CHAPTER 2

Astronomical datings

1. THE STRANGE LEAP OF PARAMETER *D"* IN THE THEORY OF LUNAR MOTION

Nowadays we have special calculation tables – the so-called canons – whose compilation was based on the theory of lunar motion ([534]). They contain the date of each eclipse, the area to be covered by the lunar shadow, the phase, etc. See the well-known astronomical canon by Ginzel, for instance ([1154]). If an ancient text describes some eclipse in enough detail, we can determine what characteristics of the eclipse had been observed – the phase, the geographical area that the shadow passes over, etc. The comparison of these characteristics to the referential ones contained in the tables may give a concurrence with an eclipse possessing similar characteristics. If this proves a success, we can date the eclipse. However, it may turn out that several eclipses from the astronomical canon fit the description; in this case the dating is an uncertain one. All the eclipses described in the "ancient" and mediaeval sources have been dated by the following method to some extent at least ([1154], [1155], [1156], [1315], [1316], [1317], etc.).

Nowadays the datings of the "ancient" eclipses are occasionally used in astronomical research. For instance, the theory of lunar motion has the notion of the so-called parameter D'' – the second derivative of lunar elongation that characterizes acceleration. Let us remind the reader of the definition of elongation. Fig. 2.1 shows the solar orbit of the Earth and the telluric orbit of the moon. The angle between the vectors *ES* and *EM* is called lunar elongation D – the angle between the lines of sight drawn from the Earth to the Sun and the moon. Apparently, it is time-dependent. An example of the elongation of Venus can be seen in the picture on the right. Maximal elongation is the angle where the line of sight as drawn from Earth to Venus ($E'V'$) touches the orbit of Venus. One has to note that the orbits in fig. 2.1 are shown as circular, while being elliptic in reality – however, since the eccentricity is low here, the ellipses are schematically drawn as circles.

Some computational problems related to astronomy require the knowledge of lunar acceleration as it had been in the past. The problem of calculating

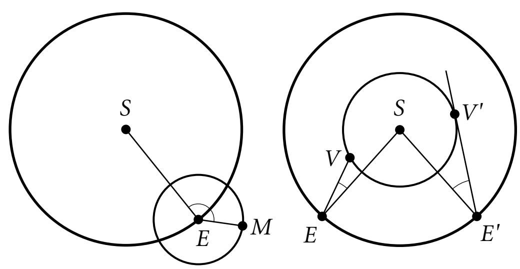


Fig. 2.1. Lunar elongation is the angle between the vectors *ES* and *EM*. The elongation of Venus is the angle between *ES* and *EV*. The maximal elongation of Venus is the angle between *E'S* and *E'V'*.

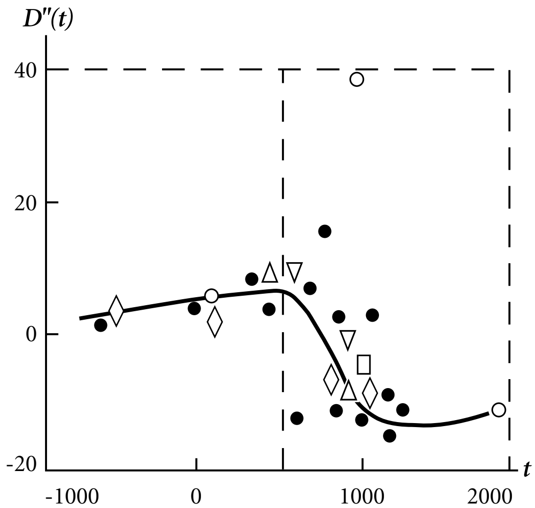


Fig. 2.2. The D'' graph calculated by Robert Newton. Parameter D'' performs a sudden leap on the interval of the alleged VI-XI centuries A.D. Taken from [1303] and [1304].

D'' over a large time interval as a time function was discussed by the Royal Society of London and the British Academy of Sciences in 1972 ([1453]). The calculation of the parameter D'' was based on the following scheme: the equation parameters of lunar motion, including D'', are taken with their modern values and are then varied in such a way that the theoretically calculated characteristics of ancient eclipses should coincide with the ones given for dated eclipses in the ancient documents. Parameter D'' is ignored for the calculation of actual eclipse dates, since the latter are a rougher parameter whose calculation does not require the exact knowledge of lunar acceleration. Alterations in lunar acceleration affect secondary characteristics of the eclipse, such as the shadow track left by the moon on the surface of the Earth, which may be moved sideways a little.

The time dependence of D'' was first calculated by the eminent American astronomer Robert Newton ([1303]). According to him, parameter D'' can be "defined well by the large amount of information containing dates scattered over the interval from 700 B.C. until the present day" ([1304], page 113). Newton calculated 12 possible values of the parameter D'', having based them on 370 "ancient" eclipse descriptions. Since R. Newton had trusted the Scaligerian chronology completely, it is little wonder that he took the eclipse dates from the Scaligerian chronological tables. The results of R. Newton combined with the results obtained by Martin, who processed about 2000 telescopic observations of the moon from the period 1627-1860 (26 values altogether) have made it possible to draw an experimental time dependency curve for D'', q.v. fig. 2.2.

According to R. Newton, "the most *stunning* fact… is the drastic drop in D" that begins with 700 [A.D. – A. F.] and continues until about 1300… This drop implies the existence of a "square wave" in the osculating value of D''… Such changes in the behaviour of D'', and such rates of these changes, *cannot be explained* by modern geophysical theories" ([1304], page 114; [1453]). Robert Newton wrote an entire monograph titled ***Astronomical Evidence Concerning Non-Gravitational Forces In The Earth-Moon System*** ([1303]) that was concerned with trying to prove this mysterious gap in the behaviour of D'', which manifested as a leap by an entire numeric order. One has to note that these mysterious non-gravitational forces *failed to manifest in any other way at all.*

Having studied the graph that was drawn as a result of these calculations, R. Newton had to mark that "between the years (-700) and (+500), the value of D'' had been the lowest as compared to the ones that have been observed for any other moment during the last 1000 years" ([1304], page 114).

Newton proceeds to tell us that "these estimations combined with modern data tell one that D'' may possess *amazingly large values,* and that it has been subject to *drastic and sudden fluctuations* over the last 2000 years, *to such an extent that its value became inverted around 800 A.D.*" ([1453], page 115).

SUMMARY:

1) The D'' value *drops suddenly,* and this leap by an entire order begins in the alleged V century A.D.;

2) Beginning with the XI century and on, the values of the parameter D'' become more or less constant and close to its modern value;

3) In the interval between the alleged V and XI centuries A.D. one finds D'' values to be in complete disarray.

This strange fact has a natural explanation within the paradigm of the New Chronology.

2. ARE THE "ANCIENT" AND MEDIAEVAL ECLIPSES DATED CORRECTLY?

2.1. Some astronomical data

Let us give a brief digest of the information that shall provide for a better understanding of the current chapter. More detail can be found in such sources as [534], for instance.

When the moon gets into the cone of telluric shadow, one can observe a *lunar* eclipse on Earth – more specifically, on its nocturnal hemisphere, the one that faces the moon. A lunar eclipse can be observed from any point of the Earth's nocturnal hemisphere. An eclipse doesn't last longer than three hours and is only possible during a full moon; however, due to the irregularity of the movement of the moon, it doesn't happen every time the moon is full. The repetition of lunar eclipses is roughly and approximately periodic, and conforms to the so-called *Saros cycle.* A Saros period equals about 18 years. 28 lunar eclipses occur over this time, so one can find an eclipse practically every given year. A Saros is easily determined over 50-60 years of systematic observation, and might have already been known at the dawn of astronomy. The prediction of lunar eclipses based on the Saros cycle is nevertheless somewhat uncertain, not only due to the imprecision of the Saros cycle, but also because of the fact that the eclipse might occur when the hemisphere where the observer is located is illuminated by sunlight, which renders the moon invisible.

A *solar* eclipse occurs when the observer gets into the cone of the lunar shadow. If the solar disc is completely covered by the moon, the place where the eclipse can be observed becomes darkened to the extent of one being able to see the stars. This is a full eclipse whose duration does not exceed 8 minutes in the equatorial zone, and 6 in moderate latitudes. The lunar shadow moves across the surface of the Earth at the speed of about 110 meters per second, forming a narrow line. The width of this line does not exceed 4 degrees. The track of the umbral shadow is bordered by stripes of penumbral shadow, whose width as counted from the centre of the umbral shadow comprises about 30 degrees in moderate latitudes and about 15 degrees near the equator. The observer in the penumbral shadow only sees a partial covering of the solar disc by the moon: a partial eclipse. The maximal degree of the covering of the solar disc by the lunar shadow is called the depth, or the phase of the eclipse. The estimations of the phase are usually expressed by the b value that is calculated by the formula $b=12h$, with h being the ratio between the shadow-covered part of the solar diameter and the entirety of the latter. Hence, a total eclipse of the Sun will have a phase value of 12. A solar eclipse becomes visible as a darkening of the solar disc starting with the phase values of 3"-4"'.

The lunar eclipse phases are calculated differently – namely, another item that is proportional to the duration of the eclipse if the latter is more than full is added to the phase value of 12". Thus, the phase value of a lunar eclipse might reach up to 22.7".

In cases of *solar* eclipses there may arise situations when the cone of the moon's umbral shadow does not reach the Earth. In this case, an annular solar eclipse is possible, when the stars are not visible, as is the case with all partial solar eclipses. A solar eclipse is only possible when the moon is new; however, not every new moon is marked by a solar eclipse, since the Earth may slip past the cone of the lunar shadow due to the incline of the lunar orbit towards the ecliptic (or the plane of the telluric orbit). This is why there are only 2-7 solar eclipses happening every year. Every geographical area of the Earth gets an eclipse with a minimal phase value of 6" in the span of 10-20 years from any date.

Predicting solar eclipses is a truly formidable task due to the complexity of the lunar movement that is defined by a large number of external factors. One may attempt to predict solar eclipses by the Saros cycle that includes about 43 solar eclipses – 15 of them being partial, 14 annular, 2 belonging to the category of the so-called "total-annular," and 12 total. However, the eclipses from the Saros cycle can occur in different areas of the Earth, and so a prediction for a given location is true in one case out of 400 in general. That is to say, the probability of a correct prediction based on the Saros cycle equals 1/400 ([544], Volume 4, page 415). In theory, the so-called triple Saros, whose duration is 24 years, should be more precise; however, the probability that it may give a correct prediction equals about 1/99, so it is of little practical utility. From the astronomical point of view, the empirical triple Saros can only be discovered as a result of long-time solar eclipse observations. Due to the low recurrence rate of the eclipses separated by the triple Saros, let alone the problems of mathematical processing of the empirical data necessary for the calculation of an undefined recurrence rate, any such discovery would imply a well-developed system of natural sciences.

A more or less certain prediction of solar eclipses is apparently only made possible by the existence of a sufficiently advanced theory of lunar motion that would at least account for the principal irregularities of the latter. Thus, the prediction of solar eclipses remained a de facto impossibility a hundred years after Copernicus. We should thus treat the eclipse prediction reports preceding the XVI-XVII centuries with the utmost caution, or even suspicion.

2.2. The discovery of an interesting effect: an unprejudiced astronomical dating shifts the dates of the "ancient" eclipses to the Middle Ages

Dealing with certain celestial mechanics issues in the 1970s, the author of the current book discovered the possibility of a link between the alleged gap in the value of D'' (see [1303]) and the results of N. A. Morozov's research concerning the datings of ancient eclipses ([544]). A study of the issue and a new calculation of the parameter D'' attains an *altogether different quality;* namely, one sees the *complete elimination* of the mysterious leap. The parameter D'' appears to be subject to minute fluctuations around one permanent value coinciding with that of the same parameter used nowadays (q.v. in A.T. Fomenko's articles [1128], [883]). All of this can be summed up as follows.

The previous calculation of the parameter D'' had been based on the dates of ancient eclipses used in the consensual chronology of Scaliger-Petavius. All the astronomers' attempts to explain the strange gap in D'' didn't get anywhere near the issue of the correctness of datings considered "ancient" and early mediaeval nowadays – in other words, in how far the parameters of the eclipse described in the chronicle do correspond with the calculated parameters of the real eclipse that the Scaligerian chronology suggests to be described in the chronicle in question.

The following method of independent astronomical dating has been proposed in [544]: obtaining all of the characteristics described in the chronicle, such as the phase, the time, geographical observation location, etc., and copying all of the eclipse dates fitting these characteristics from the reference tables mechanically. N. A. Morozov discovered that the astronomers have been under the pressure of Scaliger's chronology, and so only considered the dates that Scaliger's chronology had already ascribed to the eclipse in question and the events related to it ([544]).

As a result, in many cases the astronomers failed to find an eclipse corresponding to the chronicle description in the required century, and had to resort to approximations, without the merest thought of questioning the Scaligerian chronology indicating an eclipse that would fit the chronicle description partially. Having revised the datings of the eclipses considered "ancient," Morozov found that the reports of these events fall into two categories:

1) Brief and nebulous accounts with no details given. In many cases it is altogether unclear whether the event described is an eclipse at all. The astronomical dating in this category either has no meaning whatsoever, or gives so many possible solutions that they can basically fit any historical epoch at all.

2) Exhaustive, detailed reports. The astronomical solution for those is often singular, or there are two or three solutions at most.

Apparently, all of the eclipses with detailed descriptions belonging to the period between 1000 B.C. and 500 A.D. get independent astronomical datings that differ significantly from the ones offered by the Scaligerian chronology and belong to a much latter epoch, namely, the interval between 500 and 1700 A.D. Being of the opinion that the Scaligerian chronology had been correct about the interval 500-1800 A.D. for the most part, Morozov did not analyze the mediaeval eclipses of the years 500-1700 A.D., assuming that no contradictions would be found there. Let us dwell on this for a short while.

Morozov hadn't possessed the sheer deliberation needed for the realization that the Scaligerian chronology had been erroneous up until the epoch of the XI-XIII century A.D. He had stopped with the VI century

A.D., assuming more recent chronology to be correct in the form offered by Scaliger and Petavius. His erroneous presupposition naturally affected the analysis of "ancient" eclipses. We see today that Morozov's analysis was not completely objective, since he had obviously been reluctant to alter the post-VI century chronology. This isn't hard to understand, as the transition from the artificially extended Scaligerian chronology spanning millennia to the one beginning with the XI century A.D. looked absurd even to N. A. Morozov.

