

ATUM to ATOM

Book 7A

THE ANCIENT THEORY OF CORRESPONDENCES And a clay planisphere in the British Museum

Asia Shepsut



'Any sufficiently advanced technology is indistinguishable from magic'
Arthur C Clarke, interviewed on his 90th birthday for **BBC Focus Magazine** December 2007

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THE ANCIENT THEORY OF CORRESPONDENCES

I have inserted this additional booklet into to the main series of books exploring the uses of Cosmokrator because it establishes just how far the tradition of the theory of correspondences reaches back into ancient history - this we know from exciting documentary evidence on clay tablets from Mesopotamia pointing back ultimately to c.3000BC (these have been known in the academic world for a long time). A similar tradition in Western Europe from the same period can be deduced from later derivative writings, but because of the impermanence of the materials used to record the originals (bark, bone, leather), they did not survive for us to refer to today. In the first instance I came to write this because a pair of academics from Bristol put forward a theory in the Spring of 2008 (reported in The Times of 31 March 2008¹) that the planisphere - illustrated in miniature on the title page here - was actually a 'field note' of a sighting of the asteroid plume that destroyed Sodom and Gomorrah. Having just inspected the astrolabe myself some months before, this didn't fit. This response to their conclusions is quite demandingly academic in places because I have to argue my case logically. But in passing it throws light on the really important concept of Correspondences lying behind Cosmokrator, and I do not underestimate the general reader's capacity to absorb difficult knowledge!

The truth about this fascinating object is a little more prosaic, yet in many ways a lot more interesting - and it has its basis in the widespread Babylonian use of a theory of correspondences - which included astronomy and astrology - whereby to understand phenomena and predict the future. In a way we could say that for them this was their Grand Unified Theory (GUT) of the Universe - something Scientists still seek today and believe they are on the brink of finding. The latter version, based on micro- and macrophysics, would fit into a row or two of the Babylonian Tables, and in my opinion certainly does not invalidate the old tradition!

Prediction in Mesopotamian Divination

In this two-part paper I propose, through the examination of a handful of clay tablets and associated comparative material:

firstly to deal with the evidence for an underlying Theory of Correspondences in Babylonian divination in relation to two Seleucid clay tablets in the Berlin Museum which have on them the remains of detailed tables of correspondences (Late Period evidence of the systematisation of what in earlier millennia would simply have been felt as rough connections between lists of things), and

thereby to consider an Assyrian clay astrolabe in the British Museum, understood by some scholars to be an astronomical instrument which can be checked against the Mul Apin Star List (the best copy is also in the British Museum) - and by others as 'merely' a divinatory device. Through its example we consider the standing of Babylonian astrology as the master discipline of prediction. Weaving in and out of our analyses we hope to point out where we think the recent claims of Bond and Hemsell² about Astrolabe K are wide of the mark - though some of their observations are useful.

¹ see www.timesonline.co.uk/tol/news/uk/science/article_3649054.ece

² A Sumerian Observation of the Kofels Impact Event Bristol 2008 - see Bibliography

I: Tables of Correspondences on some Seleucid Clay Tablets

'Mesopotamian zeal and industry in recording every conceivable object of a disordered imagination left no absurdity to oblivion, but furnished it with a significance in real life'
 Alfred Guillaume, *Prophecy and Divination* London 1938 p.219

Introduction

Today, as much as in the past, Mankind has attempted in all sorts of ways to look into the future in order to be ready in advance to cope with events. The week-ahead weather forecast given on Sundays on British television means office workers, so as not to be caught short in an unexpected storm, can decide accurately whether to take from their wardrobe cool, warm or waterproof clothes for the coming week - even if *sometimes* the forecast is wrong! There is an entire industry built around predicting future trends in the finance markets, let alone individuals' eternal quest to scry their own personal fate. Again, in many cases the predictions are fulfilled, but in other cases they turn out to against expectations (we know today from Chaos Theory that the slightest change in a sequence of concatenated events can lead to a totally different outcome). A huge body of knowledge about indicators of future happenings (some of them trivial, as Guillaume in the quotation above implies) was being built up and codified over three millennia in ancient Mesopotamia with such purposes in mind, ever aiming for increased accuracy and therefore certainty - the best of which, knowingly or unknowingly, we have inherited and built upon right on to modern times.

Halliday (1913) discussing the Babylonian heritage in Greek practice outlines the many media of prophecy for obtaining a declaration from 'the Gods' (the invisible³, higher levels of existence) used in the ancient world:

- Oracles obtained from spoken utterances at oracle centres mediated by priest or priestess (e.g. Delphi) in a state of ecstasy. Other languages could include the sounds of birds (the myth was that snakes, the animal of prophecy, licked the ears of children or seers to enable them to understand the language of the birds) or animals (the chance neighing of horses for instance);
- Visions - obtained via dreams⁴, or through the channelling of heightened energy awakened through dance, music and chanting or the absorption of mind-altering substances (from drugs to wine, blood, sulphurous fumes or sacred spring water);
- Throwing coins, knucklebones, dice or arrows (for Yes/No answers - see footnote 9);
- Scrying of shapes reflected in a crystal ball or mirror, or of substances in a bowl of liquid enhanced by swirling oil, egg-white or ink (lekanomancy) - or smoke (and mirrors!), or even looking symbolically at whatever is in the field of vision at the time a question is asked;
- Animal behaviour, such as bird flight (augury) (even today we know erratic cat or bird behaviour in a city (San Francisco) can herald an earthquake);
- Portents from abnormalities in animal, plant or seasonal shape or behaviour, especially in entrail or liver shapes (extispicy), or blood spurt patterns at the moment of animal slaughter;

³ The word 'occult' simply means 'hidden'.

⁴ Oppenheim's great book on dreams (see bibliography) emphasises how the many instances in the Bible of prophetic dreams link seamlessly to the Mesopotamian tradition.

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- Portents from involuntary human behaviour such as tingling limbs, ringing ears, shivering, itching - or sneezing (at which we still say 'Bless you' to drive away the evil spirit);
- Chance hearing of words spoken in the market place after unblocking the ears; random opening of scriptures; stabbing at a chart/map blindfold;
- Divining with rod (for water or a thief), or swinging pendulum (rhabdomancy);
- Visitations from the world of spirits or ghosts from the Underworld by sleeping near tombs and, finally,
- Portents from the interaction of the planets against the stars (astrology).

The Theory of Correspondences, basis of Religion and Magic

In the Greek world correspondences made between levels of existence were summarised by the Hermetics:

AS ABOVE, SO BELOW.

To be more than a system of intuitive guesses, two main considerations lie behind the development of methods of prediction into a more - or less - accurate science:

The first is the idea that an order of physical manifestation on one level mirrors events on a lower or higher plane (an obvious example is trees with buds that are indicators of Spring's arrival, seen by the mystics as analogous to the starting note of the octave at C, or the first colour of the rainbow, red⁵ - along with the allocation of a number to each note and colour⁶, red being seen as the first in the octave, thus given the number 1. To give an idea of the study of correspondences in its most straightforward form, the diagram below gives well-known links which go all the way back to roots in the Babylonian world⁷ (transmitted to the West by groups such as the Pythagoreans) and still commonly accepted even today. This gives seven-fold octaves of several levels of manifestation showing the natural sympathies between the colours of the rainbow, musical notes, the planets, metals⁸, the days of the week, and even vowels⁹ - from which the harmonic ratios between them can be calculated (4th row):

⁵ Indeed, new, young growth is pink or red!

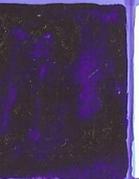
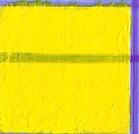
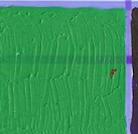
⁶ See C J Gadd 'Omens expressed in Numbers' 1967 JCS XXI 52-63

⁷ For the importance of 7-fold categorisation in the Mesopotamian approach to ordering levels of existence see under Johannes Hehn in the Bibliography.

⁸ To take two very obvious sets of correspondences that go right back to the earliest centuries of Mesopotamian culture, Langdon (see bibliography) cites several examples of the Sumerian, Kassite or Babylonian equation made between Gold/ Sun/Enlil, and Silver/Moon/Ea which is not difficult to accept today for anyone who has a sense of metaphor - or describing one thing in terms of another.

⁹ (with implications for the purpose and efficacy of words used in spells and incantations!)

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0	1	2	3	4	5	6	7	∞
Note	C	D	E	F	G	A	B	=
Solfa	Do	Re	Mi	Fa	So	La	Ti	Do ¹
Indian	Sa	Re	Ga	Ma	Pa	Dha	Ni	Sa ¹
0	1:1	9:8	5:4	4:3	3:2	5:3	15:8	1:2
Vowel	A	R (L)	E/Y	I	O/W	U	H (m)	Union with God
⊕	♁	♂	♃	♄	♅	♆	♇	♁
								
Day	Tues	Weds	Mon	Sun	Fri	Thurs	Sat	Week
↑ SILENCE ↓								↑ HARMONY ↓
Day	Earth	Mon	Tues	Weds	Thurs	Fri	Sat	Week
	4	3	1	2	6	5	7	∞
								
	4:3	5:4	1:1	9:8	5:3	3:2	15:8	1:2

III 1 A basic Seven-fold TABLE OF CORRESPONDENCES showing sympathies between the numbered Notes of the musical Octave; the Colour Spectrum; Vowels; Planets and Days of the Week and the ratios between them. Resolution and harmony occurs at Note 8 (which is at the same time Note 1 of a new octave)

By the time we reach the end of this discussion we could insert a further row into this table of concordances to the different parts of the liver (See Appendix C). Poseidonius, writing in the 2C BC, wanted “to prove that all parts of the cosmos are linked together by a natural affinity, or *sympatheia*”. This makes it possible, he

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writes, “for the shape of a sacrificial animals’ liver to have a bearing on the outcome of a battle”¹⁰) The table above could be subdivided into semitonal subdivisions (12 divisions), quarter-tones (22 or 36 divisions) and even micro-tones (56 subdivisions are known in some disciplines¹¹).

The second principle, leading to effective prediction, is the constant study of the interrelationship between such levels of phenomena - ultimately governed by the master-discipline of astrology - in order to cross-check on the reliability of such correspondences. In the beginning these would have been built up according to observation, then allocation on a trial and error basis until confirmed. For the Babylonian world this amounts to an early stage of what we in the West call ‘the scientific method’ whereby theories are checked and parts of the whole confirmed or reassigned on the basis of case studies over centuries of testing and experience. As Georges Contenau (1940) put it,

‘...l’astrologie est la seule mantique qui soit l’objet d’une méthode ne laissant rien au hasard et que le principe sur lequel elle s’est appuyé de tout temps se vérifie de plus en plus par l’expérience’.

The most obvious example of this is the observation, over centuries and millennia, not only of the annual cycle of the Sun and the monthly cycle of the Moon (key indicators for the passing of the year), but also those of the other planets¹² and of the stars against which they pass (Astronomy) - and then their annual, monthly, weekly and daily *effects* upon life on earth, both singly and combined (Astrology). The structure of the year, usually given as months - at times correlating exactly with the twelve signs of the zodiac¹³ - was aligned on a regular basis in a twelve-columned table to the ruling planets and their influence, and following on from that to plants, animal behaviour, semi-precious stones and many other phenomena - all this in the cause of trying to prevent things going wrong by treating them as both omen - and cure. If they worked, they became part of the certain body of knowledge passed on by professional astronomers, astrologers, doctors and soothsayers. We know its practitioners jealously guarded this hard-won cumulative knowledge of ‘the secrets of nature’, quite reasonably deeming that ‘only the qualified’ should either know it, or use it¹⁴.

Hopefully with their permission from beyond the grave, we now consider actual Tables of Correspondences scratched onto two clay tablets - originally from Seleucid Uruk - that were purchased from dealers by the Berlin and Louvre Museums before the outbreak of WWI when a certain amount of material was being

¹⁰ Ulansey (1997) p.73, quoting John Dillon: the Greeks inherited all Babylonian traditions of this kind, and clarified them further.

¹¹ Weidner (1956) fig.1 discusses BM 33333B, a damaged tablet of the Seleucid period with squares used for divination by throwing knucklebones or dice, giving 56 combinations or potential answers relying especially on bird and star links. Tables for increased divisions are explored further in later Cosmokrator books (www.cosmokrator.com) due out 2010-30.

¹² Most notably the nature of the cycles of Venus, in relation to Sun and Moon cycles, was systematised by the Babylonian astronomers and written down in the tables written up in the reign of Ammisaduqa (one damaged copy is in the B.M.). It was then possible to predict what Venus would do in the sky for hundreds of years ahead.

¹³ See Appendix A. A system of 12 months to the year is recorded as far back as the Uruk IV tablets of the 4M BC.

¹⁴ Rochberg 2004 pp 212-19

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siphoned off illegally as the site lay undefended. They therefore have no precise stratigraphic provenance but almost certainly derive from the library of clay tablets built up under Seleucid rule at Uruk.

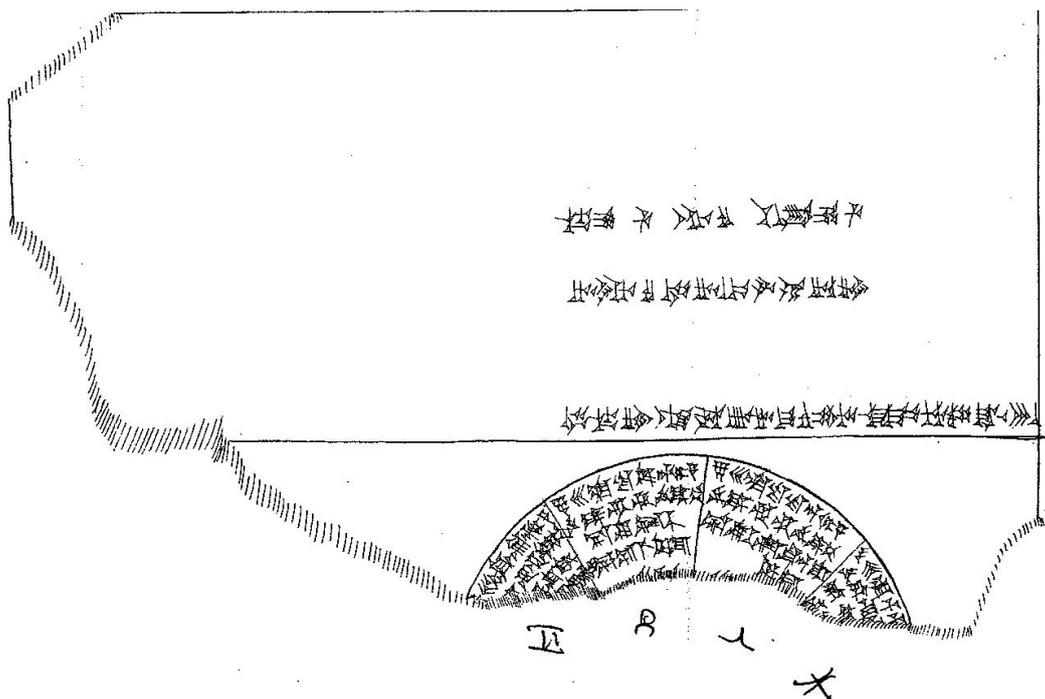
The Seleucid Tablets

According to Ernst Weidner's analysis¹⁵ two clay slabs in the Berlin Museum showing engraved astronomical illustrations and featuring the remains of tables of correspondences underneath are the only remaining tablets of what was once a complete zodiac set inscribed on anything between 8-11 tablets. They were copied at the time of Antiochus (regnal year broken off), and there is mention on one of them of breaks in the much older tablet in the Uruk library that the Seleucid scribe was copying from - *evidence that the information on the tablets dates back to an earlier period*¹⁶. Scholars can also tell from the old-fashioned vocabulary used that although dating to the 2C BC the information on the tablets goes back centuries earlier.

FIRST TABLET (VERSO) SHOWING TAURUS ♉

Weidner notes on the very top, thin edge of both tablets the words *May Anu and Antu grant success*¹⁷.

The first tablet is devoted to the zodiac sign of Taurus on the front (recto) whilst on the back (verso)¹⁸:



Ill 2: Clay tablet for the sign of Taurus (verso, upside down) - Berlin Museum VAT 7851

there is a broken-off circular zodiac, on which Weidner states that only the sections for Pisces, Aries, Taurus and Gemini remain, numbered 6, 7, 8 and 9. Interestingly, from the size of the sectors it looks more like an

¹⁵ E Weidner *Gestirn-Darstellungen auf Babylonischen Tontafeln* (hereafter abbreviated as GD).

¹⁶ *We shall see shortly that we do not have this kind of evidence in the case of Astrolabe K.*

¹⁷ Exactly akin to the Islamic *In the Name of God the Merciful, the Compassionate* at the start of a document.

¹⁸ We have deliberately placed it with the flat edge at the top to correspond with our reproduction of the top side, even though this puts the text upside down.

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8-fold, rather than 12-fold, zodiac so that some of the sectors should have covered slightly more than one sign as we shall see is the case for Astrolabe K.

Remembering that our reproduction is upside down so that the right angle made by the straight sides is still at the top in relation to the recto (next illustration), the lines in the empty space above the zodiac say that the next tablet will start with an account of a lunar eclipse in the sign of Gemini, so we know what to have expected from the next tablet, now missing, whilst underneath the scribe who compiled the tablet signs off

'Tablet of Anu-aḥu-iddinu copied by Anu-mukīn-apli

Whoever respects the God Anu, may he not steal this tablet, and may no-one unqualified look at it'.

The text remaining in each zodiac section concerns the fate of children born at the time an eclipse takes place in that particular sign, as follows:

- ♋ 6: *If an eclipse takes place in Pisces...;*
- ♈ 7: *If an eclipse takes place in Aries, the child born will from his mother's body 'der männliche Steppengeist reissen*;*
- ♉ 8: *If an eclipse takes place in Taurus, the child born will from his mother's body 'die Gotteshand reissen*;*
- ♊ 9: *If an eclipse takes place in Gemini... .*

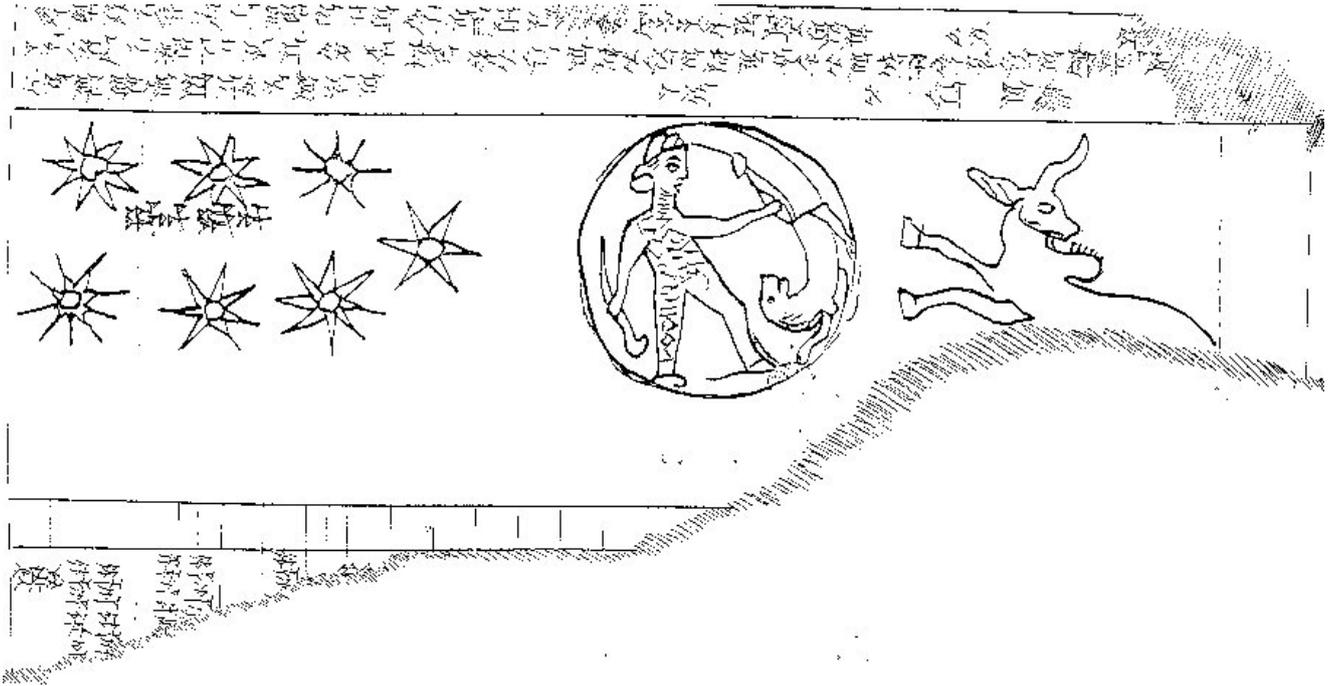
* loss in translation to the German by Weidner would be lost further by putting these phrases into English

RECTO

Turning back to the upper side of the tablet,

- the text above the pictures is a report of the extensive omens to expect for the ruin of Elam in the event of an eclipse happening in the month Iyyar during the Sun's journey through Taurus. It matches a corresponding text in **Enuma Anu Enlil**. The fact that each zodiac picture is introduced by a report of an eclipse with (usually) dire consequences led Weidner to the conclusion that Eclipse *omina* had been extracted from a local Uruk set of **Enuma Anu Enlil** and allocated as headings to each sign of the zodiac, slightly artificially since the text does not always 'fit' with the picture.
- At the very bottom is just the corner of a table which would have stretched across the whole tablet, with just a few decipherable words left. The columns correspond to 2.5 days of the month each, and the zodiac signs are divided up into micro-decans. The first column has the heading 'Taurus' and the next column 'Gemini', so the microzodiac table begins with the sign for which we have the picture above. We will understand what it would have looked like complete when we consider both sides of the second tablet.
- Between the two zones is a trio of drawings, the one on the left provided with a cuneiform label:

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Ill 3: Clay tablet for the sign of Taurus (recto) - Berlin Museum VAT 7851

- on the right is a prancing zebu bull, its hump marked with bristles;
- in the centre a figure with club grapples with a lion, both fitting into a disc, as if to convey the idea of a waxing and waning Moon - by convention exalted in Taurus;
- At the left is a group of seven stars arranged as three pairs and a single between the rows at the end, labelled in cuneiform as *MUL MUL/MUL ZAPPU* (conventionally translated as the *Pleiades* but not proven - it is a puzzle which of several prominent seven-star groups they could refer to).

The Seven-Star group appears in the same arrangement on Neo-Assyrian seals four centuries earlier showing scenes of high ritual - but once also in the rural ploughing scene below, along with Venus and the Moon.



Ill 4: Neo-Assyrian black serpentine sealing c.650 BC - Ward Pierpoint Morgan Coll 1909 no.633

How do we read the iconography of the scene? It may seem obvious to read it literally, but later we will show there is room for decoding the whole of it as an astronomical reference to the start of the New Year. It would be the work of a different paper to systematically run through and prove which stars the Seven-Star

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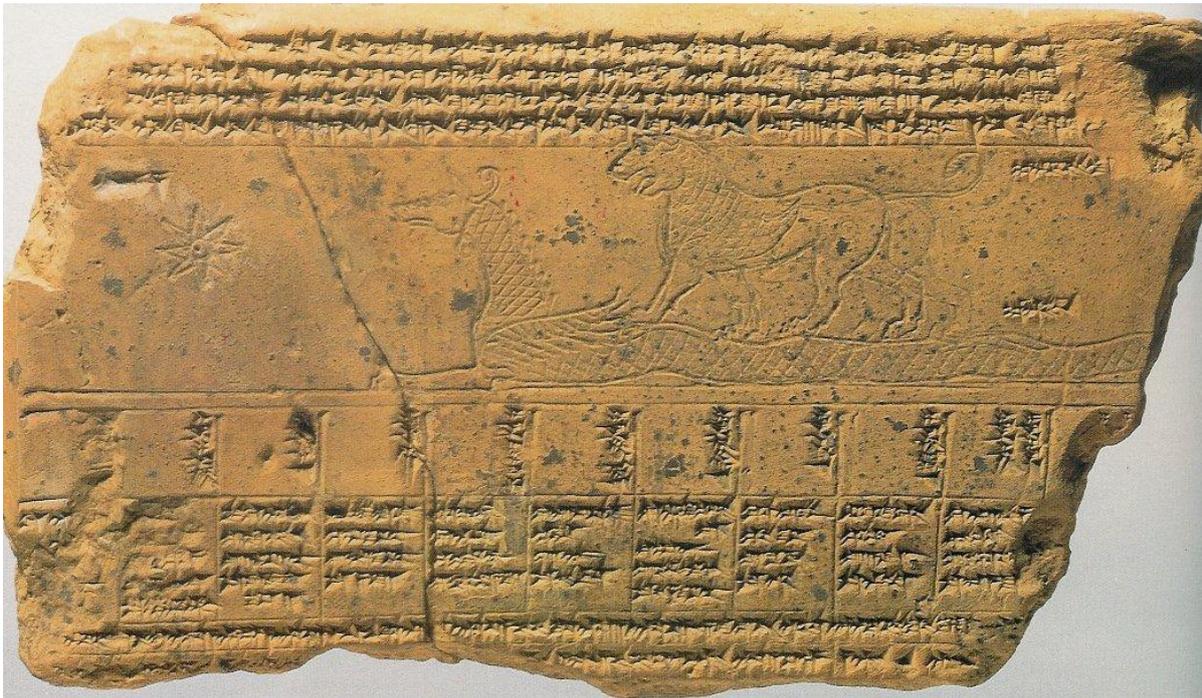
group does represent¹⁹ There is no doubt that it is of iconic importance, and to cut a long story short, I believe it refers to the first star group mentioned on the Mul Apin Star List - MUL APIN itself.

We have now thoroughly examined Tablet 1 without fully interpreting it at this stage and turn immediately to Tablet 2, since its patterns of presentation will reveal more about Tablet 1.

THE SECOND TABLET (RECTO) SHOWING LEO

Along the top, as with the Taurus tablet, are lines of text describing the dire effect of a lunar eclipse if it occurs in the sign of Leo - resulting in widespread famine and destruction for the kingdom of Akkad if the benign planets of Venus and Jupiter are absent from the sky.

Below is a line drawing showing Leo (signs of a redrawing are evident), labelled *Urgula*, striding over Hydra, labelled *Muš*, and a star on the left representing Jupiter, labelled *Sagmegar* (or *Sag-uš*). Weidner explains the presence of Jupiter here as due to its exaltation in Cancer, which Hydra often stands in for since the stars of Cancer above are so faint. In other words, two signs - Leo and, by implication, Cancer - are referred to on one side²⁰. The lion walks over the winged Hydra which has a head remarkably like the Sarrush on the Ishtar Gate of Babylon, giving food for thought that perhaps the Sarrush does indeed refer to Hydra/Tiamat beneath Leo as marking the domain where Marduk/Jupiter is in exaltation, or maximum influence.



Ill 5: Clay tablet for the signs of Cancer and Leo (recto) - Berlin Museum VAT 7847

Comparing the direction of the heads of both Leo (with Cancer in front) and Hydra with the actual stars below, we realise that on the tablet they are depicted in reverse, pointing west rather than east.

¹⁹ We aim to do this in the last two chapters of our book on the Ancient Near Eastern Canon of Art which over the coming decade will be posted on our website www.layish.co.uk.

²⁰ Other tablets could have done the same - which is why Weidner posits as few as 8 and as many as 11 tablets to have made up the set.

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What is amazing is that, as Weidner describes in **GD**, a join was made between this piece and a tablet in the Louvre - revealing the full extent of the tables which would have been shown under each sign to something *much* more considerable and comprehensive than Tablet 1 alone would have led us to imagine:



Ill 7: Almost complete Table of Correspondences restored by joining VAT 7847 with AO6448 (recto side)

But before describing the contents of the material in the rows underneath on AO6448 (and its twin on the back of it) we will take a quick look at the trio of astronomical drawings on the verso of the Leo tablet.

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THE SECOND TABLET (VERSO) SHOWING VIRGO ♍

On the Berlin piece for Virgo, again there is a description, this time very much damaged, of what to expect from a lunar eclipse if it occurs in Virgo in the month of Elul, with unfortunate results (again) for Elam.

