AL-BĪRŪNĪ'S TREATISE ON ASTROLOGICAL LOTS

FUAD I. HADDAD*, DAVID PINGREE**, and E. S. KENNEDY***

Introduction

This paper presents one of the minor works of Abū'l-Rayḥān, Muḥammad b. Aḥmad al-Bīrūnī (973–1048), the great polymath of Central Asia. The unique extant copy of the text is Bodleian MS Seld A. 11, ff.85v–92v according to the Arabic foliation; the Library's foliation numbers are greater by one. It is reproduced here in facsimile by permission of the Curators of the Bodleian Library, Oxford. The treatise is listed in the bibliography of his own writings prepared by al-Bīrūnī himself when he was sixty-three years old. It is designated *RG76* in *Boilot*, p. 201. (Here and in the sequel, references in italics are short titles of items listed in the bibliography at the end of this paper). An English translation is also given, followed by a commentary.

A précis of the treatise follows. After some general remarks concerning the motives and methods of scholarship, the author reproaches his anonymous patron for his contempt for Indian science as compared with that of the Greeks. The rest of the contents are almost all astrological, although the emphasis is on ways of applying concepts rather than predictions to be inferred from them. Al-Bīrūnī gives Ptolemy's definition of the "lot of fortune", then a different definition of the same lot, plus that of the "lot of the demon". These depend upon the longitudes of the sun, the moon, and the horoscope, at the time and place in question. He then discusses in less detail the lots of the planets. Interspersed throughout are references to and quotations from various Greek, Muslim, and Indian writers. Most, but not all of the books named are known to

* The American University of Beirut, Beirut, Lebanon.

** Department of the History of Mathematics, Brown University, Providence, R. I. 02912, U.S.A.

*** Institut für Geschichte der Arabisch-Islamischen Wissenschaften, Beethovenstraße 32, D-6000 Frankfurt 1.

the literature. From the *'Amūd al-Ḥikma* curious definitions are given for the "lot of the sun" and the "lot of the moon".

Beginnings of lines in the text are indicated in the translation by numbers enclosed in square brackets. In the commentary, references to the text give folio and line numbers, separated by a colon. In the translation, words enclosed in parentheses have no equivalents in the text, but have been added for clarification. The word *falak*, which on occasion may mean "heaven", or "sphere", or "circle", we consistently translate with the somewhat archaic and ambiguous "orb". Al-Bīrūnī's prose is not easy, and there are phrases, words, and allusions which we do not understand. We hope the publication will stimulate correction of our errors.

There are two figures in the treatise, which have been transcribed in the translation, the letters following the system described in *H&K*. Figures 3 and 4 are also based on the text figures. They have been added to assist in explaining variant definitions. Lower case letters on the figures have no analogs in the text. They are used in algebraic expressions in the commentary and denote both the object referred to (or its projection on the celestial equator) and its celestial longitude. They are:

f the lot of fortune,
g the lot of absence,
h the horoscope,
l_m the lot of the moon,
l_s the lot of the sun,
m the moon,
s the sun.

The authors express appreciation to the National Science Foundation, Washington, D. C., for the support which made this work possible. We also thank Ihsan Abbas, Faruq Abi Khuzam, and Munir Shaar for assistance with the translation, without thought of implicating them in any errors made by us.

ARABIC TEXT AND TRANSLATION OF AL-BĪRŪNĪ'S

Maqāla fī sayr sahmay al-saʿāda wa-l-ghayb

f. 85v

[1] In the name of God, the Merciful, the Compassionate. Oh God, pray for Muḥammad and his people. [2] The Treatise of Abū'l-Raiḥān b. Aḥmad al-Bīrūnī: [3] On the Motion of the Two Lots, that of Fortune and that of Absence. [4] The duty of the servant of science is not to differentiate among its kinds, even though it may [5] not be easy for him to control all its branches. Rather he should know that in an absolute sense science is good in itself, apart from its (content of) [6] knowledge; that its lure is everlasting and unbroken, and that is the result of seeking its lore, whereas it [7] (the lure) vanishes upon the attainment of comprehensive knowledge. He (the servant of science) should also praise the assiduous who investigate those [8] branches (of science) whenever their effort is for delight (in science itself) rather than from victory [9] in argument. He does not look upon their work with the eye of disgust, but in contemplating it his determination is to learn with humility so as to find the right way [10] and obtain guidance. He takes the better and the more correct and leaves what diverges from validity. [11] My remarks refer to what I perceive to be your deviation from this method when you read [12] the beginning of my book "On the Representation of the Two Eclipses Among the Indians" before you knew what is behind it. Then (there is) [13] your assumption of something that does not exist in itself which would make it necessary to stop [14] the ever-moving heavens. I find this in you arises from your assumption [15] concerning the Indians, whether they be right or wrong, especially your inability to have anything but disrespect for whatever [16] you hear of them. If it is not one of these two reasons, then it is the intensity of your apprehension [17] that the heaven will disintegrate like the disintegration of the spinning top from the intensity of its rotation. [18] Just keep calm, and do not feel afraid; this disintegration in the heaven is deemed necessary [19] by those who (would) bring part of it an actual stop, while the rest is in actual motion. But we, [20] thank God, are not of them. So accept our intercession on behalf of the Indians, and be a little lenient with them, even if they did not [21] find what the Greeks found concerning proofs and methods of demonstration. [22] Indeed, in our times they confine themselves to their ancestors' principles as a tradition, the antiquity of which forbids [23] a theoretical investigation. In the remote past they and the Greeks were like

بسم الله الرحمن الرحيم   اللهم صلى على محمد واله وصحبه

مقالة أبي الريحان محمد بن أحمد البيروني

في تسيير سهمي السعادة والغيب

الواجب على خادم العلم أن لا يفرق بين أنواعه وأن لم يكن ميسر الخلقة لحصر سائر أصنافه بل يعلم أن العلم بالإطلاق حسن في ذاته وبالإضافة في معلوماته وأن لذته أبدية غير منقطعة وأنها في معلوماته حاصلة عند الطلب ومنقرضة عند الإحاطة ثم تحمد المجتهدين في إثارة ما في تلك الأنواع متى كان اجتهادهم للالتذاذ بها والالتذاذ دون الغلبة بما اتفق من الجدال ولا يلحى عمالهم بعين الازدراء بل يجعل قصده في تأملها التدرب والتقوي للاهتداء بأيها أحسن والأصوب ويعرض عما باين المتفق عليه حتى يرجع كلامي إلى ما تبينته من انحرافك عن هذا النهج عند مطالعتك أول كتابي في حيالي الكسوفين عند الهند قبل وقوفك على ما وراءه ثم استخفافك بشيء لا وجود له بالذات حتى تحوج إلى تشكيك متحرك في الفلك المتحرك دائما وما أريد هاهنا منك إلا منبعثا عن استخفافك بأنهم أصابوا في المطلوب أو أخطأوا فيه وخاصة مع قلة اعتيادك ما هجم من جهتهم على مسمعك فإن لم يكن وجه أحد هذين فهو شدة إشفاقك على الفلك أن ينفك تفكك الدوامة عند شدة الإدارة أو يطحا شا ولا يستشعر له خوفا فإن هذا التفكك في الفلك واجب عند من يسكن بعضه بالفعل مع حركة سائره بالفعل ولسنا منهم بحمد الله فأقبل لذلك بما عندنا في الهند ولن أنهم قليلا فإنهم وإن لم يهتدوا لما اهتدت له اليونانية من الحجج والطرق البرهانية فلقد اعتصموا في زماننا تقليدا بأصول أسلافهم وأولئك قد يحدث نظرية لا محالة توجب الحرمة وقد كانوا في القديم واليونانيون كتبت

وليس يجمعها في الجملة اعتقاد متشابه وفي علم النجوم في جنسيه طريق متقارب ثم كان الهند يقرون لهم بالتقدم وانهم محقوا من العلم بما اختصوا به دونهم واني اعرف ذلك من لحظ الظاهر ولو استشف بالحقيقة احوالهم وانما نعرفها من كتب المقالات وانتحال اصحابها في واد وهم في واد وطالع امر نحو ههم من زيجات الفزاري ويعقوب بن طارق وامثالهما وهما لم يعرفا اسما كتبهم واصحاب علومهم فضلا عنها ونحن نرجع الى امتحان حالها ونستعين ابانا في تغطيتهما ولكنك ترى علينا في التقليد لها دون الاستهلاك والتحقيق فيما هم عليه من علم احكام النجوم فان وجدنا في قوانينهم مثل ما انكرته ان كان تزيل لكشف عن الهنود وتسمح لهم بالتاسي باولئك فطرعهذا اسلس للحقيقة من ان يشتبه علينا العناد عنه واعلم اولا ان كتب المنجمين من الفرس والروم تنطق بتقدمة الكسوف في العالم مدة تتقدمه لونه ومثلها بعده وصيغوها بايام تفصلونها في القمر يوما وفي الشمس اياما ثلثة وان كانت دوامغ النقمة تبحث من الاصل من جميع الجهات واذا تاملت الامر عرفت انهم يشيرون الى انحاس المدار الكائنة فيه الكسوف فان اثر الصدمة منه باقيه والشمس بطيئة البعد عنه فهي متلوثة بما فيه اياما والقمر سريع التنحي عنه بالمسامعة العرض معا فهو متبرى عنه الا يوما فما المانع اياك عن تجويز مثله للمدين عند لحادة معارنها او تساويهما فان تأثير المؤثرات العلوية على موجب المناسبات الطبيعية متعلقة بالمدارات اليومية وواجب على من اعتقد في اوقات ظهور التاثيرات حصول الاشكال النظرية بين اجرام الكواكب ان لا يستنكر حصول المخصصة التي ذكرها الهند في وقتي ذانك لكنها بين فانا الفي احدا بين الجرمين هاتان الامتان غير مختلفتين في

f. 86r

[1] one family, united by similar beliefs; and in the science of stars in its two kinds [2] they had similar methods. The Indians admitted that they (the Greeks) had the lead, and that they bestowed upon those less advanced they (those branches) [3] of science in which they specialized. Can a person who has not intermingled with them know that, when he does not know [4] the truth about their conditions? Or can they be known by those who write treatises when they are in one spot [5] and those (about whom they write) are in another? Read about matters concerning their astronomy in the zījes of al-Fazārī and Ya'qūb [6] b. Ṭāriq and other people like them! They knew neither the names of their books nor their scientists! [7] We go back to a nation whose situation we have talked about. I would not be exaggerating in claiming its greatness. [8] But you charge us with unquestioning faith in it without criticism or investigation of what they attained [9] in astrology. If we find in their laws what you denied, you have to relinquish [10] what injustices were done the Indians, and allow them to be forgotten. Your nature is more flexible [11] than stubborn. Know first that the books of the astrologers, [12] Persians and Greeks (or Byzantines, *al-Rūm*), say that the duration of the maleficence of eclipses in the world is for a period that precedes their occurrence [13] and the same (length of time) after it. They determined it in days, and then they apportioned it as one day in the (case of the) moon, and in the (case of the) sun [14] three days. If the motives for criticism of the basis come from all directions, and [15] if you contemplate the matter, you will realise that they indicate the maleficence of the day circle [16] in which the eclipse took place, and that the effect of the blow from it is lasting. The sun is slow in receding [17] from it (the day circle), so it (the sun) is retarded in it (the effect) for some days. But the moon is fast in receding from it both in declination and in latitude, [18] so it is exempt (from maleficence) except for one day. So what prevents you from allowing the like of it to the two luminaries [19] when their day circles coincide, or when they are equal? Verily the effect of the heavenly factors according to [20] natural measurement is connected with the day circles, and it is the duty of anyone who believes [21] in the times of the appearance of effects resulting from visual configurations among the planetary bodies [22] not to deny the resultant maleficence which the Indians mention at the times of those [23] two representations (*khayālayn*), so the shadow is a distance between these two bodies. These two nations do not disagree as to the

