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**Tools of time: Devices for organizingn public and private life in the premodern
Islamic world**

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ORIENTALIA LOVANIENSIA

ANALECTA

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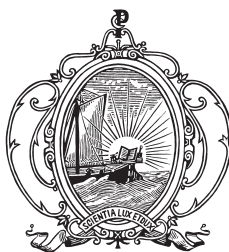
RE-DEFINING A SPACE OF ENCOUNTER

Islam and Mediterranean: Identity, Alterity and Interactions

*Proceedings of the 28th Congress
of the Union Européenne des Arabisants et Islamisants
Palermo 2016*

edited by

ANTONINO PELLITTERI,
MARIA GRAZIA SCIORTINO
DANIELE SICARI and NESMA ELSAKAAN



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TOOLS OF TIME: DEVICES FOR ORGANIZING PUBLIC AND PRIVATE LIFE IN THE PREMODERN ISLAMIC WORLD

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Since more than a century, the topic of time is a major theme in cultural history.¹ Some of such studies became famous in their disciplines.² Jacques Le Goff's brilliant article "Temps de l'Eglise et temps du marchand" ("Church's Time and Merchant's Time"), published in 1960 is still classical in medieval studies.³ His example of the city tower of Aire-sur-la-Lys, built in 1355 AD stands for the beginning of a new kind of time, the professional time. Its bells did not ring for prayers, but for commercial transactions and the labour of the workers. For the merchant, the time of business gave structure to his daily life, while the bells of the church served as another horizon of existence. There was at the same time essential separation and contingent encounter of professional and supernatural time.⁴ The source on which Le Goff based his famous thesis of the time of the merchant is a decree of the royal governor of Artois, who authorized the people of Aire-sur-le-Lys to construct a *beffroi* with bells ringing the hours.⁵

This reminds of another decree, issued more than two hundred years earlier by King Roger II of Sicily, in which the construction of a clock was ordered. It is the famous trilingual inscription on display at the entrance to the Capella Palatina.⁶ The Latin text speaks only of a *horologium* in general.⁷ In the Arabic

¹ See P. BURKE, Reflection of the cultural history of time, *Viator* 35 (2004), pp. 617–626, on the idea of "social time" with references du Durkheim and Weber.

² N. ELIAS, *Über die Zeit* (Arbeiten zur Wissenssoziologie 2), Frankfurt, 1984 (engl. N. ELIAS, *Time: an Essay*, Oxford, 1992).

³ J. LE GOFF, Au Moyen Age: Temps de l'Eglise et temps du marchand, *Annales. Histoire, Sciences Sociales* 15, 3 (1960), pp. 413–433, see p. 424 (engl. in J. LE GOFF, Merchant's time and church's time, in *Time, Work and Culture in the Middle Ages*, Chicago, 1980, pp. 29–42).

⁴ LE GOFF, Temps de l'Eglise, p. 428.

⁵ J. ROUYER, Aperçu historique sur deux cloches du beffroi d'Aire, *Mémoires de la Société des Antiquaires de la Morinie* 7, 2 (1845), pp. 233–255, see pp. 253–254; G. ESPINAS and H. PIRENNE, *Recueil de documents relatifs à l'histoire de l'industrie drapière en Flandre I*, Bruxelles, 1906, pp. 5–6.

⁶ M. AMARI, *Le epigrafi arabiche di Sicilia: trascritte, tradotte e illustrate* (Edizione nazionale delle opere di Michele Amari, ser. 1, [2]), Palermo, 1971, p. 30.

⁷ HOC OPUS HOROLOGII PRECEPTI FIERI DOMINUS ET MAGNIFICUS REX ROGERIUS. ANNO INCARNATIONIS DOMINICE MCXLII. MENSE MARTIO INDICTIONE V. ANNO VERO REGNI EJUS XIII. FELICITER; AMARI, *Le epigrafi*, p. 30.