In Volume 4 of [544], for instance (in Section 4, Part II, Chapter 2), Morozov discusses one of the eclipses that is today ascribed to the V century A.D., being of the opinion that its Scaligerian dating is confirmed. However, this discourse clearly shows that no confirmation of the Scaligerian chronology could have possibly taken place. The description of the eclipse is quite nebulous, and the use of comets for dating purposes is impossible due to reasons that shall be related in the chapter of CHRON5 where we shall consider comet lists specifically. Being certain that Scaliger's history was following the correct chronology ever since the V century A.D., Morozov was inconsistent in his analysis of post-V century eclipses. Had he encountered an equally nebulous description referring to a *pre-IV century* eclipse, he would have justly considered it a description that cannot be proved astronomically.

Morozov made a similar mistake in his descriptions of other eclipses dated nowadays to the alleged V-VI century A.D. He treated them a lot more benevolently than their pre-IV century precursors. The eclipses of the VI-XI century weren't checked by Morozov at all, since he had thought the Scaligerian datings to have been satisfactory. Unlike Morozov, we have continued with the critical research, having covered the post-V century period up until the XVII century A.D., and discovered that Morozov should not have stopped with the IV-V centuries. The datings of the eclipse descriptions that are ascribed nowadays to the X-XIII centuries A.D. contradict astronomy to just as great an extent as those preceding the IV century A.D. In those cases where there's a concurrence of sorts, one almost always finds traces of the fact that these eclipses have been *calculated a posteriori*, that is, affixed to a certain point in the past by the mediaeval chronologers of the XVI-XVII centuries in order to confirm Scaliger's chronology, whose naissance occurred around that time. Having calculated the dates for certain lunar eclipses of the past, the Scaligerite chronologers included them in the "ancient" chronicles that they were creating in order to give "solid proof" to the false chronology. It is of course possible that the odd occasional veracious description of the VI-XIII century eclipses would reach the chronologists of the XVI-XVII centuries every now and then. However, it would surely have to pass the filter of the Scaligerian version and "brought into accordance" with the "correct" dates.

Thus, continuing the research that began in [544], the author of this book conducted an analysis of other mediaeval eclipses in the interval between 400 and 1600 A.D. It turned out that the "transfer effect" affecting the "ancient" eclipses as described in [544] also applies to those usually dated to 400-900 A.D. This either means that there are many possible astronomical solutions, which make the dating uncertain, or there are just one or two, in which case they all fall in the interval between 900 and 1700 A.D. Only starting with approximately 1000 A.D. – and not 400 A.D., according to Morozov in [544] – does the Scaligerian dating begin to concur with the results of Morozov's method satisfactorily enough, becoming more or less certain by as late a date as 1300 A.D.

Let us give a few extremely representative examples demonstrating the transfer forwards in time of eclipses and related chronicles considered "ancient."

2.3. Three eclipses described by the "ancient" Thucydides

The Scaligerian history tries to convince us that Thucydides was born in approximately 460 B.C., or 456-451 B.C., and died around 396 B.C. ([924], page 405). He was a wealthy aristocrat and politician from Athens. During the Peloponnesus war Thucydides had been in command of the Athenian fleet, albeit unsuccessfully. He had then been banished from Athens for 20 years. He had written his famous tractate during his sojourn in Thracia. Thucydides had received amnesty near the end of the war; he returned to Athens and died shortly afterwards.

Historical tradition trusts Thucydides in his descriptions of military events, considering him an eye-

witness and a participant. Thucydides himself writes the following: "I was writing down the events witnessed by myself as well as what I had heard from others, after as meticulous a study of each fact as circumstances allowed… I have survived the entire war… understood it, and studied it attentively" ([923], V:26).

Thucydides is the only source that we have in what concerns the history of the Peloponnesus War. Historians write that "after Thucydides… nobody turned to the history of the Peloponnesus war ever again. Many have however thought it would prove flattering for them to be seen as his followers, and started their own works where the tractate of Thucydides ended" ([961], page 171). It is supposed that the work of Thucydides either hadn't had any title at all originally ([924], page 412), or had been called ***Communal Account*** in Greek, but received the name ***History of the Peloponnesus War*** in later translations. The entire account of the history of the 27-year war between the Ionians and the Dorians (could Doria mean "Horde" when read in reverse?) is given by Thucydides clearly and consequentially, though it remains incomplete.

The entire work of Thucydides, whose volume comprises about 800 pages when printed ([923]), is written in a brilliant style. Numerous commentators have pointed out the following hallmarks of his book a long time ago:

1) Thucydides demonstrates great erudition and writing experience;

2) The phrase constructions are complex and contain non-trivial grammatical structures;

3) One sees a clear development of an elegant realistic concept in the account of historical facts;

4) The author is sceptical about everything supernatural in people's lives.

We are being convinced that this work is a creation of the V century B.C. when writing materials had been scarce and expensive – the Mesopotamians use styluses to scribble on clay, the Greeks aren't familiar with paper yet, and write on pieces of tree bark or use sticks for writing on wax-covered plaques.

The oldest written copy of the ***History*** of Thucydides is supposed to be the ***Codex Laurentinianus*** parchment dated as the alleged X century ([924], page 403). All other old manuscripts belong to the alleged XI-XII centuries ([924], page 403). Some papyrus fragments of the second book by Thucydides were found in Egypt in the XIX century. A papyrus commentary is also in existence, published as late as 1908. However, the condition of these fragments is very poor indeed ([544], Volume 4, page 495). Let us note straight away that the datings of all the "oldest" manuscripts listed are based on palaeographical hypotheses exclusively, and therefore don't seem very trustworthy. Any alteration of the chronology changes all of these "palaeographical datings" automatically.

There are no calendar dates mentioned in the ***History*** by Thucydides, and no planetary horoscopes. However, it contains the descriptions of three eclipses – two solar ones, and one eclipse of the moon. We shall be referring to this combination as a triad. Apart from that, the first book (I:23) contains mentions of solar eclipses – however, those are rather general and vague, and cannot serve for an astronomical dating. The descriptions of the triad, however, are quite sufficient for an unequivocal solution. We shall be considering it below.

The second volume of the ***History*** contains a rather detailed description of the eclipse. (The Russian original refers to the well-known professional Russian translation of Thucydides done by F. G. Mishchenko in the XIX century [923].) Thucydides writes that "the summer that the Athenians have chased the Aeginians with their wives and children from Aegina [Thucydides is referring to the first year of the war – A. F.]… The very same summer, when the moon was new – apparently, that is the only time when such things can happen – *the sun became darkened after midday and became full again, having attained the shape of a crescent, and several stars appeared*" ([923], II:27-28). The Greek text can be seen in fig. 2.3.

Let us pay attention to the fact that the author appears to understand the mechanism of the eclipse well, mentioning the new moon to be a sine qua non, which is a reference to a long-time practise of eclipse observation in the epoch of Thucydides.

Τοῦ δ' αὐτοῦ θέρους νουμηνίᾳ κατὰ σελήνην . . . . ὁ ἥλιος ἐξέλιπε μετὰ μεσημβρίαν καὶ πάλιν ἀνεπληρώθη γενόμενος μηνοειδὴς καὶ ἀστέρων τινῶν ἐκφανέντων.

Fig. 2.3. The Greek text of Thucydides describing the first eclipse from the "Thucydides triad" – a solar eclipse. Taken from [1154], page 176.

τοῦ δ' ἐπιγιγνομένου θέρους εὐθὺς τοῦ τε ἡλίου ἐκλιπές τι ἐγένετο περὶ νουμηνίαν . . . . .

Fig. 2.4. The Greek text of Thucydides describing the second eclipse from the "Thucydides triad" – a solar eclipse. Taken from [1154], page 178.

μελλόντων αὐτῶν . . . ἀποπλεῖν ἡ σελήνη ἐκλείπει· ἐτύγχανε γὰρ πανσέληνος οὖσα.

Fig. 2.5. The Greek text of Thucydides describing the third eclipse from the "Thucydides triad" – a lunar eclipse. Taken from [1154], page 178.

The second eclipse of the triad, also a solar one, happens in the *eighth* year of the Peloponnesus war, in the beginning of the summer. Thucydides writes in the fourth volume that "the winter had ended, and with it – the seventh year of this war whose history has been described by Thucydides. *In the beginning of the next summer, with the advent of the new moon, a partial solar eclipse had occurred*" ([923], IV:51-52). The text in Greek can be seen in fig. 2.4. Apparently, the summer month mentioned as the month when the aestival campaign began had been March, the month of Mars when military campaigns were usually started. It shall be interesting to verify this statement *after* the finite solution of the problem is obtained.

The third (lunar) eclipse is described in the seventh volume: "The winter was coming to an end together with the eighteenth year of the war whose history has been described by Thucydides. As soon as the next spring began, the Lacedaemonians and their allies invaded Attica, in the earliest season" ([923], VII:18-19). The events of the summer are related in detail further on. The analysis of the manoeuvres described shows that the next sections (50 and 51) most probably refer to the *end of summer.* This is where Thucydides writes that "when everything was ready, and the Athenians were preparing to sail away, *a lunar eclipse occurred; it had been full moon then*" ([923], VII:50). See Greek text in fig. 2.5.

Let us sum up. The following information can be obtained from the text by Thucydides with absolute certainty:

1) All three eclipses were observed from the square fitting into the following geographical coordinates: longitude between 15 and 30 degrees, latitude between 30 and 42 degrees;

2) The first eclipse is solar;

3) The second eclipse is solar;

4) The third eclipse is lunar;

5) The time interval between the first two eclipses equals 7 years;

6) The interval between the second eclipse and the third equals 11 years;

7) The first eclipse occurs in the summer;

8) The first solar eclipse is a full one, since one can see the stars – that is, its phase value equals 12. Remember, one cannot see the stars during a partial eclipse;

9) The first solar eclipse occurs after midday, local time;

10) The second solar eclipse occurs in the beginning of summer;

11) The lunar eclipse takes place around the end of summer;

12) The second solar eclipse occurred within the temporal vicinity of March. As a matter of fact, this consideration doesn't have to be included in this list.

The problem can be formulated as follows: finding the astronomical solution that would satisfy the requirements 1-11.

The historians and chronologists have naturally paid attention to such a precise description of three eclipses in an "ancient" work, and tried to date them accordingly. Apparently, the chronologists immediately ran into serious difficulties that haven't been overcome since. We shall proceed to give a more detailed account of the problem of dating the triad of Thucydides, following the well-known astronomical work of Ginzel ([1154], pages 176-177).

In the XVI century the chronologer Dionysius Petavius found the date that fitted the first eclipse: 3 August, 431 B.C. Johannes Kepler later confirmed the fact that there had indeed been an eclipse that day. The beginning of the Peloponnesus war was dated with the very same year, 431 B.C.

Petavius found the date for the second eclipse as well, which was 21 March, 424 B.C. I. Kepler also confirmed the fact that a solar eclipse took place that day.

The date that D. Petavius found for the third eclipse was 27 August, 413 B.C.

This is how astronomy seems to have dated the events described by Thucydides to the V century B.C. However, a secondary analysis of the "astronomical solution" offered by Petavius unearthed serious complications that have been repeatedly discussed in astronomical and chronological literature in the XVIII-XX centuries. These rather heated debates have recurred and abated several times; however, modern historians prefer to remain taciturn in everything that concerns this long and difficult discussion, pretending that the problem doesn't exist and has never existed.

The main dating problems that the chronologers ran into concerned the first eclipse. The fact of the matter is that the eclipse of 3 August in 431 B.C. *proved an annular one, and so it couldn't have been total anywhere on Earth.* This was realized after the inclusion of the Scaligerian "astronomical dating" of the beginning of the Peloponnesus war into Scaliger's chronological tables. This eclipse is claimed to have been annular by Ginzel's canon as well ([1154], page 176). The fact that the eclipse in question was an annular one can also be proved by the existing computer software for eclipse calculations. We have verified it using a simple programme called Turbo-Sky that was created by the Muscovite astronomer A. Volynkin in 1995, which is easy to use and convenient for approximate calculations. The eclipse of 3 August that occurred in 431 B.C. was in fact an annular one.

However, Thucydides tells us explicitly that stars were visible during the eclipse. As we have already stated, one cannot observe the stars during a partial eclipse. Furthermore, it turned out that the phase value of the "Petavius eclipse" of 431 B.C. had been a rather small one in Athens, which means that Kepler had also made a mistake in his ***Optics*** telling that the phase value of this eclipse had equalled twelve, or, in other words, that the eclipse had been a full one. Such a statement on the part of Kepler is most probably explained by the imperfection of the eclipse calculation methods of his age. The calculation of the phase of an eclipse is a delicate matter. However, we should not exclude the possibility that Kepler, who had been involved in many chronological matters, had been perfectly aware of the fact that one can only see the stars during a total eclipse, and slyly transformed the annular eclipse of 431 B.C. into a full one in order to make it satisfy the description given by Thucydides

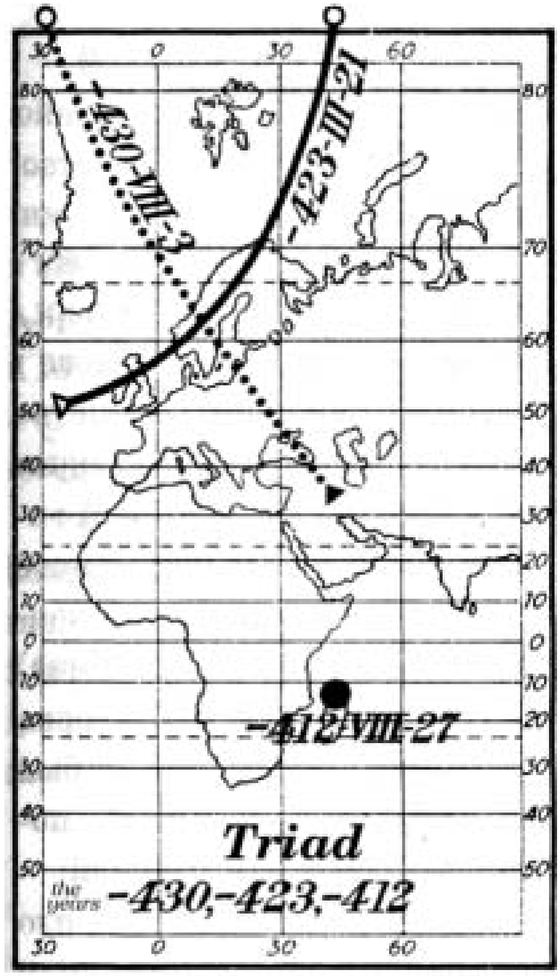


Fig. 2.6. The erroneous astronomical "solution" for the "Thucydides triad" of eclipses as offered by D. Petavius. The track of the lunar shadow for the first annular solar eclipse of 431 B.C. is represented by a dotted line. The track for the second solar eclipse of 424 B.C. is represented by a solid line, with the large dot standing for the zenith point of the lunar eclipse of 413 B.C. Taken from [544], Volume 4, page 505.

and protect the edifice of the nascent Scaligerian chronology from such an unpleasant dissonance. Kepler had been in constant contact with Scaliger, who had been his correspondent.

