional Torah perspective. The truth is somewhere between these and there will be a range of authentic approaches, but clear limits, beyond which biblical interpretation will exceed legitimate hashkafic boundaries.

Questions on this approach

- (i) Adam obviously could not be created as a new-born or indeed as an embryo. But why should God try to fool us with 'pretend' fossils? On the other hand, is there any philosophical legitimacy to the question 'why' would God do anything?
- (ii) If one sees it as a test of faith, how can this be when the fossils can be explained in other ways (see below)?
- (iii) There is a principle that the world was not created to fool us. On the contrary, we are meant to see emet through the Creation.

11. הכל ברא הקב"ה בעולמו חוץ ממידת השקר שלא ברא

תנא דבי אליהו - אליהו זוטא פרשה ג

Chazal state that the midda of sheker - falsehood - was not created in this world.

(iv) How far does this argument go?

- Did God include in creation the cave-paintings which appear to be 10,000 yrs old? Was light created on its way to earth, looking as though it had started its journey billions of years earlier?
- What about civilizations that appear to have existed between 6000 and 5000 years ago. Were these people given false memories of previous centuries? This would mean that God created false information in the minds of men even after the Creation?
- If the world was created 5780 years ago with a 'false' history, maybe the world was created 5 minutes ago to look as though it had a longer history. Some respond to this by arguing that 5 mins is an arbitrary time-frame, but 5780 years is not arbitrary. It is based on a literal explanation of the pesukim, which is a much more authentic approach.

C3] APPROACH 3 - THE 6 'DAYS' OF CREATION RAN AT DIFFERENT SPEEDS

This approach was adopted by Rav Shimon Schwab⁶ (20C Germany/America) and the Leshem (the grandfather of Rav Yosef Sholom Eliashiv - 19/20C Jerusalem). It proposes that before the creation of Man on day 6 the world did not run at the same pace. In fact, although the six days of creation were indeed six 24-hour periods, the world ran at a such a speed as would take billions of years by our current reckoning. As such the world really is 5780 years old, but creation squeezed a lot into the first 6 days!

Questions on this approach

- (i) How could everything speed up without destroying life e.g. from atoms and radiation moving at a billion times normal speed? Rav Schwab answers that the whole system was speeded up together and so could function.
- (ii) If so, when everything speeds up, there is no external fixed reference point to measure 6 'days'. Rav Schwab answers that the Creation Light created at the start was the fixed rising and setting of the 6 days. Everything else was accelerated within that.

C4] APPROACH 4 - THE WORLD LOOKS OLD BECAUSE OF THE CATACLYSM OF THE FLOOD

Some approaches, especially of 19C writers like the Malbim and the Netziv, sought to explain fossils as a consequence of the cataclysm of the Flood. These fossils were understood to be from creatures which were alive before the flood, but were subsequently killed, and the bones fossilized under intense pressure and extreme conditions within a few years instead of millions. Some suggest that the tilt of the world's axis shifted after the Flood.

Questions on this approach

- (i) There is no scientific basis for suggesting that bones could be fossilized in a few years or that the earth shifted axis in this way. It may have been reasonable in 19C scientific thought, but any attempt today to bridge the gap between science and creation must be based on modern scientific understanding.

C5] APPROACH 5 - THERE WERE WORLDS PRIOR TO OUR CREATION

This approach was adopted by Rabbi Aryeh Kaplan. It brings from classical sources to show that the present world may be 5780 years old, but there were billions of years of prior worlds before ours.

6. In his essay "How Old is the Universe", Challenge p169

12. אר"י בר סימון 'יהי ערב' אין כתיב כאן, אלא *ייהי ערב*. מכאן שהיה סדר זמנים קודם לכן. א"ר אבהו מלמד שהיה בורא עולמות ומחריבן, עד שברא את אלו. אמר - דין הניין לי, יתהון לא הניין לי. א"ר פנחס טעמיה דר' אבהו וירא אלהים את כל אשר עשה והנה טוב מאד - דין הניין לי, יתהון לא הניין לי.

בראשית רבה פרשה ג':

'*And it was evening and it was morning*' is taken by Chazal to indicate that there were many worlds in existence prior to our world, which God subsequently destroyed.

Rabbeinu Bachya on Bereishit 1:3 states that this accounts for the mention of the Torah existing 2000 years before the universe. Furthermore, pre-creation time is on a different scale entirely, as we see in Iyov 10:5.