f. 86v

[1] modification for the horoscope and the two luminaries in the extraction of the life spans of human beings, even if [2] the Indian method differs in the application of those methods which we find in the books copied [3] for us from Hermes, Dorotheus, Valens, and Ptolemy, because the Persians [4] refer to them and rarely differ from them in anything. But as for what the Indians had, it may be [5] included in a book by Varāhamihira on nativities, of which I undertook its translation into Arabic, and I worked out [6] a treatise on the extraction of life spans according to their opinion. As for what the (above-)mentioned people believe, [7] their books have been translated into our language, exist in our country, and are (in fact) commonplace. You may encounter [8] ideas that those opinions are more recent than the opinions of the Indians, obtained [9] either by successive experiments or convincing measurements, because we find among the Indians a book [10] called *Yavan* (Arabic *jbn*) or "The Book of the Greeks", and the method of extracting the (length of) life in it [11] agrees with what they did in the book on nativities and in the book *Sārāvalī*, [12] or "The Chosen", which was edited by Kalyāṇavarman (Arabic Kalānayaran) the king, or it was selected by his order. So we think [13] that both nations agreed in this as concerning the two luminaries and the horoscope, [14] they being at the time of birth of limited substance, as mentioned. Whoever came after [15] that old time of forgotten date, and differed with the Indians as to the aspects of planets [16] and the other principles, and based them upon what is approximated by observation (*al-qiyās*) they being not necessarily (present) [17] in nature, he differentiated between conjunction and opposition with regard to the course of heavenly events in a manner [18] resembling essentially the order and principle of their two periods. To look into those events, [19] he assigned a part to the position of the conjunction or the opposition of the two luminaries at nativities occuring [20] during the period attributed to it, and we admitted (as valid) that the duration of its effect in its position be similar to the duration of the effect of the eclipse [21] in its day circle. It is not strange (that for) the duration of the effect upon what it affects there be a length of time accompanying the disappearance of the affecting (element) from [22] the place of the effect. So (now) go back to the other associate, it being the lot of fortune. [23] You knew its position from investigations (or indication, *istidlāl*) in the art (of astrology), to the extent that it became the mainstay

التعديل على الطالع والنيرين في استخراج اعمار الادميين عند من خالف
طريق الهند في استعمال ذلك الطرق التي نجدها في الكتب المنقوله
الينا من جهة هرمس ودوروثيوس وانطيوخس وبطلميوس لان الفرس
يرجعون اليهم ولا يتفردون منه بشي نادر خلا ما الذي عليه الهند فقد
يتضمنه كتاب ابراهيم في المواليد ثم لبث نقله الى العربي وعملت
مقالة في استخراج العمر على ابنهم واما الذي عليه القوم المذكورون
فكتبهم بلساننا مترجمة وفي ديارنا موجودة متداوله وربما تعثر في
الهرجس على ان تلك الارا احدث عمرا من ازال الهند سافت اليها
امل الجارب متوالية واما قياسات افاعيه لانا نجد عند الهند كتابا
يسمى جبنلي كتاب المواليد وطريق استخراج العمر فيه
موافق لما عملوه هم في كتاب المواليد وفي كتاب ساراولي
اي المختار الذي تولى جمعه كلابرن الملك او انتقى بامره فنظن
ان كلتي الامتين كانتا مجمعتين في ذلك على التيرويث والطالع
وهي وقت الميلاد اذ اعمار محدوده مشار اليها وان مزجا بعد ذلك
الزمن المتقادم المنسي تاريخه خالف الهند في تناظر الكواكب
وسائر الاصول لا فاما منها على ما يقرب من القياس ملتبسة بضروبه
في الطباع وقسم ما بين الاجتماع فلا سيما تقابل المجاري احداث الجو
على شبه بالنظام وميرامدنيه اصلا للنظر في تلك الاحداث
جعل لموضع اجتماع النيرين او تقابلهما شركة في المواليد الكاينة
في المدة المنسوبة اليه وقد سلمناه بقاء اثره في موضعه كبقاء الكسوف
في مداره وليس بعجيب مكث الاثر في المؤثر فيه مدة مع زوال المؤثر عن
موضع التاثير ثم نرجع الى الشريكة الاخر وهو سهم السعادة
وقد علمت موقعه من الاستدلال في الصناعة حتى انه العمدة فيهما

عند من يشتغل باستخراج الخبي في القبضة والحمرة والضمير في الخاطر والفكرة وربما قد عنه على اصلهم وغلب دلالته على اشخاص الفلك واعيانه وبطلميوس يلتزم فيه طريقا بسيطا مستمرا على وتيرة واحدة بالليل والنهار ويقتصر عليه وحده ولا يجعل سهما آخر يباينه بصفه ولا يزال ياخذ في كل وقت مفروض بعد القمر من الشمس ويلقيه من درجة الطالع فحيث ينتهي اليه واما غيره فانه يقسم عمل هذا السهم الى البعد الذي ذكرنا فيوافق فيه بطلميوس بالنهار ويسميه بالليل سهم الغيب ثم يذهب في عمل سهم السعادة حينئذ الى عكسه البعد المذكور دورا تاما وياخذ بعد الشمس من القمر وهو باقي الاول اذا نقص من كل الدور ويلقيه من درجة الطالع فينتهي اليه وهو سهم السعادة بالليل وسهم الغيب عنده بالنهار فان كان سهم السعادة شيئا موهوما وبالوضع مذكورا لا نزله في الفلك ذاتا لها موضوعه مع تلك القوة التي تعرفها فاشتغل بالتعجب منهم عن التعجب ممن يحيل الى الكمون كما يتداوى شارب الخمر بالخمر وانا ابين الا وجود انيه له في الفلك فمعلوم ان سهم السعادة وقت الاجتماع هو درجة الطالع ثم يفارقها عند حصول بعد ما فيما بين النيرين الى ان الى البروج ولست هذه المفارقة بموجبه لمعنى درجة طالع الاجتماع بعد بل انه لو سكن لكانت الدرجة تبعد عنه بالحركة الاولى الغربية وانما تقتضي المفارقة بعد الله من كل درجة توافي افق المشرق فكان القياس يوجب لو التفت اليه ان يكون البعد من درجة طالع الاجتماع حتى يكون اثرها باقيا بقا اثر جزء الاجتماع ويكون سهم السعادة قوة حاصله من شكل الاجتماع يديرها الفلك نحو المغرب كما يدير النيرين وتلك الدرجة لكن هذا البعد لما كان ماخوذا في كل وقت من درجة طالعة

f. 87r

[1] of anyone who works at detecting what is hidden in a fist or a hole; or for the mind, [2] a thought or an idea in (it). He may make it precede its two bases, and its indication (*or* significance) surpasses persons (studying) [3] the heaven, and people distinguished in it (the study). In it (the *Tetrabiblos*) Ptolemy adheres to a simple method, continuing in [4] a single routine for night and day, restricting himself to it alone, and he does not define any other lot [5] differing from it in any feature. He always takes (it) at any assumed time as the distance of the moon from the sun, [6] and subtracts it from the degree of the horoscope, and (thus) obtains it. However, others divide the calculation (*'amal*) of this [7] lot into: (1) the distance which we mentioned; thus agreeing with Ptolemy for the day, and (2) calling it [8] by night the lot of absence. Then they go on, in determining the lot of fortune, to take the complement of [9] the (above-)mentioned distance with respect to a revolution. And they take the distance between the sun and the moon, it being the remainder of the first [10] if it is subtracted from the whole revolution, and they subtract it from the degree of the horoscope and obtain [11] the lot of fortune by night and the lot of absence by day. So, even though the lot of fortune [12] is an imaginary thing, and mentioned by position (only), having no (real) existence in the heavens, and its strength despite [13] that is the strength which you know, then work in marvelling at it rather than in marvelling at the representation [14] of the two eclipses, like the wine drinker who tries to cure himself with wine, even if you deny everything except its existence [15] in the heavens. It is evident that the lot of fortune, at the time of conjunction, is the degree of the horoscope, [16] and it differs from it when there is a distance between the two luminaries along the direction of the succession of the signs. [17] This difference does not demand a distance from it to the horoscope of conjunction. Even if it were to become stationary [18] the degree would have receded from it by the first, westerly motion, (i. e. the daily rotation), but the difference does demand a [19] distance from it to each degree that meets the eastern horizon, and analogy would require, if it is considered (at all), [20] that the distance be from the degree of the conjunction horoscope, so that its effect will remain (the same) as [21] the effect of the longitude (? *juz'*) of the conjunction. The lot of fortune will have a strength resulting from the figure [22] of the conjunction (horoscope). It (the strength?) is rotated toward the west by the heavens, (just) as they rotate the two luminaries and that degree. [23] But since this distance is taken at any time in rising degrees,

f. 87v

[1] the lot of fortune is something which moves as the distance of the two luminaries, which varies according to the difference of their motions. [2] Let *E* (Figure 1) be the center of the heaven, and *AED* the diameter passing through two degrees, (those of) the horoscope and of the setting (point), [3] and *A* is in the east. Let the sun be at *T* and the moon at *K*. So *TK* is the elongation of the moon [4] from the sun. If we take from *A* an arc *AB* equal to arc *TK*, [5] then *B* is the position of the lot of fortune, and the diameter *EB* (sic) is the one which rotates it in the plane [6] of the ecliptic along (the direction of) the succession of the signs until at the time of opposition, it meets the point *D*, which is the degree [7] of setting. (Thereafter) it will be visible above the earth, and it will begin to approach the degree [8] of the horoscope, I mean *A*, and it will meet it at conjunction, and this picture is it. [9] (The reason) it is that which is called the horoscope of the moon is, on the one hand, that the arc of rotation [10] of the ecliptic since daybreak, if it is [11] *TKA*, and is subtracted from the sun, it will necessarily end at *A*, [12] the degree of the horoscope. But the arc *AB* is equal to arc *TK*, so it is necessary that arc [13] *KAB* be equal to arc *TKA*. So if that arc of rotation is subtracted from the moon, I mean [14] *K*, it will end at *B*. So degree *A*, the horoscope, is determined by the sun, and its distance [15] from it equals the distance of the degree of *B* from the moon. So the lot of fortune is therefore the horoscope of the moon. [16] Except that times are not measured by the degrees of the signs. The author of this talk orders, [17] according to the *Introduction* (*to Astrology*, the *Madkhal*) of Abū Maʿshar, the multiplication of the hours past of the day [18] by the parts of an hour. Then he goes to the rising times and works with a solar day, [19] but his talk applies only to equal degrees (i. e. the celestial equator), and on condition that [20] the arc of rotation mentioned (above), even if it is of it, be taken by day from the time of sunrise, [21] and by night also from this time, not from sunset. So [22] this arc of rotation will be for the night plus one hundred and eighty degrees, which are for the whole preceding day(light) [23] along the ecliptic. Do you not see that if the sun is at *L* (Figure 2) and the moon at *D*

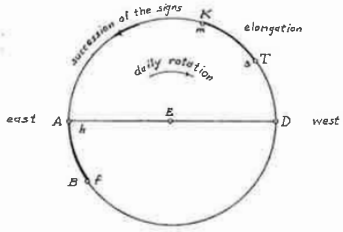
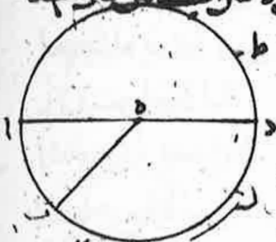