Due to the abovementioned circumstances, the astronomers and the chronologists began re-calculating the phase of the eclipse of 431 B.C. All sorts of empirical corrections were made in the equations of lunar movement in order to make the phase value of the eclipse as observed from Athens and neighbouring areas approach 12. Amongst the most prominent astronomers of the time that have dealt with the "Thucydides triad problem" have been such names as Petavius, Zech, Heis, Struyck, Kepler, Riccioli, Hofman, Ginzel, Johnson, Lynn, Stockwell and Seyffarth.

According to Petavius, the phase value of the eclipse equalled 10"25 ([1337], page 792). The phase value equalled 11" according to Struyck, 10"38 according to Zech, 10"72 according to Hofman, and only 7"9 according to Heis (!) ([1154], pages 176-177). Ginzel devoted the most attention to the problem of the "stars of Thucydides." He obtained a phase value of 10" ([1154], pages 176-177). It became perfectly clear that apart from having been an annular one, the eclipse could have only been observed from Athens as partial, and with a rather small phase value at that. The lunar shadow track on the surface of Earth during the eclipse of 3 August 431 B.C. is shown in fig. 2.6 as a dotted line, which signifies the fact that the eclipse was an annular one. No umbral shadow was to be observed anywhere.

The fact that the phase value of the Athens eclipse of 431 B.C. only equalled 10" means that 1/6th of the solar disc was open. This is all but bright daytime, and one naturally cannot see any stars or planets. Furthermore, as we can see in fig. 2.6, this eclipse had only passed Crimea around 17:22 local time (17:54 according to Heis). Thus, it can hardly be called an afternoon eclipse as Thucydides explicitly states. It should rather be called an evening one.

Having used the modern application Turbo-Sky that is convenient for approximate calculations, we have computed the respective positions of the moon and the sun at the moment when the phase value had been maximal for the observation point – the city of Athens and the area around it. One can see the screenshot in fig. 2.7. It is obvious that a large part of the solar disc is open, and neither stars nor planets can possibly be seen.

Thus, the eclipse of 3 August 431 B.C. couldn't have been the one described by Thucydides, since conditions 8 and 9 aren't satisfied, as shown above.

This discovery was naturally a most unpleasant one for the Scaligerian chronologers and historians. The astronomer Ginzel went so far as to claim that "the low phase value which equalled 10" for Athens according to the latest calculations *caused a shock and significant doubt about the fact that 'the stars could be seen,' as Thucydides claims*" ([1154], page 176).

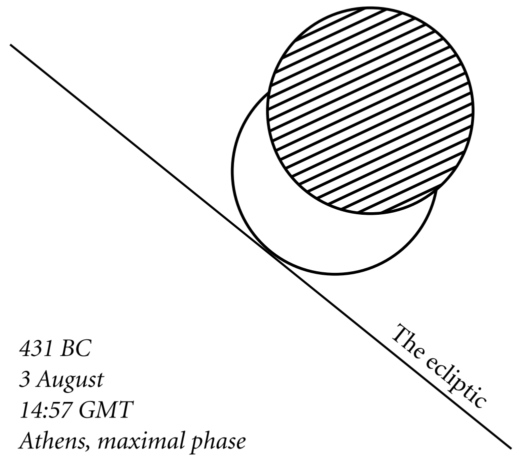


Fig. 2.7. The solar disc during the maximal phase of the 431 B.C. eclipse as seen from Athens. A large part of the sun remained uncovered. Neither stars nor planets were visible. Calculated with Turbo-Sky software.

Since the stars clearly couldn't have been visible during the eclipse of 431 B.C., Heis and Lynn decided to calculate the disposition of bright planets in hope that they might save the situation. However, it turned out that Mars had only been 3 degrees above the horizon. Venus had been high enough, about 30 degrees above the horizon. Ginzel makes a cautious remark in regards to Venus and Mars saying that these two planets "may have been visible" ([1154], page 176). However, this probability is low in what was practically broad daylight. All other hopes have been for Jupiter and Saturn, but it turned out that Jupiter was *below the horizon* during the eclipse, and therefore invisible; and as for Saturn, although it had been above the horizon, its position was in Libra, a long way off to the south, and, according to Ginzel, its "visibility had been *very dubious* [*sehr zweifelhaft*]" ([1154], page 176).

We have used the Turbo-Sky software in order to compute the planet locations for the time of the eclipse that occurred on 3 August 431 B.C. (see fig. 2.8). What one sees here is a view of the sky from Athens for the maximal phase of the eclipse at 14:57 GMT. It is clear that Venus, Mars, and the much dimmer Mercury are

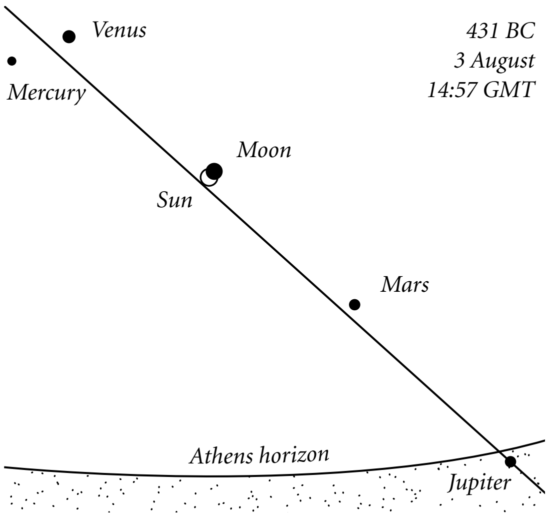


Fig. 2.8. Planet disposition at the moment of the eclipse in 431 B.C. Venus and Mars are close to the sun, and most probably aren't visible with a large part of the solar disc exposed. Mercury is altogether dim, whereas Jupiter is below the horizon. Saturn is far away to the south, and its hypothetical visibility is "quite dubious", as Ginzel justly points out.

close to the sun, and thus rendered invisible by the rays of the partially obscured radiant orb. Their visibility in broad daylight is extremely improbable.

The gravity of the situation that the proponents of the Scaligerian chronology had been well aware of made Johnson suggest a different eclipse, one that occurred on the 30th of March in 433 B.C.; however, it isn't included in any triad. The nearest triads are 447, 441 and 430 B.C., and 412, 405 and 394 B.C. They don't fit for different reasons. The phase value of the eclipse suggested by Johnson also turned out to have equalled a mere 7"8, which is even less than the eclipse mistakenly suggested by Petavius ([1154], page 177).

Stockwell then tried to revise the phase calculations in order to make it maximal. However, the very peak of his ingenuity only allowed him to obtain the result of 11"06. However, Ginzel's reaction to Stockwell's calculations was quite sceptical.

Seyffarth put forward a hypothesis that Thucydides may have been referring to the eclipse of 27 January 430 B.C. ([1154], page 177). However, despite the fact that this eclipse is far from fitting the description given by Thucydides (for instance, it cannot be included into any triad at all), a thorough check showed that the eclipse could not have been visible near Athens ([1154], page 177).

The shock that Ginzel mentioned eventually became replaced by a confusion of sorts, which led to the use of altogether different considerations that led farther and farther away from astronomy; among those – pure demagogy. Zech, for instance, had tried to eliminate the problem by his references to "the clear skies of Athens and the sharp eyes of the ancients" ([1154], page 177). Apparently, our contemporaries would fail to see any stars at all, but the ancients were an altogether different race. Their vision was a lot keener. They ran faster, too.

Hofman went even further in his suggestion to consider the stars of Thucydides a mere rhetorical embellishment ([1154], page 177). This translates as "we trust him in every other respect, but refuse to do so in this particular instance." Hofman tries to find linguistic proof for his theory, implying that Thucydides reports the appearance of stars when the sun had already assumed the shape of a crescent. We have asked the philologist E. V. Alekseyeva (Department of Philology, MSU, 1976 – see CHRON1, Appendix 2.1) to perform a philological analysis of the text that can be seen in fig. 2.3. The linguistic verdict was that the following four events are described by Thucydides:

1) The occultation of the sun;
2) The crescent shape assumed by the sun;
3) The appearance of stars;
4) The restoration of the entirety of the solar disc.

Thus, the entire eclipse process is described. The darkening of the disc at the beginning, its transformation into a crescent, and the subsequent visibility of the stars (this only happens at the maximal phase of a total eclipse), and the return of the disc to its original form. The consequence of events 1-4 is quite natural, and is unequivocally defined by the grammatical structure of the phrase. Actually, that was exactly the way that the professional translator quoted above, F.G. Mishchenko, had translated this fragment from the ancient Greek in the XIX century. The analysis performed by E. V. Alekseyeva confirmed the correctness of the classical translation yet again – it wouldn't have been questioned in the first place, if it hadn't been for the problem with astronomical dating that arose in this respect.

Therefore, Hofman's opinion, that was also shared by the modern astronomer Robert Newton, is really based on the wish to save the Scaligerian chronology at any cost, and not the actual translation.

We see that the attempt to substitute astronomy for linguistics does not solve the problem.

Despite all this, the erroneous date offered by Petavius wasn't altered, and any modern history textbook gives the date of the beginning of the Peloponnesus war as 431 B.C., albeit for no other reasons than Petavius' opinion. *His chronology has been legitimized despite its blatant deviation from the clear and unambiguous description of Thucydides.*

The description offered by the original text is a detailed and fundamental one, which makes all attempts of rectifying the case by altering the text look ridiculous. Apart from Hofman's "solution," it was proposed to alter the durations of the intervals between the neighbouring eclipses (the ones that equal 7 and 11 years according to Thucydides). However, even the authors of this proposal refused to elaborate on it.

It is hard to doubt that Thucydides was referring to a full eclipse when describing the first one of the triad. In the case of the second one (which had been partial) he explicitly states that "a *partial* eclipse of the sun occurred when the moon was new" ([923], IV:52). The word "partial" is used here; apparently, the author understood the difference between a total eclipse and a partial one well. That is why he emphasized the visibility of the stars in the first case, which is a hallmark of a total eclipse.

Let us give a summary. The astronomers failed to find any other fitting astronomical solutions in the interval between 600 and 200 B.C. However, no one had thought of broadening the search interval so that the Middle Ages would be included. It is well understood – they have all been raised on the Scaligerian chronology, and have trusted it, by and large. As a result, the erroneous triad of Petavius had been kept, despite the fact that this "solution" contradicts the text of Thucydides. The use of the independent dating method in the entire interval between 900 B.C. and 1700 A.D. shows that a *precise astronomical solution does exist; furthermore, there are only two solutions that fit exactly.* The first one was discovered by N. A. Morozov in [544], vol. 4, p. 509; the second, by A. T. Fomenko during a new analysis of the "ancient" and mediaeval eclipses.

The first solution *(N.A. Morozov)*:
1133 A.D., 2 August (total solar);
1140 A.D., 20 March (total solar);
1151 A.D., 28 August (lunar).

The second solution *(A.T. Fomenko)*:
1039 A.D., 22 August (total solar);
1046 A.D., 9 April (partial solar);
1057 A.D., 15 September (lunar).

Even condition 12, stipulating a time around March for the second eclipse, is met here. More importantly, the first eclipse is a *total* one, the way Thucydides describes it. Thus, once we managed to venture out of the Procrustean paradigm of the Scaligerian chronology, we found the answer to a question that has been of great interest to astronomers – that of the astronomical descriptions contained in the book by Thucydides.

Taking all the facts that we already know into consideration, we should conclude that the solution closest to historical reality is apparently the one suggested by Morozov – the more recent triad of eclipses falling on the middle of the XII century – namely, 2 August 1133 A.D., 20 March 1140 A.D., and 28 August 1151 A.D. The XI-century solution is most probably too early. Morozov's 1133, 1140, and 1151 A.D. solution is illustrated in fig. 2.9. One can see the lunar shadow tracks on the surface of the Earth for total solar eclipses of 1133 and 1140 as well as the zenith visibility point for the lunar eclipse of 1151 A.D.

We have verified the two solutions listed above with the Turbo-Sky software. Let us quote the exact data characterizing the total eclipses of 22 August 1039 and the 2 August 1133. They are listed as full in the Oppolzer eclipse canon ([544], Volume 5, pages 77-141). The Turbo-Sky application identifies them as total eclipses as well. We shall give the geographical coordinates of the beginning, middle, and end of the lunar shadow trajectory on the surface of the Earth for the total eclipse of the 2 August 1133. The first line gives the longitude, and the second, the latitude.

–89	+8	+72
+52	+53	+9

The umbral lunar shadow had been at the central point of the trajectory (with the sun being in the zenith) from about 11:15 to 11:17 GMT (according to the Turbo-Sky application).

For the eclipse dated 22 August 1039 of the sec-

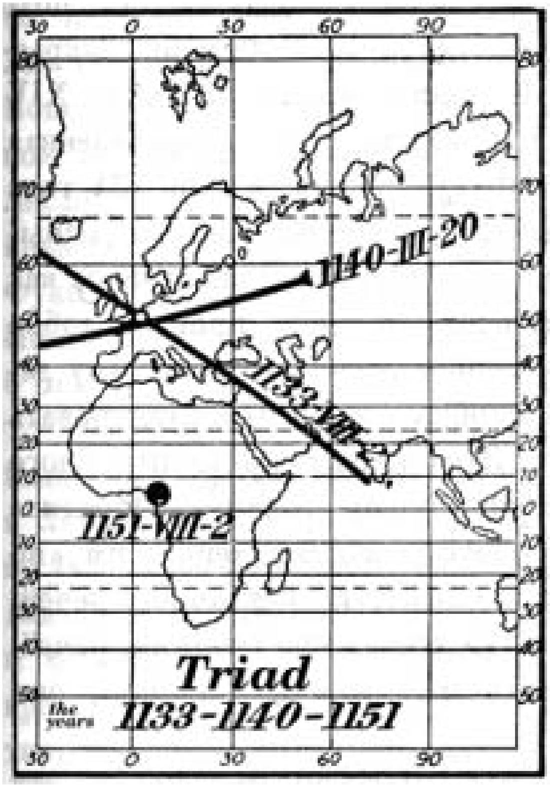


Fig. 2.9 The triad of eclipses described by the "ancient" Thucydides: 1133, 1140, and 1151 A.D. The solution was found by N. A. Morozov. One sees the lunar shadow tracks for the first two eclipses and the zenith visibility point for the lunar eclipse of 1151. Taken from [544], Volume 4, page 509.

ond triad (the XI-century one), the umbral shadow of the moon was at the central point of the trajectory at about 11:15 GMT. The coordinates are 7 degrees of Eastern longitude and 45 degrees of Northern latitude (Turbo-Sky).