13. הַכִּימִי אֶנּוֹשׁ יִמִּידָא אִם-שְׁנוֹתֶיךָ כִּימֵי גִבֹר

איוב י"ה

14. אמר רב קטינא: שית אלפי שני הוו עלמא וחד חרוב

סנהדרין צו.

Chazal tell us that our world exists in a Sabbatical Cycle of 7000 years - 6000 of life and 1000 of destruction

Sefer Hatemuna (a kabbalistic work attributed to 1C Tanna R. Nechunia b. Hakana) states that there is a larger Sabbatical cycle of 7x 7000 years. According to some views, we are now in the 7th cycle, thus there were 42,000 'years' before our world came into being. Rav Yitzchak ben Shmuel of Acco (12C kabbalist) states that all pre-creation years are Divine 'years'. How long is a Divine 'year'?

15. כִּי אֶלֶף שָׁנִים בְּעֵינֶיךָ כְּיוֹם אֶתְמוּל כִּי יַעֲבֹר וְאַשְׁמוּרָה בְּלִילָה

תהלים פרק צ"ד

A verse in Tehillim states that one day to God is like 1,000 years to us. Thus the mekubalim explain that since our year is 365.25 days, each Divine year is $1000 \times 365.25 = 365,250$ years.

Rabbi Aryeh Kaplan suggests that if this idea is connected with the 42,000 Divine years of the Sabbatical Cycle, it emerges that our world is $42,000 \times 365,250$ years old - i.e. 15,340,500,000 - around 15 billion, which is roughly the age suggested by science.

16. I am sure that many will find this highly controversial. However it is important know that this opinion exists in our classical literature; moreover that one of the most important kabbalists of 7 centuries ago calculated the age of the universe and came to the same conclusion as modern science.

Rabbi Aryeh Kaplan - *Immortality, Resurrection and the Age of the Universe* pp. 9-10

The general approach, if not the kabalistic calculations, that dinosaurs are remnants of past destroyed worlds is also supported by the Tiferet Yisrael - Rav Yisrael Lifschitz (1782-1860) and Rav S.R. Hirsch.

Questions on this approach

(i) R. Yitzchak of Ako, who calculates the Divine Years, does not actually agree that we are in the seventh Sabbatical cycle but the second! So the calculation of 15 billion only works by mixing different opinions in ways which may not be legitimate.

(ii) The concept of Sabbatical Cycles is not accepted by all kabbalists.

(iii) The Netziv (Haemek Davar Bereishit 7:23) points out that Chazal state that these prior world were destroyed - so how could traces remain in dinosaur bones?

(iv) R Dovid Tzvi Hoffman (19C/ 20C Germany) objects on the grounds that, according to this theory, the billions of years happened before our creation. Then there were 6 cataclysmic days when all the event of Ma'aseh Bereishit happened, followed by 5780 normal years. There is no scientific evidence for any such cataclysm.

17. However, what we can't understand we rely on our faith. It is obvious that man's thoughts are not comparable to G-d's in the ability to understand Nature. Similarly, we acknowledge that we can't comprehend or adequately explain G-d's ways concerning good and evil in each generation. In these issues we simply rely on our faith in G-d's greatness. In contrast, they prefer to explain that man is the product of millions of years of development. As evidence they cite what appear to be ancient bone fragments that have been discovered in Madagascar and other places. Their evidence is total nonsense since prior to the Flood man lived for a thousand years. This difference in what was normal growth and development makes the bones appear as if they were a million years old. With this type of shaky evidence they want to refute the words of our Sages and undermine the faith that exists amongst the Jewish people.

Their main concern is to shake the faith in G-d - which has been accepted by us generation after generation. They want to replace this faith with the acceptance that events are determined primarily by the laws of nature Scientists - even those who are described as religious - are ashamed that we don't agree with the views of leading scientists that man is descended from the apes. They rush to find isolated statements of our Sages, rabbis and commentaries that seem consistent with contemporary scientific view ... Therefore they use misleading and distorted citations from Torah literature to claim justification for such scientific beliefs in the words of the Sages.