Figure 1

كان سهم السعادة شبيها بما مثل بينا عدا النيرين المختلف باختلاف حركتهما
فلتكن ه مركز الفلك و ا هد القطر المار على درجتي الطالع والغارب
واخو المشرقه ولتكن الشمس على ط والقمر على ك فطك بعد القمر
من الشمس واذا افرزنا من عند ا قوس اب مساوية لقوس طك
كان ب موضع سهم السعادة وقطر هب هو الذي يبرزه في سطح
فلك البروج التي تعاليها الى ان توافي وقت الاستقبال نقطة د التي هي درجة
الغارب ويبرز منها ظاهرا فوق الارض ما يخص في الاقتران من درجة



الطالع اعني ا ويوافيها عند الاجتماع فهذا هو
الذي يسمونه طالع القمر فهو من جهة ان الدائر
من فلك البروج في الماضي من النهار اذا كان
طكا والقمر من الشمس ينتهي بالضرورة الى ا
درجة الطالع لكن قوس اب مساوية لقوس طك فمن الضرورة ان قوس
كاب مساوية لقوس طكا فذلك الدائر اذا اذا القمر من القمر اعني
كا ينتهي الى ب فدرجة الطالعة معلومة بالشمس وبعدها
عنها كبعد درجة ب عن القمر فسهم السعادة لذلك طالع القمر
الا ان الامر لا انه كان يدرج البروج وصاحب هذا الكلام يامر
على ما في مدخل ابي معشر بضرب الساعات الماضية من النهار
في اجزاء الساعة فهو اذا ذهب الى ان المطالع وعامل بنهار
الشمس لكن كلامه لا يطرد الا على درج السواء وعلى شريطة ان
يكون الدائر المذكور بعلو منها ملحوظا ابدا النهار من وقت طلوع الشمس
وبالليل كذلك من هذا الوقت بعد غروب الشمس فيكون هذا
الدائر هو من الليل مضافا اليه ما به تمام نوند درجة التي لكل النهار
المتقدم في فلك البروج الاترى ان الشمس اذا كانت على ل والقمر على د

او فوق الارض ليس بتسوية ما بلغني من القمر الى سهم السعادة الذي هو على ب الا بعد ان يكون الملقى هو قوس لما ثم هكذي الحال الى ان تبلغ الشمس بنقطة الطلوع من الافق فيكون القمر بالضرورة على نقطة ب وهذا ايضا سبب ثان لتسمية سهم السعادة طالعا للقمر والى هذا الراي مال ابو العباس التبريزي في تفسيره لمقالات بطلميوس الاربع لما حكى كلام دوروثيوس في سهامه الكثيرة واختلافه الحال بينهما بالنهار والليل فقال ان دوروثيوس كان منجما صاحب احكام فقط ولم يكن محكما علم الجزء الاول البرهاني لكنه صاحب تجارب حافظ لما استقرى كثير الصواب وكل ما ياخذه من الشمس الى بعض الكواكب من السهام بعد ان سيرها فهو تابع فيه القياس وذلك ان بطلميوس ان كان اخذنا رسم سهم السعادة فقط لكي يكون قياس الشمس الى الطالع كقياس القمر الى سهم السعادة حتى يكون طالعا للقمر فيجب ان تكون هذه النسبة محفوظة في جميع الكواكب السبعة حتى يكون مثلا سهم الاب طالعا لزحل فاما من هذا الاصل الذي اصل ابو العباس فان يجد اعداد السهام عدة الكواكب وان كان استناد دوروثيوس الى الامتحان والتجربة فربما استقر له عن قياس السهم الى موضع مفروض كقياس الكوكب الى الشمس سواء سماه طالعا له او لم يسمه ولكن يعتبر اجتماعها ودرجة الطالع او درجة ذلك الدليل ما بين اقترانهما المتواليين ما اعتبر في سهم السعادة وشهر القمر فلا يكاد يتصور امر القطر المدبر للسهم اعني هو على الصفة المتقدمة من التخلف عن الحركة الاولى فلا نعرف في الاثير فلكا ولا كوكبا ولا قطرا مدبرا يثبت في مكانه ولا ينقاد للحركة الغريبة فضلا ان يعاندها ويزيد على

f. 88r

[1] or above the earth, what is subtracted from the (position of the) moon does not give the lot of fortune, which is at [2] *B*, except after the subtracted (quantity) becomes the arc *LDA*. So, thus is the case until the sun reaches [3] point *A*, the rising point on the horizon, and the moon will necessarily be at the point *B*. [4] But this is another reason for naming the lot of fortune a horoscope for the moon. Unto [5] this idea Abū'l-'Abbās al-Nayrīzī was inclined in his commentary on Ptolemy's *Tetrabiblos*. [6] When he related the talk of Dorotheos with his many lots and the difference [7] between the two of them by day and night he said: "Verily Dorotheos was an astrologer and a man [8] of (astrological) judgments only. He was not possessed of the primary science of proofs (i. e. theory), but he is a man [9] of experience and remembers what he reads, a man of great correctness. In everything concerning lots he took (the distance) from [10] the sun to some planets, after noting their motion, he followed [11] analogy (*qiyās*) for it. That (was done) even though Ptolemy chose the lot of fortune [12] only, which related the sun to the horoscope, just as the analogy of the moon to the lot of fortune was [13] to be a horoscope for the moon. This analogy should be retained for all the [14] fast planets so that, for example, the lot of the father will be a horoscope for Saturn." As for [15] this principle, the principle of Abū'l-'Abbās, the number of lots did not exceed [16] the number of planets even if Dorotheus' reliance on examination and trial [17] may have revealed to him a relation of the lot to an assumed position like the relation of the planet [18] to the sun, whether he called it a horoscope for it or not. But he considers for their conjunction [19] and the degree of the horoscope or the degree of that indicator between their two successive conjunctions [20] what he considered for the lot of fortune and the lunar month. He could hardly imagine the diameter [21] which directs the lot, I mean *EB*, as having the preceding feature of lagging behind [22] the first (i. e. daily) motion. So we do not know the effect of an orb, or a planet, or a guiding diameter which is fixed in [23] its place and is not carried along by the westerly motion; in addition (to this) it opposes it (the westerly motion), and does more than

f. 88v

[1] stopping and lagging behind it by (engaging in) a motion contrary to it. He would not imagine the possibility for it of following a method [2] other than adhering to a heaven distinguished by this rare and exceptional action. [3] We rarely countenance telling people about a stationary heaven, with no planets, surrounding [4] the actual causes of motion, in order to do without it for (attaining) their objective, and because it differs from the theoretical form. [5] So how do we pass through this circular existing object this diameter [6] which does not participate in the primary motion? Verily (the motion) became general throughout it because it envelopes it, and it comes from a [7] prime mover outside it, which does not move. I think that by this amount you have been turned away from your creation (of fancy) [8] and toward what suits you better. (So) then we say, concerning the lots which have a relation [9] to the horoscope like the relation of the planets to the sun, that they are moving along the (ecliptic) degrees along the succession [10] of the signs, if the planet whose distance from the sun is taken is one [11] of the three superior planets or the moon, moving differently only (to the extent that the motion) is fast or slow. But if it is [12] one of the two inferior (planets) that lot will move forward and backward; [13] that is it is taken from the horoscope along the succession of signs when they are combust (i. e. in conjunction) at [14] the middle of their forward (motion), and recede from it as much as their distance from the sun, then it retrogrades [15] from the extreme after reaching its maximum distance to the west, then returning [16] to the horoscope when they are both combust at the middle of their retrogression, and it passes it in the direction of [17] the twelfth domicile until attaining a maximum for it upon attaining maximum distance to the east, [18] whereupon it goes into forward (motion) and starts toward the horoscope. Because of this frequent coming and going, Abū'l- [19] ʿAbbās al-Nayrīzī deviated from the operations of the people in calculating the lot of the mother, which he took from the sun [20] to Venus, and subtracted the distance of Venus to its epicyclic apogee modified [21] by the third (column in the) tables, that being the modified anomaly, from the horoscope, to obtain the lot. [22] He had indicated before what had impelled him to it, and these are his words concerning it: "Verily, Ptolemy [23] made the indication of money to be the lot of fortune because of what the moon gains in light

الوقوف والتخلف عنها بالحركة الى خلافها ولم يتوهم لامكانه وجه سوى التخصيص بفلك يتميز فيه بهذا الفعل النادر الشاذ على انا قلنا لم يجز لجبار القوم عن الفلك الساكن غير الكوكب المحيط بالحركات الموجودة للاستغناء عنه في مقصودهم ولهذا فاه المسلك النظري كما باه فكيف يجيز في هذا الموجود المستند بهذا الفطر الفاتر عن الحركة الاولى حد فقد ممته الحاطنه بها وجيبها من محرك او الخارجه لا يتحرك وظنك بهذا المقدار مرتفعا عن خلقك مرعوبا الى الابتدائي ثم نقول في السهام التي يكون قياسها الى الطالع كنسبة قياس الكواكب الى الشمس انها سايرة في درج البروج بالتوالي اذا كان الكوكب المأخوذ اليه البعد من الشمس احد الثلاثة العلوية او القمر يسير بمختلف ببطؤ وسرعة فقط واما اذا كان احد السفليين فان ذلك السهم يختص في سيره بالاستقامة والرجوع وذلك انه يأخذ من الطالع الى توالي البروج من عند احتراقهما في وسط استقامتهما ويتباعد عنه بقدر بعدهما من الشمس ثم يرجع عن الغاية عند بلوغهما اعظم الابعاد في المغربية ويعود راجعا الى الطالع عند احتراقهما في وسط رجوعهما ويجاوزه نحو البيت الثاني عشر الى غاية له عند بلوغهما اعظم الابعاد في المشرقية فيستقيم حينئذ ويأخذ نحو الطالع ولهذا التردد الخرف ابو العباس النيريزي عن عمل القوم في عمل سهم الامر المأخوذ عنده من الشمس الى الزهرة والتي بعد الزهرة عن ذروة فلك تدويرها محل الابعاد الثالث وذلك هو الخاصة المعدلة من الطالع فانتهى الى السهم واشار قبل ذلك الى ما اوجبه عنده وهذا كلامه فيه ان بطلميوس صير دلالة المال لسهم السعادة بسبب ما يكتسبه القمر من النور