Then in the drawing below Virgo, labelled *Ab-Sin*, holding the corn-ear star *Spica* faces the *Raven*, labelled *Uga*, shown pecking at the tail of Hydra which then runs on under Leo on the other side (the continuity is seen on the star map (Ill. 6 above). The star in the middle is simply labelled *Gu-ud*, the planet Mercury, placed here, Weidner explains, because Mercury is exalted in Virgo. This bears out the pattern which Weidner²¹ spotted on these tablets and other astronomical lists - that planets codified in lists and tables are placed against the sign of their exaltation (or enhanced influence) rather than in their rulership sign (Annex A lists the difference between the two) - both links being used in the Astrology tradition today²².



Ill 8: Closeup of Virgo with the ear of wheat in her hand, Mercury and Corvus - VAT 7847, verso

On the corresponding *verso* of the Louvre tablet joined to it (see illustration on the next page), we can piece together most of another comprehensive Table of Correspondences - which Weidner says more or less repeats the one on the Leo side but according to the overall plan starts this time with Virgo correspondences in the leading column. Although much of the information given in these two large tables is, according to Weidner, illegible or untranslatable, there is enough to convey an overall idea of how the whole set of tablets would have been drafted out according to this template²³.

²¹ *ibid.*

²² We could say Western Astrology is one of the longest unbroken oral traditions surviving into modern times.

²³ Weidner (1956) discusses a similar tablet, VAT 15377 (pl.vii) found in Babylon, without much information on it apart from scratched drawings of the principal Gods along the middle as would be found on boundary stones, and tables with lots of columns and rows ruled in with some zodiacal signs as headings but no further information in the cells themselves.



Ill 9: Almost complete Table of Correspondences on the Virgo side restored by joining VAT 7847 with AO6448

Content of the Tables of Correspondence given on tablet VA 7847 joined up to AO 6448

What we would not have guessed from the Taurus tablet is that each sign would have had an extensive table like this running down below the main drawing for the sign and its accompanying planet of exaltation, with

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twelve headings allocated to each sign²⁴ for each month of the year. Appendix B gives a comparative table of months and signs using such headings. Although in the 2C BC the list associating Nisan with Aries would be the one we would expect to look at, as these two clay tablets are copies of earlier documents the signs and months we have actually correspond to the list where the month of Nisan is associated with Taurus as the first month of the year - *an indication of the authenticity of the original age of the texts*. In the rows beneath each heading the signs and months are, in Weidner's words:

[Mit] Je ein Tempel oder eine Stadt, ein oder zwei Bäume, eine oder zwei Pflanzen und ein oder zwei Steine verbunden. In den nächsten Zeilen (oder auch erst in einem späterem Abschnitt) werden allerlei nahezu undurchsichtige Zahlenkombinationen angestellt. Es folgen in dreimal zwölf Abschnitten persönliche und kultische Vorschriften und landwirtschaftliche Angaben. Jeder der zwölf Abschnitte wird durch eine Zahl abgeschlossen. Das ist das allgemeine Schema, von dem hier und da abgewichen wird. [GD p.6]

Unfortunately in this paper we cannot spend time reproducing in detail the tables in their entirety (with interesting variations here and there), and how tantalising that we do not have the complete set of zodiac depictions with their ruling or exalted planets and all the related tables of correspondences! We can only fill out other available possibility from other fragments, the most important of which, with very similar tabulated information, Weidner refers to as in the British Museum²⁵.

Erica Reiner refers to a variation on this kind of table which assigns healing ointments to each month and sign whose ingredients this time include animal body parts (a high proportion from birds):

For the first month, corresponding to the zodiacal sign Aries, the ingredients are blood, tallow and wool...; for month II (Taurus)... they are blood, fat or hair of a bull; for month III (Gemini) the head, blood and feather of a rooster; for month IV (Cancer) the blood and fat of a crab; for month V (Leo) lion blood, tallow or lion fur; for month VI (Virgo) barley flour, the head and feather of a raven; and so it goes on, with big gaps, for the rest of the zodiac, naming also goat, swallow, dove and eagle. [Reiner Astral Magic²⁶ p.116].

Cross-Disciplinary Divination and the Master Role of Astrology

The glimpses these tablets give us of the systematisation of correspondences between the signs of the zodiac, planets, plants, stones, weather, agricultural tasks and even temple sites at this late point in Mesopotamia's history is quite an eye-opener. It would take a brave scholar to try, from all the other plain textual sources we have, to tabulate it all in similar fashion into one master-table on the lines of our

²⁴ To spell it out again, there would have been a complete table under *each* sign, but *starting* in each case with the sign for that particular tablet. We can only see the top of the table for the Taurus tablet (VA 7851), and are just left with the two tables under Leo and Virgo from which to extrapolate what the other tablets would have had on them.

²⁵ Reproduced in Pinches *Late Babylonian Astronomical Texts* no. 1580.

²⁶ Hereafter abbreviated to AM.

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illustration 1, though these days with a computer and using an Excel table it is feasible!²⁷ There is a huge amount of material giving lists of plants, herbal medicines, stones, substances which evidently over centuries were being related to each other into larger and larger cross-referenced lists such as the tables we have on the two sides of the Leo/Virgo tablet. The fact that they come from Uruk at such a late period is evidence for the stage of interconnection being worked on by Greeks in cooperation with Neo-Babylonians at the end of an ancient tradition going back to the Sumerians where, as we mentioned above, correlations were already being made between Sun-Gold-Enlil/Moon-Silver-Ea - and Venus-Copper-Anu - remaining embedded as further elaborations ensued. Apart from straight lists of stones, or plants, or animals, of the full panoply of correlations on the scale of these two Seleucid tablets that would have been written in for the other signs missing from the Seleucid suite, we have only disparate fragments from other documents - some mentioned by Weidner, and others collected by Erica Reiner in both her **AM** and **Uses of Astrology**²⁸. One set of correlations of capital interest collected by Reiner, not easy to decipher and found on an obscure and poorly preserved tablet also from Uruk, allocates regions of the liver to months and associated signs of the zodiac²⁹ - for cross-referenced divination between astrology and extispicy:

[It] enumerates the parts of the liver (with which the gall bladder is also customarily associated as the Sky itself) - and the marks on it- giving for each a correspondence with a god, a month, and a constellation. To quote some of the better understood lines:

- The 'station [mark]' is Enlil, Month I ...
- The 'path' is Shamash, Month II ...
- The 'sweet mouth' is Nusku, Month III - **Orion**
- The 'strength' is Urash, Month IV - **Cancer, Plough**
- The 'gate of the palace' is Nergal, Month V - **Regulus**
- The 'bubble' is the storm god Adad, Month VI - **Corvus**
- The gall bladder is Anu, Month VII, **Libra** ...
- The 'finger' is ..., Month VIII, **Goat Star** ...

The last two elements of each entry refer to the month and the zodiacal sign associated with it: these are standard, and some recur in the MIL APIN List. The novelty of this unique text is its establishing correspondences between the liver examined by the haruspex and the heliacal risings of the constellation.

[Reiner AM p.78]

It is worth remembering that In **Enuma Anu Enlil**, once Marduk has split Tiamat in two, her upper half becomes the sky where 'he established the zenith in her liver'³⁰.

Of all the possible levels of correspondence the master instrument of prediction under which all other levels were increasingly aligned, were Astronomy and Astrology because they revealed the movements of the realm of the Gods themselves at the highest level of causation. As Reiner (1985) explained in 'The Uses of Astrology'³¹ (her Presidential address of that year to the American Oriental Society), and expanded in her

²⁷ On www.cosmokrator.com I present a 3-D model and accompanying books which go some way to showing the many zones of life such a master list can apply to, with strong harmonic results if applied knowledgeably.

²⁸ Henceforth abbreviated to **UA**.

²⁹ Appendix C reproduces the transliterated text from the relevant volume of the **AUWE** set summarising all the Uruk material.

³⁰ *apud*. Heimpel 1986 p.134

³¹ Abbreviated as **UA**

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Astral Magic, this science (or art) was increasingly used with less precise forms of divination to set the seal on a decision or prediction - and *vice versa*, as in the following instance, one of the best documented cases of cross-checking divination she refers to.

Nabonidus himself³² described what happened at the occurrence of an eclipse. Just as the two Seleucid tablets we began with start with the description of an eclipse above the zodiac drawing, so [when] “*on the 13th of Ululu, the month of the work of goddesses, the Fruit (Moon) became eclipsed and set while eclipsed [this meant] His sign and decision were - “Sin requests a high priestess”*”. But his priests felt the omen of an eclipse in that sign (possibly after consultation from just such tablets as we have just analysed) was not sufficient. At this juncture an extispicy was performed to confirm the astrology and double-check whether this was indeed what should be done. Nabonidus reported: “*Shamash and Adad as usual answered me a reliable yes*”. Only then did Nabonidus have a new high-priestess sent to the Moon Temple - indeed it was his own daughter. As Reiner concludes: ‘No doubt he consciously imitated the Sumerian practice of binary consultation in regard to the choosing of a high priestess...’. So it was not such a new practice after all, as this is again a referral back to ancient tradition in methodology to gain certitude.

Reiner describes how, whatever simpler form of divination was used (see the categories listed at the very beginning of this essay) prayers and rituals were then addressed to particular stars, or substances irradiated with their light overnight, to reinforce and set the seal on a good result, the countless vivid examples of which we have run out of space and time to describe here. Increasingly Astronomy in alliance with Astrology was proving itself as the tried and tested discipline beyond all others.

The Mul Apin Star List and its Contents

We have a mixture of both Astronomy and Astrological omens in a key cuneiform document, the Mul Apin Star List, the best copy of which (covering both sides) is in the British Museum. We need to linger over it briefly by way of transition to the second part of this paper.

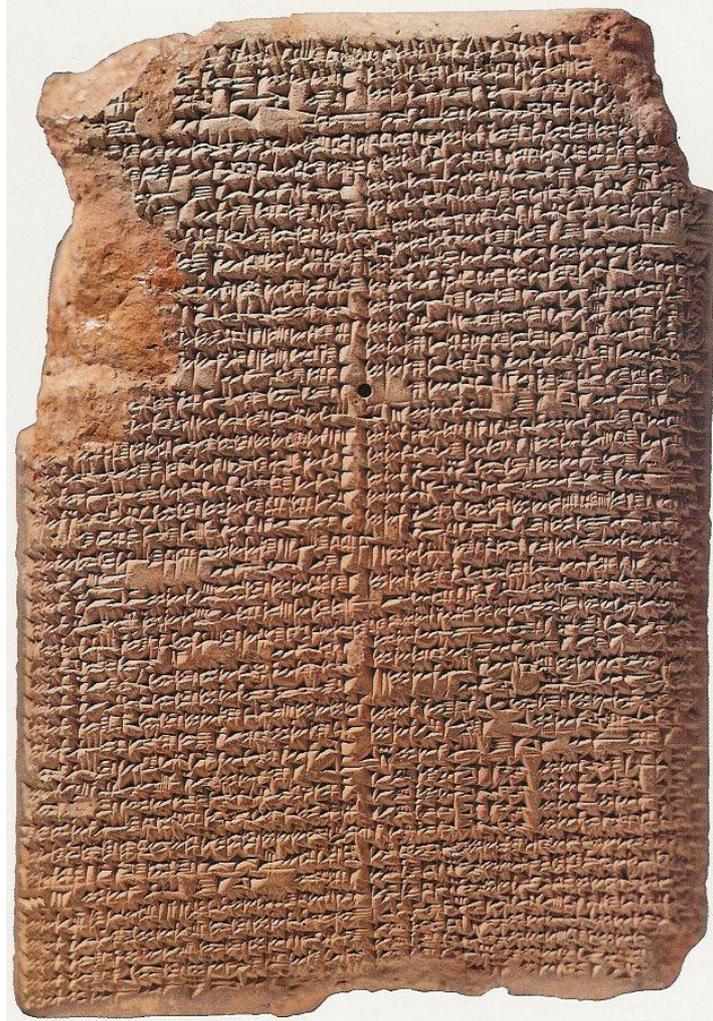
In Mesopotamia observation of star positions gave the backdrop against which to observe the short-term time indicators - the planets. The main preoccupations of the Mesopotamian astronomers that we learn from an overview of the contents of the Mul Apin Star List were to measure and then forecast:

- Solar cycle - Days/Years
- Lunar cycle - Weeks/Months
- Venus cycle - to integrate Solar and Lunar cycles
- Integration of all other planetary cycles to Lunar/Solar/Venusian
- Observe movements of planets against stable backdrop of the stars in order to measure and then predict their timing.
- Thence to predict the start of the New Year, and

³² Recounted in Reiner AM pp76-77

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- Thence give dates for the start of the Four Seasons/Quarters of the Year at the Solstices and Equinoxes.
- Draw conclusions about omens in the above that could affect the kingdom.



Ill 10 Clay tablet showing the Mul Apin Star List British Museum (BM 86378)

A brief overview of the content of the MUL APIN document³³ reveals how it covers these issues. Most copies are 6C BC in date or later, but it incorporates observations made c.1200 (some argue even that some of the observations go back to 2300BC or even earlier). It is evidently a patchwork of centuries of observation which led to an understanding of recurring patterns in planetary and stellar positions - and thence their possible effects on events on earth. We can do no better here than give Hunger's³⁴ summary on his page 13:

³³ From remaining almost complete copies, and fragments of others (adding up to a total of 40 pieces) - see Hunger and Pingree's analysis of the subject matter duplicated on each - it is wellnigh certain that the full Mul Apin text was written in two columns of closely gouged Babylonian cuneiform on two double-sided tablets. Ill.17 above shows the completest version of Tablet I (BM86378): Tablet II (BM42277) is also in the British Museum and not usually given as much attention as the main body of the material on Tablet I.

³⁴ Hunger & Pingree 1989

Section	Tablet/Text section and line numbers	SUBJECT	Hunger/ Pingree start page number
A	I i 1 to ii 35	Catalogue of Stars	137
B	I ii 36 to iii 12	Dates of Heliacal Risings	139
C	I iii 13 to 33	Simultaneous Risings and Settings	140
D	I iii 34 to 48	Time Intervals between dates of heliacal risings	141
E	I iv 1 to 30	Ziqpu Stars at Midnight	141
F	I iv 3 to II I 8	Path of the Moon against the Stars	144
G	II i 9 to 24	First Intercalation Scheme	150
H	II i 25 to 37 & 68-71	Heliacal Risings and Wind Directions	152
I	II i 38 to 67	Planetary theory	146
J	II A 1 to ii 20	Second Intercalation Scheme	152
K	II ii 21 to 42	Shadow table	153
L	II ii 43 to iii 15	Water clock measurements	154
M	II iii 16 to iv 12	Omina	145 & 150

Ill 11 Summary of Contents of the Mul Apin Star List (BM 86378)

Quite clearly the Water Clock and Shadow measurements are comparatively recent inclusions, whilst the weather observations need not concern us here. Along with the basic star list, the heliacal risings and ziqpu stars with their dates are of great interest, and of key importance beyond these are the simultaneous risings and settings, the description of planetary behaviour and the two intercalation schemes on which the timing of the New Year Festival depended. Thus the preponderance of the information given on the table is purely astronomical. But interwoven, and also taking up the very last section of the tablet are the Omina - predictions of what will happen on earth below if certain astronomical phenomena occur.

Stars, Animals, Gods and Planets

We should therefore never forget the comprehensive *sympatheia* seen in Mesopotamian culture between the Gods, their corresponding heavenly bodies and their totem animals retained from the Neolithic era.

The stars and planets themselves are seen either as domesticated sheep or cattle (fixed stars) or wild sheep (planets)³⁵. In Sumerian literary texts, the stars are likened to the cattle of the Moon and their milk, as in this Akkadian hymn to Sin, the Moon God:

How many they are, how many, many are the cows!
 How many, many are the wild cows, Sin!
 The dark ones are translucent lapis lazuli,
 The light ones of the cows are the rising moonlight
 The small ones... before you like grain

³⁵ Heimpel Festschrift Sjöberg_249-52

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The large ones are many before you like Aurochs³⁶
 The many cows in his many pens
 He, the splendour of heaven, releases from the tether
 Their yellow milk he pours in the churn.....
 He himself exercises herdsmanship over the cows

Another Sumerian hymn translated by Mark G Hall³⁷, this time addressed to the Moon God as Nannar, is almost entirely devoted to describing the various types of livestock in his herds, which are counted by Nisaba, the Goddess of Writing and Counting, and divided into 7 groups, each allocated a number, notably:

White cows and cow bulls	3 x 36,000 plus 5 x 3,600 each
Female and male calves	3 x 36,000

Altogether there are 15 x 36,000 plus 15 x 3,600 (i.e. 594,000 animals), plus a group of 4 (sixties) x 5 each (therefore 5 x 5), giving a total of 6,000. Added to the number for the white cows and cow bulls, a grand total is reached of 600,000 head of cattle, allocated to various parts of the sky ('4 pens/4 pen-houses of 6 acres'). In charge of the cows are 7 falcon herdsman and 4 who live among the cows (the latter referring, according to Heimpel, to the planets Jupiter, Mars, Saturn and Venus, who move amongst them).

These vast levels of correspondence should always be held at the back of our minds when dealing with any one of the factors on their own - to remember that in the Assyrian, Babylonian or Seleucid mind these were so obvious that these interrelationships were so basic that they were rarely spelt out.

INTERIM CONCLUSION

As Frederick Cryer (1994) puts it, 'only sparsely attested in the second Millennium, astrology eventually supplanted extispicy as the pre-eminent form of Mesopotamian divination.'

Where we could say our two Seleucid tablets consist of drawings with labels that are astronomical in character, and the remaining 80-90% of the information on them astrological and divinatory, in the case of the Mull Apin Star List it is the other way round: we could say that just 10% of the material is astrological and divinatory in character, and the rest purely observational and 'scientific' - yet most of it is put down with a view to predicting the future.

We will now proceed to use some of the information in the Mul Apin Star List to test the content of another clay document in the British Museum (round in shape) which suddenly became topical after it was reported on March 31 2008 in The Times that two amateur authors in this field from Bristol, Alan Bond and Mark Hempell³⁸, were claiming in a recently published monograph that it was a record made in Sumerian times, copied in the Assyrian period, of the sighting of the asteroid plume that had destroyed Sodom and Gomorrah in the Levant. Their map shows that the path of the Köfels asteroid (well-known in current astronomy circles) which they link to this famous Bible event did not cross Sumer or Palestine but ran north up the Red

³⁶ Sjöberg (trsl) Mondgott 1: 1-10, 14

³⁷ JCS XXXVIII 1986 152-166

³⁸ A mechanical engineer and an astrophysicist respectively.

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Sea, over Sinai, then across the sea to Greece and into Austria where at Köfels (not Sodom) it hit a mountain. Though they say the destructive *plume* would have been visible from Sumer, near the end of their book on page 103, on their own admission they write:

'The observer seems to have recorded this but regrettably that part of the tablet is missing'!

Having in the first part of this paper established some basic approaches and truths about a few astronomical tablets we move now to analyse this circular document ourselves. The issue will be to decide from its scrutiny what balance of information on it is astronomical, and whether to any extent it might have been used as a divinatory instrument as well. In the process I will draw in any helpful information other scholars have put forward- Bond and Hemsell as well - that can help us make a judgement.

II: Astrolabe K: Planisphere, Divinatory Instrument or Record of an Observation?

One of the earliest clay documents ever found at Nineveh and brought back to the British Museum by Henry Layard was a damaged clay planisphere³⁹ - fitting neatly into the palm of the hand and described by Theophilus Pinches as 'Astrolabe K'. Engraved on it is a representation of the sky divided into *eight zones* with dot and line diagrams, some cuneiform captions, and further lines of repeated syllables.



III 12 Astrolabe K (missing quadrants restored by similarly coloured clay) - British Museum BM K8538

³⁹ We can buy a plastic planisphere today in order to hold it up against the sky and match the star map on it with the real stars above, so as to locate and identify what constellations we are looking at.

Initial Orientation of the Planisphere

It goes without saying that in assessing this instrument we need mentally to put ourselves in the position of astronomers using naked-eye observation techniques only, and should not superimpose any modern astrophysical knowledge the Assyrians did not have.

Koch (1989) states that Röllig wrote to him of Astrolabe K, 'Der Text is ja offensichtlich in Nineveh gefunden worden. Wenn er noch irgendeinen Sinn gehabt haben soll, muss er ja auch *dort* [this author's italics] verwendet worden sein'⁴⁰. This observation led Koch to calculate his interpretation of the star diagrams on the so-called astrolabe as relating to the latitude of Nineveh at 36°. As Nineveh had fallen in 612 BC some years after the reign of the last great Assyrian King Ashurbanipal (668-627) from whose library it came, he assigned a rough date for the time of its use to c.650 BC. There is no *obvious* evidence on it (a scribe saying he had copied it, as we have for the Seleucid tablets) that this is an Assyrian copy of an event observed from Sumer almost three millennia before, as claimed by Bond and Heimpel (2008)⁴¹. As we proceed to analyse the information on it closely we shall simply work on the hypothesis that this is a straightforward planisphere - with one special section serving a specific calendrical purpose every year.

For consistency we will orientate all illustrations of Astrolabe K⁴² with the SW-NE direction on the horizontal, with the supposed SW to the left, to make comparison with a modern star map easier. In the Northern Hemisphere, during a period one month either side of the Winter Solstice, a clearly obvious diametrical line marked by bright stars runs in this direction at night, running parallel with the horizon and threading in and out of the main sweep of the Milky Way:



III 13 The sky divided into two halves by the Milky Way, backdrop to a SW-NE chain of stars

We should mention here Bond and Heimpel's interesting thought that the syllables AN (Sky) with NA (Fine Smoke) on the planisphere refers to the Milky Way.

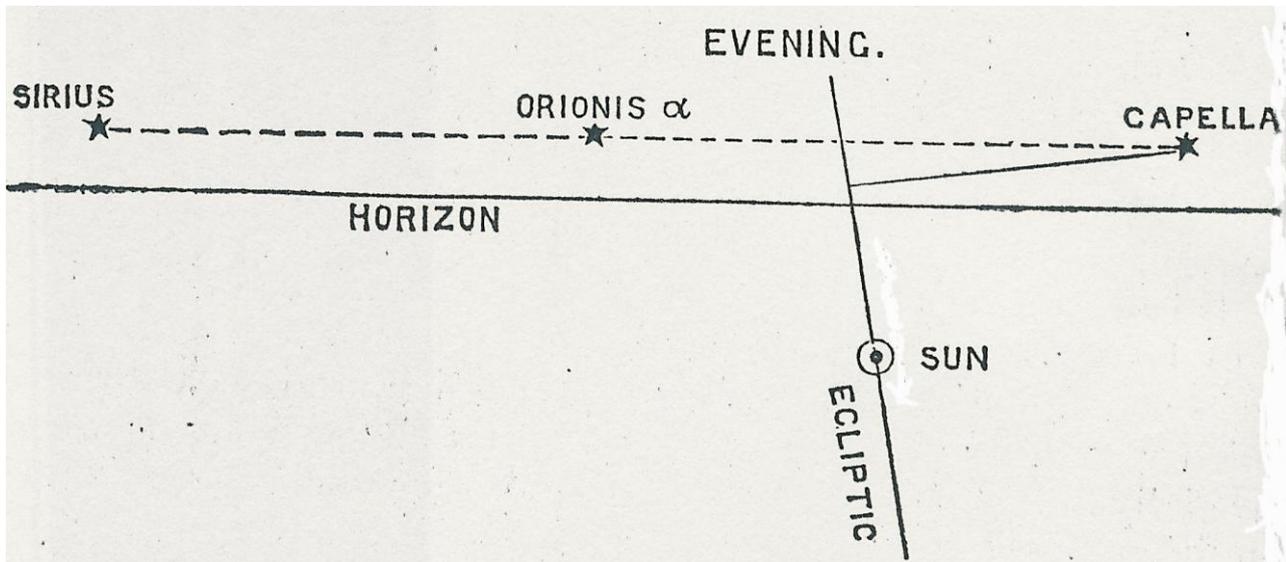
⁴⁰ Bond and Hemsell reckon the observation was made far to the south of Nineveh in Sumer, and that Astrolabe K is a 'field notebook'.

⁴¹ But we could argue that the 8-fold division of the sky, as in Ill. 2, *does* signify antiquity - indicating a carve-up of the sky to synchronise with the Venus synodic cycle which we aim to demonstrate in our book on the Ancient Near Eastern Canon of Art.

⁴² It was first reproduced in CT XXXIII (1912) on pl.X, and a description given of it by L W King (but no interpretation).

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What did this diameter across the sky signify to the Assyrians who made Planisphere K? In their first paper (S&B1) on Babylonian astronomy⁴³ preceding their second paper on Astrolabe K (S&B2), Sayce & Bosanquet had calculated that in the Assyrian period, as in centuries before, Capella must have marked the 0° longitude line⁴⁴ linking it to Betelgeuze and Sirius - their illustration for this alignment is shown below on the same SW-NE alignment as the star map above for ease of comparison:



Ill 14 The 0° meridian - S&B-1 p.460

We have sympathy with S&B's conclusion that this also features on the planisphere as the equivalent of the 0° line of longitude, the Greenwich Mean Time line of its age, providing a clear starting line from which to proceed around the rest of the sky as the year moves on - and for us to pin down what else is marked on the disc. This is why we are placing this presumed line on Astrolabe K to run horizontally across the page so we assess everything else in relation to it.

In comparing S&B's diagram with the star map just before, there are other obvious star lineups we could follow. For instance there is a much more direct line-up than that between Sirius, Betelgeuze and Capella - running from Sirius to Betelgeuze and then Perseus (*Šhugi*⁴⁵), the falling man who seems to cascade down into the sky, making a continuing zig-zag from Cassiopeia, with Andromeda her daughter (Anunitum) falling further down below him. There is an even stronger line running from Sirius along Orion's Belt to Aldebaran and the Pleiades, the Seven-Star group which we have seen in Part I could be the stars featured on the Taurus Seleucid tablet (Ill 3). There is a huge amount of evidence that all three of these fiducial⁴⁶ lines - all in the

⁴³ H M Bosanquet and A H Sayce published three linked papers on Babylonian astronomy which we refer to often:
 1. 'Preliminary Paper on [the] Babylonian Astronomy' *Monthly Notices of the Royal Astronomical Society* XXXIX, 8 June 1879, 454-461 (abbreviated to S&B1);
 2. '[The] Babylonian Astronomy 2' (notably on *Astrolabe K*) *MNRAS* XL, 3 January 1880, 105-123 (abbreviated to S&B2),
 3. and '[The] Babylonian Astronomy 3: The Venus Tablets' *MNRAS* XL, 9 July 1880, 565-78 (abbreviated to S&B3)

⁴⁴ Some scholars doubt the Assyrians knew about longitude: possibly not in the modern sense, but they must have used orientation lines linking stars, and they must have had a starting points somewhere in the sky from which to measure changes.

⁴⁵ c.f. Ill. 3.

⁴⁶ *Fiducial* simply means 'point/line of reference'.

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same sky field and starting at Sirius - were used for orientation by Assyrian and Babylonian astronomers. Being such prominent star chains we might expect one or other (or all) of them to feature on Astrolabe K. Ultimately the aim is to read off the information on this disc with enough accuracy to be able to link it to any star map today. But for the immediate task in hand we still have two preliminary questions to resolve.

For what Observation Time are the Star Names given on Astrolabe K?

The main viewing times of star positions in ancient astronomy were at dawn or evening twilight:

1. at Dawn, when the most visible star nearest the rising Sun on the horizon was seen rising as the star opposite set, (*heliacal rising*);
2. at Sunset, when the most visible star *nearest the setting Sun* on the horizon was seen rising as the one opposite set (*acronyca*).

Sayce & Bosanquet comment that 'The frequent mention of the rising of stars confirms us in the opinion that the *heliacal* rising was the phenomenon by which they were chiefly classified'. It could well be more likely that it was the *acronyca*, or *evening*, rising of stars which was taken as the benchmark time of day for noting star behaviour and measuring the year, as they stay visible longer as it gets darker. The difference between the two observation times is no less than a seasonal difference of half a year, so it is a further issue for understanding Planisphere K's actual use.