N. A. Morozov made the following justified remark regarding the full eclipse of 2 August 1133 in the XII-century triad: "The sun appeared to rise in total occultation on the southern coast of the Hudson Bay, it had been matutinal in England as well, came to Holland at noon, to Germany, Austria, *the vicinity of the Bosporus,* Mesopotamia, and the Gulf of Arabia, and set in complete darkness in the Indian ocean" ([544], volume 4, page 508). The eclipse was full and its phase maximal, everything went dark, and one could naturally see the stars in the sky.

Thus, the XII-century triad discovered by N. A. Morozov can be seen as follows:

1) The first total eclipse of the sun occurred on 2 August 1133 A.D. and happened in the following manner:

–89	+8	+72
+52	+53	+9

The central point of the lunar shadow trajectory on the surface of the Earth was passed between about 11:15 and 11:17 GMT (see fig. 2.9; also see [544], Volume 5, page 122).

2) The second full eclipse happened on 20 March 1140, as follows:

–96	–30	+48
+20	+42	+55

The central point of the lunar shadow trajectory on the surface of the Earth passed at approximately 13:40 GMT (Oppolzer's canon; see [544], Volume 5, page 123, and fig. 2.9).

3) The partial lunar eclipse of 28 August 1151 A.D. had the maximal phase value of 4" at 23:25 GMT. The zenith visibility of the moon concurred with the point whose geographical coordinates were 8 degrees of Eastern longitude, and 7 degrees of Southern latitude ([544], Volume 5, page 51).

This XII-century triad is ideal in all respects. The second eclipse really occurred in March, as one should have expected from the text of Thucydides.

The XI-century triad discovered by A.T. Fomenko:

1) The first solar eclipse, of 22 August 1039 A.D., happened in the following way:

–82	+7	+64
+55	+45	+2

The central point of the lunar shadow trajectory on the surface of Earth was passed at about 11:15 GMT (see fig. 2.9; also see [544], volume 5, page 118).

2) The second solar eclipse (partial) of 9 April 1046 A.D. occurred as follows:

+22	+87	+170
+19	+47	+50

The central point of the lunar shadow trajectory on the Earth surface was passed about 5:46 GMT (Oppolzer canon; see [544], Volume 5, page 123 and fig. 2.9).

3) The partial lunar eclipse of 15 September 1057 A.D. had the maximal phase value of 5" at 18:09 GMT. The zenith visibility of the moon concurred with the

point whose geographical coordinates were 86 degrees of Eastern longitude, and 1 degree of Southern latitude ([544], Volume 5, page 49).

The Thucydides eclipse triad is a very substantial argument proving that the ***History of the Peloponnesus War*** by Thucydides couldn't have been written earlier than the XI century A.D. It is most improbable that the triad is a fantasy of the author, since in that case a fitting astronomical solution would most probably have been nonexistent. It is also hard to consider the eclipses an apocryphal part of the "ancient" text, since they fit the consecutive and detailed narration incredibly well.

N. A. Morozov appears to have been correct in writing that "the book of Thucydides isn't ancient, it isn't mediaeval, it is [from] the thirteenth century of our era at least, the Renaissance epoch" ([544], Volume 4, page 531).

2.4. The eclipses described by the "ancient" Titus Livy

Let us give a few more examples. Omitting the details this time, we shall just report that the eclipse from the ***History*** by Titus Livy (XXXVII, 4, 4) that the modern chronologers ascribe to 190 B.C. or 188 B.C., also fails to satisfy the description of Titus Livy. The situation with the eclipses of Thucydides is repeated yet again. It turns out that an independent astronomical dating yields just one precise solution in the interval between 900 B.C. and 1600 A.D.: 967 A.D. ([544]).

The situation with the lunar eclipse that Titus Livy describes in his ***History*** (LIV, 36, 1) is exactly the same. The Scaligerian chronologers suggest that Livy is referring to the eclipse of 168 B.C. However, analysis shows that the characteristics of this eclipse do not fit the description given by Livy. The eclipse that he describes could really have happened on one of the following dates:

• Either in 415 A.D., at night between the 4th and the 5th of September;

• In 955 A.D., at night between the 4th and the 5th of September;

• Or in 1020 A.D., at night between the 4th and the 5th of September.

This pattern of false dating goes on and on. A list of such examples includes all the ancient eclipses that have detailed descriptions. We shall present the whole picture of this effect of moving ancient eclipse dates forward in time, below.

3. TRANSFERRING THE DATES OF THE "ANCIENT" ECLIPSES FORWARD IN TIME INTO THE MIDDLE AGES ELIMINATES THE ENIGMATIC BEHAVIOUR OF THE PARAMETER *D*"

The author of the current book proceeded to re-calculate the parameter D'' values using the new dates for ancient eclipses that were produced as a result of the method described above. The discovered effect of moving ancient eclipses forward in time led to the identification of many "ancient" eclipses with the mediaeval ones. This, in turn, allowed us to expand and alter the list of such mediaeval eclipses. New data was obtained from the descriptions considered "ancient" earlier on, and added to the mediaeval eclipse descriptions. Nevertheless, research has shown that previous values of D'' basically didn't change in the interval of 500-1990 A.D. A new curve for D'' can be seen in fig. 2.10.

The new curve is qualitatively different from the previous one. In the interval between 1000 and 1900 A.D. the parameter D'' reflects in an even curve on the graph, one that is practically horizontal and fluctuates around one constant value. It turns out *there have never been any drastic leaps in the parameter, whose value has always equalled the one it has today*. Therefore, one doesn't have to invent any mysterious non-gravitational theories.

The fluctuation rate of D'' values that is rather low in the interval of 1000-1900 A.D. grows significantly when we move from 1000 A.D. to the left, towards 500 A.D. This means that either the scarce astronomical descriptions that chronologists ascribe to this period are very nebulous, or, what is more probable, these chronicles are also misdated, and the events they describe are in need of re-dating. However, due to the utter vagueness of the remaining astronomical descriptions, they cannot be used for dating purposes since they offer too many solutions. The re-dating of the events preceding the XI century shall have to be done by other means and methods, some of which shall be related below.

Further on, to the left from 500 A.D., we see the zone of no observation data. We know nothing at all about this epoch.

The resulting picture reflects the natural temporal distribution of the observation data. The initial precision of the mediaeval observations of the IX-XI centuries was naturally rather low, and then grew together with the precision and perfection of the observation techniques, which resulted in a gradual decrease in the fluctuation of D'' values.

4. ASTRONOMY MOVES THE "ANCIENT" HOROSCOPES INTO THE MIDDLE AGES

4.1. The mediaeval astronomy

The naked eye can see five planets: Mercury, Venus, Mars, Jupiter, and Saturn. Their visible movement trajectories are adjacent to the solar ecliptic, or the line of its annual movement. The very word "planet" means "wandering star" in Greek. Unlike stars, the movement of the planets is relatively fast. Their movement on the "sphere of immobile stars" is characterized by significant irregularities that can be explained by the fact that the planet trajectory as observed from Earth is a result of the projection of the telluric orbit onto the immobile celestial sphere through the moving planet. Most of the time, the planets as observed from Earth follow the sun in their movement. However, after certain periods of time that differ for various planets, they begin to move *in the opposite direction.* This is the so-called *retrograde movement* of the planets. We should note that Mercury and Venus don't go far from the sun in their movement as observed from the Earth. Other planets can get far away from the sun, since their orbits are located *beyond* the telluric orbit, unlike those of Venus and Mercury.

Complex and seemingly chaotic movement of the planets gave birth to the belief, back in the days of yore, that there is a feedback between planets and human lives. Objectively, this belief was based on the undeniable correlation between the change of seasons and the position of celestial objects. This is how astrology was born – a science of planets, stars, and the effect on people's lives.

A significant part of mediaeval literature contains

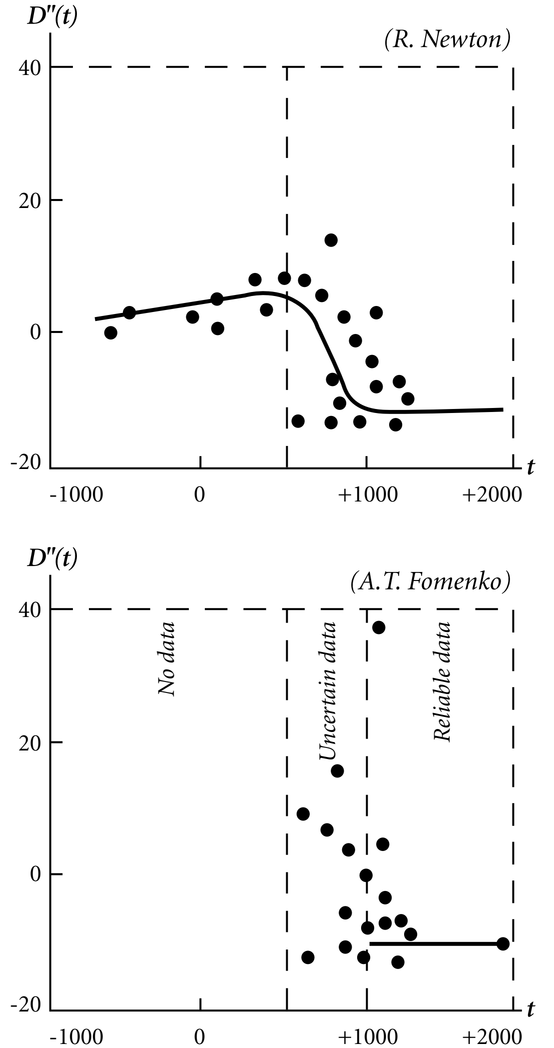


Fig. 2.10. Comparison of D'' graphs as calculated by R. Newton and A. T. Fomenko. The new D'' graph has neither gaps nor leaps, and fluctuates around a constant value.

astrological texts, especially astronomical tractates up until Kepler's age and even after that. The existence of several competing astrological schools led to the use of lavish symbolism by mediaeval astrologers, which makes it hard to speak of unified astrological definitions. Furthermore, each school developed its own linguistic and symbolic system. However, we shall soon see that many countries have surprisingly enough used a more or less *uniform astrological symbolic system* –

for zodiacal constellations, for example. This can mean that astrology had been born relatively recently, in the epoch when the means of communication between the astronomers of different countries had already been developed well enough to provide for regular information exchange and a similar "astrological language" – in Europe and in Egypt, for instance.

It would be expedient to remind the reader that the modern names for planets have been introduced by astrologers. The names for days of the week in such languages as English, French and German are also in direct relation to astrological concepts ([470]).

Planets have roughly the same trajectory across the sky. The circle of their movement along the ecliptic plane is called the zodiac. It is separated into 12 parts or constellations ([571]). Astrology was of the opinion that there is a special relation between the planets and each zodiacal constellation ([470]). A detailed theory was developed in this respect, wherein each constellation and each planet have been assigned a "character": Mars is alleged to be aggressive, Jupiter divine, Saturn deathly, etc. In the so-called ***Four Books*** of the mediaeval astrologers, one may read that "Mars scorches and burns; his colour is red, the colour of fire" ([470]). Colour used to be ascribed to the planets as well – thus, Mars was considered red, Saturn pale, etc. ([470]). The combination of planets and constellations was given special attention. For instance, bloodthirsty Mars entering the sign (constellation) of Leo was considered an extremely dangerous omen of war and bloodshed. Ill-boding Saturn, the "god of death," when entering the sign of Scorpio, was regarded as an omen of epidemics and plague. Saturn and Scorpio were actually considered symbols of death ([470]).

As we have already mentioned, the projections of planets onto the immobile stellar sphere move in leaps as the Earth revolves around the sun. In its movement between the stars from the west to the east, each planet located *outside* the orbit of the Earth slows down at some point, then stops and begins to move in the opposite direction. It stops after that, begins to move back, stops again, and resumes its movement from the west to the east. An elongated loop appears as a result – the projection of the telluric orbit onto the immobile stellar sphere through a planet. These *leaps* were naturally observed a long time ago, and led to the comparison with *horses* running across the sky.

A *horoscope* is a name used to refer to the disposition of planets in zodiacal constellations: Mars in Virgo, Saturn in Pisces, etc. Horoscopes can be calculated. The question of a planet's location in one constellation or the other is a question of its fitting into the sector about 30 degrees wide. For many problems, the longitudinal precision of 5 degrees to one side or the other is quite sufficient. The *latitude* of the planet doesn't have to be calculated. Their deviations from the ecliptic are minute from the point of view of fitting into a constellation. This is why the old documents that contain horoscopes usually only give the zodiacal, or longitudinal, planetary disposition.

Horoscopes are calculated in the following way. Having fixed the constellational distribution of planets for a given moment (today, for instance), and knowing the numeric values of the periods of the planets' revolutions around the sun, we can move to the front or to the back using periods divisible by the revolution length, and get zodiacal planetary dispositions for the past or the future. Tables of various precision exist nowadays, ones defining the zodiacal positions of planets. Such tables have been compiled by P. Neugebauer, Newcomb, Leverrier, Morozov and others. Also see [1293]. Such tables exist to answer the question of what the zodiacal position of a given planet was on a given day in a given year. N. A. Morozov and M.A. Viliev have also compiled reverse tables showing when a given planetary disposition may have really taken place ([544], volume 4). Relatively recently a number of good computer applications have appeared that are used for horoscope calculation. We have employed some of them.

Nowadays we have a rather vague concept of the way of thinking pertinent to mediaeval astrologer astronomers. The astrological hue had been dominant in the perception of many mediaeval scientists, not just astronomers. Mediaeval books on astronomy are filled with astrological symbolism despite the fact that they describe real celestial events. These books weren't written in a cipher – this was the usual way of writing down celestial observations understood to both writers and readers. For instance, dates of death on gravestones and monuments, or memorable dates, have been often written down as horoscopes – in other words, drawn as the zodiacal positions of planets for a given moment in time.

