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The Astronomical Book of Enoch

The Astronomical Book (AB) is a remarkable book in many respects. It contains detailed observations of the movements of the sun, moon and stars and correlates their movements through a solar year - the earliest instance of Judean science. The observations it contains allow us to gauge the degree of interchange of ideas between Judea and surrounding nations. Its geographical descriptions provide some insight into the geographical knowledge of the Jews in the Hellenistic period. The absence of omen texts and lack of interest in the stars also provide some insight into Judean monotheism.

The AB is one of a compilation of five books:

1. Book of Watchers 1-36
2. Book of Parables 37-71
3. Book of Luminaries (Astronomical Book) 72-82
4. Book of Dreams (includes Dream Vision of Flood 83-84 and Animal Apocalypse 85-90)
5. Epistle of Enoch 92-105

The AB does not present its information as the work of human wisdom but as the revelation of the angel Uriel to Enoch. Enoch is a somewhat obscure pre-diluvian Biblical character to whom later tradition assigned the status of a great primeval scribe and a “sign for wisdom”. (Ben Sirach 44:16 Cairo Geniza) Some attempt has been made to equate Biblical Enoch, 7th in the line of Seth, with Enmeduranki, the 7th king of the antediluvian king lists. A text from the library of

Ashurbanipal describes how Enmeduranki is taken to the gods, one of which was Shamash, the sun god, and taught divination and astrology. According to Gen. 5 Enoch lived 365 years, a number that has an obvious association with the solar year. Kvanvig identifies two Enoch traditions rooted in Babylonian myth.

- a) Terrestrial Enoch –a Chaldean wise man who is a prophet of judgment and salvation
- b) Transcendent Enoch – a wise savior who brings knowledge from heaven... comparable to Ea-Oannes who Berossus describes as a fish man who gives the knowledge of writing to mankind. "The Primeval sage is the terrestrial antitype of the god Ea" (Kvanvig 1983, 13)

Despite the importance of Enoch in the 2nd temple period among certain groups, 1 Enoch was not considered canonical by rabbinic Judaism or catholic Christianity. Apart from a few Greek fragments, very little was preserved of 1 Enoch until a complete manuscript was discovered in the 18th century by missionaries in Ethiopia. The origins of the Ethiopic edition are obscure. Knibb suggests that it was translated in the fifth-sixth century from a Greek text that "likely came into existence in the first century CE." (Knibb 2008, 40) Quotations of the Book of Enoch in the Letter of Jude and the Epistle of Barnabas provide a *terminus ante quem*. A major advance in our understanding of the Enoch tradition came with the discovery of eleven Aramaic fragments of 1 Enoch found among the Dead Sea Scrolls. All of the books of 1 Enoch were represented in the Dead Sea Scrolls except for the *Book of Parables*. Its exclusion is probably due to its late date of authorship. The discovery of the Aramaic texts were vital in placing Enoch within a Jewish, 2nd temple context.

The Aramaic text fragments of the Book of Enoch have also enabled scholars to reconstruct the early text. Milik states that,

“if we compare the fragments of 4QEn (including the restored text) with the Ethiopic text, the balance appears fairly satisfactory. For the first book of Enoch, the *Book of the Watchers*, we can calculate that exactly 50% of the text is covered by the Aramaic; for the third, the *Astronomical Book*, 30 per cent; for the fourth, the *Book of Dreams*, 26 per cent; for the fifth, the *Epistle of Enoch*, 18 per cent.” (Knibb, 32)

However Knibb cautions that these estimates by Milik are based on the restored text and that only a small portion of the fragments from Qumran provide a useful comparison with the Ethiopic. According to Knibb, “we remain dependent on the Greek translation, insofar as it survives, and the Ethiopic version for our knowledge of the bulk of the text of the book. (Knibb 2008, 33)