We should not forget, however, that another viewing time was:

3. in the middle of the night, when the stars culminating at the pole were noted (*the ziqpu position*). In ancient Mesopotamia observation of the stars at their culmination point in the heart of darkness was the means whereby the infinitesimal slippage between stellar and solar years could, and still can be, spotted, and thus the entire drama of precession (the slippage of the sun backwards through the zodiac) could be tracked. We should therefore bear in mind the key time for observation could as likely have been at midnight when the stars crossing the 0° meridian can be timed precisely because at this point even the date of the year can be measured.

Today star tables for Navy or astrological use start either from midday *or* midnight, the latter being more common, since stars and most planets are not observable in the middle of the day!⁴⁷ In modern times acronyca and heliacal observation are not essential any more for keeping our clocks accurate (we rely now on a caesium chip), and in the West star maps in most books and newspapers are given for 22hrs at night when most people are still awake enough to look up at the sky - this is close enough to the *ziqpu* hour of night culmination for purposes of comparison in this essay, *and for practical reasons will be the observation time we mostly give for our star maps*.

Those in the field know that the conventional method of recording observations of planetary behaviour (as well as the odd comet or eclipse) was by daily entries in lists like the *Astronomical Diaries* edited by Sachs -

⁴⁷ The time at which a new day is deemed to start probably gives us the clue to the observation time of the ancient astronomers whose traditions we have inherited. In the West a new day starts at midnight, but there is a strong middle eastern tradition for the new day starting at sunset.

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or on tables such as the Venus Tables of Ammisaduqa. There are no instances of a particular sighting of one unusual phenomenon being recorded on a circular document - and this in itself makes Bond and Hempell's interpretation of Astrolabe K unlikely. What is more, in the Bible the destruction of Sodom and Gomorrah is described as an omen - the consequence of man's immoral behaviour. No omen-like apodosis appears on this planisphere on the pattern of the omen announcement sections of the Mul Apin Star List - or our two Seleucid tablets.

Certainly some scholars (e.g. Koch 1989 - **NU**) take Astrolabe K seriously as an actual star map, whilst others (such as Weidner 1915 - **HBA**) understand it as a diviner's instrument covered in mumbo-jumbo incantations (Bond and Hempel give quite a few practical astronomical explanations for some of these syllables to seriously bear in mind). The first to comment on the clay disc, Sayce and Bosanquet⁴⁸ in their paper for the Royal Astronomical Society (**S&B2**), stand between the two extremes in their evaluation. To understand Astrolabe K we must gear our mentality to the straightforward ancient methods of naked-eye observation.

Given we cannot spin it round to a particular day as we can the modern Philips plastic versions our first thought about Astrolabe K is 'at what time of day or night was it used, or in what season of the year, so we know to what part of the year its use as a planisphere was particularly applied? To anticipate our conclusion, we believe it was *made for use when the start of the New Year was imminent, to observe whether key marker stars had arrived according to schedule, or were slightly delayed - and thence whether to insert an intercalary month or not.*

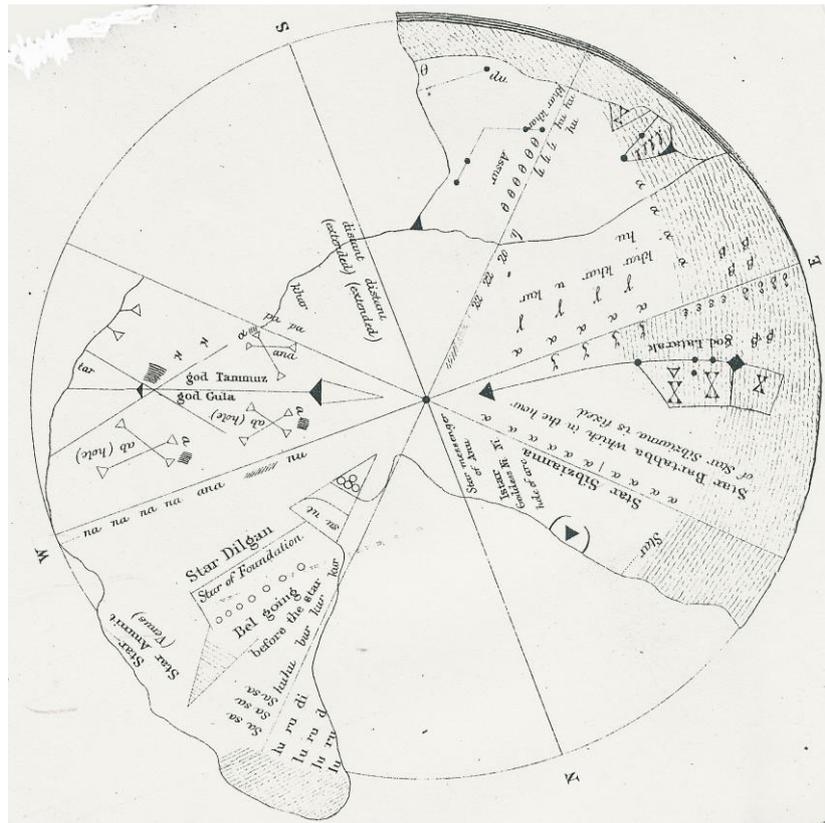
Now we will analyse everything on the clay disc in detail to test this assumption with one preliminary caveat.

Translating and Identifying the Star Names Given on Astrolabe K

Sayce and Bosanquet provided a diagram in their paper that is handy in many ways for understanding the overall positioning of the text, even if aspects of their English/*Greek!* transliteration or translation were later superseded by Weidner and Koch. This is the version we reproduce first (Ill. 15).

On first attempts to read the captions on the disc we are faced with the hurdle of the problematic translation of star names in this and related texts. Even if the texts in front of us are the more recent Babylonian, Assyrian or even Old Babylonian, they are themselves often copied from much earlier material going back to 4-3M Susa and Sumer at the dawn of systematic observational astronomy, so we have to master correlations between the same star names in different languages.

⁴⁸ H M Bosanquet and A H Sayce's three papers on Babylonian astronomy were listed under footnote 30.



III 15: Astrolabe K8538 as reproduced in Sayce & Bosanquet (1880)⁴⁹

We also have to cope with slight shifts in application over the centuries from a word at first referring to one star, to the same word referring to the group of stars surrounding it, as in our modern zodiac. As in the case of the Seven-Star group discussed above, we really are not sure which star or group of stars a name refers to, for the experts differ in their conclusions or repeat each other uncritically.

We need not here go into such problems in a lot of detail for *all* the stars listed in Babylonian Astronomy, but we have to for ones named on the disc. To sort the sheep from the goats (to use a Mesopotamian metaphor) I decided to take one obvious step which will be seen either as a blind leap of faith - or a very obvious logical move. As the arrangement of stars in the sky is constant⁵⁰, and if we can be sure which the main stars are that are named in one or two key sectors of this clay planisphere, then the identity of those in between should fall into place with a high degree of certitude. The use of seriation as a method of ensuring the

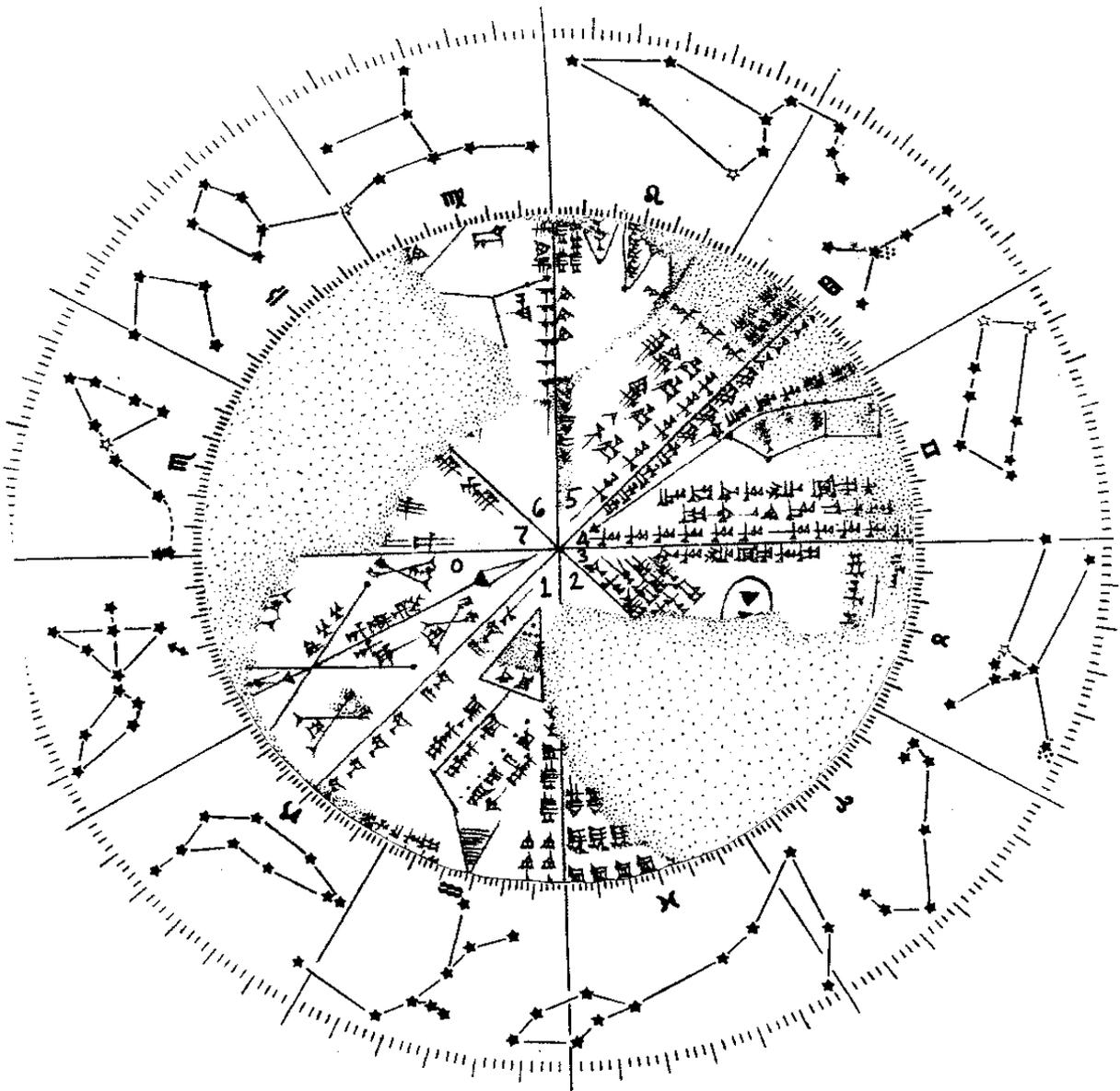
⁴⁹ in [S&B-2](#)

⁵⁰ For speed of reference we give below the basic sigils for the signs since they are quicker to use than words when repeated often.

♈ ARIES	♉ TAURUS	♊ GEMINI	♋ CANCER
♌ LEO	♍ VIRGO	♎ LIBRA	♏ SCORPIO
♐ SAGITTARIUS	♑ CAPRICORN	♒ AQUARIUS	♓ PISCES

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positioning of parts within the whole was famously championed by Petrie in sequencing predynastic Egyptian pottery. The method is the very basis of physical archaeology but it can also be used in a logical process of ordering information. To provide a reality check of the content of the planisphere against the actual layout of the sky, from the very outset we decided to overlay the basic sections of a modern-day 360° zodiac round the planisphere's circumference, keeping to the same orientation with the line ending in the large hollow arrow-head to the left on the planisphere, in order to make sense of how the 12-fold and 8-fold zodiacs interleave, this time using Weidner's drawing of the planisphere in *HBA*. We keyed the outer zodiac to the prominent constellations of Virgo and Gemini whose outlines are obvious, letting everything else fall into place accordingly. We hoped thereby to illuminate significant nodes that matched and thence fill in the sequence of information in intervening gaps.



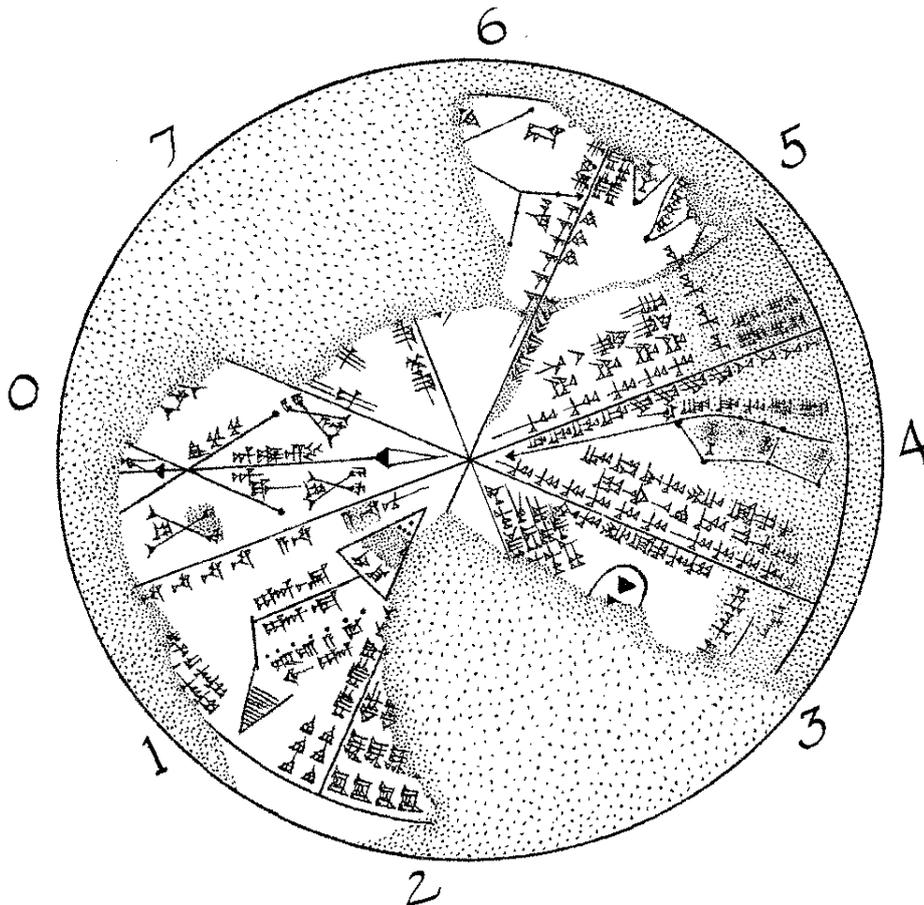
III 16 Astrolabe K8538 framed by the 12 Signs systematised later by the Babylonians still in use today

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From a quick look at the Virgo⁵¹ and Gemini signs on both (see below at clock positions 11.55 and 12.15) which do correspond, though in reverse⁵²), these two good matches are dependable pegs confirming this is a justifiable procedure to adopt and pursue.

Our imminent section-by-section analysis will shortly prove the fruitfulness of laying down a preordained template (the sky itself), since by the checks it provides it solves the task of reading the disc (especially the missing parts) in one move! But taking it slowly, with the superimposed modern zodiac in the background as the touchstone we shall, like the other scholars before us, describe the Astrolabe section by section, compare the information on them with other cuneiform documents that describe the key stars of Babylonian Astronomy (especially the *Mul Apin* Star List - Ill.17) to test our hypothesis systematically.

Weidner in *HBA*, and later Koch in *NU*, scrutinised the Astrolabe more closely than Sayce & Bosanquet were able to do, and discerned further characters and lines in the star diagrams, so were able to add to the labelling information and render some of the vaguer lines as definite. They did not, however, put their translations onto the diagram, but they numbered the sections for commentary as follows:



Ill 17 Astrolabe K8538 - section numbering used by Weidner and Koch

⁵¹ No-one else had so far identified the Virgo outline, which is quite characteristic, and in the right place in the series of signs.

⁵² In other words, we are looking down on the planisphere *from Pole-eye view* (the stars appear the other way round when looking up at the sky from earth up to the pole (the usual way) - making the outlines seem not to match, when in fact they do.

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To avoid confusion in referring back to Weidner and Koch we follow the same section numbering they allocated to the eight zones of the planisphere, but for the purpose of our own sequenced argument we discuss them in the order 2-7, then 0 and finally 1.

Procedure for Describing Planisphere Data, Sector by Sector

Bearing in mind the differing possibilities for what the centre point on the planisphere could be (on modern day planispheres we would not hesitate to see it as the North Pole/Polaris) - for instance it could be a particular star at the zenith - we concentrate on examining and describing the surrounding eight sectors in turn. Since Sections 0 and 1 are the most difficult and important, we have left them to last since the former includes the SW-NE line (llls. 13/14) we have placed on the horizontal which Sayce & Bosanquet believed to correspond to the 0° Winter Solstice meridian and starting point of the year - and the latter the pair of pointers joined by another straight line in a dog-leg arrangement with mention of the first stars in the Mul Apin Star List-strong benchmarks from which to come to a conclusion about the rest of the disc. So we will start shortly from Section 2, hoping to describe in due order the information on each sector, anticlockwise, and then weigh for each the contrasting views of Sayce⁵³, Weidner⁵⁴ and Koch⁵⁵, whose work is roughly spaced apart by 60-year gaps. After these two procedures we hope to arrive at the most consistent account of what all the information given on the disc adds up to.

At the head of our discussion of each Section, on the left we will reproduce Sayce and Bosanquet's graphic rendition of the sector first - because the positioning of the lines of translated text is still helpful - and alongside it the section in the original cuneiform as copied by Weidner, which in some cases means a few added syllables or lines to the diagrams which Sayce and Bosanquet missed.

We will always use Weidner's physical description first (since his decipherment of the cuneiform writing is more up to date), but will also include Sayce & Bosanquet's observations if they add anything further. We give precedence to Weidner's *interpretation* of the text and diagrams, whilst also drawing on any part of Sayce & Bosanquet's paper (S&B2) that still deserves consideration - capping both with any new insights that Koch has added since 1989 and some asides on Bond and Hemsell 2008.

Furthermore, as we go round the astrolabe sector by sector, from Section 6 onwards (which is opposite Section 2) we shall be able to start to take into account the opposing sector in order to check out expected oppositions. In other words, having covered four sectors we consider the *second* four both separately and in relation to their opposite sector. This is because, as given in our summary of the Mul Apin Star List earlier, most Babylonian texts describe star behaviour in terms of 'As y rises, so x sets', such that *these oppositions will help to establish which stars⁵⁶ to expect in the damaged sections!*

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⁵³ In S&B2 1880

⁵⁴ In HBA 1915

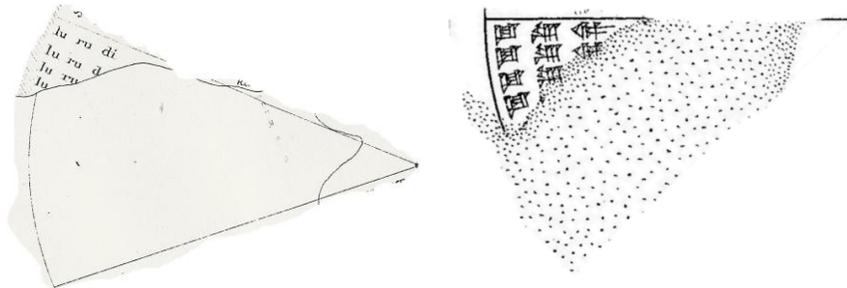
⁵⁵ In NU 1989

⁵⁶ In translating star names we often leave out the determinative preceding each name, i.e. *Kakkab/Mul*, Sumerian/Akkadian for *Star* - since it is simply an indicator that the word after it refers to a star

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FIRST HEMISPHERE OF PLANISPHERE K (Sections 2-5)

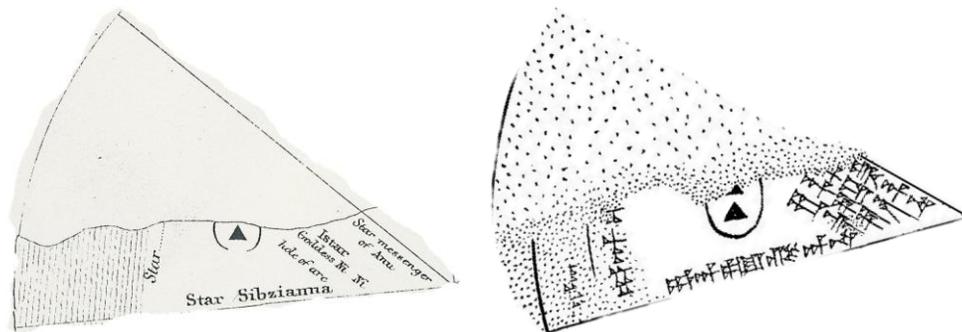
SECTION TWO: X / Y



Almost all of this sector is broken off, and Weidner was only able to decipher the phrase *lu nadi di*, repeated at least four times. From our speculative superimposition of the zodiac over the planisphere (*Ill 16*) we can see that the beginning of this sector would have covered most of X , running on into Y , which is where we would have expected to find Triangulum + Aries (named by several writers as candidate for the *Mul Apin* star⁵⁷). Actually we already know that the label *Mul Apin* is written in the *previous* segment (Section 1), meaning that from the very start we should have to discount link between *Mul Apin* and Triangulum + Aries!

Koch does not mention this sector at all, treating it as completely empty.

SECTION THREE: Y /ORION/SIRIUS



A great deal of section 3 is missing also, but there is also some interesting information on it. In the middle area are two large cuneiform wedges surrounded by a cartouche⁵⁸ (Sayce and Bosanquet only saw one, but Weidner could see the beginning of a second).

⁵⁷ as posited in Van der Waerden 1949 and repeated by successive scholars uncritically since (including Hallo 2008).

⁵⁸ Bond and Hemsell consider the large wedge to stand for the position of a planet (Saturn). They seek information on the presence of all the planets on the disc from which to enable their Redshift software to extrapolate the whole star map back to 3123BC. I believe only Sun, Moon and Venus are implicated in the planisphere by other means - helping to confirm my view that we have an intercalary instrument here.

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At the *circumference* the determinative *Mul* appears twice - the first at the outer edge noticed by Weidner, though almost obliterated; the second in full followed by the beginning of a word which according to Weidner could be the start of the name, *Mul Giš-li-e* which we know from star lists is taken to refer to a star or stars forming the jaw of Taurus, probably Aldebaran with the Hyades). Koch believes the two cuneiform wedges in the ellipse represent the stars *Mul* and *Gišli-e*, the labelling on the circumference referring to them, taking the outer one to stand for *Mul Mul* as representing the Pleiades⁵⁹, but as only the ‘*mul*’ determinative of their names is given at the circumference below them we need to bear in mind they may be nothing to do with each other.

Nonetheless our superimposition of the zodiac over the planisphere (Ill.18) does indicate this is the right area for Taurus and the key stars in it of Aldebaran, the Hyades branching off it forming the face of the Bull- and the Pleiades further up (see star map, Ill.13). If the faded labels do refer to stars in Taurus, it is more likely that they translate the other way round, since Aldebaran is so much brighter, though equal in importance to the Pleiades in standing close to the Ecliptic (Aldebaran just below, and the Pleiades just above). In the *Mul Apin* Star List (I iii,13)⁶⁰ we are told that when Aldebaran, heralded by the Pleiades, rose c. 650 BC in Nineveh after sunset at the time of the Winter Solstice, at the same time the claws of Scorpio set, followed almost immediately by blazing Antares the brightest star its head (see the opposition in Ills 27 and 31).

Along the upper line of the sector and filling most of the centre angle we have the words transliterated by Weidner as [*il Papsukkal*] *sukkal ANNA [u] Ištar il-Iliabrat*, then along the line on the lower section the words *kakkab-SIBZIANNA* which according to many different commentators refers to Orion. Weidner believes the reference to Orion is expanded by the longer phrase, so that the whole line would translate: *Orion, Vizier of the Sky, and Ištar(Venus OR Sirius), soaring through the sky (iliabrat)*. *Iliabrat* is an epithet of the God referred to in the legend of Adapa, and refers also to Ninshubur, but the word could equally be taken separately, referring first to Orion, Vizier of the Sky and then to Ištar. On the other hand as the movement of a planet like Venus is more apparent than a star, the phrase *soaring through the sky* may just belong to Venus.

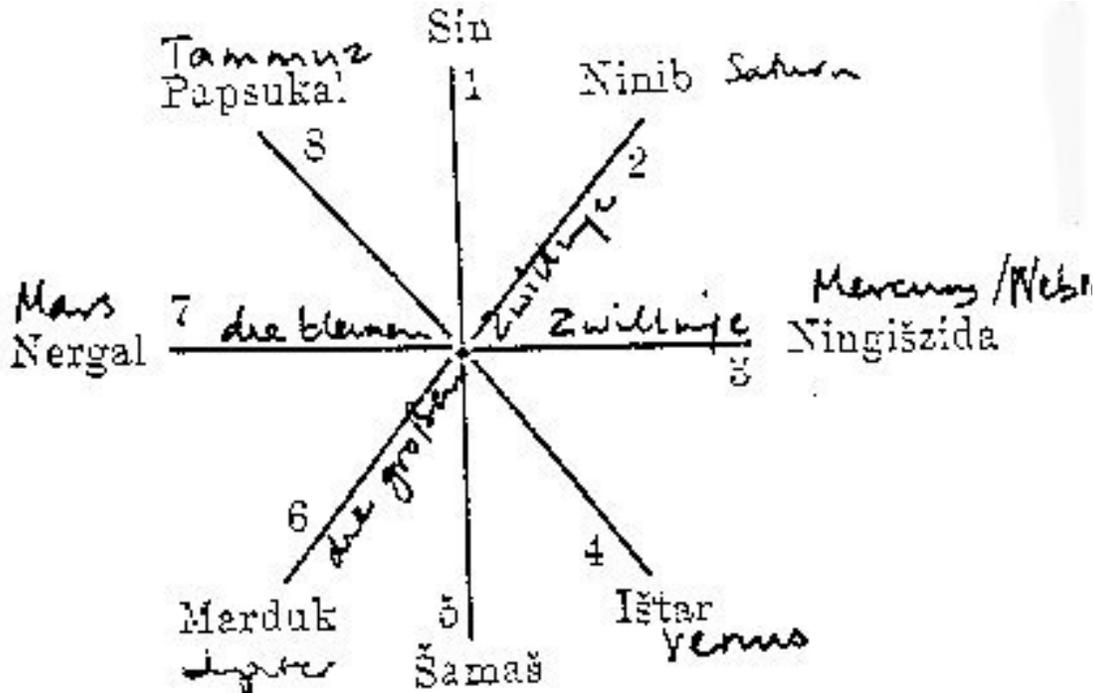
The fact they are in the same sector as the stars of Taurus is important, especially as Orion (*Uru-Anna, Light of the Sky*) is definitely within the vicinity of Taurus on an actual star map above (Ill.20). We have already seen how the line running between Sirius, Orion and on to Aldebaran is of the utmost importance in naked-eye astronomy, serving as a orientation line from which to then seek out other crossing lines of stars. Sayce & Bosanquet do not translate the word *Sibzianna* as *Orion* on their drawing of this Sector, because in their mind its literal meaning, ‘Shepherd of the Sky’ refers to Bootes, prominent a little higher up and round from Orion. However, by referring to our zodiac superimposition, as far as sequencing is concerned this interpretation

⁵⁹ Names for the Pleiades in other languages include *Satilla* (Greek), which translates the Assyrian *Kimtu* and Hebrew *Kimah* - all words referring ‘tie’, ‘bond [of life]’ - or ‘fiduciary point’?

⁶⁰ In Hunger’s edition

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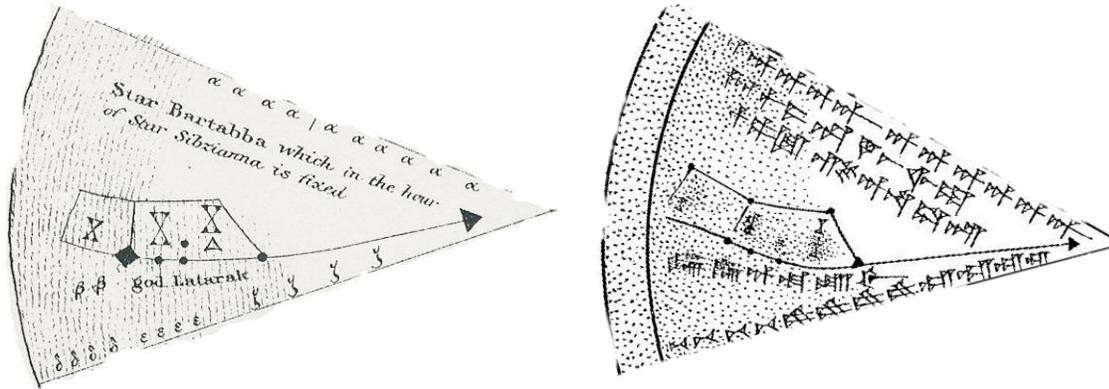
certainly does not, at first glance, seem to fit. Taken overall, these words probably refer to the relationship between Orion, Sirius and the stars of Taurus - and also Venus, with the Moon co-ruler of Taurus.