Astrology occupied one of the leading positions as a fundamental cosmological discipline. This ideology is largely lost for us nowadays. That is why the understanding of such books requires the knowledge of the symbolism used in them. An ideological overview of mediaeval astrology is given in [849], for instance. Troels-Lund, a specialist in history of religion, gives an illuminating description of the mediaeval Western European scientific Weltanschauung. This is what he writes about planets in particular:

"Such strange movement could only have been interpreted as a manifestation of will, as proof of independent life… the opaque celestial dome rotates above all of this, and it has 'stars affixed to it, in figures bearing semblance to animals'… This had been nothing but *astronomy transformed into a religion*… Thus happened the birth of the art and science that would never fail to attract human attention for centuries to come, and considered the crown of human knowledge." ([849], pages 24-26)

The book [849] quotes Biblical fragments that are astronomical in their nature according to Troels-Lund. We shall get back to this issue soon.

The flourishing scientific astrology invariably spawned an offshoot, the so-called applied astrology, or the science of predicting the destinies of people, states and monarchs by planetary movements, or "by the stars." Astrology enjoyed state support in mediaeval Western Europe ([849]). Astronomy (mixed with astrology) was also extensively used by the Roman church, which employed it for calendarian purposes in particular ([849]).

"Astrology became the leading science of the time, the basis for all other sciences" ([849], page 166).

"If we shall regard the XVI century astrology objectively nowadays… Our first reaction shall be that of surprise at how great a role the belief in stars and the way they affect one played in that epoch… It had not just been the ignorant masses that believed in astrology, even the greatest minds followed suit… It suffices to take a look at the great variety of works on astrology that appeared in the XV and XVI centuries. Just the ones that can be found in the two main Copenhagen libraries, would make a rather voluminous pile… Their authors aren't obscure anonymous scribblers – au contraire, these books were written by the greatest minds of the time. There is no name in the XVI century Scandinavia that could equal Tycho Brahe, one of the greatest representatives of natural sciences… a popularizer of Heinrich Rantzau, the viceroy of Schleswig-Holstein." ([849], page 169)

About Tycho Brahe: "all of his scientific activity had been dedicated to [astrology's] development to a certain extent" ([849], page 169).

The same can be said about Melancthon and Kepler in Germany. Astrology flourished at the courts of European monarchs in France, England, and Italy. It is known that Rudolf II, Louise of Savoy, Catherine de Medici, Charles IX, Henry IV, and other Western European rulers were active proponents of astrology ([849], pages 170-171).

Melancthon claimed that the Bible gives direct indications of the divine origins of astrology ([849], page 175). *The fact that many fragments of prophetic books of the Bible, for example, are astronomical and contain horoscopes in cipher was considered indisputable in the Middle Ages* ([849], page 180).

It is considered that the authority of astrology had been dealt several mortal blows by Copernicus, Newton and Laplace. Therefore, the astrological symbolism of many ancient texts lost its importance and mystery, became lacklustre and were soon forgotten. Nowadays the majority of readers will fail to understand it for the most part. The discovery of the chronometer and other instruments rendered quotidian sky observations void of value, which completely crushed the foundations of astrological ideology.

"There has been no other epoch when people's direct perception of the sky had been quite as meagre [in reference to the XIX-XX centuries – A. F.]. There is hardly one person in a hundred in London, Paris and Copenhagen that knows whether the moon is full or new today, or what the current location of Ursa Major is. The light of the nocturnal sky had assumed a purely decorative role." ([849], pages 212-213)

Unlike the Western European countries, the Russian Orthodox Church is considered to have had a very negative attitude towards astrology.

"A very demonstrative episode occurred in the Kremlin in 1559, when Ivan the Terrible had returned the present of a sophisticated clock embellished with moving representations of celestial bodies to the Danish ambassadors, who were told that 'the present is of no use for a Christian ruler who believes in God and does not concern himself with either planets or (celestial) symbols.'" ([775], pages 125-126)

At the same time, astronomy was used in Russia for Paschalian calculations. We shall be relating this in more detail in CHRON6. Apart from that, we quote some facts in CHRON6 that shall greatly aid in the explanation of the negative attitude of the Orthodox church towards astrology that has been prevalent ever since the second half of the XVI century and continues until the present day.

4.2. The method of unprejudiced astronomical dating

As we have already mentioned, the idea of using the horoscopes contained in old documents for the astronomical dating of the events described in the texts originated as early as the XVI century. It has been occasionally used by astronomers and chronologists of more recent epochs. If some document contains a horoscope, then the use of theoretical calculation tables for reference can allow for the attempt to select a fitting horoscope whose astronomical characteristics would satisfy the description of the old document. A certain date would be the result of these calculations, or a number of dates in the case of several astronomical solutions, which will happen if the description is vague or incomplete. However, the practical use of this apparently simple idea ran into great practical complications whose reasons were far from astronomical – the culprit was the existing Scaligerian chronology.

N. A. Morozov had discovered that under the pressure of the Scaligerian chronology, the astronomers of the XVII-XIX centuries had to resort to *arbitrary fittings* to a greater or a lesser extent in order to make the "historical tradition" that they believed in correspond to the results of their astronomical calculations ([544]). The thing is that the astronomers of the XVII-XVIII centuries had lived in an epoch when Scaliger's chronology *had already been shaped*. Ergo, the principal historical reigns, wars, characters, etc. had been distributed across the temporal axis by the historians for the most part. This is why the astronomers had already "known" the approximate datings of old texts that they had to date astronomically from historical chronology. The role of the astronomers would thus become limited to making marginal corrections of the historical datings with the "astronomical method." If the astronomers failed to find a precise astronomical solution in the "necessary" epoch, they preferred to *question the old document's exactness, and not historical chronology.* In such cases astronomers usually utter something along the lines of "the scribe must have made a mistake putting Saturn into Pisces, since it has to be in Virgo so that the events described would fall in the V century B.C." Correcting Pisces for Virgo, the astronomers ipso facto "confirmed" the opinion of the Scaligerian historians who dated the document as V century B.C.

N.A. Morozov's great achievement was that he was the first to question the consensual historical chronology, and not the astronomical reports contained in the old documents. He suggested extending the search interval of astronomical solutions so that it would include *the entire* historical epoch up to the Middle Ages. However, even N.A. Morozov hadn't been entirely consistent and usually preferred not to venture further in time than the VI century A.D.

It turned out that the accurate use of the astronomical method reveals dates that are *a lot more recent* than the ones offered by Scaliger. Furthermore, in some cases the new dates turn out to belong to *the late Middle Ages!* All of this is notwithstanding that the astronomical results obtained by Morozov cannot be regarded as *finite.* Being certain that only the "ancient" chronology was incorrect, he had been gullible enough to have trusted the mediaeval chronology beginning with approximately 300-500 A.D. This is why he usually failed to research the entire possible time interval, most often contenting himself with the attempts at finding the solution in the period between 2000 B.C. and 600 A.D., and only occasionally further into the Middle Ages.

Morozov most often did not consider the later epoch between the XIV and XVIII centuries at all. He was of the opinion that "ancient" eclipses and horoscopes couldn't possibly have moved forward in time to such an extent that they wound up in the XIII or even XVII century A.D. Thus, moving forwards along the time axis in his search of astronomical solutions, he would most probably stop at the first fitting solution.

This is why we treat his astronomical results as preliminary when we report them. It is possible that if we carry on with his unfinished research, we shall find astronomical solutions that will be a lot more recent, and occasionally more precise.

However, we can already state the following with certainty: if new and more precise astronomical solutions are really found – this is the case with the Dendera zodiacs and the Apocalypse (see below) – they shall be even closer to us than the ones found by N. A. Morozov, since he had already analyzed the period between ancient times and the VI century A.D.

4.3. Many "ancient astronomical observations" may have been theoretically calculated by late mediaeval astronomers and then included into the "ancient" chronicles as "real observations"

One shouldn't forget that in the creation of the "correct history according to Scaliger," the chronologers of the XVI-XVII centuries often turned to astronomers asking them to perform this or the other kind of calculations.

We have already mentioned the heavy astrological influence that the mediaeval science was subject to. The astrological schools of the XV-XVII centuries may have occupied themselves with solving such "scientific" problems as the planet disposition during the coronation of Justinian I (who had lived in the VI century A.D. according to the erroneous opinion of the mediaeval chronologers) with astronomical/astrological methods.

Another problem they may have been busy with was giving exact datings to the lunar eclipses of the Roman Empire epoch that the mediaeval chronologers had already erroneously ascribed to the III-VI centuries A.D.

Yet another one may have been the estimation of the Easter Sunday in the year of the Nicaean council, whose erroneous dating of allegedly the IV century A.D. had already been "calculated theoretically" a few years earlier, in the XVI-XVII centuries.

All of these "astronomical calculations" have been slyly included in the final editions of ancient chronicles. All of this probably happened in the XVI-XVII and even XVIII centuries. It was a great body of work, which would have been useful if the chronology created by the mediaeval historians had been *correct*. However, this chronology proved *erroneous*, and so the mediaeval astronomers have aggravated the mistakes of the historians, calculating the planet dispositions for the VI century A.D. (when Justinian I is supposed to have lived), and entering something like "on the day Justinian I was crowned, the planets were in such-and-such constellations" into the chronicles. As a result, the chronicles may have been given an erroneous chronological and astronomical skeleton, which was apparently just a result of latter mediaeval calculations represented as true "ancient astronomical observations" in the chronicles.

Afterwards this partially erroneous and partially falsified material rigidified, gathered some authority dust, and reached us in this exact form. Our contemporaries, both historians and astronomers, read ancient chronicles and rejoice to find "astronomical data" in them. The alleged observations – fruits of *theoretical calculations* of the XVI-XVIII centuries – are dated with modern astronomical methods, and everybody is clearly brimming with satisfaction when the results obtained concur with the Scaligerian chronology. Thus, the chronology of Scaliger-Petavius receives additional "proof," which *leads to a vicious circle.*

Of course, one occasionally finds discrepancies with modern astronomy due to the fact that the astronomical calculation methods of the XVI-XVIII centuries (those dealing with past dates) were imprecise, and a lot worse than the ones currently used. Having located such a discrepancy, modern historian astronomers patronizingly correct the "ancient observer," which creates an even greater illusion of the veracity of the Scaligerian chronology.

What should one do when the results of modern astronomical calculations *radically* contradict the Scaligerian chronology? In such cases modern historians start talking about "the ignorance of the ancient observers."

Our new results show that *mediaeval chronology can only be trusted from the XVI century on* (see CHRON5). One needs to perform an even greater body of work in the field of finite independent dating of eclipses and horoscopes present in written sources. According to the latest research, N. A. Morozov's astronomical solutions are often complemented with new, *considerably more precise and recent* solutions scattered across the interval between the XIII and XVI centuries.

4.4. Which astronomical "observations of the ancients" could have been a result of late mediaeval theoretic calculations?

Our idea is as follows: the chronologers of the Scaliger-Petavius school first created the erroneous chronology of ancient and mediaeval history, having arbitrarily extended the real history of the XI-XVII centuries A.D. into the past.

After that, in the XVI-XVII centuries a great body of work was started in order to make this scheme "look scientific" as a result of astronomical calculations. If we're to call a spade a spade, it really was a deliberate falsification of history.

1) The "*Ancient calendar theories*" were put forward. The chronologers of the XVI-XVII centuries began to "reconstruct" the ancient calendarian systems that people had allegedly used in antediluvian times for hundreds and thousands of years. Calendarian "starting points" would appear as a result of theoretical calculations, as well as such dates as that of the Genesis, the Great Deluge, etc. The results of these calculations would be *written into* the "ancient" chronicles without any hesitation whatsoever in order to "help maintain chronological order." What this meant in fact was the confirmation of mistakes or blatant falsifications of the Scaliger-Petavius school. Real mediaeval events assumed wrong datings that moved them a long way into the past. Nowadays these "ancient" datings are considered to prove the Scaligerian history by historians who remain unaware of the fact that many of these "calendarian observations" are a result of *theoretical calculations* of the chronologers of as late an epoch as the XVI-XVII century A.D. – yet another vicious circle.

2) Certain *horoscopes* may have been calculated into the past. Rough calculations of planet dispositions may already have been known in the late Middle Ages. The chronicles would then undergo special editing, after which they began to contain such phases as "in the VIII century since the foundation of Rome, on the day Julius Caesar was murdered, the planets occupied the following positions." The planet dispositions would be calculated exactly for the I century B.C., since the astronomers of the XVI-XVII centuries "already knew" in their blind trust of Scaliger-Petavius that Caesar had lived in the I century B.C. Nowadays historians believe these "astronomical observations" to be the real thing, and try to present them as proving the correctness of the Scaligerian chronology, which leads to a vicious circle. For instance, one of the astronomer/astrologers of the Middle Ages would first calculate that some astronomical event occurred in the I century B.C. Afterwards the fact that this dating had been calculated would fall into oblivion, and the result of the same mediaeval calculation would be called *proof* – of the fact that Julius Caesar had really lived in the I century B.C., for instance.

3) First and foremost, a number of *lunar eclipses* were calculated into the past. Let us mention that *the lunar eclipse calculations are rather simple.* They were successfully performed already in the epoch of the XVI-XVII century. *Solar eclipses are different, and involve a lot more complex calculation.* However, in the XVII, let alone the XVIII century, the astronomers were already capable of counting solar eclipses into the past as well. The "calculated" lunar and solar eclipses may have been included into the erroneous history of Scaliger and Petavius in the following manner: "On the day such-and-such emperor died, an eclipse occurred." The process was apparently as follows: having calculated that some eclipse occurred in the beginning of the II century A.D., the astronomer would take the "Petavius textbook" and see what emperor's reign coincided with the date of the eclipse that he had calculated. For instance, the Scaligerian chronology would claim that some ruler had died that year. The edited chronicle would then become altered to include some phrase like "the moon (or the sun) had darkened when he died." The examples of mediaeval calculations that have been claimed as "ancient observations" a posteriori were given in abundance by the modern astronomer Robert Newton in his well-known work titled ***The Crime of Claudius Ptolemy*** ([614]).

4) The appearances of certain *comets* may have been calculated into the past. Late mediaeval scientists starting with Tycho Brahe and Kepler were already able to calculate their recurrence periods based on trustworthy observations. The Galley comet may

serve as an example. Then the alleged dates of comet appearances were calculated by extending several recurrence periods into the past. After that the erroneous "Petavius textbook" was used for reference, and the edited chronicles would be altered to contain such phrases as "in the nth year of reign of emperor such-and-such a comet with a fuzzy tail adorned the sky."

Nowadays we are being convinced that the ancient astronomers had really observed all of these "appearances of the Galley comet" in times immemorial. What's more is that these "observations" are nowadays presented as proof for the Scaliger-Petavius history textbook. This is not the case in reality. We shall cover comet "datings" in general and the Galley comet in particular in the chapters of CHRON5 that deal with the history of China.