بالتباعد من الشمس واذا كان ذلك بسبب الضو فان القوة الكبر منه
والشمس قوة مع القمر والكواكب السبعة وبها تكون حركة العلويه في
افلاك تداويرها وحركة مركز تداوير السفليين وحركتنا
الخارج المركز ومركز التدوير جميعا في القمر وعلى هذا اوجب في
العلويه والقمر ان يوخذ بعد كل واحد منها من الشمس الى التوالي وفي
السفليين يوخذ بعدها من ذروة التدوير بما بينه من تعديل الجدول
الثالث ثم يلقى ذلك البعد من الطالع وذلك ان البعد في فلك التدوير
للعلويه شبيه بالبعد في فلك البروج بالتقريب وينقل الحكم الثالث الى
السفليه وهو من اجل الطالع اما من عدا بطلميوس ومن يسمى سهم
سعادته بالليل سهم الغيب ويعمل سهم السعاده ليلا بتكمله بعد القمر
عن الشمس الى البعد كله فتعين له الشكل المتقدم ولكن الشمس
فيه تحت الارض على م والقمر على ل تكملة مل بعد القمر عن الشمس
هو له ام فاذا القي من درجة الطالع بلغ نقطة ح القاصرة عن مقدار
قوس مل فيكون ح سهم السعاده عندهم بالليل وسهم الغيب
بالنهار وسوا عمل عملهم كما ذكرنا او عمل بالبعد نفسه دون تكملته
فالقى من درجة الطالع منكوسا الى خلاف توالي البروج وذلك لان حركه
هج القطر المدبر لهذا السهم هي كذلك وكان القوم ذهبوا
في ذلك الى ان قطري هب هج المدبرين يتحدان وقت الاجتماع
على قطرها في الافق وكل واحد يتحرك بمثل بعد القمر عن الشمس
في جهتين مختلفتين من توالي البروج وغير توالبها ولذلك يكون ما
بينهما وهو حاب ابدا مثل ضعف بعد ما بين النيرين المفروض
ويكون هب تحت الارض وهج فوقها في المدة التي من الاجتماع
الى الاستقبال ثم يتحدان ايضا على قطر هد في الافق وتجتمعان

f. 89r

[1] by receding from the sun. If that is because of the light, the strength is greater than it, [2] and the sun has a strength together with the moon and the fast planets, and from it is the motion of the superior (planets) in [3] their epicycles, and the motion of the center of the epicycles of the two inferior ones, and both the motions, [4] that of the eccentric and the center of the epicycle, in the (case of the) moon. So it is necessary [5] in the case of the superior (planets) and the moon to take the distance of each from the sun along the sucession of the signs, and in the case [6] of the inferior ones their distance is taken from the apogee of the epicycle, with what modification it requires [7] by the third table, then this distance is subtracted from the horoscope. That is, that the distance in the epicycle [8] for the superior ones equals the distance in the ecliptic, approximately. Because of that the judgment is transferred to [9] the inferior ones." But this is one of the most impossible (of things). Of those other than Ptolemy, (there are) some who call his lot [10] of fortune by night the lot of absence, and they make the lot of fortune by night the complement, with respect to a whole rotation, of the distance from the moon [11] to the sun. Let us go back to the preceding figure (but see Figure 2), and let the sun, [12] on it, be under the earth at M, and the moon at L, and the complement of ML, the distance of the moon from the sun, [13] is $LDAM$. If it is subtracted from the degree of the horoscope it reaches point G, which is behind A by [14] the arc ML, so G is the lot of fortune for them by night, and the lot of absence [15] by day. Whether their operation was performed as we mentioned, or (it was) calculated by the distance itself without (taking) its complement, [16] it was then subtracted from the degree of the horoscope reversed, contrary to the succession of the signs. That is because the motion [17] of EG, the diameter directing this lot is thus. The people went on, [18] concerning that, to say that the two diameters EB and EG of the two directing ones coincide at the time of conjunction [19] at its diameter EA in the horizon (plane), and each moves as much as the distance of the moon from the sun [20] in two different directions, along the succession of the signs, and not along their succession. That is why what is [21] between them, it being GAB, is always twice as much as the true distance between the two luminaries, [22] and EB will be under the earth and EG above it during the period from conjunction [23] to opposition. Then they coincide again along the diameter ED on the horizon, and conjoin

f. 89v

[1] at the degree setting at that time. When they separate after opposition, *EB* [2] will be above the earth and *EG* under it, and they remain as such until the time of conjunction, [3] whereupon they coincide again at the degree of the horoscope. It is not true what is said about [4] its (the lot of fortune) being the horoscope of the moon, for it is the horoscope of the sun, and that is necessitated by analogy. [5] That is because the arc of rotation of the rising of the moon, it being at *L*, [6] is the ecliptic arc *LDA*, so if it is subtracted [7] from the sun, it being at *M*, it lags behind *A* by an arc equal to [8] *ML*, and that is the arc *AG*. So *G* is the horoscope of the sun by night. [9] Thus the sun will be at it when the moon [10] rises at point *A*. If *EB* remains under the earth and *EG* above it, it would have been [11] imagined first that what was attributed to the moon would be stronger under the earth, and what was attributed to [12] the sun would be stronger above it, because of the turn (*nawba*?) and the horoscopes(?) of virtue(?). At any [13] rate, they went in the case of *G* (and) *B*, to the stronger and the weaker because the lot of fortune [14] *B* shifted because of the night to *G*. This shift does not occur except by the overcoming (*zafra*) of [15] the order. So the lot of fortune, which is it, moves by day along the succession (of signs), [16] and by night contrary to the succession, keeping what belongs to the night of its first motion [17] until it comes to its end by day excluding the position which it won. It is like rabbits, (who produce) [18] one year male and another year female, according to what is said by the authors of the books on animals. [19] When the lot *G* is needed as an entity in itself it would have a day circle rotating contrary [20] to the rotation of the day circle of *B*. Let them intersect like the two rings of Ptolemy for the observation of the [21] obliquity of the ecliptic. Muḥammad b. Jābir al-Battānī found a way to distract people from the ugliness [22] of this subject in the commentary to the *Tetrabiblos*, by saying, "As for the lot [23] of fortune (here the Persian *bakht*), one should always take the number which results from the position of the sun

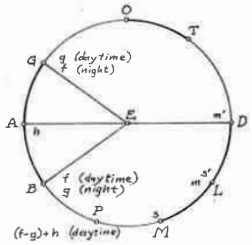
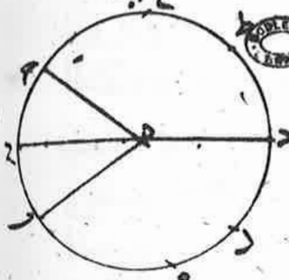


Figure 2

عند درجة الغارب حينئذ فاذا افترقا بعد الاستقبال حصل هب فوق الارض وهج تحتها ولا يزال كذلك الى وقت الاجتماع فيعود ان ينطبقا عند درجة الطالع واسبن اطرد فيه ما ذكروه من كونه طالع القمر ان يكون طالع الشمس وهذا هو مقتضى القياس



وذلك ان الدائر من طلوع القمر وهو على ط انما هو في فلك البروج قوس ط ا فاذا القى من الشمس وهو على م تخالف عزا بمثل قوس مل وتلك قوس اج تجد طالع الشمس بالليل كذلك تكون الشمس عليه عند طلوع القمر من نقطة ا ولو دام كون هب تحت الارض وهج فوقها لسبق الى الوهم ان ما نسب الى القمر يكون اقوى تحت الارض وما نسب الى الشمس يكون اقوى فوقها بسبب النوبة وزوائج الحيز وعلى كل حال فقد ذهبوا في جهة الى الاضعف والاقوى لان سهم سعادة ب قد انتقل من اجل الليل الى جه فان هذا الانتقال لا يتاتى الا بطفرة المنظام ثم يكون سهم السعادة وهو هو سائر بالنهار الى التوالي وبالليل الى خلاف التوالي مع حفظه ما يخص الليل من حركته الاولى حتى يعود الى منتهاها بالنهار دون الموضع الذي منه طفر كالارنب تكون سنة ذكرا وسنة انثى على ما هذا اليه اصحاب كتب الحيوانات ومتى احتيج لسهم جه الى ذات قائمة كان له فلك يتحرك خلاف حركة فلك ب فليجعلها مثل الذين يلحقون بطلميوس لرصد الميل الاعظم وقد خرج محمد بن جابر البتاني لاخراج القوم عن شناعة هذا الموضوع وجمعا في تفسير الاربع مقالات وقال ـــ اما سهم البخت فهو ان يوخذ ابدا العدد الذي يحصل من موضع الشمس

الى موضع القمر بالنهار والليل جميعا ويعدله من درجة الطالع
الى تواليها البروج فينتهي اليه ويكون بمنزلة طالع القمر وحقيق ان يكون
الى هذا المعنى ذهب الذي قال ينبغي ان يعد في الموالد التي تكون
بالليل من القمر الى الشمس خلاف ما يفعل بالنهار فاما اذا عددنا مثل
ذلك من درجة الطالع الى خلاف الجهة التي عددنا بالنهار اعني الى الجهة
المتقدمة للبروج خرج سهم الغيب في الموضع الذي كان خرج
فيه اولا بهذا ما قاله البتاني واما ابو العباس الاصبهاني فانه قال
في تفسير الكلمة التسعين من كتاب الثمرة لقد غلط كثير من
المنجمين في اذ مذهب بطلميوس في استنباط سهم السعادة هو
ان يوخذ ابدا الليلا كان او نهارا من الشمس الى القمر ويلقى من الطالع
مستويا فلو كان الامر على ما ذهبوا اليه لكان ما ان يبطل سهم
الغيب اصلا او يوخذ ابدا الليلا كان او نهارا من القمر الى الشمس
ويلقى من الطالع مستويا وهذا خلاف مذهب جمهور القدماء من علماء الحكماء
الذين من الروم والهند والفرس وغيرهم في ذلك والذي خفي على جماعة
من الناقلين لكلامه هو انه امر ان يوخذ من الشمس الى القمر ابدا لكن
يلقى من الطالع بالنهار مستويا وبالليل معكوسا فينتهي الى سهم السعادة
ويلزم منه ان يوخذ سهم الغيب ايضا من الشمس الى القمر ابدا لكن
يلقى من الطالع بالليل مستويا وبالنهار معكوسا فيوافق حينئذ مذهب
عامة الحكماء المشهورين وانما افادنا ذلك ما وقع الينا من شرح
الناقلين للاربع مقالات لبطلميوس لحضرة المامون
ونحن نقول فيما اورد ابو العباس انه حمله عليه شدة
اشفاقه على سهم الغيب وسائر السهام ان يضيع فقد بطلميوس
عهدتها مع براءته من جملتها وقد قيل في سبب عدم اسم الوقار

f. 90r

[1] up to the position of the moon by both night and day, and another distance equal to it from the degree of the horoscope [2] along the succession of the signs and ending at it (the distance). It will be in the domicile of the moon's horoscope. It is probable that [3] this was meant by the one who said, 'One should count, in the case of [4] nocturnal nativities, from the moon to the sun, contrary to diurnal nativities'. If we count as many [5] as that from the degree of the horoscope contrary to the direction in which we counted by day, I mean [6] the preceding direction along the signs, the result will be the lot of fortune at the position in which he obtained it [7] at first". That is what was said by al-Battānī. But as for Abū'l-'Abbās al-Iṣbahānī, he said [8] in explaining the ninetieth saying of the book *Fructus*: "Many [9] astrologers were mistaken in regarding the doctrine of Ptolemy concerning the extraction of the lot of fortune as [10] taking always, whether by day or night, the distance from the sun to the moon and subtracting it from the horoscope directly. Had the [11] matter been as they regarded it, either the lot of fortune [12] would have been cancelled or taken always, whether by night or day, from the moon to the sun [13] and subtracted from the horoscope directly, and that is contrary to the doctrine of the ancient [14] Greek, Indian, and Persian astrologers and others. That which was hidden [15] from those who transmitted it is his talk that he prescribed that it should be taken always from the sun to the moon, but [16] subtracted from the horoscope directly by day and the reverse by night, and the result will be the lot of fortune. [17] The lot of absence should always be taken from the sun to the moon, but [18] subtracted from the horoscope directly by night and the reverse by day, and thus it will agree with the doctrine of most [19] of the famous astrologers. We were informed about this by what we encountered concerning the explanation [20] of the translators of the *Tetrabiblos* of Ptolemy in the presence of al-Ma'mūn". [21] When we say concerning what was related by Abū'l-'Abbās that what led him to it was his great [22] fear that the lot of absence and the other lots may be lost, ascribing to Ptolemy [23] the responsibility for them, even though he (Ptolemy) was innocent of all of them. It was said concerning the nonexistence of (the word) *loyalty*