Ill 18 Orion and the Planets seen as sets of twins - from Weidner61 book review

More clues come from Weidner's reference to *Papsukkal* in his review of Kugler's book, *Im Bannkreis Babels* in which he describes *the primitive 8-fold zodiac* used in Elam in the 3M, and its relation to the text referring to the key 8 Month Gods arranged in pairs. In his diagram (reproduced above), the planets Jupiter-v-Saturn are named in some texts as the Greater Twins; Mars-v-Mercury as the Lesser Twins; the Sun and Moon form an obvious opposition related both to year length and eclipses - whilst the fourth covering the month Tammuz, is governed by Papsukkal in opposition to Ishtar - in other words Orion (the only body *not* a planet, but a constellation) is paired with Venus/Inanna (because both come into play as prominent markers for the start of the New Year, the details of which cannot be fully described in this essay). We should not forget, however, that Ishtar in many contexts also refers to Sirius so that the *Ishtar-Tammuz opposition is also to do with the distinctive Sirius-Orion's Belt-Aldebaran line of stars* already emphasized in earlier illustrations.

⁶¹ OLZ 1913,2 column 55



This is a sector with a figure that has an extended pointer running from it towards the centre and should therefore help us decide what that point represents (there is the tiniest possibility it is meant to be the magnification of a smaller constellation closer to the centre, but its outline is quite distinctive). Weidner transliterates the syllable *an* repeated 11 times on the upper dividing line, and on the lower the syllables *be be be kas kas kas kas zu zu zu* (represented in S&B2 by Greek letters). Under the top line of syllables are incised the words *kakkab MAŠTABBA ša ina maḥrat kakkab SIBIZIANNA izzazu* which Weidner translates as ‘*Gemini, standing in front of Orion*’, but from the verb *izzazu* it is more a matter of ‘*Gemini rising above Orion*’ (it is certainly the case that Gemini is higher up in the sky than Orion and will therefore rise first - see Ill. 13).

The distinctive outline certainly looks close to that of the constellation Gemini, with 7 dots marking particular stars quite emphatically, though *not quite* (Bond and Hemsell also pondered this) mirroring the arrangement of its actual stars (looking at the disc, possibly an 8th has rubbed off at the corner). On the constellation as drawn on Section 4, only one star a third of the way down is particularly emphasized with a larger hole, whereas on Gemini both Castor and Pollux at the top of the outline are in reality the brightest stars - but the larger hole may emphasise the star in Gemini that is actually *on* the Ecliptic, *Al-Wasaṭ*, in reality an unobtrusive, faint star.

Gemini and Orion are indeed listed after each other in the Mul Apin Star List, and although Weidner could make no sense of the pointer running from Gemini to the fixed centre of the astrolabe, even in today’s popular astronomy books the invisible line connecting Gemini to Betelgeuse in Orion (see illustration below) is used as an aid for star location.

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Ill 19: Star lines between Gemini and Orion in a modern star map

MAŠTABBA is usually taken to be Pollux (and later Castor and Pollux together were known as *MAŠTABBA-GAL-GAL*), but looking at the drawing it has to be said that if it is Gemini the pointer line running on from its lower side does seem to curve round more in the direction of **Aldebaran** than **Betelgeuse** - so these are two possible candidates for the centre of Planisphere K⁶².

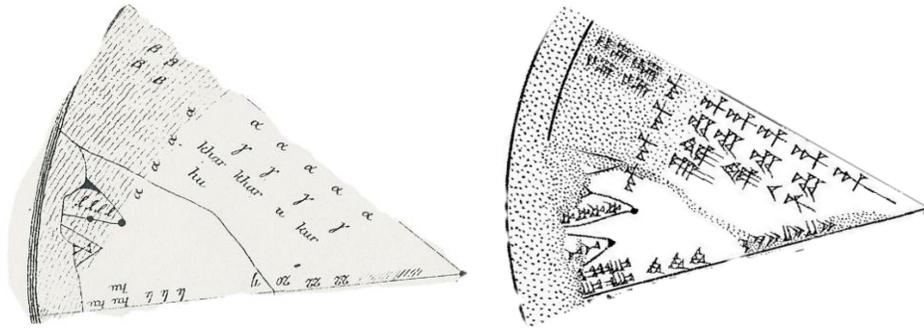
Koch differentiates between the brightest stars of Gemini, Castor and Pollux, *Maštabba-gal-gal*; the second brightest pair, the next two stars down, *Maštabba-tur-tur*; and finally the three lowest stars in the rectangle which he links to a further differentiation on some star lists - *MAŠTABBA ša ina maḫrat kakkab SIBIZIANNA izzazu*, but in our opinion these lower faint stars in Gemini would not merit attention if they were not close to the Ecliptic and the top of Orion and I think the wording is more likely to refer to the behaviour of the top two stars or the whole constellation!

Beneath the constellation of II in Section 4, (following the direction of the writing) according to King in CT XXXIII words '*Lugal lu LATARAK*' are written, but Weidner corrects this to *Lu-Lal*⁶³ *LATARAK*⁶⁴. If we are looking at **Regulus in Leo** being at the *zenith* in the centre of the planisphere, as happens in Spring, then *Lugal* (accepted as the word for Regulus) could be correct, but the full word *Lugal* is repeated along the top line of the *adjoining* Sector where it makes more sense for the same position, as far as the zodiac sequence goes.

⁶² To save a separate discussion on what the centrepoint of the Astrolabe must be, I am highlighting in bold red the possible candidates as we meet them.

⁶³ The difference between *Lugal*/Regulus in Leo and *Lal* is critical. *Lal* is an intercalation term to do with the time difference between Moon and Pleiades risings - whose translation Koch (1997) cleverly solved.

⁶⁴ *LATARAK* is shown on an Assyrian relief in the B.M. as an upright priest or diviner dressed from head to toe in a lionskin.



This section, although cracked, is however almost complete, and mostly consists of chains of words or syllables: the upper line is transliterated by Weidner as *lugal lugal lugal lugal*, and in the corner *an an an an*. Then on the next line *an an an an an en en en en har har u kur u*. On the line of the lower edge is a row of numbers, according to Weidner: 22 22 20 40 [4]0, then at 180° a further 40 40 40, and at 180° to them the syllables *u u ... u tab + tab(?) - b[a..]*. which could be numbers calculating degrees (*ush*), the time of day - or even weather conditions as Bond and Hemsell suggest.

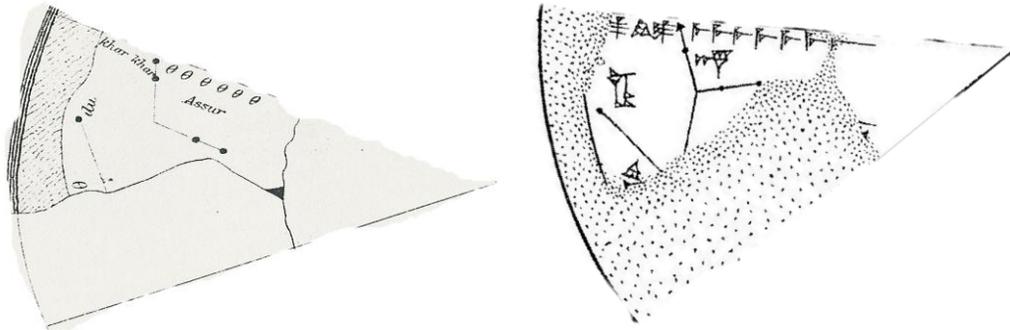
It is the three small irregularly drawn triangular shapes (Sayce & Bosanquet only discerned two) on the damaged circumference of the astrolabe in this section that give more definite information. In the lowest, straightest of them remain the syllables *be be*, which could be *Krater* because the second, according to King, looks like the tail of a bird, with the syllable *hu* written inside it four times, identified by Weidner as *u-eltega*, or *Corvus (UGA)*, at the feet of *Virgo*; though the third figure is almost totally destroyed, there are enough traces to see there was a third item next to *Corvus* which Koch identifies as the end of *Hydra*. These are key star alignments used by amateur astronomers today which seem to match this section of the planisphere, and they fit in with our zodiac superimposition over the clay planisphere (*III 16*). *Corvus (Uga)* must therefore be imagined over *Hydra* in this section of the planisphere, whilst we shall see *Virgo* delineated just underneath in section 6, the following section.

We are reminded of the relationship between *Leo*, *Krater* and *Corvus* in *III 5* and *III 8*. *Leo* walking over *Hydra* on the Seleucid clay tablet fits the repetition of the word *Lugal* along the top of this sector since it locates *Regulus/Leo* over the front area of *Hydra* whose tail on our star maps we know ends underneath *Uga*, *Raven*. On the back of the same Seleucid tablet, we saw when discussing *Virgo* that *Uga* indeed appears on the tail of *Hydra*, with *Spica/Virgo* to the right. The distribution of information on *Astrolabe K* is more curt, but the same factors are present in the same sequence.

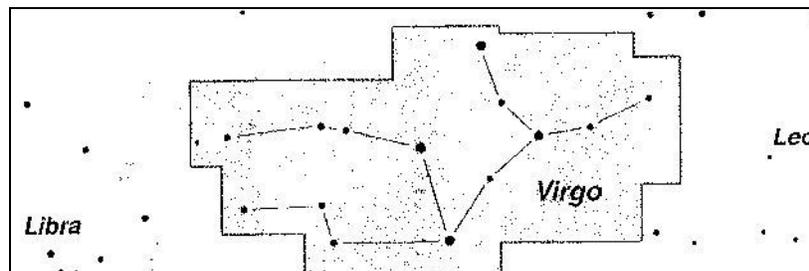
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SECOND HEMISPHERE (using Axis Checks with First Hemisphere sectors)

SECTION SIX: 𐎠𐎢𐏁



About one-third of this section remains intact, though enough remains to identify the distinctive outline of Virgo (rather than Libra as identified by Weidner and Koch, which on an eight-fold zodiac will not be separated out from Virgo or Scorpio on either side - so its stars may be lost further down in the damaged section). The further line spotted by Weidner in *HBA* and added to the incised diagram reinforces the likelihood of its identification as the brighter end of the constellation Virgo, providing the second vital keying point to a modern star map:



Ill 20: Actual outline of the constellation of Virgo

We have already seen how Virgo, labelled *Ab-sin/Spica* with the corn ear in her hand, appears as the third surviving Seleucid zodiacal image in the Berlin Museum (*VAT 7847 - Ill 8*) on the back of the same clay tablet that depicts Leo striding along Hydra. The outline of the constellation on Astrolabe K, though partly damaged, is not only a good match to the actual outline of the constellation, but also in the right sequence.

Inside the wide angle of the constellation appears the place-name, *Aššur*. This is interesting, since apart from the Seleucid tables of correspondence discussed in the first essay above, other cuneiform lists exist (e.g. K4386 ll.58-62) that associate constellations with Mesopotamian cities, as follows:

- | | |
|----------------------------|---|
| Al-Lul (Cancer/Praesepe) | Sippar - (in our eyes Sippar is mainly famous for its Sun Temple) |
| Margidda (?Auriga/Capella) | Nippur |
| Iku (?Square of Pegasus) | Babylon |

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Aššur

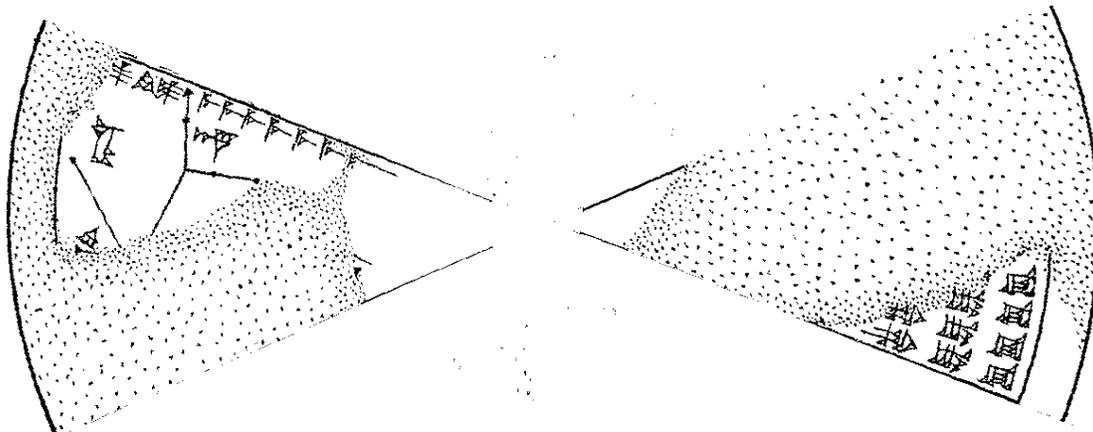
Susa

Tantalisingly the star names associated with Aššur and Susa are broken off, but from the evidence of this and Section 5 just analysed it could plausibly have been Spica/♄ for Aššur.

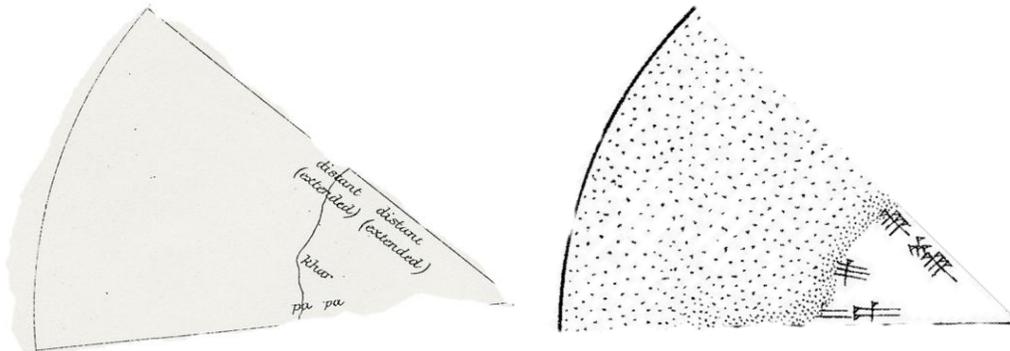
The remains of a second word along the circumference arc reads [...]IDU, which Weidner guesses is Enkidu but is more likely to be Eridu. We have no documentary evidence as to which astrological sign was associated with Eridu though from the *archaeological* evidence of fish remains on the earliest altar it makes sense to have been Nun/Pisces (with Iku/Square of Pegasus above) and as we have so often seen in ancient astronomy, the sign *and* its opposite (in this case Virgo, on an axis with Pisces opposite) should always be taken together. Then under the upper partition line appear the syllables [h]ar har me me me me me me me me.

AXIS CHECK

We have reached the point on our circuit of Planisphere K where we are in a position also to consider the opposition between Sections 6 and 2 and whether they balance each other in the Mesopotamian convention of measuring star risings against star settings. As we have already said, Pisces/Aries in Section 2 (almost completely destroyed) should be taken as opposite Virgo/Libra in Section 2):



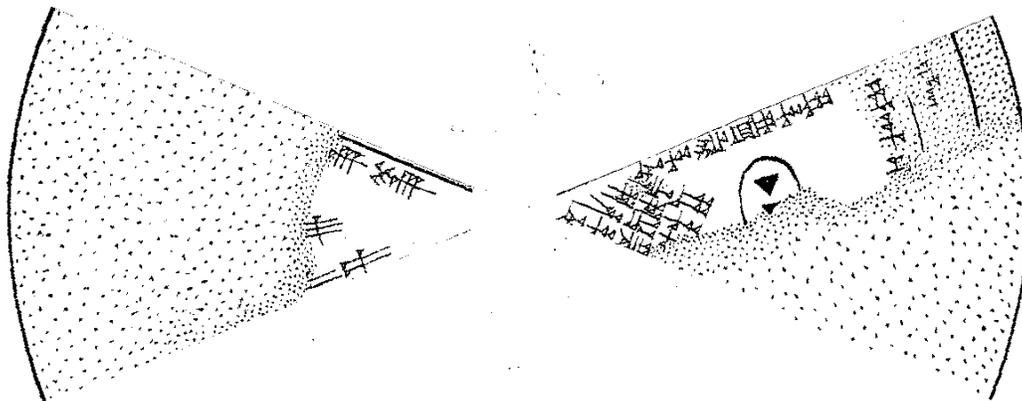
The identification of Virgo/Libra in this section enables us, by again looking at our superimposition of the zodiac over the clay disc (*Ill 16*), to confirm that, if our overall view of the disc is indeed similar to a modern-day planisphere, Section 2 (q.v.) must cover the end of Pisces/most of the Aries region. Since the other polarities mostly check out, it is helpful just to know what ought to have been there.



Section 7, according to Weidner, is almost entirely lost, with only groups of syllables [s]ud sud at the top, har in the middle and [p]a pa below along the bottom partition remaining. We can only turn immediately to an axis check for help.

AXIS CHECK

Having already with the previous section contrasted one pair of oppositions that check out, if we again resort to checking our zodiac superimposition on the clay disc we know we are almost certainly looking, in Section 7, at the sector that covered most of Scorpio and the start of Sagittarius, the area of the sky we would expect to find opposite the Taurus and start of Gemini/Auriga region of the sky.

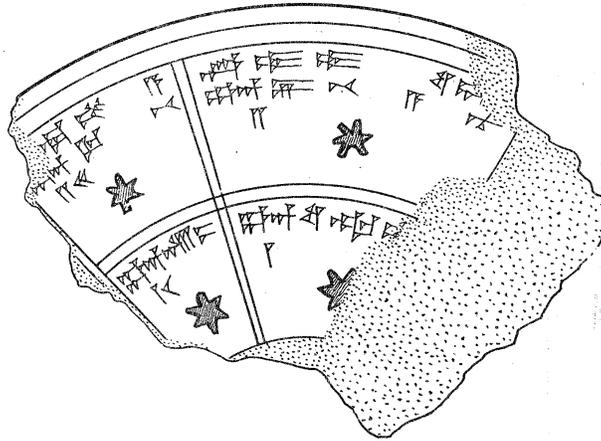


This certainly confirms Weidner and Koch's interpretation of the stars in Section 3 as the key stars in Taurus (maybe they used our method without saying so!).

In this instance we have some added help in filling in possible missing labels by checking elsewhere the star-names likely to have been used in Section 7. Sayce & Bosanquet in **S&B2** refer to an even more fragmentary *Akkadian* planisphere (British Museum Sm162, part of a 12-sign astrolabe with the three stars in each sector prominent for each month) showing two sectors whose azimuth degrees are marked as out of 240° on the outer

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circle and 120°⁶⁵ on the inner, the first of which happens to fill in this very gap on Astrolabe K (the representative stars this time are indicated by a six-pointed symbol, with labels above):



Ill 21 Fragment of a 36-star Astrolabe BM Sm 162/K2894 - reproduced from CTXXXIII pl.11

For the month of Marchesvan = Arahšamna (Scorpio, the 8th month) it shows on the left the star on the outer circle at Right Ascension 140° the name *Ligbat* - now read as *Uridim* - Mars exalted in Scorpio⁶⁶, and at the inner circle at 70° *Girtab*, *Scorpio*); and for the following month of Kislev (Sagittarius, the 9th month) the names are given on the outer circle at 120° of *Nibatenu* - now read as *Shalbatanu*- Jupiter, ruler of Sagittarius and the inner circle at 60° *Utucagaba* - now read as *Udkaduha* - Cygnus, paranatellon⁶⁷ to *Sagittarius*).

In contrasting this early fragment with Astrolabe K Sayce & Bosanquet warn that because the latter is a later, Assyrian astrolabe from Nineveh dating to c.650 BC, we have to allow for the fact that, due to the difference of latitude and the precession of the equinoxes, the Spring Equinox on Astrolabe K would now be taking place, not in the month of Nisan, but in Iyyar (see Appendix B). Also on the basis of this fragment Sayce and Bosanquet strongly emphasise the precise position of *Girtab*/*Antares* in Scorpio at 180° exactly opposite *Aldebaran* in *Taurus* -this is probably why it is listed in the *Mul Apin* Star List as the first pair of oppositions (I iii,13).

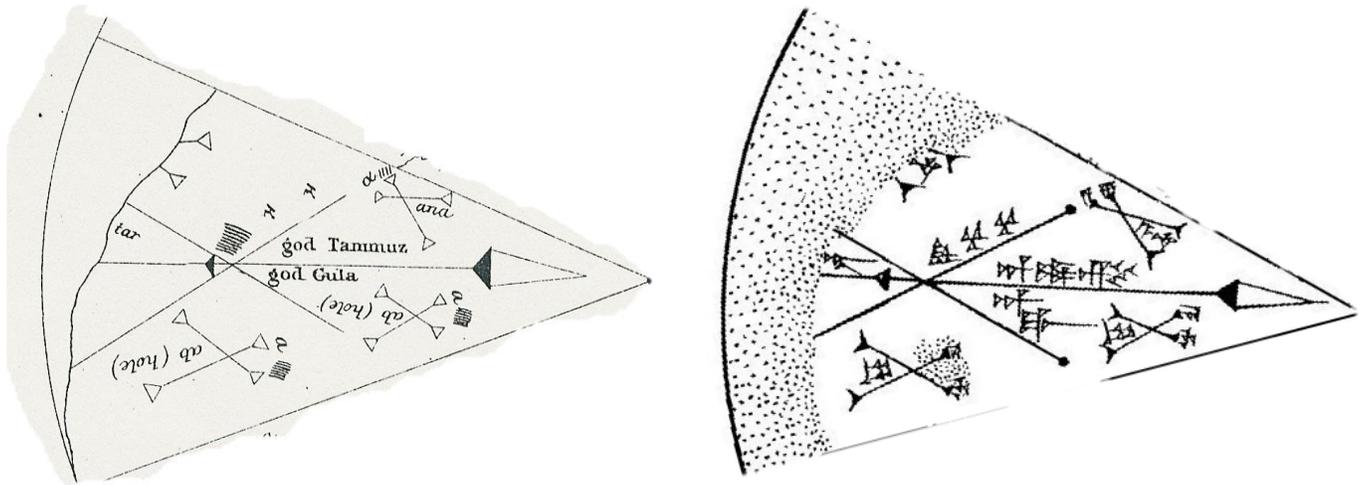
We are now certain enough in our interpretation of the probable coverage of this damaged Section 7 to be able to say that it covers the Scorpio/Sagittarius region and that in the next sector of Planisphere K (numbered Section 0 by Weidner) we should expect to see (given that each sector in the 8-fold zodiac will run across more than one current zodiac sign) information referring to the succeeding zones of the end of Sagittarius, all of Capricorn and the very start of Aquarius. This sets the stellar background for a difficult section to understand coming next.

⁶⁵ Sayce & Bosanquet remind the reader that the circle of the horizon was not necessarily divided into 360°, but into 8, 12, 120, 240 or even 480 degrees, depending on the closeness of any circle of stars to the centre.

⁶⁶ Also pointing to what is likely to have been shown on the relevant clay tablet dealing with Scorpio in the Seleucid set!

⁶⁷ A constellation or star higher in the sky which rises above the main constellation, heralding its imminent appearance.

SECTION ZERO: END OF α/γ / START OF α/γ



Section 0 consists of a large X on its side which is exactly bisected by what we have positioned as the SW-NE line in all our diagrams that ends in a large wedge pointing to the *circumference* of the planisphere whilst a lightly drawn in arrow from its flat side points either to the centre of the planisphere- or even to the opposite sector of the astrolabe towards Aquarius/*Gula*. (We should bear in mind the ambiguity of an arrow or spear expressing the idea of a line, which could refer to a significant alignment between points in the sky, OR serve as a pointer to a particular spot⁶⁸.) We also have another ambiguity in that we are not sure whether these three long lines crossing each other represent a constellation and links between its stars (Orion/*Tammuz* being the obvious candidate) - OR whether it is a series of orientation lines for mean and extreme Sun risings in its annual cycle. Let us take it step by step.

- Along the top of the eastern shaft of the arrow from the *centre* of the main X we have the word *The God Dumuzi* (= *Tammuz*, an epithet of Orion), and along the back end of the shaft the likely remains of the words [*The Goddess Ish*]tar (which we know to associate both with Venus and with Sirius). As we have seen, we have evidence they are seen as twins (Ill.18), joined by the same orientation line (Ills 13/14). We have noticed both mentioned together *on this same planisphere* in Section 3 on the other side of the planisphere where Cancer would be (not *diametrically* opposite, but possibly for space reasons put there to remind us that the diagram in *this* section actually belongs there, below Gemini. Weidner interprets Ištar as referring to the group of stars known as The Bow (Ban/Pan), which are the stars of Canis Major without Sirius, and Dumuzi as Sirius itself (though I think it makes better sense to read Ishtar as referring to Sirius and Dumuzi to Orion, a much more commonly accepted allocation). This is because the image is of an arrow fired from Ishtar's bow (which is how she appears on some late

⁶⁸ Black and Green (1992) simply state that 'the arrow is a symbol of Sirius', which could indeed be applicable.

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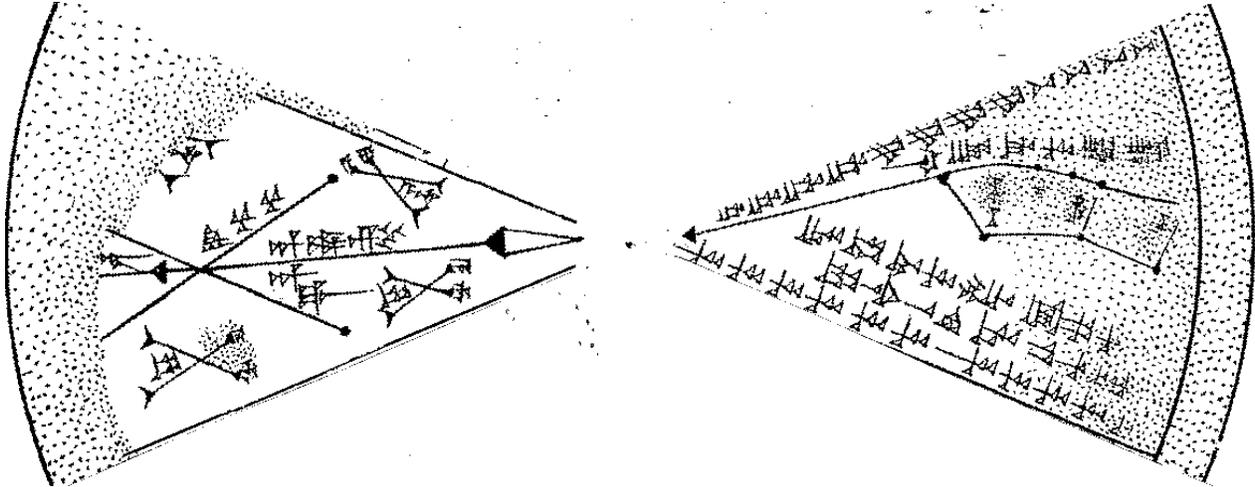
cylinder seals) to line up with and hit the star Betelgeuze on the shoulder of Orion and onwards to Capella exactly as shown in S&B's diagram (*Ill 14*);

- Underneath the line of the shaft beneath the word Dumuzi is the word *Rabu*. Sayce and Bosanquet translate it as Goddess *Gula*. The sources give us Gula in the Aquarius region of the sky, opposite to the *Leo/Urgula* region of section 5, and Gula is probably to be identified with a Aquarius of the same brightness further back on the borders of the Capricorn zone, thus lining up opposite Sirius the Dog on the other side of the sky beneath Leo and Cancer. This could be why Sirius becomes identified with the Goddess *Gula* because she sits on the dog throne of Sirius in highly prominent depictions on boundary stones: and certainly an orientation line can be drawn from the Sirius side of the sky, crossing the Pole and running over to the sign of Aquarius. If we refer to the whole planisphere geared against the zodiac that we set up at the beginning, the positioning checks out. *It means we are looking at information about the whole Leo/Cancer-Aquarius/Capricorn axis all squeezed into the Aquarius/Capricorn sector*, so that the X diagram for Orion is appearing diagrammatically on the opposite side to where it really should be in stellar terms. I will try to explain why shortly.
- On the eastern top arm of the X are the words *Belit Mātāti*, an epithet of Venus, also called Ištar: does this *third* mention of Venus here refer to the starting point of the Venus cycle? ⁶⁹ Certainly this section's *labelling* emphatically underlines the overriding importance of Orion, Sirius and Venus in this section of the sky⁷⁰.
- In the triangular spaces nearest to the centre created by the bisected X on its side are four further x shapes, the top two marked *ana* at the front and *a* and *b* at the back, and the bottom two *a še* on the front arms and again *a* and *b* at the back - seeming to refer to positions in relation to the main X (Bond and Hemsell have some practical astronomical ideas for interpreting these syllables).
- Although it is tempting to see the large X and its W-E axial cutting line as an outline of the constellation Orion, Sayce & Bosanquet make an equally good case for interpreting the two arms of the large X as directions for sunrises and sunsets marking the Solstitial extremes of the year, the crossing point of the two arms and the straight arrow representing the position of a notional shadow stick. The horizontal line would mark the equinoxes and the extremes of the X the solstices on either side of them. If their interpretation is correct, then capturing these solar extremes would be the preliminary to calculating the start of the New Year and could involve the intercalation process- these we come to at the very end of this paper.