In the XIX-XX centuries even some of the professional astronomers have been taken in, thinking that they dealt with true ancient observational material, which led to the construction of theories that should have made the calculated trajectory of the Galley comet's movement "more precise." However, such "reconstructions" invariably lead to the distortion of the very mathematical theory of the comet's movement, since certain constants in motion equations have to be obtained from empirical observations. If such observations are incorrect or simply fictitious, the constant values also turn out wrong, not the way they're really supposed to be.

One sees just how serious the consequences for the history of science may prove, the ones that arise from such late mediaeval chronological calculations that have been slyly presented as "true astronomical observations" later on.

These considerations are primarily valid for written sources. It must have been easy enough to take a quill and *write* the "ancient observation" down on the page of the chronicle.

Such suspicions are less applicable to *trustworthy archaeological findings* or ancient monumental architecture, although the utmost caution is required there as well. However, if a horoscope is presented as a large bas-relief on the ceiling of an old cathedral, or on a coffin in an old sepulchre, one has reason to believe that we see the result of a *veracious* astronomic observation, and not a latter calculation based on Scaliger-Petavius chronology.

5. A BRIEF ACCOUNT OF SEVERAL EXAMPLES OF EGYPTIAN ZODIACS

In this section we shall give a rather brief account of the results of our research that is related in detail in CHRON3, Part 2.

5.1. Some general observations

The ancient horoscopes that have reached our days are a valuable body of chronological material. A horoscope's dating can be based on modern astronomical theory. Generally speaking, horoscopes may possess several astronomical solutions, but usually only one of them falls into the historical time interval. In this case we may obtain a precise dating of this horoscope.

However, the dating of horoscopes is a tricky business. The concept of using astronomy for the purposes of dating old documents was already familiar to I. Scaliger and the rest of the XVI-XVII century chronologers. Thus, the ones responsible for the forgery of history may have employed this concept and must have certainly done so. Since the written sources have largely been edited in the XVII-XVIII centuries, as we understand, the astronomical information contained therein may also be a forgery – especially in cases when this did not require much time and effort, as with horoscopes. The astronomers of the XVI-XVII centuries already knew planetary revolution periods well, and could calculate horoscopes for any given date, including those belonging to days long gone.

Thus, in order to obtain certain chronological datings based on the horoscopes that are independent from the Scaligerian chronological scale, it only makes sense to use the horoscopes whose calculation in the XVI-XVIII centuries is improbable. From this point of view, a horoscope *carved in stone on the wall of an ancient temple* is a lot more dependable than a horoscope included in an "ancient" manuscript. Carving a large and detailed bas-relief in stone would require lots of effort; apart from that, the construction of a temple is an event of high social significance that directly involves a large number of people. Writing something about the constellation that housed the planets on a given "ancient date" on a sheet of paper isn't nearly as difficult. This is office work. The history

Fig. 2.11. A rare old picture showing a dilapidated arch, and the Great Dendera Temple behind it. We see its main northern entrance. The drawing was made by the French painters who accompanied the Napoleonic troops during the Egyptian invasion. Taken from [1100], A., Volume IV, pl. 5.

swindlers have been involved in precisely this sort of activity. It was only after the Scaligerian history had become consensual that it began to affect monumental construction as well, in the XVII-XVIII centuries. Furthermore, it is a lot easier to correct the horoscope in a manuscript while editing it than altering one carved in stone on a cathedral wall, which is hardly a possibility at all.

Thus, the horoscopes contained in written sources are of little interest in what concerns independent dating. This particularly refers to the "ancient" Greek horoscopes collected in the well-known work titled ***Greek Horoscopes*** by O. Neugebauer and H.B. Van Hoesen ([1290]).

5.2. The Dendera Zodiacs

The images called nowadays the Round and the Long Zodiac have been found in the Dendera temple in Egypt. Multiple attempts by XIX-XX century astronomers to find "ancient" solutions that would fit the horoscope depicted on the Zodiacs, have failed to yield any results. Such eminent scientists as Laplace, Fourier, Letron, Biot and Helm have tried to solve this problem. The search for a correct solution was eventually given up after many unsuccessful attempts. Nowadays the temple and the horoscopes are dated to 30 B.C. and 14-37 A.D. However, it turns out that there are *exact astronomical solutions*. We shall only briefly touch on the matter here, since part 2 of CHRON3 gives a detailed account of this problem.

Dendera is a town in Egypt, north of Thebe, on the bank of Nile. The ruins of the ancient town of Tenteris, with its remains of a beautiful temple, are located nearby. We shall cite several unique old drawings made by the French artists who accompanied Napoleon's military units on his Egyptian expedition

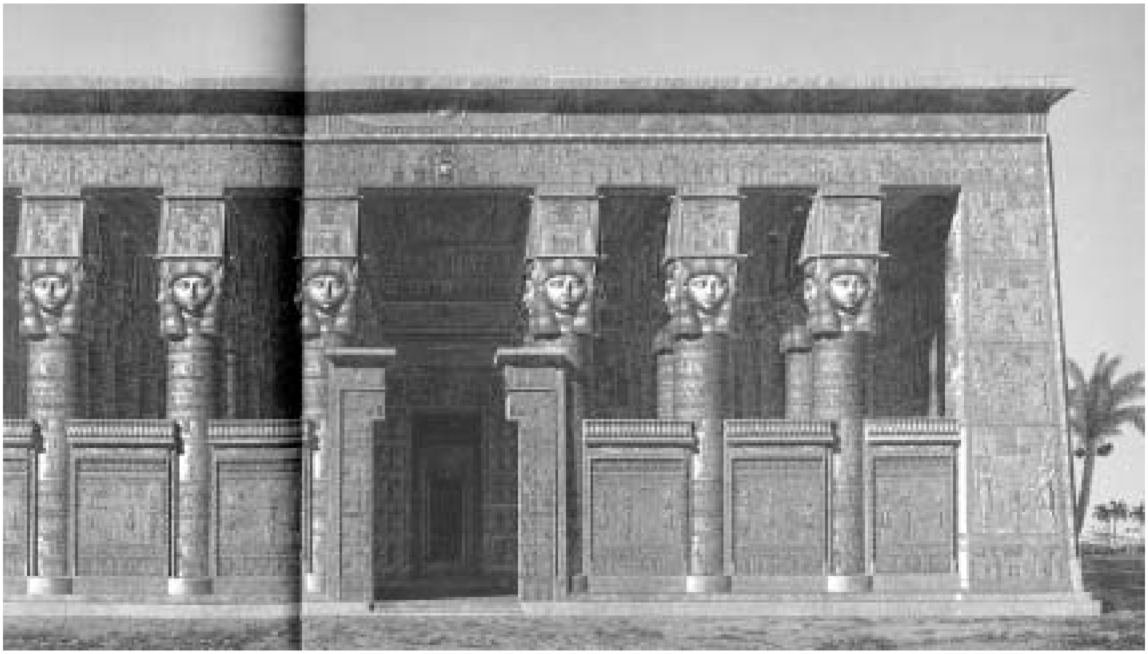


Fig. 2.12 A reconstruction of the Dendera Temple done by French painters of late XVIII – early XIX century. We only show the right portion of the "reconstructed" façade here. The reconstruction in general was apparently done rather conscientiously; however, one immediately notes the curious fact that the faces of the statue columns on the "reconstruction" significantly differ from those on the original drawing ([1100], A., Volume IV). Also see Chron3, Part 2. The original stone faces with chipped noses have high cheekbones differing from the ones depicted by the "restorers" of Egyptian history. It isn't quite clear just what considerations the French artists were guided by, and why they would have to substitute "becoming Graeco-Roman faces" for the original ones with high cheekbones. Taken from [1100], A., Volume IV, pl. 29.

of violent conquest, towards the end of the XVIII century. These drawings present priceless proof; they are extremely important documents since they present us the state of the Egyptian monuments near the end of the XVIII century – right after the troops and the artillery of Napoleon fought their way through the terrain. They can be considered "photographs" of sorts, reflecting Egypt the way it was in the late XVIII/early XIX century, taken by eyewitness members of the Egyptian campaign. Of course, they are far from being real photographs, but we have no reason to doubt that Napoleon's artists faithfully reflected what they saw.

In fig. 2.11 we can see a dilapidated arch and a view of the main, northern, entrance to the Dendera temple. We can see that the buildings are largely in a decrepit state. We give a "reconstruction" of the temple in fig. 2.12 for comparison. Its authorship can most probably be credited to the very same artists who made the other drawings. What we see is thus their concept of what the temple "really looked like" prior to its destruction. The reconstruction is most satisfactory in general (see fig. 2.12), although the "reconstructed faces" on the columns are visibly different from the semi-obliterated stone originals, q.v. in Chron3, Part 2.

In figs. 2.13 and 2.14 we can see the rear view of the Great Temple of Dendera. This was how Napoleon's artists would have seen it when the front line could finally advance, and Napoleon's troops had entered Dendera. It is clearly visible that it wasn't "almighty time" that caused most of the destruction. We see a scene of utter devastation here; the buildings have either been shelled, or simply exploded with gunpowder.

In figs. 2.15, 2.16 and 2.17 one sees modern photographs of the Dendera temple. Pay attention to the immaculate stonework of the wall surrounding the

Fig. 2.13. Rear view of the Great Dendera Temple. We see utter devastation most probably caused by artillery or powder kegs placed under the foundations of the buildings. Taken from [1100], A., Volume IV, pl. 3.

temple (fig. 2.15). The piers supporting the foundation of one of the buildings that used to stand in front of the temple are clearly visible. The building is destroyed, q.v. in fig. 2.16. The stonework quality and the ingenuous construction solutions give us an idea of the highly professional work of the "ancient" builders of the temple. In fig. 2.17 we see a bird's eye view of the Dendera temple and its environs. One thing in particular that draws our attention is the tall wall surrounding a large area around the temple, and containing remnants of other buildings. One gets the idea that the entire set was planned as a Christian monastery – possibly a relatively recent one.

Two sculptural compositions from the dome of the Great Temple of Dendera survived – the so-called Round and Long Zodiacs. They are ancient bas-reliefs carved in stone. The Round Zodiac is about 2.5 by 2.5 metres ([1177], Volume 1, page 121). The Round Zodiac was taken to Paris, and is now kept in the Louvre. The Long Zodiac was also taken to Europe. In fig. 2.18 we can see the drawing of the Round Zodiac done by Napoleon's artists ([1100], A., Volume IV, pl. 21). It was published in the fundamental oeuvre titled ***Description de l'Egypte*** ([1100]), compiled by the artists and archaeologists who accompanied Napoleon's troops in Egypt. The work was published

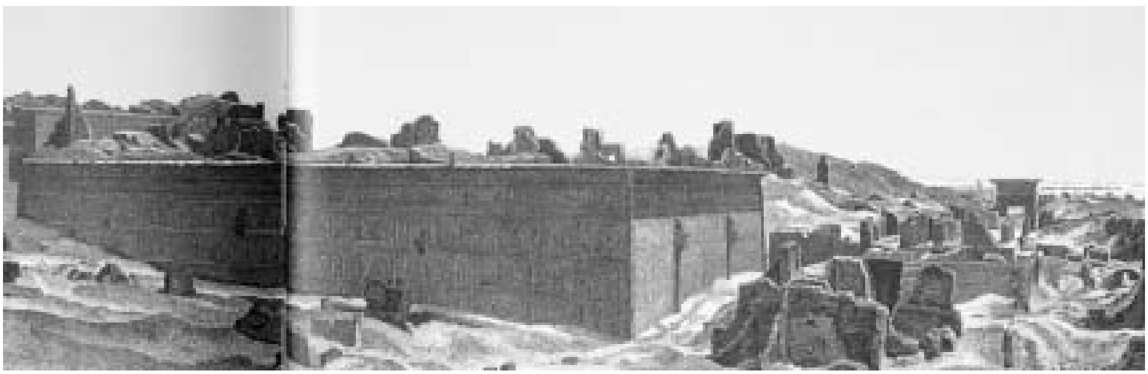


Fig. 2.14. Rear view of the Great Dendera Temple. The devastation wasn't necessarily caused by the French troops; it may have been the result of the Ottoman=Ataman conquest of the XV-XVI centuries, when the troops of Moses that came from Horde-Russia, or the children of Israel (the army of Joshua), were conquering "their very own" Egypt, cleansing it from the "plague" that reigned there. From the epidemics, in other words, q.v. in CHRON6. Over the centuries passed since that time, a large part of the ruins have become buried in sand. However, the sand may have gathered over a matter of decades, or even have already accumulated by Napoleon's era, which means it would only have taken several years. This is quite possible, since the strong dry winds of Egypt carry sand continuously. Taken from [1100], A., Volume IV, pl. 3.

Fig. 2.15. Modern condition of the Dendera Temple. The low wall around the temple is built from large blocks; the stonework is done accurately. Taken from [1062], page 10.

under a direct order from Napoleon, which is explicitly stated in the subtitle: "Publiée sous les ordres de Napoléon de Bonaparte."

Both Zodiacs – the Round one and the Long one – contain images of planets presented as various human figures located in zodiacal constellations. Thus, what we have in front of us is a pair of horoscopes which can be dated astronomically.

These images have been discussed in astronomical literature as well as historical. The consensual dating of the Zodiacs attributes them to 30 B.C. and 14-17 A.D., respectively ([1453], No. 4, page 64). However, this dating falls apart at the first criticism, q.v. in CHRON3, Part 2.

The fact that the Zodiacs of the Dendera temple contain horoscopes is reflected in their very names, and the zodiacal positions of the planets that they depict have been noted by astronomers some time ago. The constellations and the planets are represented as human and animal figures in a standard Egyptian symbolism, some of the figures are combined in the procession.

An event as unique as the discovery of a horoscope in an ancient temple invoked great interest among as-

Fig. 2.16. Modern condition of the Dendera Temple. Taken from [1062], page 63.

Fig. 2.17. A bird's eye view of the Dendera Temple and its environs. The temple and the constructions around it were erected as a Christian monastery. One sees a tall wall containing a considerable amount of space around the temple. Taken from [1062], page 64.

tronomers. However, as we have already pointed out, astronomical research shows that during the distant past and up until the III century A.D., the planets did not form those celestial configurations observable on the Dendera Zodiacs. On the other hand, the detailed accuracy of the bas-reliefs was so great that the chronologists reluctantly formulated a hypothesis that the bas-reliefs depicted pure fantasy, bearing no relation to actual celestial events. After that no further attempts at dating the Zodiacs were made. None of the astronomers thought of extending the researched time span forwards, beyond the III century A.D.