f. 90v

[1] in the language of the Turks that it is (due to) the nonexistence of the thing itself among their essential categories. So he was not satisfied with such a thing from Ptolemy. [2] There is nothing in his (Ptolemy's) whole book about lots except the lot of fortune, and for him the lot of absence did not exist. [3] So let Abū'l-'Abbās be consoled for him and not be frightened by the disagreement of people. He did that and finished. [4] But as for the subtraction, whether direct or reversed, it is as was said by al-Battānī, since he was not interested [5] in the lot of absence as he (Abū'l-'Abbās) was. I wonder how Abū'l-'Abbās could make use [6] of these translations as he did. We had them and found that the things translated in them for al-Ma'mūn [7] from Greek, and before him for Khālid b. Yazīd, and what was translated by 'Umar b. al-Farrukhān [8] from Persian, and what was translated by Ḥunayn b. Isḥāq and the commentaries prepared for them all agree (with one another) [9] contrary to what he mentioned, although the people, the place, the times, and the opinions are different, [10] and they were far from being (cases of) collusion. (Now) let us go down from this class to the rabble. They have two books [11] attributed to Hermes, and Māshā'allāh took (material) from them. One of them is called "The Basis" (*Al-Asās*) and "The Eighty-five Chapters", and the other is subsequent to it and is called "The Pillar of Wisdom" (*'Amūd al-Ḥikma*). Most of the beliefs (contained) [13] in them are contrary to our beliefs in that the two (books) are babblings (read) [*sh*]*ijiniyāt*) from Baghdād, or else they are delusions inspired by the devil. [14] In the latter of the two books I discovered (lit. *know*) the lots of the seven planets and take them as evidence, verily [15] they have great strength. The lot of the sun by day is (the distance) from the degree of the sun [16] to the degree of the tenth (locus, or house) subtracted from the degree of the horoscope, and by night from the degree of the tenth [17] to the degree of the sun subtracted from the degree of setting, both of them (taken) along the succession (of the signs). [18] The lot of the moon by day is (the distance) from the sun to the moon, subtracted from the horoscope, and by night the [19] opposite to that subtracted from the setting. This example suffices for the lots of the rest [20] of the planets, which do not exceed the number mentioned by al-Nayrīzī. Let us consider [21] the tenth point as O (in Figure 2), the cardines being in approximate quartile. If the sun is [22] at it the lot would be at A, and if it goes away from it until, for example, [23] T is obtained, the lot deviates from A and falls by a quantity equal to the cadence of TO. So if the sun meets

في لغة الترك انه عدم عينه في جواهرهم فلم يكتف من بطلميوس بمثله فجليس في كتابه باسره سهم غير السعادة وقد بطل عنده سهم الغيب فاستغرب ابو العباس عثوره كلا بروعه بمخالفة الامر فقل فعل وفرع واما الالقا مسنونا ومنكوسا فهو كما قال البتاني اذ لم يهمه سهم الغيب كما اهمه وليت شعري كيف استفاد ابو العباس من ذلك القول ما استفاده لم يحد منها وقد وجدنا المنقول منها للمامون من اليونانية وقبله لخالد بن يزيد والذي ترجمه عمر بن الفرخان من الفارسية والذي نقله حنين بن اسحاق والشروح المعمولة لها متفقة على خلافه مما ذكر مع تباين القوم في الزمان وامكان التواطي وبعدهم عن المواطاة ولينحط عن هذه الطبقة الى الحشوية ولهم كتابان منسوبان الى هرمس عن حنينهما اختراقه ما شاء الله يسمى احدهما بالاساس والخمسة والثمانين بابا والاخر تابع له ويسمى عمود الحكمة ومعظم اعتقادهم فيهما على خلاف اعتقادنا انهما من مخبيا نت بغداد فان لم يكونا لهرمس وساويرس الخنابس وفي الكتاب الاخر منهما اعرف سهام الكواكب السبعة واستشهد بها فان لم يوثق بعظيمه وسهم الشمس منها بالنهار من درجة الشمس الى درجة العاشر ملقي من درجة الطالع وبالليل من درجة العاشر الى درجة الشمس ملقي من درجة الغارب فكلتيهما على التوالي وسهم القمر بالنهار من الشمس الى القمر ملقي من الطالع وبالليل مخالفا ملقي من الغارب ومنها للمثال كفاية عن سهام سائر الكواكب التي لا يعلو احدها عدد ما ذكر الا ان ترتيبه في الجملة العاشر تقطع والاوتاد منتزعة بالتقريب فاذا كانت الشمس عليه كان السهم على اوتاد العمر حتى تحصل مثلا على طتيجي السهم عنا وانحط بمقدار ما يقطع حتى اذا وافت

الشمس د بنقطة الغروب كان السهم بالتقريب على وتد الارض في مقابلة ع فاذا تجاوز ذلك كان من العاشر اليها ثلثة ارباع دور مستثنى منها قدر انحطاطها واذا الفي ذلك مر د على التوالي تراجع السهم حتى اذا حصلت الشمس على وتد الارض كان بعدها عن العاشر نصف دور وبلغ السهم نقطة ا بالتراجع فاذا جاوزت الشمس وتد الارض طلع السهم وعند طلوعها بلغ نقطة ع فاذا ارتفعت عن الافق صار ما منها الى العاشر على التوالي ثلثة ارباع مع مقدار ارتفاعها فاذا الفي من ا الفي السهم متراجعا من ع نحو ا فهذا السهم اذا لا يفارق النصف المظلم الذي يتوسطه الطالع ويسير فيه الى التوالي بالنهار والى خلاف التوالي بالليل واما سهم القمر فمعلوم انه بالنهار سهم السعادة المعهود فاما بالليل فعلى ما ذكر اذا القيت تكمله بعد لم مرد الى توالي البروج انتهى الى مقابلة ج سهم الغيب وهو بحمد الله راي ثالث مشتت للشمل نتيجة انمام القلب والخلاف كما اقيم السابع مخالفا للطالع فحصل به مقابلا لنا ب ج دونا نفسها ثم استدل سخفا منه ما في الكتاب الاول لمنهما في الباب العاشر منه ان الانوار التي بها تعرف الخبايا خمسة هي النيران ونور ما اشرقه من الشمس الى القمر ونور ما اشرقه من القمر الى الشمس وهو زعم سهم السعادة والنور المنشعب بين النورين اذا اخذت من نور ما اشرقه من الشمس الى نور ما اشرقه من القمر بلغت النور المسمى ما بين النورين واذ صرح في الثاني بانه سهم السعادة فقد وضح منه ان الاول هو سهم الغيب واظن ابا معشر سمى سهم السعادة سهم القمر بسبب هذا التقابل لانه نور ما اشرقه من القمر الى الشمس وقد نقل نبذا من خرافات من الكتاب الى المدخل ومعلوم ان زد جي الطالع والسابع هما اسطقسان بين سهمي السعادة والغيب وانهما بينا على ان عن ذلك

f. 91r

[1] point D, the setting point, the lot will be approximately at the cardine of the earth, opposite O. [2] If it deviates from D there will be from the tenth to it three quarters of a revolution, excluding [3] from it an amount equal to its depression, and if that is subtracted from D, along the succession, the lot retrogrades so that [4] if the sun arrives at the cardine of the earth its distance from the tenth will be half a revolution, [5] and the lot reaches point A by retrogression. If the sun goes beyond the cardine of the earth [6] the lot rises and when it (the sun) rises it (the lot) reaches point O. If it (the sun) rises above the horizon the distance from it [7] to the tenth will be three quadrants along the succession plus its altitude. If it is subtracted from A, the lot is subtracted [8] when retrograding from O towards A. So this lot does not separate from the ascending half which has [9] the horoscope in its middle, and it moves in it along the succession by day and contrary to the succession by night. [10] But as for the lot of the moon, it is known that it is by day the well-known lot of fortune, but by night [11] as was mentioned. If you subtract the complement (with respect to a revolution) of the distance LM from D along the succession of the signs it ends opposite G, [12] the lot of absence. Praise God, this is a third opinion which is confusing and was produced by [13] a complete reversal and disagreement. The seventh (locus) was put in place of the horoscope, and there resulted the opposites of B (and) G [14] and not them. (Even) sillier than that is what is in the first book of the two in [15] the tenth chapter. That is, the lights by which the (length of) life is determined are five. They are the two luminaries, and the light of what [16] has risen (*ashraqa* or what is more eastern?) from the sun to the moon, and the light of what has risen from the moon to the sun, it being claimed [17] to be the lot of fortune, and the light scattering between the two lights (*nūrayn*). That is, if you take from the light of what has risen [18] of the sun to the light of what has risen of the moon you obtain the (above-)mentioned light between the two lights. [19] Now if it is clear that the second is the lot of fortune, then that is evidence that the first is the lot [20] of absence, I think that Abū Maʿshar called the lot of fortune the lot of the moon because of the one [21] who said that it is the light of what has risen from the moon to the sun, so he transferred an item of the superstitions [22] of this book to the *Madkhal*. It is known that the two degrees, of the horoscope and the seventh, [23] are midway between the lots of fortune and absence and they recede from

f. 91v

[1] each one of them by the same distance and contrary to the succession. If [2] the distance between the two lots, of absence and fortune, is halved the result will be the distance of the lots of fortune [3] from the horoscope; if it (the distance between the two lots) is subtracted from it (the horoscope) the result will be a degree with a distance from the horoscope twice as great [4] as the distance of the lot of fortune from it. So the relation of this degree, according to what they said, [5] to the lot of fortune is as the relation of the lot of fortune to the horoscope, and as the relation [6] of the moon to the sun. Among the properties of this middle light is that it (the middle light) reaches the degree of the horoscope [7] at opposition, just as it (the lot of fortune) meets it at conjunction, and it meets the degree of the seventh at the two quartiles. [8] So it resembles the center of the (lunar) epicycle in its eccentric orbit (rotating) twice each month, [9] as the lot of fortune itself resembles the center of the deferent, (these rotating) in their cycles once a month. [10] Upon my soul, whether we are silly after all this, or reasonable, this ratio is [11] necessarily repeated by resemblance to the equality of multiplying one of the two sides by the other (for) [12] the square of the mean but we triple the repetition and square it to increase these lights [13] and shadows. The originator (*ṣāḥib*) of this nonsense mentioned that in opposition to each of these lights [14] there is darkness like the shadow of the earth, and everything dark has light opposite to it, but I do not think [15] that Abū Saʿīd Aḥmad b. Muḥammad b. ʿAbd al-Jalīl saw in his dream anything but this darkness [16] between the two darknesses. I saw him in great anger stirred up by someone theatening to slap him [17] doubled by repetition. Desire to utilize (his counsel) caused me to ask him [18] about this, and he explained it to me. It is a slap so strong [19] that the head reaches the wall and bounces back because of the strength of the blow until it reaches [20] the hand on its way back and is slapped by it again, and this is the light between the two lights, so do not forget it. [21] If the two lots for these people were only these, we would have discarded what places they made necessary [22] in the ether. But the people of that art used lots involving distances [23] between the planets, and their subtraction from their degrees and the degrees of the domiciles, and they entered

كل واحدة منهما بعدا واحدا في جهتين التي الى خلافه واذا انتصفنا
بين سهم الغيب الى سهم السعادة لم يحصل غير بعد سهم السعادة
عن الطالع فاذا القي منه انتهى الى درجة بعدها عن الطالع ضعف
بعد سهم السعادة عنه فنسبة هذه الدرجة اذن على ما قالوه
الى سهم السعادة كنسبة سهم السعادة الى الطالع وكنسبة
القمر الى الشمس ومن خواص هذا النور المتوسط ان يوافي درجة الطالع
في الاستقبال كما يوافيها في الاجتماع ويوافي درجة السابع عند التربيعين
فيشابه مركز التدوير في دوره الخارج المركز في كل شهر مرتين
كما يشابه سهم السعادة نفسه مركز الكامل في دورهما في الشهر مرة
ولعمري ان الجانبين ان تسامحنا بعدة او تغافلنا الزمنا هذه النسبة
لوازم التكرير بالتثنية من هنا واقتضرب احد الطرفين في الاخر
مربع الواسطة بل ثلثنا التكرير وربعناه حتى كثرنا هذه الانوار
والاظلال فقد ذكر صاحب هذا الهذيان انه ان في مقابلة كل نور
منها ظلمة على مثال ظل الارض وكل شيء كمد يقابل به نير وما اظن
ابا سعيد احمد بن محمد بن عبد الجليل ارى في مثا مه الا هذه الظلمة
بين الظلمتين فقد شاهدته في غضب شديد استفزه لتهدده من جرد
عليه بصفع متتابع لتكريره جملتي الحرص على الاستفادة ان سالته
عن كيفيته حتى فسره لي بانها صفعة يبلغ من مثانتها ان يجعل
راس المصفوع بها الحايط فيرجع منه لشدة الصدمة حتى يبلغ
اليه عائدا ويصفع بها ثانية وهذا هو النور بين النورين فلا تنسه
ولو كان السهمان عند القوم هذين فقط لاغضينا على ما اوجباه في
الاثير من المحالات ولكن اصحاب تلك الصناعة استعملوا سهاما بابعاد
ما بين الكواكب والقايها من درجاتها ودرجات البيوت وادخلوا في