The relation of the AB to the rest of the Enochic corpus is difficult to determine. Milik thinks that the AB was transmitted separately. Koch goes further and doubts whether the AB was even originally attributed to Enoch. He states that the AB “looks like a cuckoo in a birds nest” because of its lack of apocalyptic language. (Koch 2010, 119) There is general agreement that the Astronomical Book represent the earliest strata of the Enochic corpus but very little consensus as to when the AB took on its final form. Mathew Black argues that the AB was, “manifestly an artificial, originally Greek, version creation... There never existed in Aramaic a third astronomical Book of Enoch. (Ben Dov 2008, 73) Ben Dov disagrees with this assessment. He states, “The work of abridgement was not carried out by translators, whether Greek or Ethiopic. On the contrary, an abridged Aramaic version existed prior to the Greek

translation and served as its Vorlage.” (Ben Dov 2008, 73) According to Ben Dov, DSS 4Q208 Synchronistic Calendar is the earliest copy of AB-related literature, dating to the early 2nd or late 3rd century BC. It contains what Ben Dov refers to as the Extended Model of Lunar Visibility (EMLV) which forms the backbone of the two astronomical treatises found in the AB. Ben Dov builds his case on the principle that the text developed from “the synthetic to the analytic” and that the “shift from the tedious Aramaic roster to the more "elegant" analytical chapters of the AB represents a natural way of reworking the material.” (Ben Dov 2008, in loc)

Although it may not be possible to date the final redaction of the AB with any precision, the science and theology of AB give us a means of determining its *sitz im leben*. The AB recognizes the cyclical nature of the movement of the stars, moon and sun but it does not attribute their regularity to natural law. The stars are governed by angels who in turn are organized into a hierarchy. The regularity of the heavens is related to the obedience of the angels to God. Their movements correspond to a 364 day calendar which is described in detail in the AB. Features of the 364 DY:

- a) The year is divided into four equal quarters of 91 days called tequfot
- b) Each quarter contains 3 months with 30, 30 ,31 days respectively
- c) Every quarter lasts for twelve full weeks plus two additional half weeks

Months 1,3,7,10 – Start on Day 4 :End on Day 5 (30 days)

Months 2,5,8,11 – Start on Day 6: End on Day 7 (30 days)

Months 3,6,9,12 -Start on Day 1: End on Day 3 (31 days)

- d) Months are designated by ordinal numbers
- e) Year begins on the fourth day of the week - the day that the Sun, Moon and Stars were created in Genesis

f) Sunday always falls on the 28th in those months which conclude season II, VI, IX, XII 4Q394 - on the twenty-eight in it (= the twelfth month) Sabbath. U[nt]o it (add) the day after [the] Sab[bath (i.e., Sunday) and the second day (of the week), and an addi]tional (=epagomenal) [day] and the year is complete, three hundred and si[xty-fours] days.

g) Pessach falls in 1st rather than in the 7th month

“On the 1st of Tishre is the New year of years, Sabbath Years and Jubilees...

On the 1st of Nisan is the New Year for kings and festivals.” (m. Ros. Has 1.1)

The 364 DY was a theological statement about the importance of the Sabbath. At times, the AB describes celestial movements in very idealistic terms that bears no relation to reality.

"The moon brings about the years precisely, all according to their eternal positions. They come neither early nor late by one day by which they would change the year: each is exactly 364 days." 74:12

That the year did not match their 364 day year was due to, “the sin of men and angels with the result that the astral powers departed from the correct path.” (Kvanvig 2010, 150) Embedded in this ideology is a theological message, “namely that the luminaries act "correctly" or "with justice" (74:12) and that their motion is best tracked by conforming strictly to the key numbers 360 or 364.” (Ben Dov 2008, in loc) It is remarkable that a book filled with astronomical observations and rooted in Judean monotheism does not contain any mention to the feasts or the Sabbaths. This is all the more remarkable when contrasted with the not so subtle polemics of *Jubilees*. The only polemic found in the AB is against those who fail to add the four epigonal days to a 360 day year. The AB does not provide any evidence of a calendrical dispute between

groups who adhere to a solar vs. luni-solar calendar. The calendrical debates of the 2nd century BC provide the *terminus ante quem* for the AB.

The *terminus post quem* is more difficult to establish. Ben Dov points to the close parallels between AB and the ancient Babylonian astronomical text Mul.Apin. He writes, "In our view, the closest we get to the translation of Akkadian science into Aramaic is the Astronomical Book." (Ben Dov 2010, 14) Mul.Apin was a compilation of popular astronomy of the late second and early 1st millennium that became a standard text for Assyrian and Babylonian scholars during the Sargonide dynasty in the 8th centuries BC.

Mul.Apin and the AB share distinct similarities:

- a) Mul Apin describes the lengthening and shortening of days according to a ratio of 2:1 - a ratio first mentioned in a Babylonian tablet (BM17175) that dates to the Old Babylonian period. This ratio was also central to the AB scheme of tracking the lengthening and shortening of days throughout the year even though it does not correspond to the Judean day length. This suggest that the formula was not devised in Judaea but originated in the traditional Mesopotamian system.