text it is called a “machine for the observation of the hours” (*al-āla li-rasad al-sā’āt*).⁸ More technical information is given in the Greek text: “New miracle! To the powerful prince, King Roger, God gave the scepter that controls the flow of the liquid element, dispensing precise knowledge about the time of the year.”⁹ This makes clear that the machine was a water clock, probably with an anaphoric dial on which the variable seasonal hours were indicated.¹⁰ Water clocks with such devices were common in antiquity.¹¹ In the early Middle Ages this technology fell into oblivion, but had its revival in 9th century AD in Baghdad.¹² There can be no doubt that King Roger’s clock was built by technicians from the Islamic World, and he was not the only ruler of his time, who installed a public clock. Around the year 1075 AD two water-clocks were installed in Toledo.¹³ A contemporary of king Roger on the other side of the Byzantine war front, Nūr al-Dīn al-Zangī (d. 1174 AD) in Syria ordered the construction of a mechanical clock in Damascus at the Jayrūn gate close to the Umayyad mosque. The hours during the day were indicated by the sound of two metal balls falling down into a beaker. The hours during the night were indicated by lights behind red colored glass windos.¹⁴ Nūr al-Dīn al-Zangī’s personal portable sundial is preserved (Bibliothèque Nationale de France, Cabinet des Médailles, no. F 6909).¹⁵ It is said in its inscription that the sundial was made “for the knowledge of the seasonal hours and the times of the prayers” (*li-ma’rifat al-sā’āt al-zamāniyya wa-awqāt al-ṣalawāt*). Thus it had a double function. The first function was to indicate the seasonal hours as was the case for the Palermo clock. The second function was to indicate the times of the daily prayers. The first function of indicating the seasonal hours was primordial, since on the other side only these were shown.

These two functions of the clock corresponded to two systems of time management. Seasonal hours were necessary for business, work and all kind of social activities in civil society. Prayer times were signals for interrupting

⁸ خرج أمر الحضرة الملكيّة المعظميّة الرجائيّة العلية أيد الله أيامها و أيد أعلامها بعمل هذه الآلة لرصد الساعات بمدينة صقلية المحمية سنة ست و ثلثين و خمسمائة; AMARI, *Le epigrafi*, p. 30; E. COMBE, J. SAUVAGET and G. WIET, *Répertoire chronologique d’épigraphie arabe* VII, Cairo, 1936, pp. 224–225, no. 3106; L. Kalus, *Thésaurus d’épigraphie islamique*, online at <http://www.epigraphie-islamique.org> (retrieved 8.1.2017), no. 6300.

⁹ Ὁ θαῦμα καινόν ὁ κραταῖος δεσπότης Ῥογέριος ρίξ ἐκ θεοῦ σκηπτροκράτωρ τὸν ροῦν χαλινοῖ τῆς ῥεούσης οδσίας γνώσιν νέμων ἄταιστον ὥρων τοῦ χρόνου τῷ ἰβ τῆς βασιλείας χρόνῳ μὴνὶ μαρτίῳ ἰνδ. ε ἔτ. ζχν. M. Amari, *Le epigrafi arabiche di Scilia*, Palermo, 1971, p. 30.

¹⁰ I. WEINRYB, *The bronze objects in the Middle Ages*, Cambridge, 2016, p. 166.

¹¹ A. J. TURNER, The anaphoric clock in the light of recent research, in M. FOLKERTS and R. LORCH (eds.), *Sic itur ad astra: Studien zur Geschichte der Mathematik und und Naturwissenschaften: Festschrift für den Arabisten Paul Kunitzsch zum 70. Geburtstag*, Wiesbaden, 2000, pp. 536–547.

¹² D. R. HILL, *Arabic water-clocks*, Aleppo, 1981.

¹³ D. R. HILL, The Toledo water-clock, *History of Technology* 16 (1994), pp. 62–71.

¹⁴ HILL, *Arabic water-clocks*, pp. 69–88.

¹⁵ P. CASANOVA, Le montre du sultan Noûr ad Dîn, *Syria* 4, 4 (1923), pp. 282–299.

these activities and to fulfill a religious duty. This has much in common with Le Goff's "church's time" and "merchand's time". In the context of Islamic society it is appropriate to use more general terms such as "ritual time" and "civil time".