Attempts at deciphering the Round Zodiac started a long time ago. One should name Brugsch, Morozov, and Turayev in this respect. Zodiacal constellations are depicted very skilfully, and form a zodiacal belt, as one should rightly expect. Its visual representation is hardly any different from the ones in Bayer's star charts, for instance, or even the astronomical tractates of the XVIII-XIX centuries. Identifying the planets, however, proved a lot more complex.

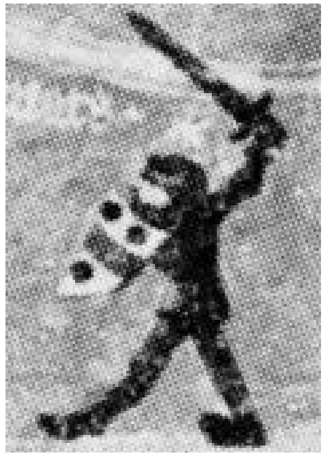
N. A. Morozov offers a partial deciphering of the Round Zodiac in [544], Volume 6, and the dating that was obtained as a result. Morozov's idea was simple, but truly revolutionary. If there was no satisfactory planet combination before the III century A.D., one should carry on with the calculations and go forwards in time in order to cover those epochs closer to us. Morozov conducted all of his calculations on the interval between the III and the XIII centuries A.D. ([544], Volume 6, pages 662 and 667). As a result, he found one astronomical solution that could provide the key to the cipher (assuming Morozov's partial deciphering), namely, 15 March 568 A.D. ([544], Volume 6). This solution (assuming the same Morozov's deciphering) was then verified by the astronomer N. I. Idelson. See the details of his confirmation in the tables in [544], Volume 6.

The Muscovite physicists N. S. Kellin and D. V. Denisenko made another attempt at dating the Round Zodiac in 1992. Their work was published in [MET2]:1 and [MET1]:6, pages 315-329. The date they obtained (given in the so called 'Old Style' calendar) is 22 March 1422 A.D.

Fig. 2.18. A copy of the Round Zodiac done by the painters of Napoleon's Egyptian expedition. Taken from [1100], A., Volume IV, pl. 21. Left sheet.

Fig. 2.19. A picture of the zodiac and the planets from a mediaeval French astronomical manuscript. Planets are depicted as human figures. The figure of a warrior with a sword and shield is unequivocally subtitled "Mars. . . ." As we see, similar symbolism – wanderers with staves – is also used for planets in the "ancient" Egyptian Round Zodiac. Taken from [1046], ill. 80.

Fig. 2.20. Close-up of the fragment depicting Mars as a warrior. Taken from [1046], ill. 80.



Later on, in 1999, a partial deciphering and dating of the Round Zodiac were performed by T. N. Fomenko, who based her method on an altogether different concept and calculated everything from scratch (see [MET3]:3). The result was as follows: either 15 March 568, or 22 March 1422 ([MET3]:3). The results of an extensive research of several important Egyptian Zodiacs, such as the Round and the Long Zodiac of Dendera, and the Greater and the Lesser Zodiacs of Esna, were published by T. N. Fomenko in Chapter 12 of the book [MET]:3.

The final solution formulated by A. T. Fomenko and G. V. Nosovskiy in 2001 is given below.

The identification of the figures from the Round and the Long Zodiacs with contemporary astronomical symbols as reflected in [MET1]:6 was based on the following method. The figures on the Dendera Zodiacs were compared to the pictures of planets and constellations known to us from mediaeval atlases. It turns out that the symbols contained in both Zodiacs are practically identical to the ones used on mediaeval and even late mediaeval star charts.

The planets on the Dendera Zodiacs are represented as human figures – namely, wanderers carrying staves. Planets were depicted in a similar manner in a number of European mediaeval books on astronomy. In fig. 2.19 we can see a zodiac with planets from a mediaeval French manuscript on astrology ([1046], ill. 80). The planets here have the form of *wanderers* proceeding on their journey across the sky. Mars, for instance, is pictured as a warrior who walks with his shield, and a sword in a raised hand, q.v. in fig. 2.20. The inscription near the picture unequivocally identifies this figure as Mars.

In a number of such cases the pictures can be identified with planets without any complications what-

Fig. 2.21. Mediaeval picture of the planet Jupiter. The Thunder God is holding a thunderbolt in his hand and has a royal crown on his head. Jupiter's chariot is rolling over the zodiacal constellations. Taken from a book by Ioanne Tesnierio titled ***Opus Matematicum Octolibrum, Coloniae Agrippinae***, 1562. The book archive of the Pulkovo Observatory (St. Petersburg). Also see [543], page 71.

soever. The mediaeval representations of the planet Jupiter sometimes emphasized the fact that Jupiter was a Thunderer, and the chief deity in Roman mythology. Jupiter's symbol is a royal crown. One of such mediaeval pictures can be seen in fig. 2.21. We see a thunderbolt in his hand, a crown of his head, and the symbol of Jupiter next to the thunderbolt. Another detailed old picture of Jupiter can be seen in fig. 2.22

Mediaeval pictures of the planet Saturn often referred to the imagery of Saturn, the Roman god of death. The standard astronomical representation of Saturn is that of a person with the scythe of Death in his hands ([543], pages 181, 241, and 157). The mediaeval astronomical symbols of Saturn include the sickle and the scythe. A well-known book by Leopoldus of Austria allegedly dating from 1489 ([1247]) has a picture of a scythe and the inscription "Saturn" next to it, q.v. in fig. 2.23. Tesnierio's book of 1562 depicts the planet Saturn with a scythe and devouring a child ([1440]). The scythe or the sickle are often located over the head of Saturn and bear visible resemblance to the Ottoman crescent, or "horns" (see fig. 2.24). It may be that the fear and respect that the inhabitants of the mediaeval Western Europe had for the Ottomans=Atamans caused the Ottoman crescent to become a symbol of punishment.

The identification of the Egyptian god Anubis with the Roman Saturn is described in the oeuvres of the Egyptologist H. Brugsch ([99]), and the expert in the history of religions J. Frazer ([918] and [919]). The Egyptian Anubis is most frequently portrayed with long pointed jackal ears, somewhat curved, q.v. in figs. 2.25 and 2.26. It is possible that the Ottoman crescent would occasionally be compared with long pointed Jackal ears.

In Tesnierio's book [1440], Saturn's chariot is drawn by a griffin and an asp – monsters of death.

The representation of the planet Saturn on the Round Zodiac is as follows: behind the Virgo constellation and beneath it we see two male figures crowned by crescents, one of them bearing a staff, and the other – a large scythe. No other figure on the Round Zodiac, including constellations, has a scythe.

Virgo is portrayed here in exactly the same manner as it is on the mediaeval astronomical charts – as a *woman holding an ear of wheat*, q.v. in fig. 2.27. Let us remind the reader that this constellation contains a well-known star – Spica, or the Ear of Wheat.

The figure of Saturn has got a jackal head. The numerous Egyptian pictures of Saturn accompanying people to the Underworld, are well known. See figs. 2.28, 2.29, 2.30 and 2.31, for instance. By the way, one clearly recognizes the well-known Christian Doomsday subject in the "ancient" Egyptian pictures in figs. 2.30 and 2.31 – one of the most popular sub-

Fig. 2.22. A mediaeval picture of the planet Jupiter from a book by Albumasar titled ***Dé Astrú Sciéncia***, 1515. The book archive of the Pulkovo Observatory. Also see [543], page 181, ill. 92.

jects in mediaeval Christian art. We see Jesus Christ sitting on a throne and pronouncing judgement. The scribe in front of him is reading a scroll, or the Book of Fate, where all the deeds of the dead are listed. The god Anubis is weighing the good and the bad deeds on his scale in order to determine whether the person should go to heaven or to hell. This is clearly an illustration of the Christian Apocalypse, or the Revelation of St. John the Divine. This means all such "ancient" Egyptian drawings belong to a Christian epoch – which couldn't have preceded the XI century A.D. according to the New Chronology.

Furthermore, the mediaeval pictures of Venus emphasized the fact that Venus was the only female among planets, not counting the moon and the sun, naturally. Astronomical maps practically always represent Venus as a woman. The mediaeval symbols of the planet Venus can be seen in figs. 2.32 and 2.33. The first picture is a close-up of a fragment of an ancient picture taken from a French astronomical manuscript cited above (see fig. 2.19). In fig 2.33 we see an ancient miniature called "The Planet Venus" ([1046], ill. 71). Venus is also represented as a woman and has her name written over her head, q.v. in fig. 2.34. Let us remind the reader that Venus resembles Mercury in being positioned relatively close to the sun.

Fig. 2.23. A mediaeval picture of the planet Saturn with a scythe over its head. The scythe looks like an Ottoman crescent. Taken from ***Compilatio de Astrorum Scientia*** by Leopoldus of Austria, 1489 ([1247]). The book archive of the Pulkovo Observatory. Also see [543], page 181, ill. 92.

Fig. 2.24. A mediaeval picture of the planet Saturn with a scythe over its head. The scythe looks like an Ottoman crescent. Taken from ***Dé Astrú Sciéncia*** by Albumasar, 1515. The book archive of the Pulkovo Observatory. Also see [543], page 241, ill. 123.

We see the astronomical symbol for the sun in mediaeval books – a large disc with a point in its centre, q.v. in the drawings in the mediaeval book by Tesnierio ([1440], fig. 2.35), as well as the mediaeval book by Albumasar ([1004], see fig. 2.23). The usual astronomical symbol for the moon is a narrow crescent, q.v. in fig. 2.36.

How did the ancient Egyptians draw the sun and the moon? On the Round Zodiac, directly over Pisces we can see a disc that contains an alectryon's eye. Let us remind the reader that the cock that cries at dawn is a natural symbol of the moon or the rising sun. On the other hand, the brightest star in the constellation of Aries is called The Eye, and the disc with an eye could really indicate that the sun or the moon were in Aries.

The fact that in certain cases the "alectryon disc" could be associated with the moon is also reflected on another stone bas-relief on the dome of the Great Dendera Temple, close to the entrance. There is no planetary horoscope here; however, one sees a large number of separate depictions of celestial objects. We can see a *disc with an alectryon's eye* yet again, with *a crescent circumscribing it*. The reference to either the moon or the sun is apparent, q.v. on figs. 2.37 and 2.38. Furthermore, we see an identical *alectryon-eye*

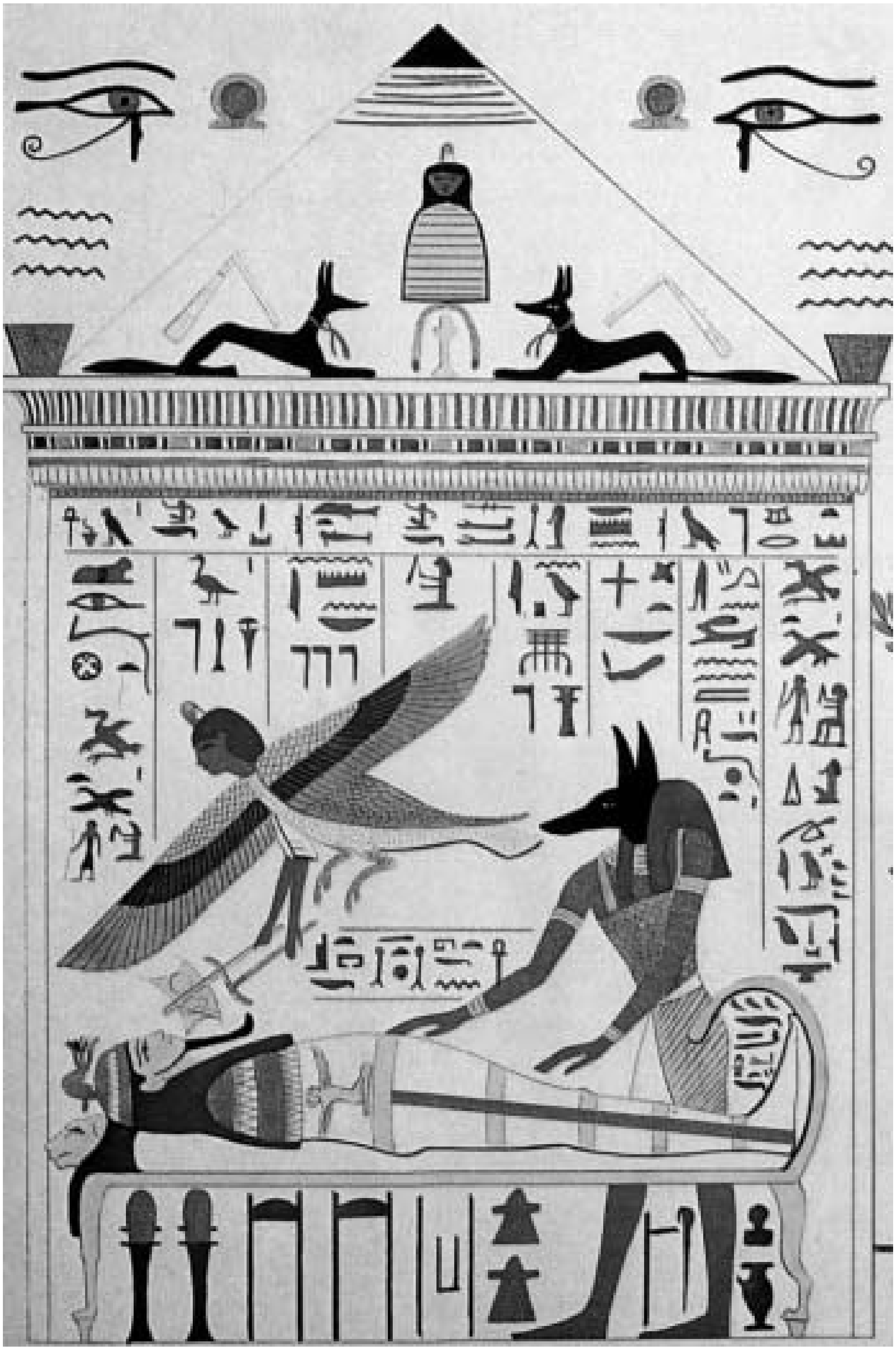


Fig. 2.25. "Ancient" Egyptian picture of the god Anubis with a jackal's head and pointed ears resembling the Ottoman crescent, or a pair of horns. The specialists in the history of religion call this picture "The Mummy of Osiris Prepared for Burial by Anubis." Taken from [1415], page 100. Also see [966], Volume 1, page 128.