- b) Mul.Apin makes use of a 360 DY which is the basis for the AB year of 360 + 4.

Although a 364 DY is never made explicit, it is described in one place in Mul Apin where it states, "10 additional days in 12 months is the amount of one year." (II ii 11-12)

According to Ben Dov, "The number 364 existed in Mesopotamian astral lore for a very short period, being very quickly replaced by more accurate numbers." (Ben Dov 2010, 167)

- c) Mul. Apin records the cardinal points in the sun's orbit as they relate to helical risings of stars, variations in the rising point of the sun on the horizon and length of days. The AB make similar sorts of observations.
- d) Sections A and B of Mul. Apin record the stars which rise in each of the three paths of heaven of heaven during the year. The first star rising in each of the paths at the New Year is described as a leader.

Mul. Apin I i I The Plough star, Enlil, leader of the stars of Enlil

Mul. Apin I i 40 The Field star, seat of Ea, leader of the stars of Anu

Mul. Apin I ii 19 The fish star, Ea, leader of the stars of Ea

This concept is also found in the earlier "Astrolabes",

"The Field star, who stands at the foundation of the east wind and spans to the south wind, that star is the new Year star, leader of the star of Ea.

AB uses similar language in describing the heliacal rising of stars and their position on the horizon. However, consistent with monotheism, the stars are led by angels rather than gods. Four angels in particular are given a prominent place as the leaders of the days "between the seasons of the months." These are the days of transition and can be equated with the cardinal days that mark the solstices and equinoxes.

The similarities with Mul. Apin provide compelling evidence that certain elements of the AB were derived from Mul. Apin. However, there are also some significant differences between the two texts.

- a) According to Babylonian practice, day and night were each divided into three watches, the length of which was measured by units of mina = 60 us = 4 minutes. In the Astronomical Book a day is divided in 18 parts. According to Ben Dov, "The reason for the change from six to eighteen measuring units lies in the fact that 18 is the smallest possible number of parts that can be divided into twelve months in a 2:1 ratio employing only whole numbers." (Ben Dov 2008, 184) This was important in devising a schematic year in which day length was related to months of the year. The Enochic unit called "jpart" (Geez kefl) is thus completely detached from the actual measurement of time units using a water clock. (Ben Dov 2008, 184)
- b) Mul Apin correlates the lunar cycle with the solar cycle by adding a month approximately every three years. This intercalation cycle that dates back to as early as the 4th century BC. The decision to add a month was based on astronomical observations such as the sun's position in relation to the conjunction with prominent fixed stars or the sun's position in relation to the Paths of Heaven.

"You l[ook?] for the risings (?) and... of the stars of Ea, Anu and Enlil

And name this year

When..., you compute [...] and year, and

For the third year you make a prediction, and proclaim this year a leap year."

The AB does not make use of this intercalation scheme. According to the schematic year in the AB, the moon ends its annual course at gate 3 ready to begin the next year at gate 4. A 37th lunar month interferes with this ideal cycle. The author of AB was aware of accumulated gaps of 30 days after 3 years but, "this did not lead him to create a new operative mechanism for the orbit of the luminaries." (Ben Dov 2008, 128)

If the 364 DY was in use for at least 150 years then it would have fallen out with the seasons in a relatively short period of time. Several explanations have been proposed for the lack of an intercalation scheme,

1. Some think the calendar was only theoretical but never implemented.
2. Others think the calendar was allowed to rotate through the year. "In the days of the sinners the years will grow shorter... The moon will change its order and will not appear at its normal time... many heads of the stars will stray from the command."
3. An extra week was added which would not have interrupted the septenary structure of the year. (cf. 4q319 – Otot lists manual of intercalation)

It has been suggested that lunar year described in 74:15 hints at an 8 year intercalation plan comparable to the octaeteris developed by a 6th century Greek astronomer in which 3 months of 30 days are added to 96 synodic months. This system presupposes knowledge of a 365.25 DY.