⁶⁹ Muss-Arnolt (1892 - p.162) equates the epithet to the *Sun*, but *Belit* has a feminine ending.

⁷⁰ Bond and Hemsell make little reference to Mesopotamian astro-mythology as relevant background.

This is the moment to see if anything more can be gleaned by our automatic exercise of considering this section along with its opposite star information in Section 4:



One thing is clear: if Section 0 does show Orion the Mighty Hunter, he has been flipped over from the opposite side of the sky (in Section 3 on the other side the labelling says Gemini rises above him) - and is superimposed over the area of the sky covered by Capricorn/Aquarius where no particularly scintillating stars are to be found anyway! Is it for spacing reasons that Orion (not a constellation on the Ecliptic) appears out of his usual sequence, which should be somewhere under Gemini, Cancer and Leo (Sections 3 and 4)? *Gula* in other texts definitely refers to the *Capricorn/Aquarius/* region of the sky which bestraddles Sections 0 & 1 exactly opposite *Leo/Urgula*, so the label for *Gula* is the zodiacal indicator. It is interesting that the modern-day symbol for Aquarius is not just a pot of water, since the large male figure pouring it mirrors Orion in the opposite part of the sky. We have found from other Mesopotamian artefacts⁷¹ showing the whole of the sky that this convention of flipping over one part of the sky to the opposite region is not an isolated case. And if we refer back to the Section 4 labelling it refers not only to its appearance along with Orion rising - there is a phrase mentioning Lugal (Regulus) underneath it. And it is the references to Orion and Ishtar in Section 3 just before Section 4, that mirror the Tammuz and Ishtar labels of Section 0 (see under Section 3 for text).

However, if the word under Dumuzi beneath the horizontal arrow line is rather to be translated Rabu, or Lord (rather than *Gula*) it does point to the line's fiducial significance, marking something of the order of the Polar Axis, the Vernal Point at 0°, or even a Solstitial line. If the Orion line is meant to be associated more to the month of Tammuz, the original fourth millennium time of the Summer Solstice for celebrating the New Year Festival, this certainly fits in with the rise of just this arrow-like line joining Sirius-Betelgeuze-Capella in the West at the

⁷¹ To be shown in my book on the Ancient Near Eastern Canon of Art on www.layish.co.uk in preparation.

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Spring Equinox several millennia later in the evening in the northern hemisphere, and in the morning at the Autumn Equinox - however, Sayce and Bosanquet apply this to the horizontal line in Section 1, *not* Section 0!

Equinoxes and Solstices

The Vernal Point, or position against the zodiac of the Sun at the Spring Equinox when day and night are of equal length, is one of the most important fiducial points in the cycle of the year, as is the Autumn Equinox. Of the two New Year festivals at the Spring and Autumn Equinoxes, Weidner (1914) comes to the conclusion that the one at Autumn was the more important. In contrast, when days are either at their longest or shortest the Sun has moved to its extreme points during the year at the Summer and Winter Solstices (Erica Reiner⁷² points to the ancient New Year quadrant as ‘commenc[ing] with the day of the summer solstice and proceed[ing] through to the beginning of winter’.

Even during the period our planisphere was in use at Nineveh, it was Uruk that was noted for its specialization in measuring the Solstitial points of the year⁷³ and the scheme used to define the solstices served as a template for other cities. As Slotsky writes, ‘summer solstice day was all-important in the determination of the seasons. It was the starting point from which the other solstice and equinox dates of the year were set. Ultimately, the seasons were entirely based on the summer solstice date.’ She points out that in a hymn to Shamash ‘who makes noonday heat descend upon the earth at midday... he is described also as ‘Shortener of the days, Lengthener of the nights...’

Yet still for all of Mesopotamia, ‘It [was] very difficult to precisely observe that maximum of solar declination when the sun is farthest north of the equator. Consequently, summer solstice dates, and in turn dates of the other seasonal turning points, were computed according to the rules of the Uruk Scheme’. This was an arithmetical scheme used to predict the future dates of the solstices and equinoxes, based on the Metonic Cycle, reconstructed by Neugebauer⁷⁴ and which Slotsky proceeds to explain in her paper. ‘Once the summer solstice was calculated, the dates of the winter solstice and the two equinoxes, as well as the seasons of the year, fell into place’, Slotsky goes on to say. Her discussion of a further Seleucid text proves that the Uruk Scheme was still being used in the reigns of Artaxerxes III, Arses and Darius III to calculate the four quarters of the year in the Achaemenid period (which post-dates the neo-Assyrian period of our planisphere, and just precedes the Seleucid period of the two zodiac tablets discussed at the outset of this paper).

To sum up, we have conflicting evidence here on the nature of the horizontal fiduciary line in Section 0, which cannot be answered until we have come to a decision about some interdependent questions:

⁷² Erica Reiner ‘Your thwarts in pieces, Your mooring rope cut’ *University of Michigan* 1985

⁷³ Alice L. Slotsky ‘The Uruk Solstice Scheme Revisited’ *Weidner Festschrift* Graz 1993

⁷⁴ O. Neugebauer ‘A Table of Solstices from Uruk’ *JCS* I 143-8 and ‘Solstices and Equinoxes in Babylonian Astronomy during the Seleucid Period’ *JCS* II 209-22 which describe 2 joined tablet fragments that calculate not only the occurrence of solstices and equinoxes within the Metonic Cycle, but also the corresponding intercalary days added to the normal date depending on what kind of year is involved (see under New Year and Intercalation).

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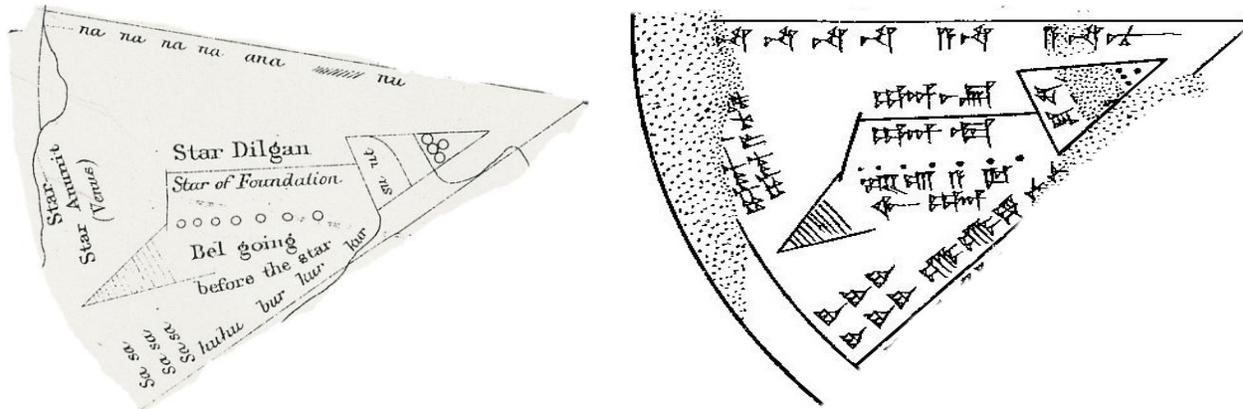
- Whether the viewing time of day for the planisphere was to observe:
 - heliacal or acronycal rising with cosmical settings, or
 - midnight (ziqpu/zenith) positions;
- what the centrepoint of the planisphere represents (a circumpolar star, polar centre, or zenith point (possibly Leo/Lugal, the label nearest the centre point));
- and whether it ties in to calculation of the time for the greater and/or lesser New Year festivals:
 - at the Spring or Autumn Equinox, *or*
 - the Winter and Summer Solstices (a difference of an entire 90 degrees!).

If the diagram in Sector 0 does refer to Sirius and Orion, then its deliberate displacement only makes sense as the projection onto the horizontal plane of the zodiac of the Polar Axis stars Sirius/Betelgeuze/Capella at the *Winter Solstice* point of the year, the time of the great Akitu festival lasting 11 day, celebrating the journey to the Underworld and back of Tammuz and Ishtar - both named in the sector!

There is therefore no reason why this striking diagram should not represent both astronomical realities in one. It would mean the X diagram taken as referring to the Sun's solstitial extremes refers to the Orion starfield along the ♃-♎ axis (also known as the Solstitial Colure), as Weidner suggests - since the predecessors of Tammuz-Ishtar were Kingu and Tiamat whose struggle in **Enuma Elish** takes place when the Sun is in the sign of Capricorn. The idea is that, since the stars of ♃ are not distinctive, the Sirius-Orion line on the opposite side of the Pole near the ♎/♏ region of the sky, already populated with distinctive constellations, are picked out and flipped across to the opposite partition. That could be why on the planisphere in sections 3 and 4 opposite, the word Sibzianna, or Orion, is written in, implying their real position on that side of the under Gemini. We should also not forget that Capella, playing such an important part on this colure, is the Nanny Goat star with her Kids, implying a relationship between the constellations of Auriga-Capricorn along a Goat (Tamm-Uz⁷⁵) Axis.

We have to leave these questions as not completely resolved for now as we move on to finalise our inspection of Planisphere K by looking thoroughly at the last, hugely significant, Section 1 which ties in precisely with the Mul Apin Star List by actually having named inside it the first three stars in the canonical order.

⁷⁵ *Uz* means *Goat*. Reiner in both **UA** and **AM**, relying on the consensus, ascribes Uz to Vega in Lyra which it may only be in relation to the solstitial colure linking Capricorn and Capella (both with goat/kid associations).



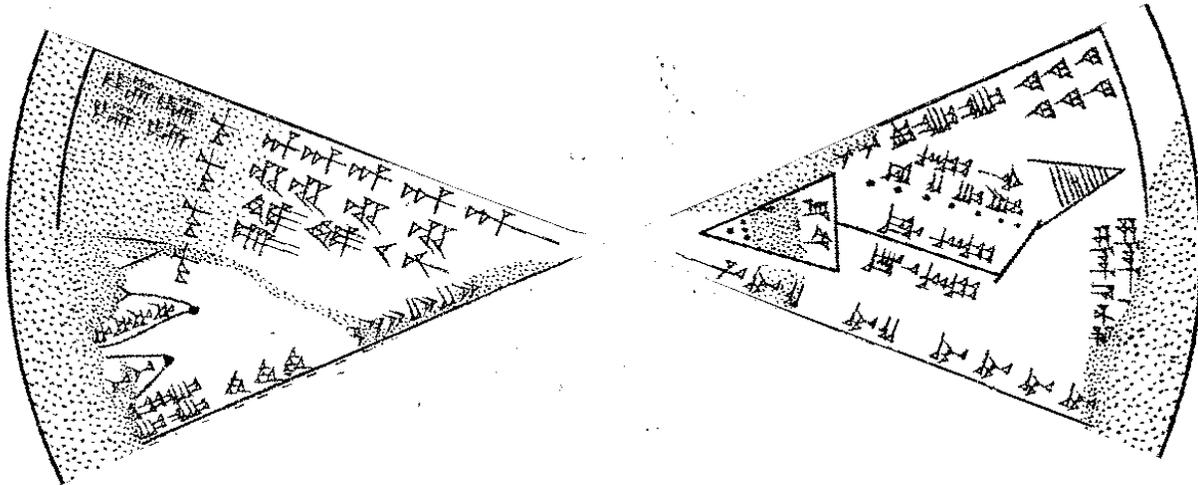
In our attempt to understand Astrolabe K this sector requires even more attention even than sector 0, since establishing the information on it clinches our argument that the disc is a straightforward astronomical instrument with a particular function. Weidner himself devotes considerable attention to the textual and diagrammatic information on this well-defined, and yet puzzling, slice of the eight-fold disc. One thing stands out: on it are named the first three heavenly bodies as listed on the *Mul Apin* Star List (*Ill* 10. 17), whilst a fourth name helps to underpin their position in the sky.

- ▷ *Mul Apin* in the *Furrow of Enlil* (northern sky, skirting the polar centre);
- *Mul Dilgan/Iku* in the *Furrow of Anu* (middle sky, just over the Ecliptic).
- ★ *Anuni[tum]*
- ✕ *Š[immaḫ]* (posited by Weidner) just below the Ecliptic, touching the *Furrow of Ea*

Because the star *Mul Apin* is unambiguously *gouged in as a label* on Sector 1, the very first star named on other cuneiform star lists, we can reasonably assume it will be associated with the same three heavenly bodies mentioned together not only on the *Mul Apin* star catalogue, but also as listed on other ‘astrolabes’ (circular zodiac diagrams naming the 36 Stars which we do not have the time and space to correlate in full here) - meaning we should be able to rely on the latter to guide our interpretation. This must be why scholars examining Astrolabe K chose this sector as the appropriate starting point.

However, although this cluster of names corresponds closely to the order of the *Mul Apin* star list, , we still do not know for certain which stars two of the names refer to: *Apin* and *Dilgan* - so we shall not be in a position to come to a final judgment until the very end of our discussion. In this instance, before describing everything on Section 1, we will take a short-cut and go straight to the axis check to obtain an instant steer.

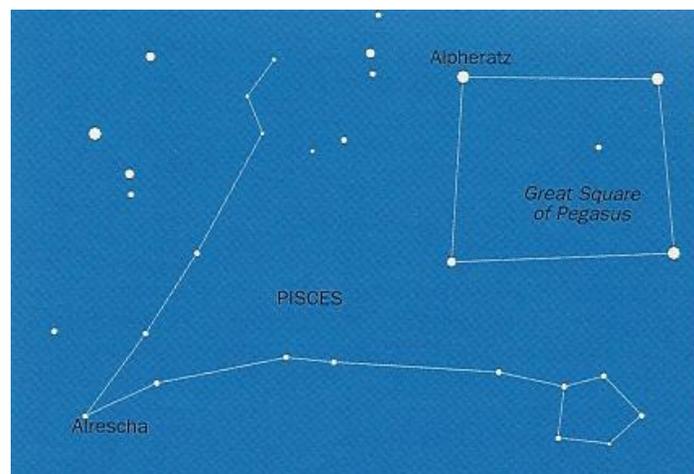
We established the star field in Section 5 as including Leo and the start of Virgo, both standing over Hydra, which means that by the traditional device of contrast seen used in the Mul Apin Star List it should lie opposite to the end of Aquarius/all of Pisces and the very start of Aries on the Ecliptic/Way of Anu in Section 1:



Checking back at our superimposition of the complete zodiac round the planisphere that we started out with this supposition appears to check out. This is further underpinned by an apposite quotation from Mul Apin I iii 21:

‘When Šupa rises, Aš-iku sets’,

where Šupa is Arcturus (a translation accepted across the board), the brightest star in Bootes, and northern parnatellon for Spica/Virgo. Low down on the opposite side of the sky, Iku/Dilgan is in the same way given as the parnatellon for Pisces.



Ill 22: Present-day outlines of Pisces and the Square of Pegasus

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More commonly known as the Summer Square because it is so prominent in the night sky during Summer, the Square of Pegasus is a strong contender amongst scholars for the title of *Iku/Dilgan*, named in Section 1 on the path of Anu - though we need to systematically test that assumption. Using the axial test straight away is a useful check that at least the partly damaged label *Š[immah]* on the circumference of Section 1 should indeed stand for Pisces, as commonly translated and never questioned by all our scholars, and the strict exercise of checking the oppositions on the planisphere not only gives us reassurance that we are reading the planisphere overall along the right lines, but also provides the probable area of the sky in which to check the detail of what we have in Section 1. This time it is appropriate to look at the section in terms of what is happening along the three paths of Ea at the outer edge, Anu in the middle and Enlil round the centre⁷⁶.

The circumference (path of Ea)

Apart from the framing syllables *na na na na ana ana nu* along the top dividing line, *u u bur bur kur kur* along the lower dividing line and *ša ša ša ša ša ša* in three rows to the side parallel to the circumference (Weidner detected more syllables than S&B), along the circumference of Section 1 itself are written two names, *Anunet* and *Š[immah]*, the latter partly broken off, which most scholars identify as the two separate arms of Pisces, but in fact we are almost sure now that *Anunet/Anunitum* refers to *Andromeda* just above Pisces, by association with the planet Venus (exalted in Pisces - therefore following pattern observed by Weidner on the Seleucid tablets). Though most scholars still seem to agree on the Mesopotamian split of present-day Pisces into two groups of stars, it was unusual for one constellation to be given two names⁷⁷, especially as none of the stars in Pisces are particularly noticeable in the night sky when compared to the Square of Pegasus above (its top star is actually α Andromeda - see Ill. 23 above).

For this area of the sky we have no Seleucid clay tablet to check against, but as Weidner showed, Assyrian and Babylonian astronomical lists regularly placed planets in their signs of exaltation when making lists, so we are not be surprised in the *Mul Apin* Star List that the third item mentioned after *Mul Apin* and *Iku* is *not* a star, but the planet, *Dilbat/Venus*, so the planet must be placed in this triad because Venus is exalted in Pisces (following the same exaltation pattern for Mercury and Jupiter that we saw was used on the Seleucid tablets). Since we only have one letter, *Š*, for the word underneath, it could still refer to enough of Pisces as *Šimmah* to give a sky location, but it is by no means proved that all of this zone lies in Pisces: our superimposed zodiac shows this section covering more of ♋ than ♐ , so that *Šimmah* indicates only the beginning of Pisces, which would continue into the next, damaged, section, Section 2 - which we have shown already by opposition would be the case.

⁷⁶ It does not make sense for the Three Paths to be split *along the horizon*, as Pingree, van der Waerden, Koch and Koch-Westendorf understand them.

⁷⁷ The exception is Taurus, with separate names given to the Hyades/*Gišli-e*, the Pleiades/*Mul Mul* and all the stars making up the head of the bull with horns in the greater constellation, given the overall name of Bull of Heaven/*Gu-Anna*.

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We hope we have sufficiently established that the location of Venus is co-subject of the label, Simmah, on the circumference in the Way of Ea, the part of the sky dipping closest to the horizon. As we will analyse below, she is named -*Anunet Anunitum*, (the feminine of *Anu*).

The pointers, one each in the Ways of Anu and Enlil

Within the main body of Sector 1 a distinctive diagram is drawn consisting of two large, hollow pointers attached to each other in dog-leg fashion by two lines- whose labelling Sayce and Bosanquet assign as follows.

Above the line and appearing to refer to the pointer indicating the *centre* of the astrolabe is the word *Mul Dilgan/Iku* already discussed above, while below the line is the word *Mul Apin* which S&B illogically (given they knew the *Mul Apin* star list) take as qualifying *Mul Dilgan* adjectivally and referring to that same pointer. Weidner, in contrast to S&B, takes the inner pointer as referring to *Mul Apin*, which *he* identifies as Cassiopeia, and the label *Dilgan* as most likely to be referring to the pointer at the circumference, believing its identity, along with van der Waerden (1949) to be the brightest stars of Aries + Cetus just to the West of Pisces - but we established in the last line of our commentary of Section 2 *that this could not be the case!* We must take the *Mul Apin* triad as guide here, along with our positioning of the zodiac around Astrolabe K.

Inside the inner pointer four dots can be seen, with unfortunately a damaged area which may have had further dots in it⁷⁸, and in the widest end of the arrow the words *šū-ut Enlil* which Weidner understands as ‘the first of Enlil’, meaning ‘the leader of the Enlil stars’ but which we know now is a standard phrase used in astronomical texts such as the *Mul Apin* star list itself and simply meaning ‘[In] the Way of Enlil’,). Since the Way of Enlil is the band of the sky nearest the polar centre, it means the position of *Mul Apin* is *above* the Ecliptic - confirmed on other astrolabes, whereas *Dilgan/Iku*, if again we follow the pattern of the canonical star lists, must be placed on the Way of Anu (the Ecliptic) below.

Unfortunately because Sayce and Bosanquet see *Dilgan* as the label for the central pointer, they translate *Dilgan* as *Capella*, and because to them the word *Mul Apin* is a further description of *Dilgan*, they translate the word as *Foundation Star (Lynch Pin)*, which to them is *Capella* since *Mul Apin* is the star from which all others are counted in the canonical Babylonian star lists. However, just as we have argued for the labeling for Pisces, from the pattern of other texts and diagrams it does not seem likely that one star/star group would be given two names on a small disc where there is very little space to write in anything (it is only 8cm across)!

Our difficulty in assigning the right text to the right pointers is compounded at this stage in our argument by our uncertainty about the actual translation and identity of *Mul Apin* and *Mul Dilgan/Iku*: only stringent sequencing and logical cross-referencing will help to rule out the secondary candidates, but the constraints of this paper do not enable us to pursue this exhaustively.

⁷⁸ Bond and Hempell reckon they represent *Aquila*.

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The line of seven dots connecting the pointers in the Ways of Anu and Enlil

Under the longer line connecting the two pointers is a line of seven dots, which Weidner sees as creating a barrier between the information concerning the triangle pointing to the centre on top of the hard line and the further words written underneath it which he takes as telling us about the lower pointer which is filled in by ten parallel lines.

Underneath the line of seven dots is further labelling which Weidner transliterates as *Enlil* (S&B give *Bel*) *alik pān kakkabāni* - translating the phrase as *Enlil, going before all the stars* (in other words, *Enlil is foremost, highest, or leader of all the stars*). He takes this to as referring to 'Mul Apin, Leader of the Stars, in the Way of Enlil' and adds that the seven dots must refer to the fact that *Mul-Apin* consists of 7 stars. In other words, although he reads the phrase as adjectival to the *Mul Apin* label under the hard line, running them together gives an intelligible description of *Mul Apin* as leader of all the Enlil stars (fitting in with *Mul Apin's* position as first on the *Mul Apin* and other lists), though he has only just assigned the *Mul Apin* label to the pointer on the *circumference*, the region of the *Ea* stars! The very mention of *Enlil* should mean he would assign the phrase to the circumpolar (*Way of Enlil*) stars encircling the centre, since the overwhelming majority of surviving star documents never describe *Mul Apin* as an *Anu* or *Ea* star.⁷⁹ Surprisingly he did not notice, or correct, his self-contradiction.

Sayce and Bosanquet translate this same phrase under *Mul Apin* (which they call the Star of the Foundation) and more clumsily, as '*Bel who goes before the star/Bel the Confronter*' which Robert Brown⁸⁰ says refers to Ursa Major on the 11th to 15th day of the month, quoting S&B's paper on the planisphere, though from my reading of the paper S&B are saying there is evidence that the *Moon* is identified with *Bel* on those dates, and that therefore the Planisphere must be geared to some time between 11 and 15 Tammuz, at the Summer Solstice. Interestingly, if we go back to Section 0 and its label there of 'Tammuz' this may refer to the *month* of Tammuz in July (see Appendix B).

Brown⁸¹, quoting Sayce, goes on to quote an original text: 'the 25th day (of the month) is the processional day of *Bel* and *Beltis* of Babylon. A lucky day. In the night the king presents his free-will offering to *Bel before the Star of the Foundation (Mul Apin)*' - an instance of straight divination before a star or constellation for good fortune, as referred to in the final paragraph of the section on p.17 above. The Middle Assyrian sealing below could well show an Assyrian astronomer-priest in front of the observation tower (ziggurat) conducting a ritual as a Zoroastrian might today, before a burning fire altar. Venus/Ishtar/Sirius is indicated by an eight-pointed star hovering over four stars enthroned, which could either be *Iku*, the Square, or even the pan of Ursa Major, a key candidate for *Mul Apin*.

⁷⁹ Brown⁷⁹ refers to Budge's assertion that *Mul Apin* must be on the Ecliptic (*Way of Anu*) because of the statement, '*Mul Apin the Road of the Sun took*', but this is an exception to the usual placing of *Mul Apin* in the *Way of Enlil*, within the circumpolar star field.

⁸⁰ R Brown 'On Euphratean Names of the Constellation Ursa Major' *PSBA* 1887, 127-130

⁸¹ Brown 'Remarks on the Tablet of the Thirty Stars I' *PSBA* Jan 1890 p.141

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Ill 23 Ritual of an astronomer-priest beneath Venus and before Iku in the ziggurat precinct before a fire brazier, possibly even to celebrate the start of the New Year -Vorderasiatisches Museum Berlin

Returning to the planisphere Section 1 and checking back at the actual stars in the sky, are there any configurations in a dog-leg arrangement to each other that stand out? There are many possibilities, not least the relationship between the Big and Little Bears. The right angle made at the Polar centre between Capella in one direction and the line along the outside of the ‘pot’ end of the Big Dipper/Ursa Major is also distinctive. As a check, there is also an invisible straight-line alignment from Capella down the handle of Ursa Major, which is especially visible in the January night sky at the *Winter Solstice*:



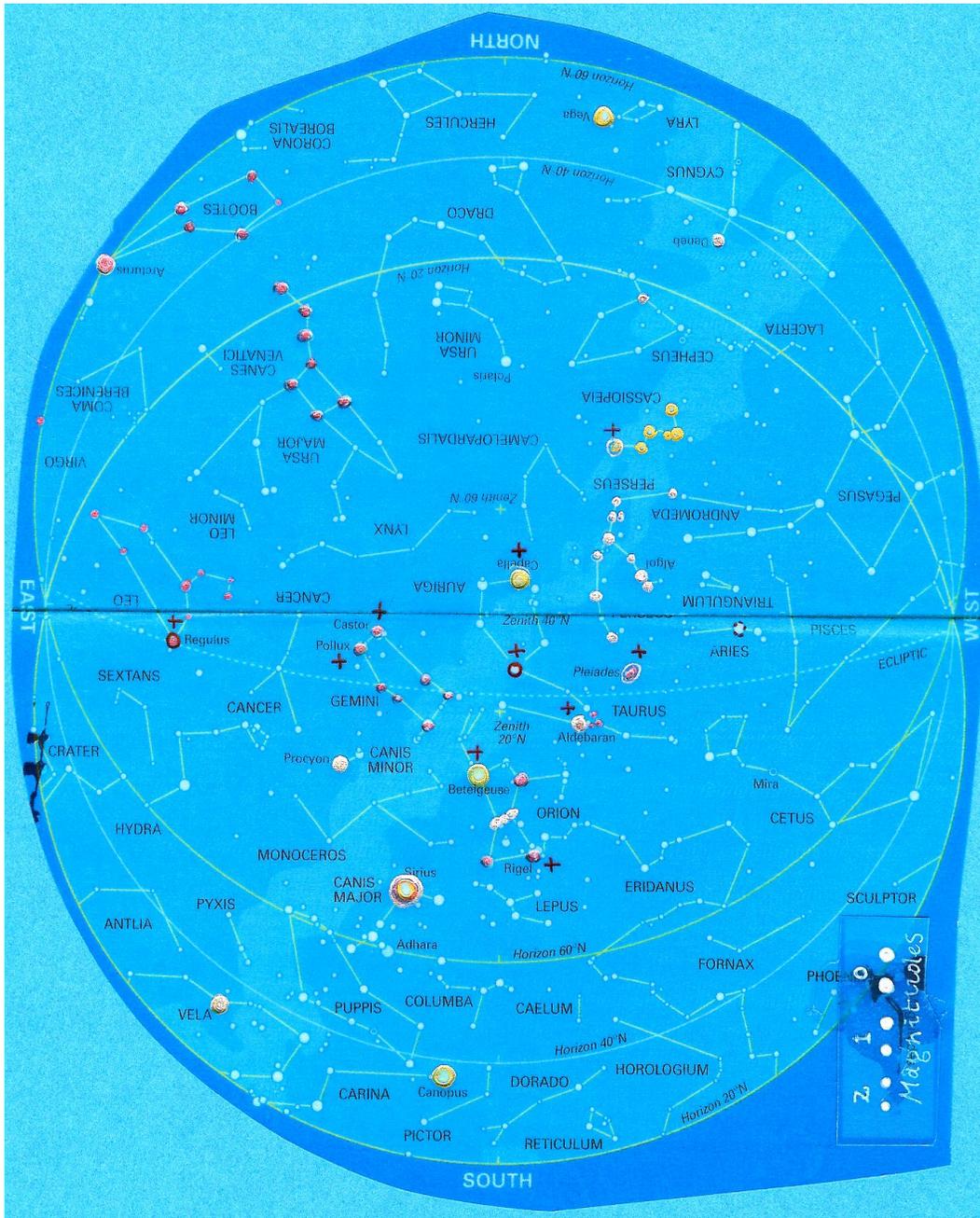
Ill. 24: Vertical alignment between Capella and Ursa Major in Winter at 2200hrs

The Meridional Line at 0° and the Annual Shortfall between completion line of the Solar Year and the Vernal Point at 0°

Even though any stars/constellations represented on the planisphere are not for the most part shown diagrammatically like our present-day star maps (where dots are joined up by lines to form the familiar shapes of the constellations):

- Sayce & Bosanquet see that general position can simply be indicated on the planisphere by a name in the general area: in Sector 1, for instance, Anunitum/Andromeda and Šimmaḥ/Pisces are named without an accompanying star diagram. On the other hand we seem to have recognisable constellation outlines at least for Gemini and Virgo. If the clay planisphere is held up against the sky (as we do a modern planisphere) at *the end of Winter* around 10.00 p.m (or at Summer at dawn). to correspond with the patterns of stars behind, Sayce and Bosanquet saw the key reference line on Astrolabe K as being the SSW-NNE running from Section 0 to Section 4 (which we have keyed to the main horizontal diameter in all our illustrations), stating several times that it corresponds to the 0° meridian (*Ill 14*), the equivalent of our present-day Greenwich Meantime meridian at 0°.
- Weidner on the other hand interpreted the horizontal line *between the pointers of Section 1* as representing that same *Spring Equinox* line (or Vernal Point) running up to the zenith at the centre.