Fig. 2.26. A picture of Anubis from the famous Egyptian ***Book of the Dead.*** The pointed ears on the god's jackal head are painted in such a way that they resemble the Ottoman crescent or a pair of horns. Taken from [1448], pl. 3.

disc on this bas-relief, this time accompanied by *fourteen* identical human figures. The reader will recall that a lunar month contains 28 days, so what we see here are probably representations of halves of lunar months, or fortnights. Each day is represented by a small figure. All of the figures are identical, as "similar days" coming one after another. This may be the way the artist represents the 14-day interval between the *new moon* and the *full moon* that is separated into two weeks each with seven figures for days. Furthermore, this second "lunar disc" is sailing the skies in a boat that clearly resembles a *crescent*, q.v. in fig. 2.39. Let us also point out that both "lunar discs" on the dome near the entrance clearly depict some celestial deity, since they are worshipped by other figures.

However, in this case our identification of the "alectryon disc" with the Moon or the Sun coincides with the one offered by the Scaligerian Egyptologists. They are of the opinion that Osiris had the double name Osiris-Moon, and a disc such as this one used to be one of his symbols ([1062], pages 22, 68 and 69. See figs. 2.40 and 2.41). However, one should also bear in mind that Osiris used to symbolize the sun.

We can see that a final identification of any particular disc on the Egyptian Zodiac with the Moon or the Sun is only feasible after all possible options are tried and all the necessary astronomical calculations performed – which is exactly what we shall do in Chron3, Part 2.

Mediaeval drawings of Mercury were based on the idea that both Mercury and Janus were considered gods of trade, and patrons of contracts of all sorts. Janus is an "ancient" Roman god with *two faces* ([533], Volume 2, p. 684). His two faces face different sides, q.v. in figs. 2.42 and 2.43. Mercury is always close to the Sun and never drifts too far away from it. In Tesnierio's book [1440] we see Mercury's famous caduceus resembling a *trident* in the hands of the planet Mercury (see fig. 2.44). Another depiction of Mercury, allegedly dating from the XVI century, can be seen in fig. 2.45.

We shall limit ourselves to these examples, since in Chron3, Part 2, we shall study all possible planet identification options for the Egyptian zodiacs with the greatest care, and select a finite version.

However, one shouldn't think that what we encounter in the Egyptian zodiacs is the fixed result of a *real* astronomical observation. The fact is that in the Middle Ages certain important dates were apparently written down as picture horoscopes, or "celestial dates" of sorts. This is why when a temple commemorating some ancient event would be erected in

Fig. 2.27. An ancient picture of the constellation of Virgo from an astronomical book by Bacharach. Virgo is holding a bunch of wheat ears. Near her hand is the star called Spica, or the "Ear of Wheat". Taken from [1021]. Also see [543], page 81, ill. 44.

Fig. 2.28. Famous Egyptian ***Book of the Dead.*** The "ancient" Egyptian god Anubis is weighing the good and the bad deeds of humans on a scale. The subject is clearly a Christian one, popular in the Middle Ages. Taken from [1448], plate 3. Also see the photograph on the back of the book cover [1448].

the XVI-XVIII century, for instance, the zodiacal dislocation of the planets could well be calculated for the "ancient date" in question, and then depicted on the dome of a temple.

Let us now report the datings of the horoscope depicted on the Long Dendera Zodiac. This bas-relief used to be on the dome of the temple, in the hall one enters via the main entrance.

N. A. Morozov offered the following astronomical solution, basing it on his partial deciphering: 6 April 540 A.D. ([544], Volume 6).

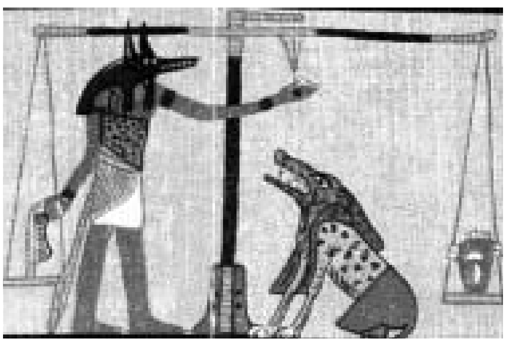


Fig. 2.29 Another "ancient" Egyptian picture from the ***Book of the Dead.*** The subject is the same one – the comparison of good and evil deeds of humankind at doomsday; its origins are clearly Christian. Anubis is weighing human deeds on a scale. Taken from [1448], plate 31.

N. S. Kellin and D. V. Denisenko extended the analysis methods, and offered the 14 April 1394 as an astronomical solution.

An even more detailed, albeit partial as well, deciphering of the Long Zodiac as well as its dating were performed by T. N. Fomenko. The result was the 7 or 8 of April, 1727 ([MET3]:3).

The finite answer obtained by A. T. Fomenko and G. V. Nosovskiy in 2001 shall be formulated below.

5.3. The horoscopes of Brugsch and Flinders Petrie

In 1857 the eminent Egyptologist Henry Brugsch found an "ancient" Egyptian wooden coffin in Egypt that was in a remarkable condition, as if it had been created in a very recent period, q.v. in fig. 2.46. It contained a typical "ancient" Egyptian mummy ([1054]). On the inside of the lid there was a symbolic representation of the starlit sky with planets affixed to constellations – a horoscope, in other words, q.v. in CHRON3, Part 2.

The entire burial rite, the artwork, and especially the demotic scripture doubtlessly indicated (according to the Scaligerite historians) that the finding was exceptionally ancient. Brugsch himself dated it to the I century A.D. at the earliest ([1054]).

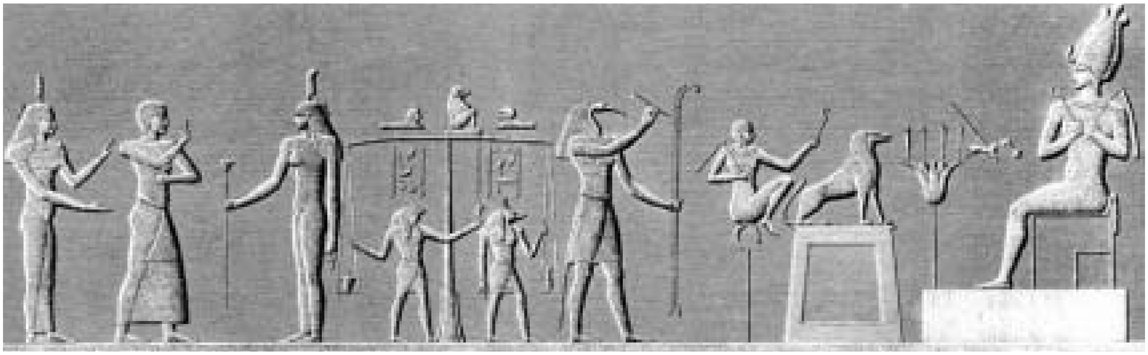


Fig. 2.30. "Ancient" Egyptian picture of the Christian Judgement Day as described in the Biblical Apocalypse. Jesus Christ is judging people; in front of him we see a scribe with a scroll, and somewhat further on is Anubis, weighing the deeds of the people on a scale. This bas-relief, distinctively Christian, is kept in the Egyptian Thèbes, Memnonium. Taken from [1100], A., Volume II, pl. 36.

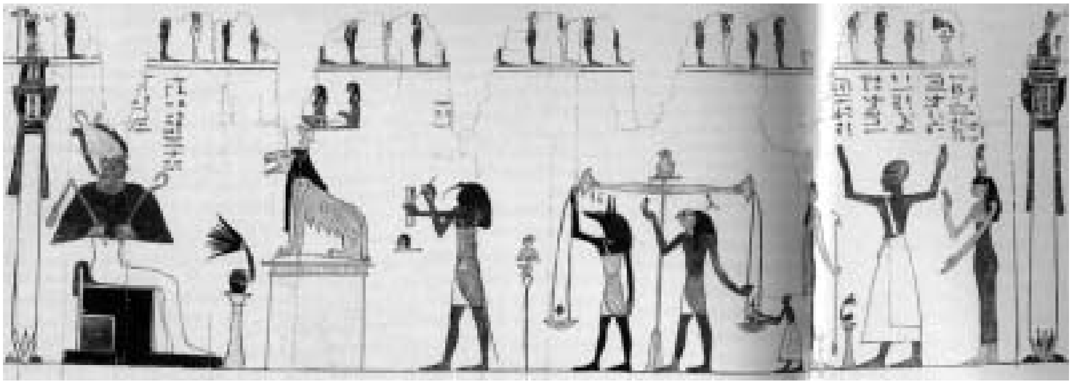


Fig. 2.31. A similar Christian Judgement Day scene from an "ancient" Egyptian papyrus. Jesus Christ is judging people, with Anubis weighing their deeds. It is evident that such drawings could only have appeared after the description of the Apocalypse, not in the dateless antiquity that they are nowadays supposed to date from. Taken from [1100], A., Volume II, pl. 67.

The demotic inscriptions are close to the figures of some zodiacal constellations and make direct references to the planets they contain.

The situation is extremely advantageous. Indeed, all the necessary astronomical information is given clearly and accurately by the creators of this remarkable "ancient" Egyptian sepulchre.

All the researchers of the horoscope were hypnotized by the alleged antiquity of the demotic scripture (first discovered by Ackerblade 20 years prior to Champollion deciphering hieroglyph writing), and dated the artefact to the historical epoch pertinent to the Scaligerian chronology of Egypt. What ensued was a series of attempts made by astronomers to identify the horoscope with the very historical epoch that concurs with the Scaligerian version of the Egyptian chronology. This, however, failed to yield any results, since, as was the case with the Dendera Zodiacs, the ancient sky, from deep antiquity and until the first centuries of the new era, had never been positioned the way the lid of the sarcophagus depicts it.

The astronomer M. A. Viliev went a little further on along the time axis than the other astronomers. However, he didn't go beyond the first couple of centuries of the new era. It is interesting that despite N. A. Morozov's numerous suggestions, M. A. Viliev *refused* to carry on with the research so that it would include the Middle Ages as well, since this would blatantly contradict the Scaligerian chronology, which Viliev did not doubt in the least ([544], Volume 6). N. A. Morozov proceeded with the calculations and went forwards in time ([544], Volume 6, pages 694-728). N. A. Morozov

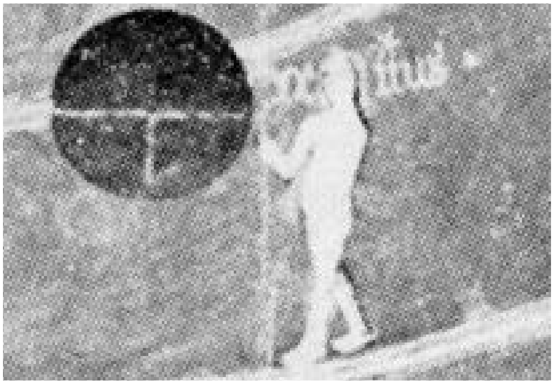


Fig. 2.32. A close-up of the picture of the planet Venus on an old French miniature. The complete title of this astronomical miniature was "Zodiac and the Planets," and it can be seen in its entirety on one of the preceding illustrations. We see Venus depicted as a woman in motion, with the inscription above her head saying "Venus." Taken from [1046], ill. 80.

discovered the following astronomical solution, basing his calculations on his own partial deciphering of the Zodiac found by Brugsch: 17 November 1682. The final 2001 solution of A. T. Fomenko and G. V. Nosovskiy will be formulated below.

In 1901 the eminent Egyptologist W. M. Flinders Petrie found an artificial cave in Upper Egypt, near Sohag, that had been used as an "ancient" Egyptian sepulchre. Its walls were covered by ancient artwork and graffiti, and there were two colour horoscopes on the ceiling (see ***Athribi*** by W. M. Flinders Petrie in Volume 14 of the ***British School of Archaeology in Egypt Research Account***, 1902. Details in CHRON3, Part 2.)

In 1919, academician B. A. Turayev suggested to N. A. Morozov performing an astronomical dating of the horoscopes. Their preliminary analysis and deciphering were performed by E. B. Knobel in Britain ([1224]), who also gave preliminary datings to the horoscopes. The dates he obtained were as follows: 20 May 52 A.D. and 20 January 59 A.D.

However, E. B. Knobel remarked that he found the position of Mercury in the second horoscope quite dubious. In other words, the solution he offered only satisfied the conditions if one was to close one's eyes at some inconsistencies. As for the first horoscope – he put forth the hypothesis that the planetary positions had been calculated by the astronomer who had painted it, and had not actually been observed. The planets were far away from the positions indicated on the horoscope on 20 January 59 A.D. ([1224]). Apart from Mercury, E. B. Knobel had his doubts about the position of Venus in the first horoscope.

This led E. B. Knobel to try out a few other "ancient" versions pertinent to the epoch where the Scaligerian Egyptologists had a priori placed them, guided by the style of burial. However, all attempts by Knobel to find a better astronomical solution yielded no result whatsoever. All the other options that he researched proved to satisfy the given conditions even less.

Furthermore, when M. A. Viliev verified Knobel's calculations, it turned out that Knobel had also been somewhat imprecise with Mars and Saturn as well. This made both of Knobel's dates (52 A.D. and 59 A.D.) highly questionable.

Then M. A. Viliev performed another series of calculations, and offered his own solution of 186 B.C. and 179 B.C. However, it turned out that the subconscious (or conscious) desire of M. A. Viliev to make the solution fit into the historical interval a priori defined by the Scaligerian chronology of "ancient" Egypt, led him to make unjustified allowances. In [544], Volume 6, pages 733-736, all of Viliev's calculations are cited, with all of their errors and deviations pointed out as a good example of what a desire to save the Scaligerian chronology by all means might lead to.

Then M. A. Viliev put forth a hypothesis that the couple 349 and 355 A.D. would provide a better fit. However, numerous verifications proved this pair to be even worse than the first solution. Another similar attempt also led to a complete fiasco.

N. A. Morozov carried on with the research. However, he also failed to find a precise astronomical solution. This started to look most peculiar indeed. The character of the painted horoscopes clearly indicated that the ancient painter was fully aware of what he was painting, and not just making it up as he went along.

Then N. A. Morozov began to suspect that the horoscope had been deciphered incorrectly. He analyzed the horoscope and suggested another interpretation, a more logical one in his opinion. It was partial as well; however, the astronomical solution for the problem presented itself as 6 May 1049 for the upper horoscope and 9 February 1065 for the lower.

Now we are ready to consider the finite answer obtained by A. T. Fomenko and G. V. Nosovskiy in 2001.