- c) Mul Apin divides the heavens into 3 paths corresponding to the Babylonian gods of An, Enki and Enlil. It is aware of the ecliptic band but according to Ben Dov, "The author is unable to track the sun's position... further evidence that when Mul.Apin was composed, knowledge of the zodiac was still unavailable." (Ben Dov 2008, 155) The AB divides the heavens into 6 paths, a division that may foreshadow the description of the zodiac by Ptolemy in which the zodiac signs are said to travel along the 6 paths in the sky. According to Ben Dov, "If this is true, the Enochic author who produced the system of gates may have been aware of the zodiacal signs." (Ben Dov 2008, in loc.)

- d) Mesopotamians divided the waxing and waning of the moon into 15 lunar phases which better fit the ideal month of 30 days. In an equinoctial month of 30 days the full moon rises on the 15th day and is seen all night. During its waning it sets earlier by $\frac{1}{15}$ of the night = 12 us (3 minas = 180 us). AB makes a significant departure from this, dividing the waxing and waning of the moon into 14 lunar phases.
- e) Mul.Apin makes no mention of sabbatical units. The AB does not make any reference to sabbatical units either but its structure of the year underlies its septenary divisions of time.

It can be confidently stated that the AB was influenced by Babylonian astronomy. The question remains whether the 364 day calendar and the division of time into sabbatical units predates the AB or whether it too was adapted from Babylonian astronomy. It has been suggested that the 364 DY evolved from the schematic 360 DY that was used as early as the 4th century BC by the Sumerians and attested in the astrolabs. Because of its usefulness in base 60 calculations, the 360 DY continued to be used by Babylonian and Assyrian astronomers even though it was known that it did not correspond with celestial orbits. The Egyptians also used a 360 DY to which they added 5 days to the end to form the Egyptian civil year. This method of calculation was used for over 3 millennia. According to Macrobius, "The Egyptians, alone and always, had a year of definite length. Other peoples varied it by different equally erroneous reckonings" By the Persian period a luni-solar calendar based on 19 year cycles in which 7 years had 13 months was firmly established. A similar scheme was also proposed by Meton in Greece by the middle of the 5th century. These calendars presupposed knowledge of a year with 365 days. Although the author of the AB must have been aware of a year length of 365 days by the late 3rd century,

he chose rather to adopt the 360 DY and modified it by adding 4 epigomal days “that stand between the seasons.” These additional days stand within the count of the years but outside the count of months. The 364 DY was adopted by the AB because it fit well with the septenary tendencies of its Jewish authors. By adopting a 364 DY all festivals could be linked to a specific day of the year thereby ensuring that no festival sacrifices were offered on the Sabbath.

Some have sought to analyze the Biblical text in order to prove that the 364 DY was the norm for Israel among the temple priesthood in the Persian Period or even in the 1st temple period. Jaubert noted that if a 364 DY is presupposed when reading the Pentateuch then it can be shown that the Israelites never travelled on Sabbath. More recently Sacchi, following in the tradition of Jaubert, looks at the specific dates found in Ezekiel and shows that important events occurred on days 1,4,6 – days thought to have cultic significance. Baumgarten questions Jaubert’s presuppositions, pointing out that, “Of the thirty-seven dates [said by Jaubert to fall on liturgical days]... twenty-six may immediately be left out of consideration because they coincide with festivals, new moons, and the middles of the months.” (Baumgarten 1977, 113) He dismisses the suggestion made by Jaubert that the Jews never did work on the Sabbath. For example, he notes that according to *Jubilees*, the Sabbath was not kept until the time of Jacob and that Noah loaded the ark on the 16th of Nissan, which was a Sabbath. He also notes that the raising of the Omer seems to have taken place the day after the Passover feast according to the Joshua 5:10-11 (MT) rather than the first Sunday after the feast. If Baumgarten is correct in stating that the 364 day calendar was never used in the temple then what was the source of the schism over the calendar? Baumgarten sees it as the result of the need of a sect to forge a separate identity. Sacchi, on the other hand, suggest that Daniel 7:35 refers to an attempt by Antiochus IV to forcibly change “set

times and the laws". He takes this as a reference to a change in the calendar that became a source of division during the Hasmonean period.