عدادا الكواكب جزوي للاجتماع والامتلا وعادوا للابعاد فاخذوها
مرة اخرى بما بين السهام مع ما بينها وبين الكواكب فبقوا عليها
بابا لا نهاية حتى لا يحكم احدهم الا بسهام مرتضع بين يديه ومن خلفه
وعن يمينه وشماله ولتبس الملك طاقة بسهام مبهم واحتمال الوجوه
فيها لمرامهم ومتى صرنا من جملة اصحاب الاحكام وجوزنا ما ذكروه
في السهام ولهم النسب فيها وان كان ذكرها تقويل بالمقطع غير محمود
في الصناعة ومعناه البعد كما تقدم وكان سهم السعادة حقيقا
ان يعتبر له عرض بسبب عرض القمر لان القمر اذا تنحى عن طريقة
الشمس في احدى الجهتين وجب ان يتنحى السهم عن طريقة الطالع
بقدره لتكون نسبة القمر الى الشمس بطول البروج والقوس التي
بينهما من الدائرة العظيمة كنسبة السهم بهما الى الطالع ثم يعتبر
في عرض السهم وعروض ما يقارنه ما يعتبر في اقترانات الكواكب
وممراتها واستظلا انها العرضية بل ان دققنا في هذا المعنى وناقشنا
وللنيرين عن وسط ابعادهما صعود وهبوط تختلف بهما نسبة
ما بينهما فيجب ان يعتبر مثله فيما بين الطالع والسهم حتى يحصل
بينهما المسافة الوترية وان يتبع كل واحد من سهمي السعادة
والغيب احدهما الاخر في ترتيب النظر للهيلاجية اتباعا النيرين
احدهما الاخر في هذا الترتيب ولم يفعلوا ذلك فخرجوا به عن القياس
وهذه جملة السهام المعروفة فاني احسبتم ذكر السهمين والنيرين
فيهما تاطوا النظر في اعظم الحوادث واجلها ثم اختلفوا فيهما على
اكثر من ثلث وسبعين فرقة كلها في الضلال ومقصودهم في
ضمن العدم كاوي الذي وجد في العالم ثباته وعدم فيه ذاته
وكل صناعة وهذه اسنسه في تطلعات مبادي به طرفته فانها الا تخلو

f. 92r

[1] among the planets the two parts of conjunction and fullness. They returned to the distances and took them [2] once more between the lots and the planets and opened [3] doors with no end so that no one will judge except by the lots which come to be in his hands, behind him, [4] on his left, and on his right. The heavens cannot stand their lots nor tolerate the methods [5] which were good for their aim. Since we have become one of the astrologers and allow what they mentioned [6] about lots and the matter of their relation, even if the mention of them is a threatening with words not known [7] to the art, meaning the distance as previously mentioned, it would be right to consider for the lot of fortune [8] a latitude because of the latitude of the moon. For if the moon deviates from the path [9] of the sun in either direction, then the lot should deviate from the path of the horoscope [10] by the same amount. So that the relation of the moon to the sun along the signs (i. e. the ecliptic), and the arc [11] of the great circle between them, is as the relation of the lot to the horoscope. Then he considers [12] for the latitude of the lot and the corresponding latitudes that which he considers for the conjunction of the planets, [13] and their transits, and latitudinal elevations. If we look into this meaning carefully and study it [14] there are for the two luminaries ascent and falling from their mean distances by which the relation between them differs. [15] So one should consider something like this between the horoscope and the lot so that he obtains [16] the distance along the chord between them, and we make one of the two lots, of fortune [17] and of absence, follow the other in the order of the *haylāj* aspects, (just) as we make one of the two luminaries follow [18] the other in this order. They did not do this, so they deviated from analogy.
[19] This is the situation with regard to the known lots. I refrain from mentioning the two lots and the two obscurities. [20] They suspended their regard upon the greatest events, then they differed with respect to the two in [21] more than the seventy-three ways, all because of ignorance, and what they meant [22] as to the interior of nothingness is like Āwā, who found his growth(?) in the world and extinguished himself in it. [23] Every art having unsound bases and flimsy principles and methods is not free

f. 92v

[1] from such objectionable difficulties. If I let the people alone [2] in their belief about the maleficence of *baytāt* and *baylart*(?), which are what I call [3] the representation of the two eclipses, we leave you (also) in your art and [4] forgive you also by not mentioning the maleficence, and we make the matter concerning both of them to be like one of [5] the problems of projection (of the rays?). So we say that for any month in which we want to, we ascertain when [6] the daily circles of the two luminaries unite, or become equal, each by one of the two kinds of its correction. [7] One of them is by the latitude of the moon, and the other according to its parallax in order that it agree [8] with the apparent (position). This would be an investigation praiseworthy of anyone who asks it. This was included in the zīj of Paulus [9] the Greek, known as the *Paulišasiddhānta*. His accounts indicate (things) about the ancients, [10] and he mentioned the divisions of times (i. e. ages), and the great wars which took place in the plain (read *barriyya*) of [11] Sthaneśvara (Arabic *Tānīshar*) and other things such as what we have mentioned, like the agreement of the Greeks and the Indians in former times [12] concerning one matter, their being in faith like one family, or that the (above-) mentioned [13] Paulus moved from Alexandria to their land, but this is the more improbable possibility. [14] May God make the rest of our lives to be devoted to the knowlege of that which we do not know. It (the quest for knowledge) is the greatest of good works, [15] and He is able to do whatever He wants.

من امثال هذه الصدمات يعترض لها فان تركت القوم فيما هم عليه من اعتقاد المنحسة في بينات وينبذت اللذين هما يسميني جبال الكسوفين تركنا التعرض لما انت عليه في صنا عنك بل سامحناك ايضا بالاعراض عن ذكر المنحسة وجعلنا الامر فيهما كاصحاب مسايل المطارحة فقلنا في كل شهر نريد ان نعلم متى نجد مدار التنين او تشاركه مدارا هما فكل واحد من نوعي تصحيحه احدهما بموجب عرض القمر والاخر بموجب اختلاف منظره ليوافق الرؤية فيكون ذلك محنتنا نحمد عليه سائله وقد تضمنه زيج بلس اليوناني المعروف ببلس سدّهانْد ولتحكّا بانه عن المتقدمين وذكره اقسام الازمنة والحروب العظيمة التي جرت في برتّيه تا نيشر وامثال ذلك على مثل ما قدمناه من اطباق اليونانيين والهند فيما سلف على امر واحد وكونهم في النحلة كبني واحد او كان بلس المذكور منتقلا من الاسكندرية الى ارضهم وهو بعد الوجهين واستحصل فتبعا عمارنا مصروفة الى علم ما لا نعلم فانه اعظم القربات اليه وهو على ما يشاء قدير ◆ ◆ ◆

Commentary

85v:4–10. The paper begins with a general statement of the proper motivation and method of any true scholar. For an exposition of its philosophical implications the reader may consult *Rosenthal.*

85v:11–12. The book mentioned here is *Boilot* RG8, not extant. Concerning its subject, the first crude Indian instructions for drawing projections of lunar eclipses were given in the earlier *Pauliśa-siddhānta* (see *PS* 8, 11–13). Later works give more elaborate methods.

85v:13 – 86r:10. The author now chides his anonymous patron for his negative attitude toward Indian science. Bīrūnī agrees that the Indians, unlike the Greeks, ignore the necessity of giving proofs and theoretical demonstrations, and that they obtained their start in science from the Greeks. The latter is a reference to a famous verse of Varāhamihira, *Bṛhatsaṃhitā* 2, 14:

> For although the Greeks are barbarians, they have brought this science to perfection, and so are honored as sages.

Nevertheless, presumably alluding to his own travels in India, he feels that one who is without firsthand knowledge of a culture should avoid passing judgment.

Al-Fazārī and Ya'qūb (both fl. 775) were the early Muslim scientists best known for having transmitted Indian astronomy to the Islamic world, and their information was certainly imperfect (see *DSB*, vol. 4, pp. 555–6, vol. 14, p. 546, and the articles *Fazārī* and *Ya'qūb*).

86r:11–23. This passage has to do with the astrological effects of eclipses. To the extent that Bīrūnī's statements can be checked from the sources, they are wrong. Dorotheus (*Dor.* 1,1,5–6), says that each hour of a solar eclipse stands for a year of its influence, each hour of a lunar eclipse for a month. He is followed in this by Ptolemy (*Tetrab.*, 2,6).

The proper motion of the sun in the celestial sphere is indeed much slower than of the moon, by about one to thirteen, not one to three. The same ratio applies roughly to changes in declination, which is what takes either luminary out of a particular day circle.

86v:1–21. The next page is about astrological methods for predicting the length of life, although little is said about the actual tech-

niques. Bīrūnī mentions Greek books on the subject put into Persian. Of these, the Pahlavī translations of "Hermes", Dorotheus, and Vettius Valens are well known, but we know of no reference to any work of Ptolemy's rendered into that language except the *Almagest*.

The author mentions two of his own books, *Boilot* RG79, his garbled Arabic translation of Varāhamihira's *Laghujātaka*, and RG 75, his "Treatise Describing the Indian Method for Extracting the (Length of) Life". Neither is extant, although the first is quoted in extenso in the *India*.

The two Sanskrit books mentioned are the *Yavanajātaka* (86v:10) by Sphujidhvaja, and the *Sārāvalī* (*Essence*) by Kalyāṇavarman (86v:12), King of Samataṭa in what is now Bengal. The *Sārāvalī* follows Sphujidhvaja; both are also cited in the *India*.

The obscure statement in 86v:18–20 seems to refer to the purely Greek division of nativities into two classes as they occur in the half-months following a conjunction or an opposition; see, e. g., Ptolemy's nāmūdār (*Tetrab.*, 3,2).

86v:22 – 87r:14. Here commences the main topic – astrological lots. The definition of the lot of fortune (*sahm al-sa'āda*) correctly attributed to Ptolemy (*Tetrab.* 3,10, p. 275) is, stated in symbols (see Figure 1),

$$f = h + (m - s). \tag{1}$$ (87r:5)

The interpretation of the text presents a difficulty. The verb describing the operation denoted by the plus sign in the expression above is *alqā min*. The same verb recurs consistently throughout the manuscript. It means generally "to cast (a thing) away from", but in a mathematical context it is taken as "to subtract from", and is so translated here. Compare the Greek ἀπολύειν, "to release from", and thence "to count from".

There is a second, conflicting and more complicated, definition of the lot of fortune which also appears in the other literature (cf. *Gr. Hor.*, p. 8). It makes a distinction depending on whether s is above or below the horizon at the instant for which the horoscope is cast. It is (see Figure 2)

$$f = h \pm (m - s) \quad \begin{cases} \text{daytime.} \\ \\ \text{night.} \end{cases} \tag{2}$$ (87r:7)

Notice that the nocturnal definition is equivalent to

$$f = h + [360° - (m - s)],$$

which is the way the text expresses it at 87r:10.