These meridians could be one and the same line, but if it *is* a case of two different lines *it is the gap between them met by the Sun in its yearly progress that gives rise to the need for intercalation* (see (a) and (b) two pages on) - a matter whose discussion should finally bring us to a reasonable conclusion. To consider it in a nutshell now in preview, we have already considered chains of stars across the sky connecting constellations and we can look for the two probable meridians against an actual star map for the Winter Sky at night or the Summer sky at dawn in Northern Latitudes:



Ill 26: The SW-NE chains of brightest stars aligned with the Milky Way, crossed at right-angles by Taurus, Gemini, Ursa Major and Bootes (paranattellonta to Leo and Virgo respectively)

Taken altogether the line of the Milky Way enhanced by this undulating line of key bright stars is hard to miss by even the most unobservant non-specialist. The key chain of stars of magnitudes 0 and 1 could have started at Canopus (very low on the horizon in the Northern Hemisphere) but certainly begins in earnest with Sirius and the stars clustered round it on the underside of the Milky Way. The line of stepping stones then runs to Betelgeuse in Orion and zags the width of the Milky Way, crossing the sky's 20° N zenith point, to Capella in Auriga, the

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brightest star in the night sky apart from Sirius, and closest of all the brightest stars to the Polar Centre, lying at right-angles to Ursa Major. Sayce and Bosqanquet trace the line no further (see diagram above), but if we follow the line to the other side of the sky as an indigenous astronomer would, beyond Capella it runs up and down Cassiopeia's stars in a zig and a zag, ending up at the north-eastern horizon on Vega in Lyra, a star almost as bright as Sirius at the opposite side of the sky, and this creates a line of seven such outstanding stars that, as mentioned earlier, they stand as candidates for the line of seven dots in Section 1.

Once that sweep of seven of the brightest stars has been identified, using the unmistakable zig-zag of Cassiopeia two-thirds of the way along as a starting point in each direction it is then easy to make out a vaguely parallel secondary line along the top of the Milky Way linking Vela (if risen), Procyon (in passing forming a perfect equilateral triangle with Sirius and Betelgeuse on the other side of the Milky Way), taking in Capella and shaving the sides of Cassiopeia to cross Alderamin in Cepheus (husband of Cassiopeia and father of Andromeda) to end at Deneb (the Swan's Tail) in Cygnus. This is mirrored by a much shorter parallel line on the *other* side of the Milky Way formed by the line from Sirius along Orion's belt ending at Aldebaran. Cassiopeia links both outer lines via the sprawling stars making up the figure of Perseus. Whatever line we take SW to NE, **Sirius, Orion, Auriga and Perseus** are key junction points. Forming a right angle to this sweep of bright stars studding the central drag and outer flanks of the Milky Way, the sweep of the constellations of Bootes (chief star Arcturus), Ursa Major, Gemini (brightest stars Castor and Pollux), Orion and Taurus (chief stars Aldebaran and the Pleiades) across it also stand out distinctively.

If the Sun on its return to the starting point of the year arrives in the gap *between*

- (a) the line marked by Procyon at the base of the Cancer-Capricorn colure, and
- (b) the line marked by Canopus, Sirius, Betelgeuse and Capella,

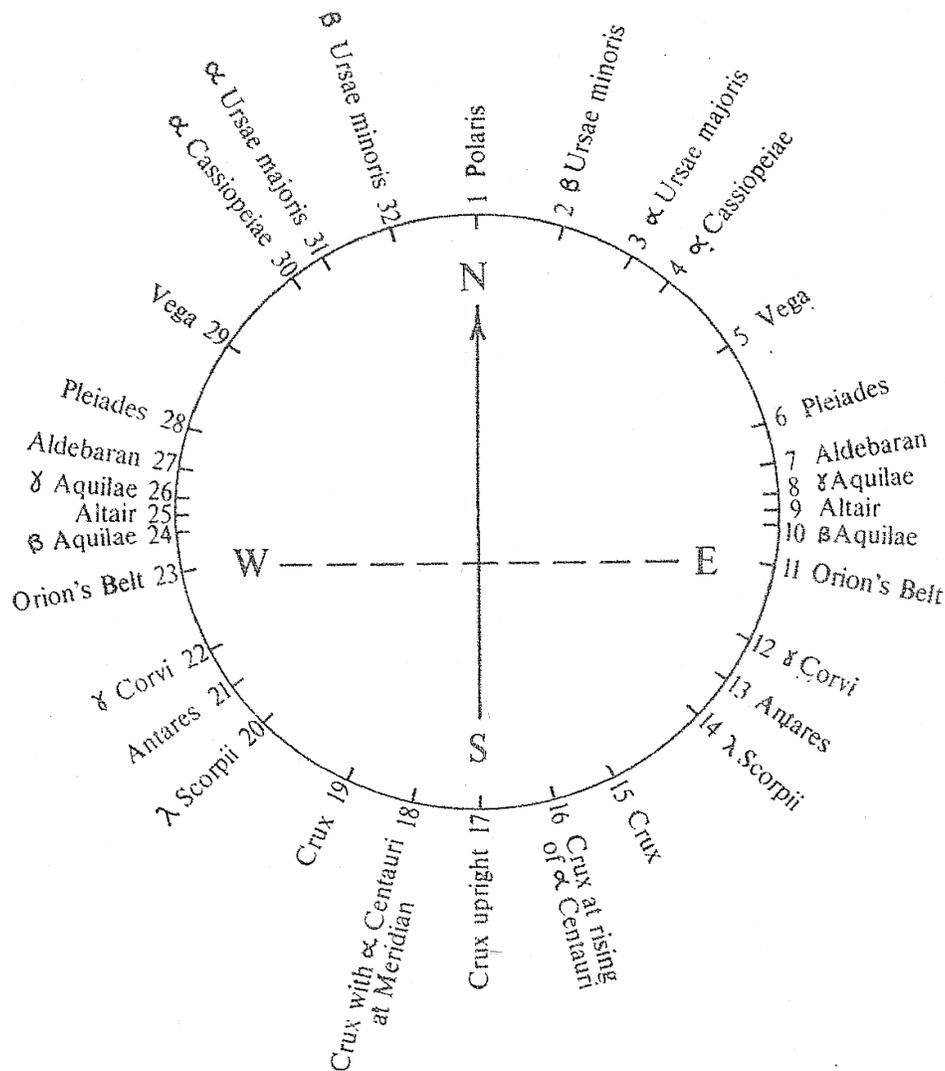
Sayce and Bosanquet argued that if it was far off reaching the 0° line ending at Capella, a spare month would have to be inserted to bring the year up to its solstitial starting point - which was done on average *11 years out of every 19 years*. In Section 1, they argued, there happen to be 11 holes altogether which could have had a peg or pegs used in them to count off this cycle (the pegs would have had to be grass stalks rather than twigs!).

Distribution of Brightest Stars in Primitive Traditions of Seasonal Star-Sighting:

The placing of these main tracks of bright stars more or less parallel to each other I think explains pre-12-fold zodiac planispheres such as the eight-fold one we are considering, which only dwell on such key alignments and give no attention to remaining parts of the sky which are comparatively featureless. It is not surprising, therefore, that these dramatic chains of stars seen crossing over each other at the time of the New Year festivals in Winter or Spring has always been, with or without the Sun cycle included, one of the most useful tools for astronomers from which to take their bearings before venturing on to make sense of intermediate positions of the year when the lesser stars come into play. It is interesting, yet not really surprising, to note how

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sailors of the Pacific islands even today use only the very brightest and outstandingly distinctive stars to measure time - let us look briefly at their practices to gain some idea of what could have early practice for the first Mesopotamians⁸³. D Lewis (1974) describes star compasses used by islanders in various regions of the Pacific until the advent of modern communications. For instance the diagram below shows the stars the islanders of the Caroline Islands use as a horizon 'star compass' - with Orion's belt marking the default horizon along the sea:



Ill 27: From D Lewis in *The Place of Astronomy in the Ancient World* 1974, fig. 8 (apud. Goodenough 1953)

Particularly striking is how Orion's Belt coincides with the W-E line; the primacy of the Two Bears, Cassiopeia and Vega to the North; the linkage between Scorpio and Corvus very low down on the horizon, and finally the

⁸³ The remnants of pre-Islamic Arab star-lore and much earlier artefacts left by Neolithic Man indicating star observation tell the same story - but we have no room to include these here. See under Bailey, Varisco and Makemson in Bibliography

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prominence on the horizon of the Aquila and Taurus stars in a tight group. The ‘time for voyaging’ for the Gilbertese was associated with Antares on the ascendant at dawn - which also marks the Autumn equinox - whilst the ‘time for staying at home’ was heralded for them by the rise of Aldebaran, marking the Spring equinox on the opposite side of the sky. Their W-E celestial equator is fixed *by the declination of Orion’s Belt*, while their **centre point is placed at Polaris in Ursa Minor**, as it would be for us.

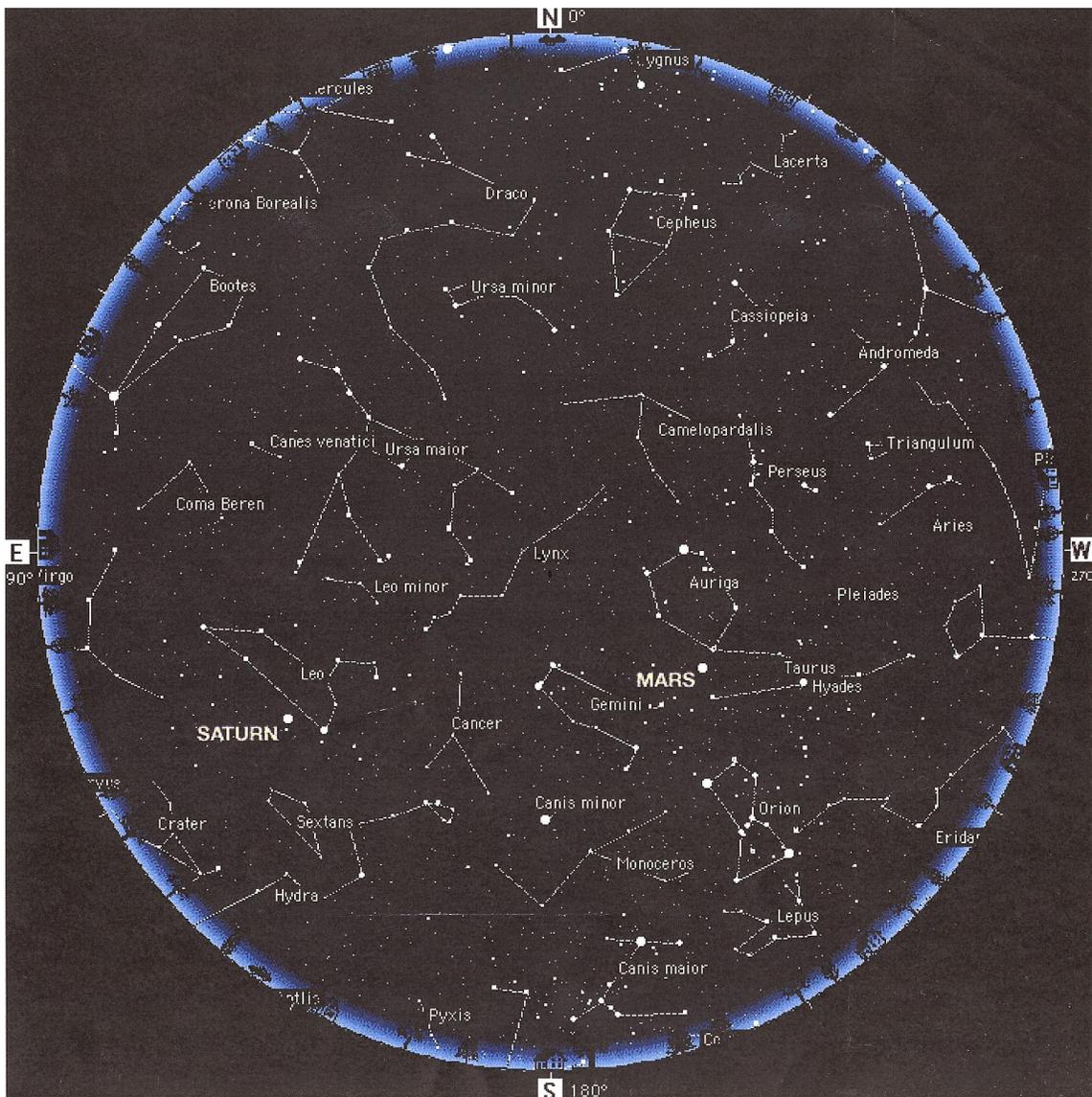
These surely give us at least a glimpse of probably similar Mesopotamian priorities - given the nature of those stars that stand out - providing the primitive framework during the time the science of astronomy was in its infancy, standing in good stead for millennia as the refined detailing of intermediate stars was added in successive centuries. There is telling evidence of ancient traditions of star observation naming just a few prominent stars in this way as a guide to the seasons, without taking the Sun’s movement into consideration at all. In the Avestan **Bundahishn** (c.500 BC) from the comparatively recent Persian tradition (its ancient origins said by Herodotus to date back 5,000 years) over and above Ursa Major and Capella the prominent stars mentioned appear in the same scatter, in the following lunar mansions⁸⁴:

<i>Lunar Mansion no.</i>	<i>Probable star</i>	<i>Common Name</i>
3	η Tauri	Pleiades
4	α Tauri	Aldebaran
5	λ Orionis	Other shoulder Opposite Betelgeuze, rising slightly earlier
6	α Orionis	Betelgeuze
7	α Geminorum	Castor
10	α Leonis	Regulus
19	α Scorpii	Antares
20	α Lyrae	Vega
22	α Aquila	Altair

⁸⁴ Where the sky is divided into 27 or 28 sections, one for each night of the month

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This late winter sky map for 8 February 2008 shows how definitively the first six in the list stand out:



Ill 28: Night Sky mid-way between Winter and Spring, 08 February 2008 at 2200hrs

while at a different time of year the last three on the list wheel into more permanent view (Ill 19 - Aquila lies below Vega and Cygnus beneath the horizon).

Sachs confirms in his paper 'Babylonian Observational Astronomy' that when looking at the positions of the 36 key stars of Babylonian astronomy, 'the reference stars are fairly well distributed in longitude until approximately 230°, after which there is a gap of more than 40°; after about 290° there is an even bigger gap of more than 60°'. It is interesting that Bork (1910) cites some textual evidence from the *Mission de la Délégation*

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en Perse to show that in proto-urban times the Elamites may have used a system of months of different lengths that lasted between one star-rising and another - just as in the Pacific tradition - during a 365-day year:

<i>Sun/Star observation</i>	<i>No of days in month</i>
Taurus star-set to Winter Solstice	44
Winter Solstice - Windy Season	44
Windy Season - Rise of Arcturus	15
Rise of Arcturus to Spring Equinox	32
Spring Equinox to rise of Taurus stars	48
Rise of Taurus stars to Summer Solstice	42
Summer Solstice to rise of Arcturus	93
Rise of Arcturus to Taurus star-set	48
TOTAL	366 days - <i>divided into 8 unequal months</i>

Bork cites evidence also of the use of 10 unequal-month year in Kamchatka, Japan, and other areas of East Asia, and over into surviving rare tribes in North-Western American - remaining indicators, he reckons, of a route of calendrical practice that could have travelled east all the way to Central and South America in ancient times.

INTERIM ASSESSMENT OF ASTROLABE K

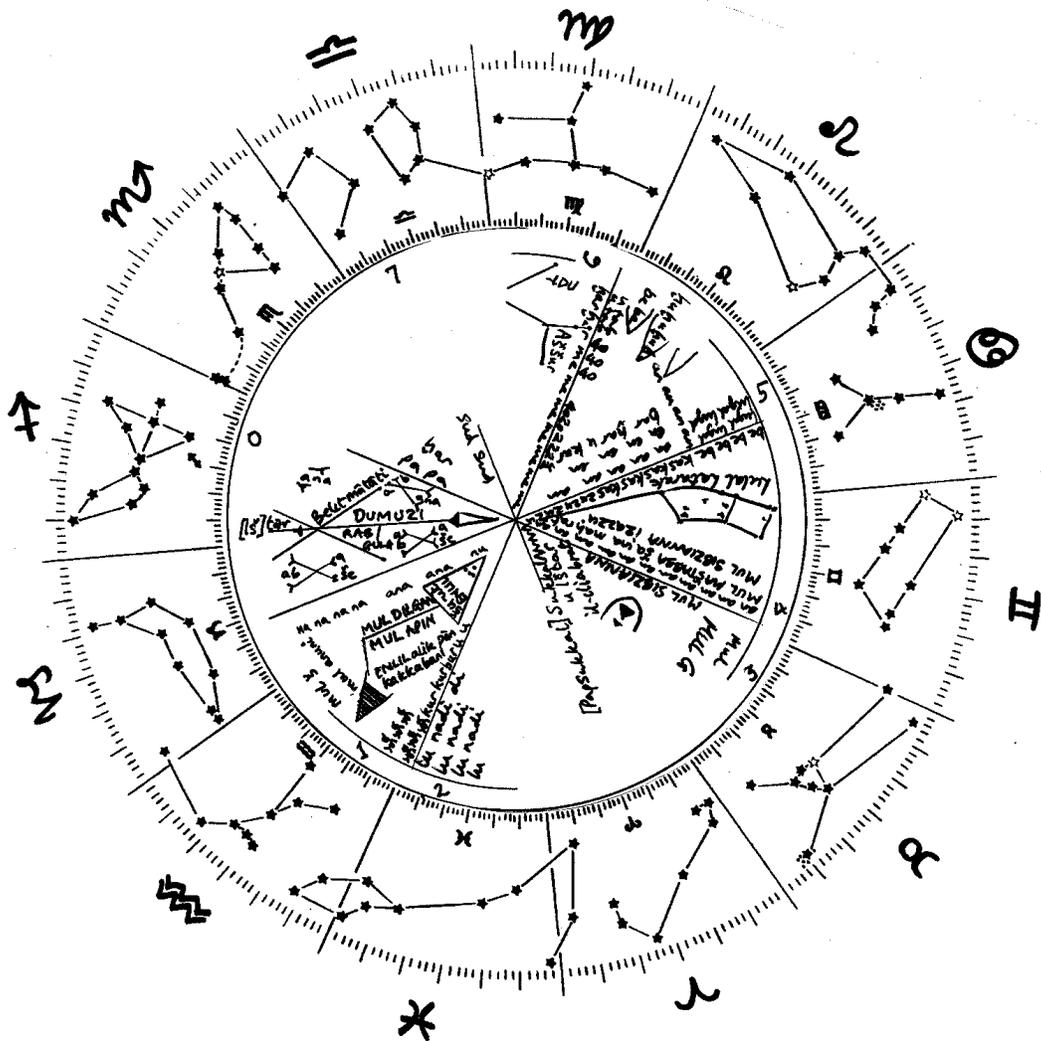
It has to be said here that, whilst I disagree with Bond and Hemsell’s conclusion as to its status as ‘a *field-note*’ recording an asteroid plume, the division of the Planisphere into only 8 sections is a very strong indication that it is indeed an Assyrian *copy* of a very much earlier sky map, but with a less dramatic and more enduring purpose which I argue for in the last few pages of this paper.

Despite by no means having clarified everything on it beyond reasonable doubt, through the logic of sequencing and matching to actual sky maps we *have* made big strides in ascertaining some of the material on it, and this is the moment to take stock of where we have got to so far in contrast to the conclusion of previous scholars. Although we draw on the work of several notable scholars from the past as well as contemporaries from our own generation who seem to have made sensible contributions towards decoding the astrolabe so far, there are still places where I believe even the most recent serious contenders using modern astrophysics to prove accuracy (Bond and Hemsell most recently, and even Koch in **NU**) are not totally correct in their readings⁸⁵ - though the latter is the first to try and make sense of the wide variation of interpretation amongst other scholars (including Weidner, whom he especially recommends as an authority). On several occasions we have found the *earliest*

⁸⁵ Some of his meticulous precision diagrams of star positions do not actually solve anything on Astrolabe K, which itself is not a precision instrument - more an indicator of general layout like the Pacific Star distribution diagram.

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attempts at interpretation by Sayce & Bosanquet⁸⁶ to still ring true, deserving to be taken into serious consideration despite being old-fashioned in some respects compared to contemporary knowledge⁸⁷. Though some of their transliteration and translation of the cuneiform labels have been superseded by Weidner and Koch, their more traditional approach to the material turns out to be an advantage. Modern writers brought up on the current astrophysical cosmos were not brought up on the ordered cycles of the heavenly bodies scrutinized and worshipped in ancient astronomy.



Ill 29 Astrolabe K8538 in Weidner's transliteration surrounded by 12-fold zodiac outlines of today

⁸⁶ As detailed earlier and in the Bibliography, the three papers published by Sayce and Bosanquet on Babylonian astronomy, all relevant to Astrolabe K, are: Monthly Notices of the Royal Astronomical Society XXXIX 8 June 1879 454-461/XL 3 Jan. 1880 105-123/XL 9 Supplementary Notice 565-578 - and are referred to here as S&B-1, S&B-2 and S&B-3

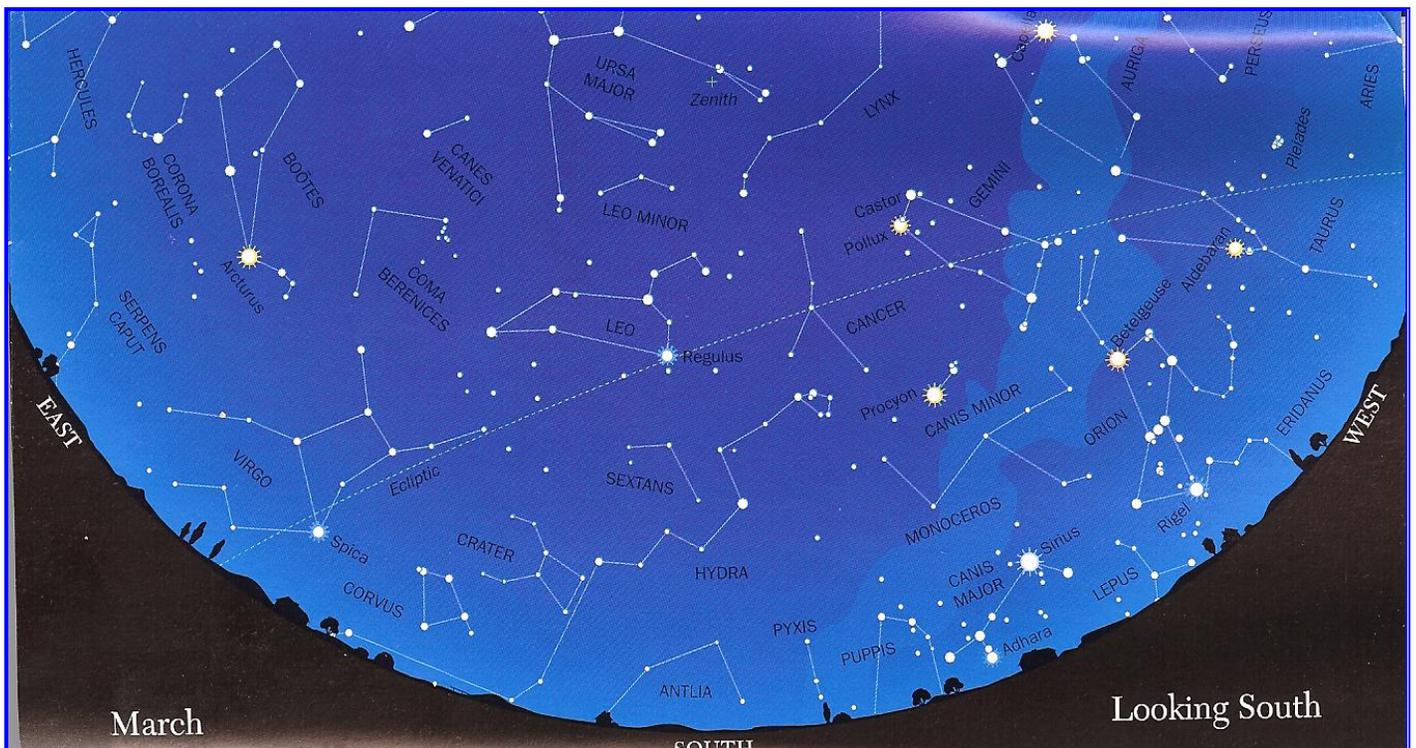
⁸⁷ One modern scholar said he wouldn't even bother to read S&B's papers - not just because "they didn't know anything then", but also because it was too much of a chore to go to a specialist library that holds the Monthly Notices of the Royal Astronomical Society!

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We give above the complete planisphere once more, still augmented by a modern zodiac round the outside - now with *Weidner's* transcriptions positioned over the relevant cuneiform to replace the Greek letters and Sumerian transliterations of Sayce & Bosanquet. But although we have given credence to our interpretation of the astrolabe at one level as pretty much an accurate representation of the ordering of stars in the night sky (with one big exception, discussed in the next paragraph), we hold off giving a version with translations into English transferred to the line drawing, since the identity of some of the key star names is still in question. Certainly the star maps we have matched to it look very close to key features on it but a definitive match is partly dependent on being sure about the identity of the centre point (in this essay we have put in red text the possible alternatives for the centre point on the astrolabe).

Why Section 0 is out of Sequence

We have tried to demonstrate, section by section, how most of the information on the 8 sectors of the astrolabe do seem to follow an actual sequence of stars round the sky. The one exception, as we have already strongly emphasized, is the possible representation of the constellation of Orion - in reality positioned below the Cancer/Sirius zone as in the star map below. On the planisphere Orion, and implicitly the stars of Cancer/Sirius nearby, are placed *opposite* Gemini instead of between Gemini and Taurus - but Orion is not a *zodiac* star group.