Sacchi states that the earliest recorded division of time into 'sevens' is a Mesopotamian omen text dating to the 7th century BCE. This omen text lists the 7th, 14th, 21st and 28th days as "inauspicious". He adds in a footnote that the 19th was also included in the list of inauspicious days "but it was a day of mourning". (Sacchi 2007, 114) There are some significant problems with this theory because it assumes that the first of every month is the first of every week with the result that two or three days are left unaccounted for at the end of each month. Moreover, are we to assume then that the Jews adopted "the week" during the exile, and then wove this number into the very fabric of the Pentateuch? Moreover, Sacchi must also account for Jeremiah's admonishments for not keeping the Sabbaths of years. Ben Dov cautions that the, "364DY was not created as a septenary construct, it was easily identified as such and consequently adopted and developed in various apocalyptic circles." (Ben Dov 2008, 59) His evidence for this claim is the description of the 364 DY in Mul.Apin.

Many questions remain about the origins of the AB and its calendar. However, it is clear that the AB borrowed from the Mul.Apin. Thus we have a *terminus post quem* of the early 1st millennium BC. The theology of the AB places it within the tradition of Judean monotheism. It is possible that AB was the product of a Jewish scribe in exile writing sometime after 586 BC but before the calendrical debates of the early 2nd century BC.

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Outline of the Book of Enoch

1. Introduction - "The book of the revolutions of the lights of heaven"
2. AB 1
 - a. Solar Theory - "And this is the first law of the lights. The light of the sun..."
 - i. The rising of the sun through the gates of heaven in one solar year is correlated with the lengths of days with special note of equinoxes and solstices.
 - ii. "So the year is exactly 364 days long"
 - b. Lunar Theory - "And after this I saw another law for the smaller light, name the moon"
 - i. Observations of the moon - The size of the moon in comparison with the sun

"When its light is full, it amounts to one seventh of the light of the sun. (Enoch 73:3)

 - ii. Lunar Month - parts of the moon - Time
 - iii. Lunar Year - place of moon in the gates - Space
 - iv. Lunar Year - number of days compared with the 364 DY
 - c. Calculation of the 364 DY – "The sun and the stars bring in every year with precision; neither will they ever advance or delay their positions by a single day, but instead they change the years scrupulously after each 364 days."
 - i. Addition of 4 epigonal days to mark the turn of the seasons
3. Intermission – "Likewise Uriel showed me"
 - a. The Cosmic Plan
 - i. Portals for the entrance of heat from the sun
 - ii. The circuit of the stars, especially on that "makes its way around the entire cosmos".
 - iii. 12 Portals, 3 in the North, 3 in the South, 3 in the East, 3 in the West through which the winds blow and bring blessing or disaster
 - iv. The four quarters of the world – East, West, North and South – and their significance
 - v. 3 geographical division – one for the habitations for the sons of men, one for seas and rivers, and one for deserts and for "Darkness and Paradise of the Righteous".
 - vi. 7 mountains

- vii. 7 rivers – where they flow
 - viii. 7 islands
 - ix. The Sun and the Moon, their names, their relation and their paths
- 4. AB 2
 - a. Lunar Phases
 - i. The waxing and waning of the moon in hallow vs. Full months
 - ii. The position of the moon to the sun as it relates to lunar phases
 - b. Lunar Year
 - i. The position of the moon in the gates in the middle of the lunar year
 - ii. After two periods of 177 days the moon falls behind the sun 5 days
 - iii. The physical characteristics of the moon – “resembles the image of a man”
- 5. Intermission – Dialog with Uriel, “I am showing you everything”
 - a. The order of Angels
 - i. Leaders of Seasons – Melkiel, Helemmelek, Meleyal, narel
 - ii. Leaders of months – 12 angels – chiefs of thousands
 - iii. Subordinate Angels – 12
 - iv. No Leaders for ‘weeks’
 - b. The Seasons – Spring, Summer,
 - i. “Melkiel is first” - Spring
 - ii. The signs of his dominion
 - iii. Helemmelk – Summer
 - iv. Two season are missing
- 6. Intermission – Dialog with Uriel, “I have showed you everything”
 - a. The tablets of heaven
 - i. The righteous are blessed and will escape Judgement Day
- 7. Enoch is brought back to earth by 7 angels
 - a. Enoch is restored to earth where he is given the task of writing down everything he has seen and entrusting his knowledge with is his son, Methusaleh
 - b. Warn the people of judgement
 - i. Include the 4 epigonal days in the count of the year!
 - c. Prophecies –
 - i. sin will cause the celestial bodies to fall out of order
 - ii. famine
 - iii. angels – “chiefs of stars” will stray from what is prescribed
 - iv. idolatry – “many... will take them to be gods”