A second lot, that of absence (*sahm al-ghayb*, called by the Greek astrologers the lot of the demon), is so defined as to be symmetrical to the lot of fortune with respect to the horizon. It is

$$g = h \mp (m - s) \begin{cases} \text{daytime} \\ \\ \text{night} \end{cases} \qquad (3) \qquad (87r:8)$$

This notion also is standard in the literature (*Gr. Hor.*, p. 9).

87r:15 – 87v:8. The motion of the lot of fortune is here carried through the course of one entire lunation. Just before new moon, when $m - s = 0$, expression (1) becomes,

$$f = h, \qquad (87r:15)$$

and this is irrespective of where the daily rotation may have carried m and s. As the moon waxes, f moves westwardly under the horizon at a rate of about twelve degrees per day. Figure 1 shows the situation when $m - s$ is about thirty degrees. At full moon $m - s = 180°$, opposition, and (1) becomes

$$f = h + 180° = D \qquad (87v:6)$$

the setting point. Subsequently f proceeds eastward above the horizon, meeting A at the next conjunction.

87v:9–15. Since the distance from m to f is the same as that from s to h, f is known as the "horoscope of the moon". This curious usage also appears in *Tetrab.* 3,10, p. 277, and with the same justification.

87v:16–22. The sense of this passage is that on the one hand the drawings presumably show the ecliptic and points on it, and on the other hand these points are used in time determinations. But ecliptic points cross the horizon at variable rates. To measure the passage of time they must be mapped on the "equal degrees" of the celestial equator by means of oblique ascension tables. On the celestial equator

(hours since sunrise) × 15°/hour = time-degrees. (87v:17)

Abū Ma'shar al-Balkhī (787–886), known in medieval Europe as Albumasar, was the most influential astrologer of the Middle Ages (*GAS* VII 139–151). His introduction to astrology was twice translated into Latin (*DSB*, vol. 1, pp. 32–39).

87v:23 – 88r:4. This passage makes sense, provided that (as remarked in the commentary to 87r:5) one reads "added" for "subtracted", and assumes that the definition being applied is (1), not (2), which reverses the direction for a nocturnal situation. In figure 2 the sun (s') is taken to be at L which is below the horizon. The moon (m') is at D, and as the text indicates, the distance from it to B is arc LDA. But at any time when the sun coincides with the horoscope the moon and the lot of fortune will also coincide.

88r:5. Al-Nayrīzī (fl. 910) was a mathematician and astronomer. His commentary to the *Tetrabiblos* is not extant. A quotation from it commences at 88r:7, but we are uncertain as to where it leaves off, and have inserted quotation marks at a plausible place. This is the case also with other quotations farther along in the treatise.

88r:6–17. The treatise now broadens its consideration of lots beyond the two named in the title to include lots involving the planets. Since the text invokes the astrologer Dorotheus of Sidon (fl. 1st century, *DSB*, vol. 15, p. 125), we tabulate below his planetary lots:

Lot of	*diurnal*	*nocturnal*
1. Father (*Dor.* 1;13)	Sun to Saturn	Saturn to Sun
2. Mother (1;14)	Venus to Moon	Moon to Venus
3. Brothers (1;19)	Saturn to Jupiter	Saturn to Jupiter
4. Children (2;10)	Jupiter to Saturn	Saturn to Jupiter
5. Fortune (1;25)	Sun to Moon	Moon to Sun
6. Wedding (2;2,3,6)		
for men	Saturn to Venus	Saturn to Venus
for women	Venus to Saturn	Venus to Saturn

(For a different system, see *B.–L.*, p. 307).

The statement of al-Nayrīzī that the lot of fatherhood is a horoscope for Saturn (88r:14) is consonant with the table above. However, he errs in claiming (88r:10) that all Dorotheus' lots involve elongation from the sun.

88r:18 – 88v:7. This passage expresses at some length a philosophical difficulty which was touched upon in 85v:14 and 87r:18. It seems to stem from the strong influence exerted upon educated people by Aristotelean cosmology. According to this doctrine, all celestial motions were initiated at the outer limits of the spherical universe by a prime motion, a rotation about the north polar axis, westward above the horizon, at the rate of a revolution per day. This motion was transmitted inward through a set of concentric physical spheres, modified on the way to yield the complicated slower motions of the planets, generally opposing the daily rotation. Now the horoscope is a point on the ecliptic, but it is constrained to remain in the horizon plane. This is the difficulty – to imagine a physical mechanism operating through the intervening spheres, to prevent the rising point from being whirled about by the daily rotation, and the lot of fortune along with it. As Bīrūnī remarks at 87r:12, the lot can only be an abstraction.

88v:8–18. Here the inference is clear that the planetary lots are defined as in the case of the moon, by taking the planet's elongation from the sun and laying off this distance from the horoscope. Since the superior planets fall farther and farther behind the sun, their lots may appear at any distance from the horoscope. The two inferior planets, however, dodge back and forth across the sun, never elongating farther than a particular maximum for each planet. Hence their respective lots will never be at distances from the horoscope which exceed these maxima.

88v:19 – 89r:8. The usages of Dorotheus and Nayrīzī diverge for the lot of motherhood, the first taking Venus' elongation from the moon, the second from the sun. This having been granted, his procedure is valid, for the epicyclic apogee of an inferior planet practically coincides with the sun. His rule amounts to taking the mean epicyclic equation of the planet and modifying it by the small correction entailed by its position with respect to the deferent apogee (c_3 in *Ex. Sc.*, p. 201; *Almag.*, vol. 2, p. 261).

It is true that the width of the lunar crescent, hence its light

(and influence?) increase with elongation (88v:23). But to extend the principle to the planets makes little sense, even astrologically. The statement that for the superior planets the epicyclic anomaly approximately equals the elongation (89r:8) is true only if the epicycle is small. For Mars it makes no sense.

89r:9 – 89v:3. The text now reverts to the definitions of the two lots given by expressions (2) and (3) above and by use of Figure 2 carries their motion through a complete revolution. Now sun (s) and moon (m) are M and L respectively, designated by unprimed lower case letters. It is clear that at all times

$$360° - (m - s) = \text{arc } LDAM, \qquad (89r:13)$$

and

$$2(m - s) = \text{arc } GAB. \qquad (89r:21)$$

Reading always "add" for the text's "subtract", at conjunction

$$m - s = 0°, \text{ so } f = g = h, \qquad (89r:18)$$

and at opposition, full moon,

$$m - s = 180°, \text{ so } f = g = D. \qquad (89r:23)$$

In between, f and g move westward under the horizon and over the horizon respectively, for daytime situations. After opposition the motion is eastward.

89v:4–20. At 87v:9 we were informed that f is the "horoscope of the moon" and the justification therefor. But this was for the simple Ptolemaic definition of f, (1). Without saying so specifically, the present passage infers that under the terms of the more complicated definition (2) *at night*, by the same reasoning as before, f is the horoscope of the sun. Using again Figure 2, illustrating a nocturnal situation, point G is now f. Assuming no change in elongation, the moon will be at G when the sun is in the horoscope, h. The rest of the argument we cannot follow, but is occasioned by the switching between night and day in definitions (2) and (3), like the alleged alternate production of female and male rabbits. Apparently al-Bīrūni also is unimpressed.

We suggest that here the technical astrological term *nawba*, "turn", corresponds to the Greek αἵρεσις. Presumably *zawāyij* is a broken Arabic plural (new to us) of Persian *zāyija* "horoscope". The sarcastic remark involving Ptolemy's two rings is a reference to *Almag.* 1,12.

89v:21–90r:6. Al-Battānī (d. 929) was an able Arab astronomer. His commentary on the *Tetrabiblos* is extant in manuscript (*DSB*, vol. 1, p. 513; *GAS* VII, 159). His definition of the lot of fortune is a restatement of expression (1), whereas the remark at 90r:3 is definition (2).

90r:7 – 90v:4. Abū'l-'Abbās al-Iṣbahānī probably lived in the tenth century (*GAS* VII, 167). However the *Kitāb al-Thamara*, Greek *Karpos*, Latin *Centiloquium* (for the 100 aphorisms it contains) is a pseudo-Ptolemaic astrological work which was translated into Arabic, and was much quoted by Muslim scholars (*Ullmann*, p. 283; *GAS* VII, 44–46). Al-Iṣbahānī gives definition (1) versus (2) and (3).

90v:5–9. The Abbasid caliph al-Ma'mūn (d. 833) was a great sponsor of science. Khālid b. Yazīd (d. 704) was a son of the Ummayad caliph Yazīd I, but he did not succeed his father. He had a legendary reputation as a patron of science, especially alchemy (*Ullmann*, p. 192). Ibn al-Farrukhān (fl. 800, *DSB*, vol. 13, p. 538) and Ḥunayn (d. 873, *DSB*, vol. 15, pp. 230–249) were, among other things, translators of scientific work, the former from Middle Persian, the latter from Greek.

Concerning translations, Ibn al-Nadīm (*Fihrist*, p. 268) says that the *Tetrabiblos* was translated by Ibrāhīm b. al-Ṣalt and improved by Ḥunayn. A commentary on Book 1 was written by Eutocius, and another by Thābit b. Qurra. Commenting on the whole *Tetrabiblos* were Ibn al-Farrukhān, Ibn al-Ṣalt, al-Nayrīzī and al-Battānī. Further, *Fihrist*, p. 273, reports that the *Tetrabiblos* was translated for Ibn al-Farrukhān, who then commented upon it, by al-Baṭrīq abū Yaḥyā b. al-Baṭrīq.

Thus al-Bīrūnī's information is not identical with that of Ibn al-Nadīm. See also *GAS* VII, 43–44, and *JAOS*, 102 (1982), 560.

90v:10–13. Of the two books attributed in this passage to the mythical Hermes Trismegistos, one, "The Eighty-five Chapters", is well known (*Ullmann*, p. 292; *GAS* VII, 55). The other is known only from this passage (*GAS* VII, 58).

90v:14–19. From the "Pillar of Wisdom" are two additional definitions of lots. Before giving them we define several technical terms. The initial point of the *tenth locus* (90v:15) is upper midheaven, the point of intersection overhead between the ecliptic and

the local meridian. It is O on Figure 2. Because the ecliptic and the celestial equator are inclined with respect to each other, the arc AO is in general not a quadrant, but it is not far from it. The *cardine of the earth* (91r:1) is lower midheaven, the point diametrically opposite O. The four points A, lower midheaven, D (the setting point, also known as the *seventh locus*), and O, comprise the four cardines, or centers (*Gr. Hor.*, pp. 3 and 8).

The new definitions are, for the lot of the sun,

$$(4) \qquad l_s = \left\{ \begin{array}{cc} h & + \\ & \\ h & -180^\circ - \end{array} \right\} (O - s) \left\{ \begin{array}{l} \text{daytime,} \\ \\ \text{night,} \end{array} \right.$$

and the lot of the moon,

$$(5) \qquad l_m = \left\{ \begin{array}{cc} h & + \\ & \\ h & -180^\circ - \end{array} \right\} (m - s) \left\{ \begin{array}{l} \text{daytime,} \\ \\ \text{night.} \end{array} \right.$$

90v:20 – 91r:9. This passage gives a series of examples showing how definition (4) operates. They are illustrated on Figure 3. Assume the horoscope h to be fixed at A.