Ill 30 : Northern Hemisphere Spring Sky looking South at 2200 hrs

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We considered the likelihood that the Orion diagram doubles up as an indicator of the Sun's solstitial extremes. Brown⁸⁸ discusses the etymology for the Assyrian word *Pulukku* which he takes to stand for Cancer. He says the equivalent Akkadian word *kas* means cut or division, close to Varahamihira's word in Vedic Astronomy *Kulira*, which equates to the Greek *Kolura*. Although there is a strong case for *Pulukku* standing for the star Pollux in Gemini, it is close enough to Cancer to still qualify for the overall concept that *Pulukku* marks the Solstitial Colure, or line where the Sun at the Summer Solstice reached its greatest height in the sky when it rose at dawn in *Cancer/start of Gemini*, the Cancer-Capricorn opposition being well-known as the Solstitial Colure (hence the ancient idea of the Sun, on reaching its most northerly position in Capricorn, in relation to Earth, being akin to a Goat perched on the high mountain peak of the Winter Solstice).

This is why it has been important in our section-by-section analysis to follow the Mesopotamian approach of always taking oppositions into account, and to constantly bear in mind the full diametrical axes of the planisphere all the way round. The convention extends even to Mesopotamian *figurative* astronomy on round artefacts like bowls, where flipping an image standing for one side of the sky is flipped over to the opposite side for reasons of space. The instance on Planisphere K, of placing material in the comparatively empty Capricorn section which really belongs in the Cancer section opposite, is not unique: other Mesopotamian artefacts survive using just this convention, but it entails too long a digression at this juncture to go into now.

The Identity of Mul Apin and Bright Stars or Constellations near the Polar Centre

We have shown that we could obtain a steer on the nature of the stars mentioned on Astrolabe K by aligning the star names mentioned in Section 1 with the same list on the Mul Apin tablet. If we compare against the Planisphere a current star map of the sky when Ursa Major is at the zenith in a dog-leg arrangement with Bootes (see next illustration) could we be sure that Ursa Major is Mul Apin, rather than Capella?

For reasons of time we have to miss out here all the possible seven-star⁸⁹ candidates we could go through (there are many) to assign Mul Apin⁹⁰ to, and jump straight to our final conclusion that it is Ursa Major - mostly because Brown⁹¹ underscores his interpretation of Mul Apin with the equivalent Greek word from Hesychios - *Ag-anna* which literally means 'Going at the front/going first [in the sky]' which Hesychios directly equates with 'Ouranoi Arktos', or Heavenly Bear. Etymologically the Greek word *Aganna* is the exact equivalent of S&B's 'Bel who goes before', or Weidner's *Leader of the Stars*'. And to be absolutely literal, as Hunger (1989) is in his

translation of Mul Apin, *Apin* (in Sumerian ) simply means *Plough*⁹² and there is no reason to believe

⁸⁸ 'Remarks on the Euphratean Astronomical Names of the Signs of the Zodiac' PSBA XIII 1891, p.254

⁸⁹ I will do this instead in my work on the Ancient Near Eastern Canon of Art, in preparation for posting on the www.layish.co.uk website

⁹⁰ Weidner states, on the basis of the line of 7 dots in Section 1, that Mul Apin must be a seven-star group.

⁹¹ Unfortunately Brown's writings are often highly unreliable and wildly off the mark - yet full of useful nuggets too.

⁹² See also Puhvel 1964 in Bibliography

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When it comes to other really bright stars just outside the circumpolar region, we have already seen in the Elamite-Pacific tradition the importance of Vega in Lyra, Deneb in Cygnus and Altair in Aquila, and we have looked at the chains of stars running in different directions over Cassiopeia, Capella and Perseus. We have shown these as important for the longer alignments stretching across the sky but other than the Antares-Aldebaran line they are not of central importance for the location of the Polar Centre itself. If the centre of the planisphere does just represent the Polar Centre (which would be the obvious conclusion) - and if the seven dots in Section 1 mean Mul Apin is a Seven-Star Constellation as Weidner thought, then it is involved as the key Polar Pointer as well, jumping via Ursa Minor to the centre, which is certainly how we use it today to locate the Pole⁹⁴.



Ill 32: Location of Polar Centre using the Two Bears

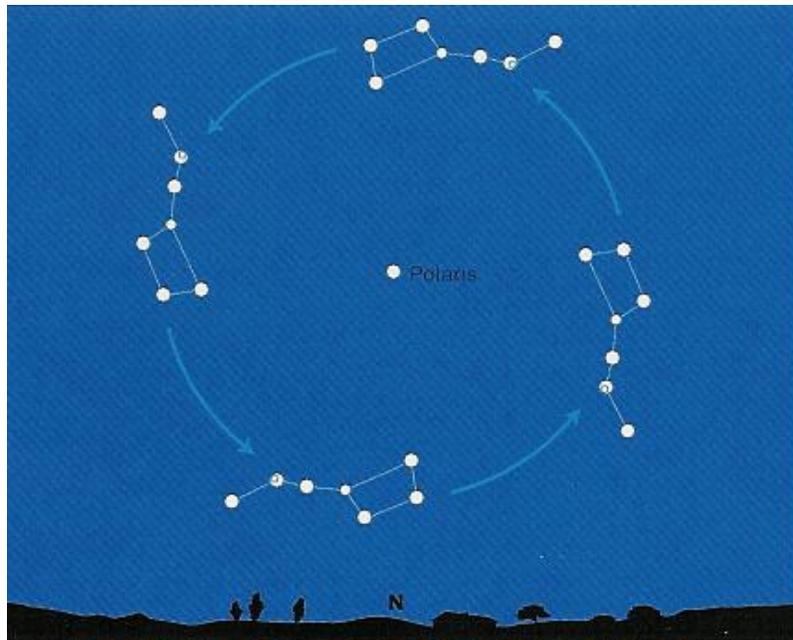
Ursa Minor is closer to the Polar Centre than Capella in Auriga (S&B's candidate for the honour of the Mul Apin label) and, even if not as bright, it is bright enough and as a constellation more consistently bright in *all* its stars than Auriga the Chariot (Margidda). Let us look further at the crucial role the Two Bears (possible candidates for the dog-leg arrangement in Sectin 1) play in orientation.

⁹⁴ Bond and Hemsell put the polar centre at Alpha Draco, consistent with their view the planisphere is a picture of the sky in 3123BC.

The Two Bears and the Polar Centre

If Aratus' *Phaenomena* (contemporary with the Seleucid tablets analysed in Part I of this double essay) follows the order of the Mul Apin Star List for his own times⁹⁵, then it is telling that he mentions the Pole first, followed by Ursa Majoris and Minoris. The Gilbertese order of stars also puts the Pole and these two constellations right at the top of their compass (illustrated above). Homer's description of the Bear as ever-turning and never setting refers equally well to both the Great and Little Bears, but being so prominent and visible the Great Bear is the easier to use as a sky clock hand as it makes an entire circuit of the Polar Centre every 24 hours.

In the course of the Solar Year the sky is later coming back to its starting point by 4 minutes every night at midnight, and even until recently observers were able to tell the date by the rotating Bears as they line up



Ill 33: Changing position of Ursa Major at the same time of night during one Solar Year

with other stars in the sky, notably making a right angle to Capella as shown earlier. This would especially become an issue at the distinctive season of the Akitu Festival at the Winter Solstice between 25 December and 6 January. Where Ursa Major gives accuracy for the month, Ursa Minor gives precision for the days⁹⁶.

Even in modern times and even amongst people otherwise ignorant of astronomy, it is known that Ursa Major is the constellation most easily used to locate the polar centre. Even though in the past it seems clear from records of Mesopotamian star observation that other parantellonta were as important, the Bears are such

⁹⁵ Scholars increasingly admit the wholesale debt Greek astronomy owes to Babylonian astronomy, partly for the very reason that the ordering of their information and vocabulary used exactly mimic those of their Semitic predecessors.

⁹⁶ Clare Vincent & Bruce Chandler 'Nighttime and Easter Time: The Rotations of the Sun, the Moon and the Little Bear in Renaissance Time Reckoning' *Metropolitan Museum of Art Bulletin* NS XXVII 1919 372-384

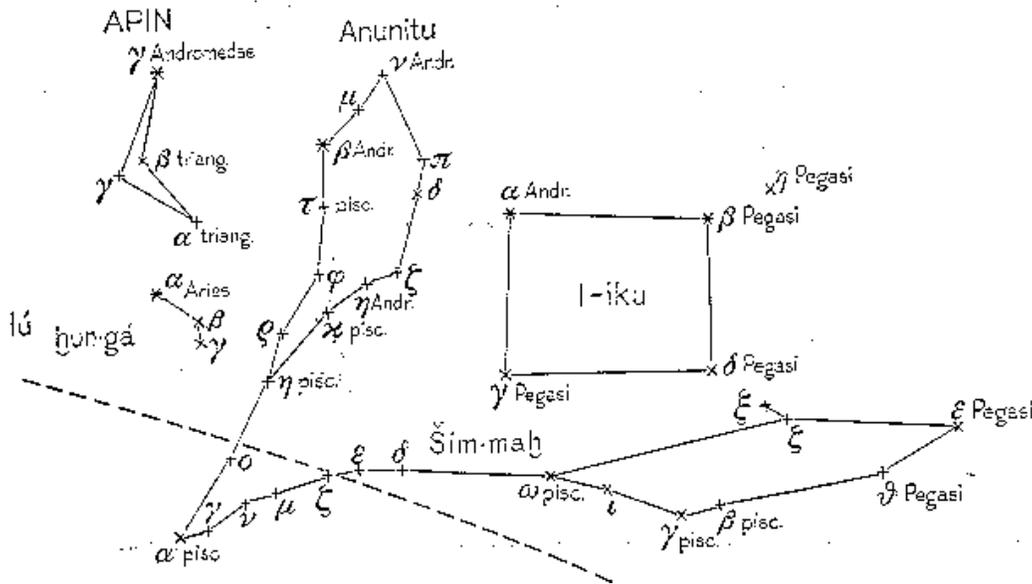
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distinctive groups of stars that they cannot but have played a prominent part in the Babylonian star lists - and Mul Apin is mentioned with the same frequency and familiarity as the Bears, which as we have seen lie in a dog-leg relation to each other either side of Draco (Ill.31).

Bérard states in *Cultes Arcadiens* 'l'ourse ... est la bête d'Aphrodité'. Here we have a correlation between Venus and Ursa Major, whilst Dupuis in *Origine de Tous les Cultes* quotes Servius⁹⁷ who says that not only does Venus rule Taurus, but she is exalted in the Great Bear, which could be why Venus is mentioned with Mul Apin in the first triad of the Mul Apin star list, and Section 1 of Astrolabe K. This also means we should read the drawings on the Seleucid zodiac tablet showing Taurus (Ill.3) - if the patterns of planets as listed in their *hypsomata* is to be followed - as actually representing Venus (co-ruler of Taurus with the Moon, but exalted in the Seven-Star Ursa Major (Zappu). Looking at Appendix A, we see Venus is traditionally exalted in Pisces - this idea survives in modern astrology - which is another reason why this constellation underpins Venus' more exalted hypsoma in Ursa Major and is aligned in the first triad of heavenly bodies listed on the Mul Apin star list! Venus is identified with Mul Apin in several astronomical texts, notably the Mul Apin tablet itself, and there are several mentions in The Venus Omens of Ammisaduga that Venus/Ishtar is to be identified with Ursa Major!

The Identity of Dilgan/Iku

We need to be more certain about the third item in the first Mul Apin triad. Van der Waerden's paper on the 36 Stars⁹⁸ gives a diagram for his interpretation of the first three bodies described in Mul Apin, which he gives as Triangulum (above Aries) as Mul Apin on one side of Pisces, and the Square of Pegasus as Iku on the other side:



Ill. 34: Van der Waerden 'The Thirty-Six Stars' fig.3

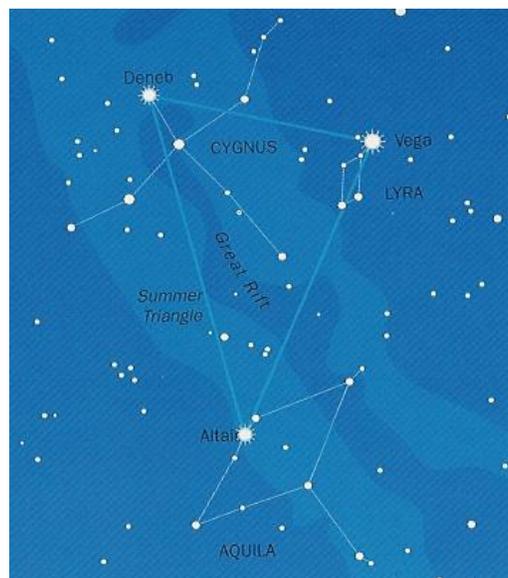
⁹⁷ Chronicles of Alexandria p.109

⁹⁸ B L van der Waerden 'Babylonian Astronomy II: The Thirty-Six Strs' JNES VIII 1949 6-26

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I have already argued that on Section 1 of the planisphere I see Anunitum as referring to Venus, and Šimmah, the Swallow, as referring to the whole of our present-day Pisces since it does look like a swallow. Dilgan/Iku he applies to the Square of Pegasus, made up of the three brightest stars in Pegasus and at its northernmost corner α Andromedae.

Koch goes for the triangle of stars within Pegasus so that he can get them to match one of the pointers on Section 1. This echoes the much more prominent and well-known 'Summer Triangle' higher up, formed of the bright stars Deneb in Cygnus, Altair in Aquila, and Vega in Lyra which together form the 'Summer Triangle':



III. 35: *The Stars of the Summer Triangle*

However, this is a triangle of stars, rather than the square alluded to by the words Dilgan/Iku.

The choice of a triangle also goes against the word *Iku* itself, which can mean *temenos* or *square area of land*, since clay tablets say the Ziggurat of Babylon occupied one iku. In support of this Ugnad,⁹⁹ who goes much further than van der Waerden in giving good reasons for the Square of Pegasus as the best identification, describes the word *dilgan/iku* as referring to a square field 120 and later 180 ells wide (perhaps related to our acre) which Brown expands on as precisely referring to 'a square field framed by canals'. Furthermore, Ugnad makes the valid observation that in Egypt on the rectangular Denderah Zodiac the sign of Pisces indeed has a square field depicted next to it which from its texture could plausibly be read as framed by irrigation canals (he takes this as an indication that the Denderah zodiac derives from Babylon)! To cap it, Ugnad cleverly points out that Iku must indeed refer to Pegasus (which gained wings under the Greeks) because of the etymological link between *iku*, *equus* and, indeed, *e-ku-e*, a name Weidner took to be for Aries, when in fact it was a Hittite word for horse.

⁹⁹ Arthur Ugnad 'Babylonische Sternbilder oder der Weg babylonischer Kultur nach Griechenland' ZDMG LXX 1923 81-91

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Ugnad's translations are the most plausible out of all the possible translations for the constellation (Kugler and Bezold take Gam/Iku to be Auriga, Hallo (2008) to be the Crook - while others equate Iku with Andromeda



Ill. 36: March 13

a constellations that does mesh in with Pegasus and rises above Pisces (see Ill.36 above). If Astrolabe K is a contemporary Assyrian document, we are at an era where the Vernal Point had moved backwards from Taurus to Aries, and looking at a star map for this region of the sky, for observational purposes the middle ground between the two signs is indeed most distinctively taken up by the Square of Pegasus/Iku. If a star is distinctive at only one time in the year, it would not be a circumpolar star like Capella which never sets, so Iku must refer to a star/star group lower in the sky.¹⁰⁰ It is higher than Pisces, which is the sign of the Zodiac actually on the Ecliptic, the Way of Anu but when Dilgan first rose on the horizon it would have looked like an Ea star, low down - and the stars of Pisces being comparatively faint, it is not surprising prominence is given, not to its stars, but to the exaltation of Venus in Pisces at the start of her synodic cycle and prominence given instead to Pisces' paranatellon, Iku.!

¹⁰⁰ Sayce 1874 p.153 quote this juxtaposition: 'The star Iku, the star Dayan-same which in the midst revolves'.

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Referring back once more to the two triangular pointers on Section 1 of the Planisphere, we remember again how Koch takes Dilgan as consisting only of the three stars of Pegasus from the Great Square to form the triangle which points to the centre, meaning that to him the centre of the astrolabe is the horizon. Taking Koch's idea, and excluding the faintest of the four stars making up the Square (γ Pegasi), the three remaining stars do make a distinctive pointer in the right position to match the pointer on the circumference of the disc! The swallow shape of Pisces itself looks more like the lower triangular indicator on the clay disc than the stars of Pegasus itself, but we have already said its stars are surely too faint to be the distinctive herald of the New Year as described in the texts.

Whatever combination of stars is the right one (according to the etymology of the word, it really should be a square) we seem to be gravitating around the Pegasus region with several good reasons for it to be the right arena for Dilgan. Looking at van der Waerden's diagram (Ill. 34) which includes Aries and Triangulum there is no doubt this is the right area of the sky for Iku to be in, since it is repeatedly said to mark the start of the year. S&B cite the text, 'The appearance at the beginning of the year of the star Iku... one observes', and Koch follows Sayce and Bosanquet's understanding of the importance of Dilgan by quoting further the following lines: 'When *Aš-iku* stands in the East at an angle, this is the star of the Beginning of the Year, The leader of the stars of *Ea*'.

ASTROLABE K, THE CALENDAR - AND THE INTERCALARY MONTH

After all our analysis, checking and cross-checking, our working hypothesis that Astrolabe K was an instrument used to measure the approach of New Year time and whether an intercalary month should be inserted is not implausible, for it was a central concern in the management of the calendar. We now look more closely at what was involved.

Sayce & Bosanquet decided after their assessment that by following the rules for calculating the intercalary year in relation to star and moon positions at the solstices or equinoxes (via Section 0) it would enable its user to decide whether to insert an intercalary month and maintain a reliable calendar.

The intercalary system of regulating the exact measurement of the sidereal year depended on being able to square the lunar and solar years, given that both those planets were helpful in measuring its cycle, but whose timings do not dovetail exactly. The discrepancy between the two cycles measure from the day when both were observed at the starting point of calculation was known as the *resh shatti*, the period between the day of the beginning of the year in lunar terms and the actual Equinoctial day - whose length could vary between 1 and 20 days either side of the equinoctial point. In more recent calculations the *resh shatti* star is quite specifically named as *Dilgan/Iku*, hence the importance of identifying it correctly on Astrolabe K. Once the gap was big enough to lose sight of the seasonal spacing of the patterns of months, an intercalary month was inserted, usually with the same name as the first month of the year to indicate it was *marque II* of the first month, bringing it up to scratch (in fact at the time of writing the Jewish calendar in March 2008 this year adds Adar II

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to Adar I for their year 5768. This provisional month was also sometimes termed the *itu dir*. Weidner 1914 (p.72) quotes the following comparative dates to show such a fluctuation against the 360° Right Ascension circuit in just a period of 3 years stretching between 28 March in the first year to 25 April in the third:

	λ	α	δ	\odot	d seit Äquin.	jul. Dat.
α Arietis	2,2	334°,80	— 0°,07	347°,34	352°,06	März 28
γ Ceti	3,5	318,34	— 33,20	8,97	4,17	April 15
δ „	2,5	339,08	— 26,26	14,31	15,04	„ 25

Looking at the discrepancy for the first day of the year which should be around March 21st, obviously by the end of the third year an intercalary month was needed to keep the months in kilter.

This is exactly our approach in the Western world where we calculate the start of Easter by the preceding Paschal Moon - this is actually a surviving practice of the method for calculating whether an intercalary month be inserted or not if the shortfall (*resh shatti*) is greater than 15 days before the Equinox, given that the lunar year falls back by 11 days each year.

Weidner reconstructed, from somewhat damaged texts, that it boiled down to the behaviour of the Moon and three crucial stars for fixing the start of the New Year:

- if Shupa/Arcturus rose during the *resh shatti*, no intercalary month would be needed. However, Shupa may in this instance refer to Orion since, as Brown points out, Shupa referred both to Arcturus and Orion (it is possible, though, that *Shugi/Perseus*, and not *Shupa*, is the correct constellation).
- If the Moon was *conjunct* Zappu¹⁰¹, (see Ill. 3) then no intercalary month was needed. Hence arose the tradition of the Moon's *hypsoma* (exaltation/maximum power) in Taurus, as illustrated on the Seleucid clay tablet described in Essay I. Hence also the inclusion on that tablet of the lion of the solar year within the moon's disc, linked, if not to the hero Perseus/Shugi, then to Orion.
- Insertion of intercalary months according to a 27-year cycle of Sirius (woven into the 19-year (Saros) Moon cycle): the cuneiform text states, 'The Sirius visibility cycle lasts 27 years: work backwards and work it out day for day', which Weidner takes to mean that after 27 years the heliacal rising of Sirius recurs on the same date, and that shortfalls have to be counted back to the start of the cycle (the difference between 27 solar years and 27 lunar years is 294+ days which through the insertion of 10 intercalary months can be brought exactly parallel to each other at the conclusion of such a Sirius cycle). In other words, Weidner writes that certainly from the time of the Ur III Dynasty c. 2400BC a Sirius synodic cycle was recognized which helped, along with double-checks against:

- (i) the conjunction of the Moon with Mul-Mul in Taurus according to the Saros cycle of 19 years and

¹⁰¹ See also Koch 1997

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- (ii) the recurrence of the Venus synodic period in the same sign of the zodiac every 8 years -
- to calculate whether an intercalary month should be inserted to take the year up to the day of the actual Spring Equinox. The shortfall between all these benchmarks with the sidereally accurate Vernal Point, he surmised, is referred to by the term *reš šatti* in the cuneiform texts. Following on from this assertion he notes that at this period the Vernal Point was marked by the rising of Aries and Cetus and this is why he assigns *Dilgan* on Astrolabe K to these stars, since in the texts *Dilgan* (whatever star it may actually refer to) is termed the *reš šatti* star in the path of Ea. In actual fact, Weidner points out, the reasoning behind whether to insert an intercalary month or not hung on the appearance not only of Sirius, but also, as pointed out above on the heliacal rising of Arcturus (*Šupa*) in Bootes, as a yet further check.

Discussing the Seleucid Sirius dates Sachs (1952) notes that their tables always show Sirius rising in the 4th month (= July): 'This is almost - but not quite - the equivalent of saying that the mean date for the rising of Sirius is IV 15th - which is precisely the date given in the schematic calendar of the older astronomical composition MUL-APIN. *This feature may well have been of prime importance in connection with the adoption of the 19-year cycle, since 'the seven intercalary months were distributed over the 19 years in such a way that these dates of the rising of Sirius always fell in month IV. Perhaps the unique intercalary month VI(2) was included to make sure that the dates of the apparent acronyca rising of Sirius should never fall outside IX or X*¹⁰².' He ends by saying 'The hypothesis that it was the Sirius-rising dates that determined the intercalation patterns of the 19-year cycle is, at least for the present, without a rival'. One would therefore think that Sirius should be considered as Leader of the Stars (Mul Apin) but Sirius features at very high status in Section 0 as Ishtar.

However, the last part of Sayce & Bosanquet's paper on Astrolabe K goes on to argue why *Dilgan* - by which, according to their reasoning, they also mean *Mul Apin* (whichever star it is - for them it is Capella at 0°) should be taken as the star against which the Moon's rising was measured so as to work out whether to insert an intercalary month to create a 'full year' of 13 months. This is based on the text they quote which says, 'When on 1 Nisan the Star of Stars (Mul Mul, usually translated as The Pleiades) and the Moon are parallel, that year is normal: [but] when on 3 Nisan the star of stars and the Moon are parallel, that year is full (i.e. has 13 months)'. The line along which the Moon and the star of stars are parallel, they state, must be 0° longitude, and it lines up with Capella (their choice for Mul Apin/Dilgan), rather than Sirius - but as we know they are aligned (Ill. 14), either would do!

It is the Moon, therefore, that was used as a pointer against a fixed star in order to calculate the correct sidereal, and thereby the solar, year. 'In Akkadian times the commencement of the Year was determined by the position of Capella, called *Dilgan* 'the messenger of light' in relation to the new moon at the vernal equinox'¹⁰³.

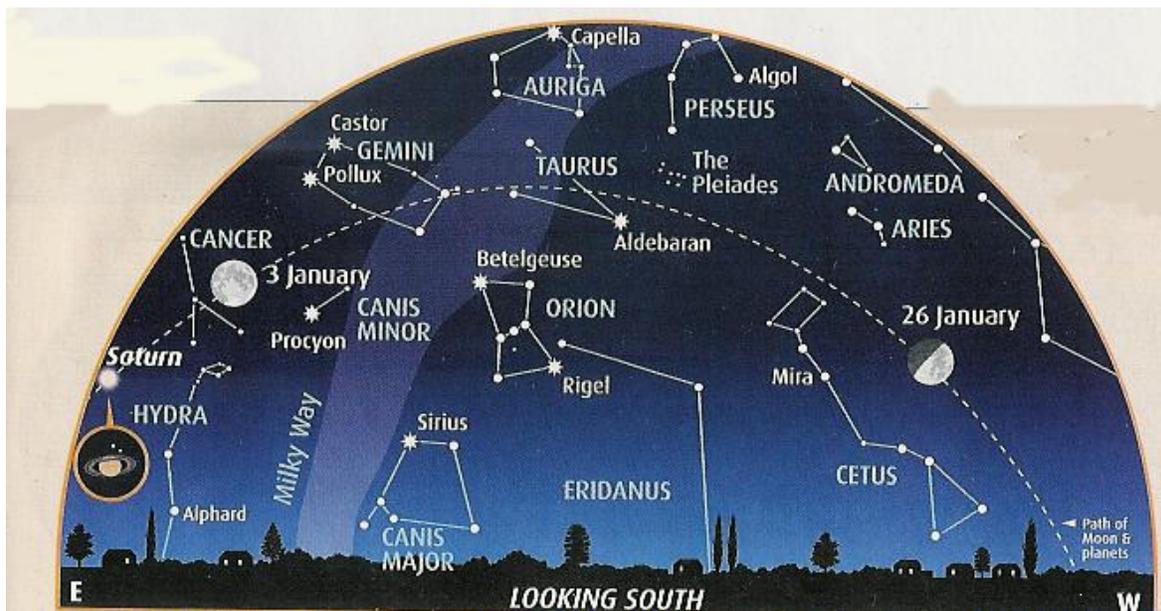
¹⁰² Month I being Nisan (covering March/April) - see Appendix B

¹⁰³Sayce, quoting Herodotus

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Sachs (1988)¹⁰⁴ gives a useful overall picture of the practice of intercalation in Mesopotamia: 'This custom of adding a month to a year can be found in the oldest documents which give any calendared information (from the third millennium) and continues to the end of the attested use of cuneiform writing. In the 1M BC there are two points in the year where an intercalary month can be added: either after the sixth or after the twelfth month. [Then] Until about the middle of the 1MBC this intercalation was done when one felt that it was needed. We know this from royal letters commanding intercalation as late as the reign of Nabonidus and from other official letters on the same topic from the time of Cyrus or even Cambyses. From 380 BC onwards a fixed pattern of intercalation was followed which had seven intercalary years in a 19-year period. Even before this time, one had evidently tried to establish such a pattern, as can be seen from the almost but not quite regular distribution of intercalary months during the preceding centuries.'

As we have already said, the insertion of intercalary months followed the Saros cycle whereby the Moon and Sun positions in relation to Iku/Dilgan came back to exactly the same starting point every 19 years. Sayce & Bosanquet relate the 7 + 4 holes in Section 1 to the 11 possible positions the Moon could be at on New Year's Day, from which it would be calculated whether an intercalary month needed to be inserted, and therefore nothing to do with the seven stars of Mil Apin! Possibly like later Greek *parapegmae* these holes took a slim peg or feather vane. From these deductions they believe the overall configuration on the planisphere 'is that of '...Capella in the western sky at the beginning of the year'- which relates to the absolutely clear-cut line-up of stars already described as particularly clear and visible in the Winter sky along the Milky Way, with Capella at the Zenith:



Ill 34: Night Sky looking South at 2200 Twelfth Night January 2007

¹⁰⁴ Astronomical Diaries and Related Texts from Babylonia Vol I (Edited by H Hunger) Vienna 1988

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In summary, Sayce & Bosanquet take the planisphere to refer to the position of rising stars in the Western sky in the evening, and the long line between the two pointers of Section 1 as the line of the Vernal Point - as does Weidner.