Letter of Rav Moshe Sternbuch on the Relationship of Science to Torah - Jan 2005

Rav Moshe Sternbuch objects to the use of such sources and sees their application as highly questionable. He argues:
 (i) *the scientific evidence for the theory proposed is shaky and thus it is not appropriate to try to fit the Torah into science which will almost certainly change in the future. (This argument will be stronger in some cases than in others - for example the statements 'man evolved from a single-celled organism'; 'the universe is older than 6000 years'; and 'the world is round and not flat' have quite different levels of scientific certainty.)*
 (ii) *there is a scientific agenda (Rav Sternbuch doesn't say if this is conscious or not) which is essentially anti-religious.*
 (iii) *attempts by other Rabbis to fit Torah in with science are distortions of the true Torah view.*

C6] APPROACH 6 - THE 6 'DAYS' ARE REALLY MUCH LONGER PERIODS

When the Torah says 'days' could it mean longer periods, even billions of years?

18. ודע, כי הימים הנזכרים במעשה בראשית היו בבריאת השמים והארץ ימים ממש, מחוברים משעות ורגעים, והיו ששה כששת ימי המעשה, כפשוטו של מקרא

רמב"ן בראשית פרק א פסוק ג

The Ramban states clearly that the 6 days of creation are actual days.⁷

19. ויקרא אלקים לאור יום ולחשך קרא לילה ויהי ערב ויהי בקר יום אחד

בראשית א:ה

However it is clear that the Torah uses the word 'yom' in different ways. Here (in the same verse) it means both the hours of light and then the full day.

20. אלה תולדות השמים והארץ בהבראם ביום עשות ה' אלקים ארץ ושמים

בראשית ב:ד

The Torah refers to the 'yom' on which God created the world. Which day is this? Rashi says it refers to the first day. But Rav Avraham ben HaRambam explains it to mean the period of the six days of creation. He explains that 'day' can mean an extended period of time. He refers to a verse in Devarim.

21. כל-המצוה אשר אנכי מצוה היום תשמרו לעשות למען תחיו ורבותם ובאתם וירשתם את הארץ אשר נשבע ה' לאבותיכם

דברים ח:א

When the Torah refers to mitzvot that God is teaching 'hayom' - today - it means over the whole 40 years in the desert.

Rav Eli Munk (Paris mid 20C) writes that, until day 4, there was no sun in the sky and, as such, there can be no meaning to a 24 hour day on days 1, 2 and 3. But were days 4, 5 and 6 then real 24-hour days?

22. להבדיל בין היום ובין הלילה - משנגזר האור הראשון. אצל צמצמת ימי בראשית שמשו האור והחושך הראשונים יחד בין זיון ובין צלילה

רש"י בראשית א:יז

Rashi explains that the time system of all 6 days of creation was the same. So there are grounds to say that each of the 6 days was not 24 hours.

23. In many places and especially in the Zohar it is proven that the expression 'day' as it appears in the account of creation is not to be understood as an ordinary human day of 24 hours, but rather the intent is to the day of God which lasts 1000 years - that is to say a day that lasts for an undefined length of time.

Rabbi Dovid Tzvi Hoffman - Commentary to Genesis p48

7. Although see above as to the Ramban's subsequent kabbalistic explanation of the verse, which negates the literal 24 hour understanding.

Questions on this approach

(i) R. Shimon Schwab asks - if the first 6 days were really aeons, how can it be that the first Shabbat was a real day so as to give us our current Shabbat. Some answer that we can never understand precisely how 'God rested on the seventh day', and that we count days differently afterwards (R. Dovid Tzvi Hoffman).

(ii) We do not see any indication in the Rishonim of 6 days being billions of years (although we do see that 'yom' can mean more than 24 hrs).

(iii) The Torah does not say '6 days' but '*and it was evening, and it was morning*'. If a 'yom' is millions of years, what do 'evening' and 'morning' mean?

(iv) Even if the days are billions of years, there are events in the creation narrative which have no clear correlation to the scientific understanding e.g. what is the 'rakia' on day 2? What is the water above and below the rakia?

(v) The order of creation in Bereishit does not correspond to the scientific understanding e.g. the sun and moon were placed in position on day four, after vegetation and trees. (Some⁸ have tried to explain that day four is not the placement of the sun but the fixing of the lengths of the orbits or the transparency of the atmosphere).