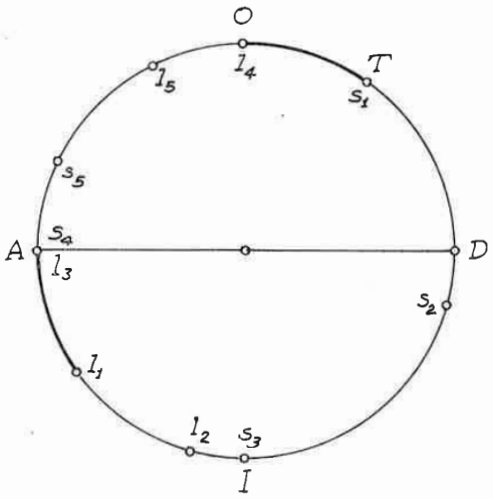


Figure 3

Let the sun be at O (90v:22), then $O - s = 0$, and $l_s = A$. Should the sun move to $T = s_1$ (90v:23), the lot will descend to l_1. This continues until the sun reaches the setting point D (91r:1), the lot then arriving at I. Once the sun descends below the horizon, to s_2 (91r:2), say, the nocturnal part of the definition applies, and the sun's elongation from O is taken negatively from D. So the lot falls at l_2. When the sun reaches lower culmination at $I = s_3$ (91r:4), horoscope and lot l_3 will coincide. Once the sun rises (91r:6), $s_4 = h$ and $l_4 = O$; thence the diurnal definition takes over. So, for instance, if the sun is at s_5 its elongation to O will be three quadrants plus As_5 (91r:7). Adding this to A puts the lot at l_5. Hence the lot is confined to the eastern half of the ecliptic, the half rising with the daily rotation.

91r:10–13. As for the lot of the moon, for the daytime, as al-Bīrūnī states, $l_m = f$. For the nocturnal situation, Figure 4 shows as much of Figure 2 as is needed for the explanation. Following (5) the elongation m-s is laid off negatively from the descendant, D. The resulting l_m is indeed opposite the lot of absence at G.

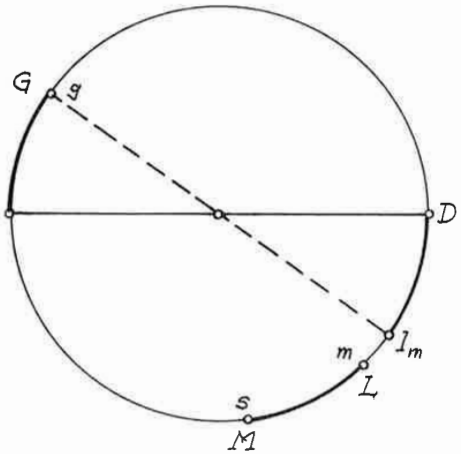


Figure 4

91r:14–21. The next passage, apparently from Chapter 10 of the "Eighty-five Chapters", is about determining lenght of life. On this

subject Ptolemy has a whole chapter (*Tetrab.* 3.10). But, except for mention of the lot of fortune, it seems to have nothing to do with our text, of which we can make little sense. Abū Ma'shar's identifying the lot of fortune with the lot of the moon resembles the daylight part of definition (5).

91r:22 – 91v:12. Here the text again reverts to simple geometrical inferences resembling 89r:21. It is a consequence of definitions (2) and (3) that f and g are always symmetrically placed with respect to the horizon, AD in Figure 2. Hence A and D are at all times midway between f and g (91r:23). Further,

$$\tfrac{1}{2}(f - g) = f - h, \qquad (91v:2)$$

and, reading as usual *add* for *subtract*,

$$[(f - g) + h] - h = GB = 2AB = 2(f - h). \qquad (91v:3)$$

The word *nisba* in 91v:4–5 translated as "relation", in a mathematical context, is used for "ratio", and the statement would appear in symbols as

$$P:f = f:h = m:s,$$

which makes no sense. If we take the relation to be "distance between", the expression can be written as

$$\text{distance } Pf = \text{distance } fh = \text{distance } ms,$$

which is true, if trivial.

Taking the "middle light" (91v:6) to be P, it moves twice as fast with respect to h as does f. At opposition, $m - s = 180°$, so $P - h = 360°$, and P will reach the horoscope, A, as B reaches D, the seventh locus (91v:6). At quartile $m - s = 90°$ or $270°$, $P - h = 180°$ or $540°$ ($\equiv 180° \pmod{360°}$), and in both situations P arrives at the seventh locus (91v:7). The AP equals the famous "double elongation" of the Ptolemaic lunar model, whereas f itself has the motion of the single elongation, like the deferent center in the same model (91v:9, see *Ex. Sc.*, p. 196).

In making fun of the whole arrangement al-Bīrūnī is reminded that the geometric mean x between two given quantities, a and b is given by the expression

$$a:x = x:b, \text{ or } x^2 = a\,b,$$

and this mean proportional relation subsists between the first two "ratios" of 91v:4 above. Hence at 94v:10 we translate *nisba* as "ratio".

91v:13–20. The Abū Sa'īd mentioned here must be Aḥmad b. Muḥammad b. 'Abd al-Jalīl al-Sijzī (fl. 1000), who was a friend of al-Bīrūnī's. He is best known as a geometer, but he wrote voluminously on astrology (*DSB*, vol. 12, pp. 431–2; *GAS* VII, 177–182). We have no information on Abū Sa'īd's dream.

91v:21 – 92r:18. Up to this point, determinations have been made as though the moon and planets were on the ecliptic. In fact the latitudes by which they diverge from it were calculable, and some people, including al-Bīrūnī, felt they should be taken into consideration in making astrological predictions. Thus, in the astrological treatise of his *Canon*, 11, 4, he describes how to involve a planet's latitude in calculating the "projection of the rays" (cf. *K&K*, p. 7). A much simpler technique of the same sort is given at 92r:8.

Another astrological refinement was the custom of computing, for a particular time, the distance from the earth to a planet in relation to its mean distance. The result was compared with an analogous computation for a second planet, and conclusions drawn therefrom. This is what is referred to in 92r:14. The doctrines are explained in detail in al-Bīrūnī's *Transits*.

The *haylāj* (92r:17, Gr. ἀφέτης) is a point on the ecliptic used in connection with length of life determinations. It is defined in the *Tafhīm*, pp. 323–327.

92r:19 – 92v:15. This is the author's peroration. At 92v:3 he reverts to a topic touched upon at the beginning of the essay (85v:12), the representation of eclipses. The doctrine of projecting the rays (92v:5) is described in *K&K*. Next he writes about the coming together of solar and lunar day circles (92v:6), mentioned before at 86r:19. The position of the moon's day circle is a function of its latitude as well as its longitude. But the coordinates first calculated are *true* latitudes and longitudes, reckoned as though the observer were at the center of the earth. From them it is necessary to determine *apparent* coordinates, giving the lunar location as it appears to the observer on the earth's surface. The difference between true and apparent is parallax (92v:7).

The *Pauliśasiddhānta* in the recension of Lāṭadeva deals with

both lunar latitude and parallax (*PS*, 3,28–31 and 7,1), but it says nothing of ascertaining when the day circles of the two luminaries unite. The *Pauliśasiddhānta* (92v:9) used by Bīrūnī was, of course, different; see e. g. *Pingree*, p. 237 and footnote 63, and *Pauliśa*.

The statement at 92r:21–22 is obscure. The seventy-three is a reference to a tradition which says that Islam is split into this number of differing sects. Ibn Āwā is a name for the jackal, and there is a saying that Ibn Āwā is real, but Āwā himself never existed.

The Plains of Thaneshwar (Sanskrit Sthāneśvara) are mentioned by al-Bīrūnī (*Tafhīm*, p. 140) as lying on the prime meridian. It lies at the legendary site of the battle of Kurukṣetra celebrated by the Mahābhārata.

Paulus Alexandrinus was not the author of the *Pauliśasiddhānta* (*DSB*, vol. 10, p. 425).

Bibliography

Almag.: Ptolemäus, *Handbuch der Astronomie*, Deutsche Übersetzung und erläuternde Anmerkungen von K. Manitius, Vorwort und Berichtigungen von O. Neugebauer, 2 vols. (Leipzig: Teubner, 1963).

Boilot: D. J. Boilot, L'Œuvre d'al-Beruni, Essai bibliographique, *Mélanges de l'Institut Dominicain d'Études Orientales*, 2(1955), pp. 161–255.

B.-L.: A. Bouché-Leclercq, *L'Astrologie grecque*, Paris, 1899.

Canon: Al-Bīrūnī, *Al-Qānūnu'l-Mas'ūdī* (Canon Masudicus), 3 vols. (Osmania Oriental Publications Bureau, Hyderabad-Dn., India, 1954–1956).

Dor.: David Pingree, ed., *Dorothei Sidonii Carmen Astrologicum*, Interpretationem Arabicam in Linguam Anglicam versam una cum Dorothei fragmentis et Graecis et Latinis, (Leipzig: B. G. Teubner, 1976).

DSB: *Dictionary of Scientific Biography* (New York: Scribners, 1970–1978), 15 vols.

Ex. Sc.: O. Neugebauer, *The Exact Sciences in Antiquity*, 2d. ed., (Providence: Brown Univ. Press, 1957). There are paperback reprints by Harper, 1962, and by Dover, 1969.

Fazārī: David Pingree, "The Fragments of the Works of al-Fazārī" *JNES*, 29(1970), 103–123.

Fihrist: *Kitāb al-Fihrist mit Anmerkungen*, herausgegeben von Gustav Flügel, 2 vols., (Leipzig, 1871).

GAS VII: F. Sezgin, *Geschichte des arabischen Schrifttums*, vol. VII, (Leiden: Brill 1979).

Gr. Hor: O. Neugebauer and H. B. van Hoesen, Greek Horoscopes, *Memoirs of the American Philosophical Society*, vol. 18, Philadelphia, 1959.

H&K: H. Hermelink and E. S. Kennedy, "Transkription mathematischer Bezeichnungen in arabischen Schriften", *Sudhoffs Archiv*, 45(1961), 85.

The same list is in the *Journal of the American Oriental Society*, 82 (1962), 204.

India: Al-Bīrūnī, *Kitāb fī taḥqīq mā li 'l-Hind* . . ., ed. by C. E. Sachau (London, 1888), also Hyderabad-Dn., 1958; transl. by C. E. Sachau as *Alberuni's India*, 2 vols., (London, 1910).

JNES: *Journal of Near Eastern Studies*

K&K: E. S. Kennedy and H. Krigorian-Preisler, "The Astrological Doctrine of Projecting the Rays", *Al-Abhath*, 25(1972), 3–15.

Pauliśa: David Pingree, "The Later Pauliśasiddhānta", *Centaurus* 14 (1969), 172–241.

Pingree: David Pingree, "Astronomy and Astrology in India and Iran", *Isis*, 54(1963), 229–246.

PS: O. Neugebauer and D. Pingree, *The Pañcasiddhāntikā of Varāhamihira*, Part 1, Text and Translation, Part 2, Commentary; Hist. Filos. Skr. Dan. Vid. Selsk., 6,1, (Copenhagen, 1970, 1971).

Rosenthal: Franz Rosenthal, "On Some Epistemological and Methodological Presuppositions of al-Bīrūnī", *Beyruni'ye Armağan*, Ankara, 1974, 145–156.

Tafhīm: Al-Bīrūnī, *Kitāb al-Tafhīm fī awā'il ṣanā'at al-tanjīm*, ed. and transl. by R. R. Wright as *The Book of Instruction in the Elements of the Art of Astrology* (London: Luzac, 1934).

Tetrab.: Ptolemy, *Tetrabiblos* (London & Cambridge, Mass.: Loeb Classical Library, 1940).

Transits: *Al-Biruni on Transits*, a Study of an Arabic Treatise entitled *Tamhīd al-mustaqarr litaḥqīq ma'nā al-mamarr*, translated by Mohammad Saffouri and Adnan Ifram with a commentary by E. S. Kennedy (American University of Beirut, 1959).

Ullmann: Manfred Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden: E. J. Brill, 1972).

Ya'qūb: David Pingree, "The Fragments of the Work of Ya'qūb ibn Ṭāriq", *JNES*, 26(1960), 97–125.