Ill 35: The Sirius-Orion-Capella line of stars, approximate markers of the Winter Solstice, coincident with the Milky Way and possibly the 0° line

Looked at now with a practiced eye the line-up of stars along Orion takes on a more precise focus, giving us Sirius (or even Canopus) as the Southern point with an upper branch consisting of Procyon and Castor & Pollux and a lower of Betelgeuze, Aldebaran and the Pleiades - and Capella capping them both as the eighth at the zenith. S&B's interpretation means the planisphere, by using sunrise 15° behind the meridian line in Section 0 (it blots out the stars any nearer to it) as well as moon positions relative to the meridian line itself in Section 1, could have been used not only to measure the start of the New Year at the Spring Equinox, but also at that very juncture to work out whether to insert an intercalary month to synchronise the solar and lunar cycles. As they say 'The most remarkable thing about the rule so far is the way in which the Moon is used as a mere pointer in the sky for measuring the distance from the Sun to a fixed point among the stars', and that 'the rule secures on the average an accurate sidereal year'. As 15° is a fortnight in days, the importance of the Moon for measuring that intermediate period comes into play, and it means that the spear-line in Sector 0 will be the related line of the equinox, or solstice. On checking their information on the basis of the planisphere information, they believe the placing of Capella at 0° at the meridian means the actual data goes back to the Old Babylonian period c.2000BC¹⁰⁵ when the Spring Equinox took place in Nisan which is simply reiterated as the ideal on this Assyrian instrument (in their own period the New Year was actually taking place in Iyyar - see Appendix B), as a benchmark still useful due to the repetitious nature of the Moon's positions in any Saros period of 19 years -

¹⁰⁵ Bond and Hemsell's contention is that the planisphere shows the sky from over a millennium earlier.

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according to Sayce & Bosanquet in **S&B1/2** this allows for 11 intercalary months to be inserted over 30 years¹⁰⁶ which means the 11 dots (7, plus 4 in the Mul Apin arrow) might also have this significance.

As the last star chart shows, Sayce and Bosanquet reckoned such an arrangement of stars in Babylonia would have been high in the sky in the evening as the Sun was setting, and would in this era have been a clear and certain marker for the time of the Winter Solstice, though this line-up would already have started to show during the Autumn Equinox, the time the major New Year celebrations were enacted in Sumer and Akkad. Every eight years the appearance of Venus at maximum brightness in this part of the sky would have been a dramatic enhancement of the renewal of the Solar and Venusian cycles, and in every Saros period of 19 years (enabling the prediction of eclipses) a full moon would even more have set the seal on such a New Year's Eve sighting.

THE AKITU FESTIVAL and PLANISPHERE K

Sayce & Bosanquet have the most to offer in terms of a serious suggestion that the planisphere is a star map whose Sector 1, following on from Sector 0, 'represents the mechanism by which the lunar beginning of the year was worked out with reference to *Iku*' (*Capella* to them). They translate the phrase under the 7 dots as saying '*Bel that goes before the star*', and take it as referring to the *Moon's* (*Bel's*) position against this region of the sky before or behind the line at 0° longitude marked by *Capella* (*Bel* being the name of the *Moon* from the tenth to fifteenth day). In other words, they believe the planisphere is an instrument whereby the Moon and its relative position against the starting point of the year at 0° marked by specific stars is used as a month-length indicator (see p.000), and also year-length indicator. They take the two extreme points of the triangles linked both by the lines and the dots in Section 1 as a scale against which the position of the Moon is measured, whereas they take the lines in Section 0 as guidelines for measuring the *Sun's* solstitial extremes. Using Sections 0 and 1 together, S&B argue, relates Sun and Moon positions to each other, against key stars at the New Year point *in order to indicate whether the insertion of an intercalary months is necessary or not*. The surviving Seleucid 'Uruk System' refers back to Achaemenid summer solstices and gives an idea of what formula was used to work out whether to intercalate or not. Slotsky 1993 describes the Uruk system of intercalation and the fixing of solstice dates, regulated by the Metonic Cycle as the scheme [which] 'called for the addition of 7 intercalary months every 19 years in order to keep the 12-month lunar year in step with the agricultural year. The 19 years were composed of 12 years with 12 months plus 7 years with 13 months. These 7 years were made up of 6 years with a second month XII, called Addaru II, and 1 year with a second month VI, known as Ululu II. All in all, 19 years are equal to 235 months'.

As already described, the movement of Sirius was also brought into tandem either with the 18-year Lunar Cycle and/or the Metonic cycle¹⁰⁷, giving a double-check on the intercalation formula - as Sachs describes in one of his

¹⁰⁶ (p.458)

¹⁰⁷ Sachs (see next reference) believes the Metonic cycle only started to be used in the Seleucid period, but knowledge of moon cycles was so detailed in Sumer, Akkad and Babylon from the very start and the pattern was surely spotted many hundreds of years before.

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papers¹⁰⁸ It amounted to 'a scheme for the prediction of the dates of the three characteristic Sirius phenomena, parallel to the solstice-equinox scheme', as follows:

Vernal Equinox	+ 1 hour 18 tithis	- Sirius setting
Summer Solstice	+ 21 tithis....	Sirius rising
Winter Solstice	+ 5 tithis	Sirius opposition

This means that at the Summer Solstice itself, when Sirius rises in the morning 21 tithis later than sunrise, it will be in opposition to the Sun 6 months later at 6m + 11 tithis at the Winter Solstice. At the Spring Equinox 10m 27 tithis later Sirius can be seen setting on the horizon for the first time, which therefore also fixes the opposite, Autumn, Equinox 6 months later. However, the conclusion Sachs came to was that none of the notations seemed to be based on actual observations, but that the lists of equinoxes and solstices were tied to the theoretical formula of Sirius risings and settings that worked for the late 4C BC.

Continuity of the Intercalation Tradition Today

We cannot underestimate the importance of the predictability of the stars and planetary cycles relied upon by Astrolabe K, an absolute foundation for the running of government - hence the title of our essay implicates the machinery of astronomy as a predictor of time cycles just as much as the interpretation of its consequences further down the line in astrological interpretation. Fortunately the Semitic world (Jewish and Islamic lunar calendars) still utilise such calendars and the calculations of Babylonian astronomy persist in the Jewish Calendar today, inherited seamlessly from their Babylonian forbears. It is easier to study current practice to see and understand how their year is calculated today than in earlier centuries when its secrets were jealously guarded by the Rabbis, as lately books have been written about the formulae used (their astronomical foundations not necessarily understood any more) to measure the years. Today, according to what kind of intercalation has been brought to bear, for the Jewish calendar there are several types of Year within the 19-year cycle. On solar grounds alone there are Ordinary Years and Leap Years, but each of these can be Deficient, Normal or Full, meaning that the Deficient Year falls short, but not enough to intercalate another month (353 days); the Normal Year has 354 days and the Full Year 355 days, at which point a 13th month is inserted. The Leap Year variations have 383, 384 and 385 days respectively. The days of the month are increased or decreased accordingly. Over the Metonic period the numbers over or under 365.25 days even out and at the start of a new Metonic cycle the year starts exactly on the 0^omeridian again.

If we cross-check with the Christian tradition the practice today of fixing the date for Easter is a remnant of this ancient intercalary practice. I quote from Kate Morris in the BBC Focus magazine for April 2007:

Easter falls on 8 April this year, which is 8 days earlier than last year, but a whopping 16 days later than it will be next year. The date lurches around so much because of its link to biblical accounts of the

¹⁰⁸ A Sachs 'Sirius Dates in Babylonian Astronomical Texts of the Seleucid Period' JCS VI 105-114

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Crucifixion. These accounts point to a date near the festival of Passover, which takes place on the first full Moon after the Spring Equinox. As the phases of the Moon don't run in sync with our calendar, the date of Easter seems to flit at random between the two extremes of 22 March and 25 April. It very rarely falls on these extreme dates. The earliest possible Easter last occurred in 1818 and won't occur again until 2285 - though we'll come within a day of it next year, when it falls on 23 March. Meanwhile, the latest possible Easter last occurred in 1943 and is next due in 2038.

Passover was and is a Jewish feast, which brings us back to consider the usefulness of the Jewish calendar - continuous with the Babylonian Calendar and still in use to the present day for gaining authentic clues about the regulation of the calendar in the millennia BC. The table in Annex B gives a comparison of present-day Jewish months for 2008/5768 (which goes back to Sumer c.3100), and its successors in Babylon and Assyria, aligned with the signs of the zodiac (the original months). Sachs (1952) describes how intercalation practices in the Seleucid period involved the coordination of peak movements of Sirius with the dates for solstices and equinoxes as also fitting into the 19-year Metonic cycle, deriding Kugler's attempt at identifying a 27-year intercalary cycle based on Sirius extreme risings and settings¹⁰⁹. He wrote 'It appears likely to me that the simplest and most natural explanation for the distribution of the intercalary months within the Babylonian 19-year cycle is connected with the heliacal risings of Sirius'.

A key consideration is whether Sirius features on Astrolabe K, and we have shown it does, as Ishtar in Section 0.

ASTROLABE K: FINAL CONCLUSION

Let us contrast Sayce & Bosanquet's overall assessment of the instrument with those of Weidner and Koch which either overlap and to a large extent support each other, even if divergent in certain instances - in stark contrast to Bond and Hemsell's theory which sees the planisphere as 'a field note' of one particular, passing phenomenon:

- Throughout, S&B take the repeated syllables to be mnemonics or technical counting references, which in one sector does indeed consist of actual numbers (Section 5), possibly to aid location of stars. In this area Bond and Hemsell make a commendable attempt to make sense of quite a few of them as referring, for instance, to the horizon, to weather conditions and to whether the sky is clear or not. But it would need consultation with experienced linguists to confirm whether their matches to words in sign lists is sufficient to take them along the right track or not.
- To Weidner, on the other hand, the syllables are meaningless, or at most spells, so that although he attempts to understand the disc in astronomical terms his final conclusion is, 'In Wirklichkeit dürften wir aber hier ein Dokument vor uns haben, *das der Wahrsagung und Zauberei mit Hilfe der Astrologie diene*' - in other words because to him the sequence of stars named does not add up to a complete star map, he decides its use must be mediumistic, magical incantations directed at star divinities. This view

¹⁰⁹ In fact, he points out that the text Kugler relied on simply stated that Sirius rises in the same place every 27 years.

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certainly accords in with Erica Reiner's research into the use of astrology as the master discipline governing a number of divinatory operations described in the first half of this paper.

- Koch's overall assessment lies between the two: while he feels the seemingly meaningless syllables on the disc detract from its usefulness as an astronomical instrument (like Weidner dismissing them as mumbo jumbo), he does believe much of the linear or textual positioning does correspond to the geography of the sky.
- My own conclusion is that the planisphere represents a credible star map and that - despite those aspects that led Weidner to believe it embodies mere magical mumbo-jumbo - S&B'S overall conclusion was in fact right - that the planisphere is an instrument with all the information on it necessary at a particular time of year to measure the arrival of the New Year Festival, and that it could be used annually.

Using Astrolabe K to work out intercalation, according to S&B, means that when on 1 Nisan the Sun rises 15° behind Iku/Dilgan it is New Year's Day. Putting aside whether their choice of bench-mark star is right or wrong, their understanding of the instrument as helping to gauge the start of the New Year is highly plausible, given that locating the starting point of the calendar was a key preoccupation for Mesopotamian astronomers.

To summarise: this configuration of stars at the Winter Solstice would have provided a clear baseline for timekeeping in full clarity via a chain of extremely bright, and therefore easily observable, stars. So distinctively does this line stand out that Sayce & Bosanquet in their first paper on Babylonian astronomy (S&B1) put forward a strong case for not only assigning it as the equivalent of our Greenwich Mean Time line of 0° latitude¹¹⁰, but linked the phenomenon to the start of the Mesopotamian Calendar and the timing of their 11-day long New Year Festival marking the shortfall between the lunar and solar year. In their second paper they convincingly relate all this to the function of Planisphere K, where changing a peg position in the 11 holes of Section 1 every day could even have counted out the days of the Festival itself!

For the astronomers in charge, the time of year when intercalation would start to be seen to be becoming necessary was precisely between the Winter Solstice (our Christmas time) and the Spring Equinox (our Easter time), and the information on Astrolabe K fits with Northern Hemisphere star maps for this quarter to the extent that we have a close enough match to be able to say that the purpose of the planisphere was to be in a position to look ahead by a month so and decide whether an extra month needed to be slipped in before the passage of the Sun marked the Spring Equinox day proper on 1 Nisan/21 March.

One question we can look at straight away - that of the name of the first month of the year, since Section 0 of Astrolabe K also mentions that name - *Gula*. Weidner 1914 p.58/9 refers to the nomination by Kugler, Langdon and Barton that it is Ezen-Bau, for on the Gudea statue E5 in the Louvre Thureau-Dangin points out the mention

¹¹⁰ The reference point from which to measure the end of the old year and the start of the new year - therefore a fiduciary line.

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of the sacred wedding of Bau with Ningirsu on *udzagmug* - New Year's Day. He therefore takes it that certainly for the pre-Sargonid calendar Bau/Gula (one and the same Goddess, usually shown seated on a dog throne) and her marriage with Ningirsu-Ninib marked the start of the year. Weidner refers to her Underworld nature, which fits with the story of the rise and fall of the cycle of the Year with, around 2900BC a Winter Solstice taking place with the Sun in Aquarius - the Gula region of the sky. The two divinities were local manifestations of Inanna (Ninsianna) and Tammuz (Amaushumgalanna), whose story is that of the ascent and descent of the Year ending in their holy marriage on *udzagmug* (New Year's Day), told in the striking myth of the Descent of Ishtar to the Underworld and back. We have already noted above how their story relives by a different metaphor the primordial battle between Merodach-Kingu and Tiamat, always understood to have taken place at the Winter Solstice, the point at which the longest night of the year begins to shorten.

This is all by way of realising that the mention of Gula/Bau in Section 0 of Astrolabe K, associated in the labeling with Tammuz/Orion, and with Ishtar/Sirius provides confirmation that a prime use of the astrolabe was to assess the start of the New Year in just this fashion. From that the other three cardinal points of the year were accordingly predictable which means that even the Summer Solstice point could be used to establish the future New Year Winter Solstice start (for Egypt the rise of Sirius at the Summer Solstice was indeed their New Year fiducial star). In Sumer the Spring Equinox features over and over again as the Minor New Year Festival, whereby the passage of the solar year could be calibrated against the stars and other planets. We know from the records that this placing of the New Year Festival survived into Old Babylonian and Late Assyrian times despite the shiftings and elaborations of other timings and events (see Weidner 1914 p.60).

We believe we have established enough evidence for the hypothesis that the astrolabe was an instrument used to measure the very end/start point of the Old/New Year where the dissonance between the solar and lunar years had to be reconciled during the 11 days and 12 nights of the Akitu Festival. We retain that tradition in our day when we celebrate the Twelve Days of Christmas at the very same time of the year. Inspecting these traditional time measures is of prime importance in rediscovering those lost benchmarks that are in fact still embedded in our own practices, for which the key star identifications established make sense. Far from being an instrument that uses spells to find out that start time of the calendar, we have here an instrument that is very much a cumulative point in time measurement with possibly some syllabic spells added along the sector lines, not simply for nostalgia's sake but appealing to these very stars to ensure the success of the measuring!

I now hand over to others to verify my assertions and conclusively establish the meaning of every part of it.

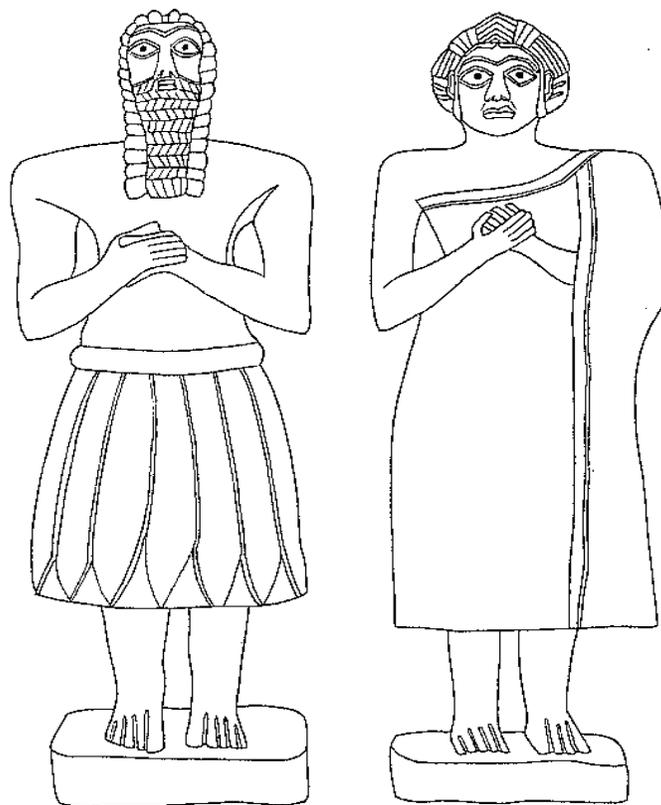
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*Worshippers stare wide-eyes at the heavens- Sumerian statues
[Black and Green's caption (1997)]*

APPENDIX A

The Symbols for the Zodiac Signs with the Classical Ruling Planets¹¹¹ and their Hypsomata

ZODIAC SIGN	SYMBOL	CLASSICAL RULING PLANET		ITS HYPSONOMA (Exaltation)	
TAURUS	♉	=VENUS	♀	♋	PISCES + MUL APIN
GEMINI	♊	=MERCURY	♿	♍	VIRGO
CANCER	♋	MOON	☾	♉	TAURUS
LEO	♌	SUN	☉	♈	ARIES
VIRGO	♍	=MERCURY	♿	♍	VIRGO
LIBRA	♎	=VENUS	♀	♋	PISCES + MUL APIN
SCORPIO	♏	=MARS	♂	♐	CAPRICORN
SAGITTARIUS	♐	=JUPITER	♃	♋	CANCER
CAPRICORN	♑	=SATURN	♄	♎	LIBRA
AQUARIUS	♒	=SATURN	♄	♎	LIBRA
PISCES	♓	=JUPITER	♃	♋	CANCER
ARIES	♈	=MARS	♂	♐	CAPRICORN

KEY: = means 'co-ruler'

¹¹¹ Note that in Classical Astronomy with only 7 planets in view, each planet except the Sun and Moon rule two signs, whereas in Aquarian astrology today, Pan is deemed the true ruler of Taurus ; Vulcan rules Virgo; Pluto Scorpio; Uranus Aquarius and Neptune Pisces. There is debate about the hypsomata of these five additions to the seven classical planets.

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THE ANCIENT MONTHS IN RELATION TO THOSE OF TODAY

APPENDIX B

3300 B.C.	♁	♆	♈	♉	♊	♋	♌	♍	♎	♏	♐	♑
NAME	TEBET	SHEVAT	ADAR	NISAN	IYAR	SIVAN	TAMMUZ	AB	ELUL	TISREH	ARAH SAMNU	KISLEV
Began	22 Dec	20 Jan	19 Feb	21 Mar	21 Apr	21 May	22 Jun	23 Jul	24 Aug	23 Sep	24 Oct	23 Nov
Old Assyrian (Ehelolf/Landsberg er ZDMG 74 1920)	Ilu SIN	Kuzalli	Allanate	Ilu Belat- ekalli	Sha- sarate	Sha- kinate	Muḥur ilani	Ab(u) Sharra ni	Ḫibur	Ṣippi	Qarrate	Tanmart e
Assyrian 1200 BC	TEBET	SHEVAT	ADAR	NISAN	IYAR	SIVAN	TAMMUZ	AB	ELUL	TISREH	ARAH SAMNU	KISLEV
Ea Star [at Tropic of ♋]	Gula	Numushda	Ku	Iku (Pegasus)	Mul	Sipzianna (Orion)	Kaksisa	Pan	Kalitum	Ninmah	Uridim	Shal batanu
Anu Star [at Equator]	Alluttum	Simmah	Neberu d- Marduk	Dilibat (Venus)	Shugi	Urgula	Mashta bba	Mashta bba- Galgal	Uga	Zibani tum	Girtab (Scorpio)	Udka duha
Enlil Star [at Tropic of ♏]	Mushenti	Damu	Aka	Apin (Plough)	Anunitum	Mus	Shulpae		Shupa	Entena barhum	Lugal	Uz
Month No.Babylonian Sachs Diary I 1988	X Tebet- AB	XI Šabatu- ZIZ	XII Addaru- ŠE	I Nisannu - BAR	II Ajjaru - GU ₄	III Simanu- SIG	IV Du'uzu- ŠU	V Abu- IZI	VI Ululu- KIN	VII Tešritu- DU ₆	VIII Araḫsamn u-APIN	IX Kislimu- GAN
Current	♑	♁	♆	♈	♉	♊	♋	♌	♍	♎	♏	♐
Begins	22 Dec	20 Jan	19 Feb	21 Mar	21 Apr	21 May	22 Jun	23 Jul	24 Aug	23 Sep	24 Oct	23 Nov
Jewish 5768/ = AD 2008	TEVET	SHEVAT	ADAR	NISAN	IYYAR	SIVAN	TAMMUZ	AV	ELUL	TISHRI	HESHVAN	KISLEV
Begins	6 Dec	17 Jan	17 Feb	16 Mar	15 Apr	14 May	13 Jun	12 Jul	11 Aug	9 Sep	9 Oct	7 Nov

DEUTSCHES ARCHÄOLOGISCHES INSTITUT
ABTEILUNG BAGHDAD

APPENDIX C

URUK

SPÄTBABYLONISCHE TEXTE
AUS DEM PLANQUADRAT U 18

TEIL IV

von
EGBERT VON WEIHER

AUSGRABUNGEN IN URUK-WARKA
ENDBERICHTE

Herausgegeben von
RAINER MICHAEL BOEHMER

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Extispizin. Kleines Täfelchen, dessen rechte obere Ecke weggebrochen ist. Die Schrift der Rückseite ist teilweise zerstört. Der Text enthält eine in dieser Weise bisher nicht bekannte Verbindung der Leberschau mit der Astrologie. Es handelt sich wohl um einen kommentar-ähnlichen Text, wo am Anfang jeweils Termini aus der Leberschau genannt werden, wonach ein Göttername folgt. Danach werden die Monatsnamen aufgeführt; merkwürdigerweise scheint der 9. Monat ausgelassen worden zu sein. Es folgen sodann die Namen von Sternen, wobei es sich wohl um Fixsterne handelt. Diese letzteren Angaben (Monat, Stern) bieten wohl die Daten für die heliakischen Aufgänge der einzelnen Sterne, wie ein Vergleich mit der Sternliste in HBA 35 ff., II 36 ff., zeigt. - Zu mehreren Zeilen finden sich Erklärungen oder Glossen. Für die Termini der Leberschau vgl. zuletzt JCS 37, 168 ff.

Vs.

1	NA	^d En-lil ^{iti} nisannu(BÁRA) x[
2		^d Dumu-zi NA man-za-z[_a
3		mul [?] [
4	GÍR	^d šamaš ^{iti} ajjaru(GU.SI.SÁ) ^{mul} GU.AN.N[A
5		SI.SÁ e-še-ri šá a-la-ku GU. [
6	KA.DU ₁₀ .GA	^d Husku ^{iti} simānu(SIG ₆) ^{mul} SIPA.[ZI.AN.NA
7		KA pu-ú ſa-b[_a
8	KAL	^d Uraš(ÍB) ^{iti} du'ūzu(ŠU) ^{mul} NAGAR ^{mul} APIN ḥ da-x[]
9		^d šul-pa-e-a
10	ME.NI	^d Hin-e-gal ^{iti} abu(NE) ^{mul} LUGAL.É.GAL
11		^{mul} BAN it-ti ^{mul} LUGAL
12	SILIM	^d Adad(ÍŠKUR) ^{iti} u'ūlu(KIN) ^{mul} UGA ^{mul} šen
13	ZĒ	^d A-nim ^{iti} tašrītu(DU ₆) ^{mul} zi-ba-ni-tu ₄
14		mu-kin-nā-at sikkat(ZI) ḡēli(AD)
15		i [?] -[]

Rs.

16	ŠU.S[I	ⁱ ti arahšanna(APIN) ^{mul} SA ?? .HUR??
17	[^{mul} A [?] .TE [?] .AB
18	MÁŠ	^d [^{iti} šebet]u(A)B [^{mul}]GAŠAN.TIN
19	DUN ₆	^d [^{iti} ša]baṭu(Z)IZ ^{mul} Gu-la
20		^{mul} ŠUDUN.KUR-tim
21	ÍD BĀ	^d x[ⁱ ti addaru(ŠE) MUL [!] meš ^d Dil-bat
22		[] BE GIBIL [?]

23 [I] M. GÍD. D[A
 24 ^mIqīšā(BA-šá-a) bu₁₂-kūr ^{md}Ištar-š[um-āreš Iīp Iīpi]
 25 ^mÉ-kur-za-kir ¹⁰MÁŠ.MÁŠ q[at[?]

Bemerkungen:

- 1 ff.: Die gleiche Reihenfolge der Termini der Leberschau auch z.B. in CT 28,46,5; ChDiv.195,26; s. auch RA 40,63; JCS 11, 96 ff. - Zu diesen Termini vgl. noch JCS 37, 168 ff.
- 2: Für die Nennung Dumuzi's vgl. HBA 36,43. - Der Terminus NA wird akkadisch man-za-z[_a erklärt.
- 3: Zwei unklare Zeichen; der oben gemachte Vorschlag, MUL zu lesen, ist sehr gezwungen; das "erste" Zeichen sieht ähnlich wie KÙ aus.
- 4: Statt ^{mul}GU.AN.NA steht in HBA 37 II 38 ^{mul}MUL; vgl. dazu noch AfO 14,256 zu Taurus.
- 5: SI.SÁ bedeutet "in Ordnung sein/kommen - vom Gehen". Damit könnte vielleicht der Bezug zu dem Leberschau-Terminus GIR = padānu hergestellt werden, denn der "Pfad" ist es, auf dem man geht.
- 6: Zu KA.DU₁₀.GA s. JCS 11,103 b zu 2.6 und oft; MSL 13,245,17; JCS 37,172 E.
- 8: Am Zeilenende vielleicht da-pi-no] zu ergänzen; vgl. dazu ŠL 4/2,Nr.99; zu Šulpa'ea s. ebenda Nr.583.
- 10: Die Namensweiterungen durch É.GAL sowohl in den Götternamen wie in den Sternnamen wohl beabsichtigt wegen des Terminus ME.NI = bāb ukalli.
- 10-11: Vgl. dazu noch HBA 37 II 44.
- 12: Zu ^{mul}UGA^{mul}šen als Stern des Adad vgl. noch HBA 36 II 9.
- 14: Zu der Lesung der Wortzeichen ZI und AD als sikkat ḡēli s. J. Nougayrol, RA 44, 21 f. Das könnte zu dem von mir angenommenen Wortspiel zwischen dem Terminus ZĒ und ZI passen, wobei ZI ja auch das Anfangszeichen des Sterns ^{mul}zi-ba-ni-tu₄ ist.
- 15: Am Ende ein ein oder zwei teilweise zerstörte Zeichen.
- 16: Am Zeilenende ganz unsicher. Nach HBA 39, 2.26 würde man wegen des Monats Arahšanna eher ^{mul}A.EDIN (= É₄-ru₆) erwarten, aber das scheint wegen der hier sichtbaren Zeichenreste kaum möglich. ^{mul}SA₅ für den Mars wäre zwar möglich, aber dann steht das letzte Zeichen ganz isoliert da.
- 17: Nur unklare Reste eines Sternnamens. Der Monatsname Kisišmu ist anscheinend ausgelassen worden.
- 18: Zu ^{mul}GAŠAN.TIN vgl. ŠL 4/2, Nr.68.
- 19: Zu DUN₆ = dēpu s. JCS 11,104 b zu Rs.6. Hier wird die Verbindung zwischen dem Terminus der Leberschau und dem Sternnamen wohl aufgrund der Zeichenähnlichkeit von DUN₆ und ^{mul}ŠUDUN.(KUR-tim) hergestellt.
- 22: Nur noch zwei Zeichen...