Day 1 - Heavens, Earth, Water, Light	-	14 billion yrs ago: Big Bang
Day 2 - Firmament separating waters	-	4.5 billion yrs ago: Formation of Earth (day 1) and moon and sun (day 4)
Day 3 - Dry land, vegetation, trees	-	500 million years ago ("mya"): Fish (day 5) 438 mya: Land plants (day 3) 434 mya: Land insects (day 6)
Day 4 - Sun, moon, stars	-	400 mya: Flying Insects (day 5) 360 mya: Trees (day 3)
Day 5 - Fish, birds and flying insects	-	300 mya: Land reptiles (day 6) 200 mya: Land mammals (day 6)
Day 6 - Land mammals, insects and reptiles	-	150 mya: Birds (day 2)

Some have tried to make them fit but such interpretations risk becoming speculative or forced.

C7] APPROACH 7 - THE 6 DAYS ARE REAL DAYS AND YET ALSO LONGER/SHORTER PERIODS

Dr. Gerald Schroeder has an approach, based on the theory of relativity - that the passage of time will differ depending on velocity and gravity. So too each day of creation was a 24 hr day from the perspective of the Creator of the expanding universe at that time. However from our perspective, in a fully enlarged universe, these 24 hr periods look much longer. This is similar to drawing a 1cm line on a deflated balloon. When the balloon is gradually inflated the same line may become 5, then 10, then 20 cm long. Using the scientific calculations for the expansion of the universe and gravitational forces, Dr Schroeder comes to the following suggestion:

Day 1 = 24 hrs = 8 billion yrs	Day 2 = 24 hrs = 4 billion yrs	Day 3 = 24 hrs = 2 billion yrs
Day 4 = 24 hrs = 1 billion yrs	Day 5 = 24 hrs = 0.5 billion yrs	Day 6 = 24 hrs = 0.25 billions yrs

6 days = 6 x 24 hrs = 15.75 billion yrs

Questions on this approach

(i) It is not found in any Torah sources.

(ii) Problems (iii), (iv) and (v) in [C6] above still need to be addressed.

8. A number of books have been written by religious scientists, such as Dr Gerald Schroeder and Dr. Natan Aviezer, who attempt to harmonize the biblical and scientific accounts. See:

- In the Beginning - Natan Aviezer (1990)
- Fossils and Faith - Natan Aviezer (2002)
- Modern Science and Ancient Faith - Natan Aviezer (2013)
- Genesis and the Big Bang - Gerald Schroeder (1991)
- The Science of GHod - Gerald Schroeder (2009)
- God According to God - Gerald Schroeder (2010)

APPENDIX 1

SCIENTIFIC EVIDENCE BROUGHT TO VERIFY THE AGE OF THE UNIVERSE

- (i) The observable existence of galaxies billions of light years away. Assuming the constancy of the speed of light, these galaxies existed billions of years ago.
- (ii) Radioactive dating of elements found in rocks, particularly using rubidium and strontium (Rb-87 decays into Sr-87 with a half-life of 47 billion years). When applied to rocks on the surface of the Earth, the oldest rocks are about 3.8 billion years old. When applied to meteorites, the oldest are 4.56 billion years old. This is understood to be the age of the Solar System.
- (iii) Measuring the luminosity of old star clusters gives ages of around 12 billion years.
- (iv) Measuring the cooling of white dwarf stars gives an age for our galaxy, the Milky Way, of around 9.5 billion years .
- (v) On a more theoretical basis, the observable expansion of the universe (seen by red-shift in the more distant stars) can be extrapolated using the Hubble Constant to a point of the original Big Bang about 15 billion years ago.
- (vi) Measured erosion and accumulation of rock and space dust on the moon indicate an age of around 4-4.5 billion years.
- (vii) Different eras evident from rock strata show that different types of species existed at different times - fossils of aquatic creatures in today's mountain ranges, different dinosaurs at different times.
- (viii) Dendochronology - tree rings - show chronologies going back up to 12,000 years.
- (ix) Ice cores (laid down every year) show layers going back over 100,000 years.
- (x) Varve analysis - sediment layers laid down yearly at the base of lakes - show histories of tens of thousands and in some cases millions of years.
- (xi) Huge stalactites, stalagmites and columns in the Carlsbad Caverns in New Mexico.
- (xii) Thickness of coral reefs.
- (xiii) Reversals of the Earth's magnetic poles as evidenced by the Atlantic Sea bottom.
- (xiv) Erosion of the Grand Canyon.