Devices for organizing "ritual time" have been studied in great detail by David King, and there is no need to discuss them here.¹⁶ The same is true for "ritual space".¹⁷

"Civil time" is present in documentary sources. In legal and business documents hours were used to indicate a precise time, as for example in a certificate of discharge for a high rank slave (P.Cair.Arab. 137): "when five hours were left of Saturday, when 14 (nights) were left of the current Sha'bān of the year 348" (*'alā khamsati sātīn baqiyat min yawmi l-sabti li-arba'a 'ashrata baqiyat min sha'bāna l-ġārī fī sanati thamānin wa-arba'īna wa-thalāthi-mi'atin*).¹⁸ The date and time corresponds to 22 October 959 AD, one hour p .m.

However, another type of time existed, different from "ritual time" and "civil time". There are special texts among early paper documents from the 4th/10th century onwards, which testify how time management was organized in every day life. These are the so-called almanacs, which contain daily entries for a particular year with various kinds of information. The earliest available example is a paper fragment of an almanac for the year 297 AH/ 909–910 AD.¹⁹ The first column to the right contains the positions of the Sun and the planets in the zodiacal signs. The middle column contains the date in the Arabic month and the position of the Moon in the zodiac. After that follows a list of the astrological aspects which the Moon forms with the Sun and the planets, together with advices for which activities the day is favorable. The last column to the left contains the corresponding dates in the Persian, Roman and Coptic calendars, the position of the moon in the lunar mansions, and the time of dusk. Among these various informations the aspects of the moon and their astrological interpretation played a central role. Aspects, Arabic *munāzarāt* occur when two heavenly bodies form angles of 180°, 120°, 90° and 60° degrees or are in conjunction. The aspects of 180° and 90° — opposition and quartile — were regarded as conflictual, while

¹⁶ D. KING, *In synchrony with the heavens: studies in astronomical timekeeping and instrumentation in medieval Islamic civilization I* (Islamic philosophy, theology and science 55), Leiden, 2004, pp. 191–622.

¹⁷ D. KING, *World-maps for finding the direction and distance to Mecca: Innovation and tradition in Islamic science* (Islamic philosophy, theology and science 36), Leiden, 2000; D. KING, *In synchrony with the heavens I*, pp. 741–846.

¹⁸ A. GROHMANN, *Arabic papyri in the Egyptian Library II*, Cairo, 1936, pp. 197–198, no. 137, pl. XXII.

¹⁹ J. THOMANN, A Fragment of an unusual Arabic almanac for 297 AH/910 CE (P.Berl.inv. 12793), in W. MALCZYCKI et al. (ed.), *New frontiers of Arabic papyrology: Arabic and multilingual texts from Early Islam*, Leiden, 2017, pp. 179–196. J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope*, Wien [forthcoming].

the aspects of 120° and 60°, — trine and sextile — were regarded as harmonious. Conjunction was regarded as neutral.²⁰

A similar almanac, made for the year 334 AH/932–933 AD, contains additional information, by adding the hour of day or night when the aspects take place.²¹ This seems to allow for even more precise scheduling of actions or the avoidance of actions at particular hours. In these early examples of almanacs the actions which are the object of recommendation or warning are only broadly described: Business matters, medical treatment, or even more generally: “favorable” without further characterization. More concrete descriptions are found in an almanac for the Coptic year 707.²² Besides more general judgments there occur such advices as “accountances of the administrators” (*muḥabāsāt li-l-wukalā*), and “to accomplish messages” (*infādh al-rusul*).²³ The tendency towards more precise predictions is continued in later almanacs. In an almanac for the year 523 AH / 1128–1129 AD, the aspect of trigon between Moon and Sun is said to be favorable for speaking with the Sultans. The Moon in sextile to Mars is significant for contacting the leaders of the army, which is appropriate if the god of war is involved.²⁴

In the 10th century existed also Arabic astronomical yearbooks, which had a more technical character and were similar in their layout to ancient Greek ephemerides.²⁵ These were lists with the daily positions of Sun, Moon, and the planets. They were exclusively astronomical in content and did not contain any astrological interpretations. In the following century we find for the first time a combination of ephemerides and almanacs. On a double page the data of a month were arranged. The right page had the layout of an ephemeris, while the left page contained the astrological aspects and their interpretations in a form similar to the almanacs.²⁶

²⁰ ABŪ MAʿSHAR, *The abbreviation of the introduction to astrology: Together with the Medieval Latin translation of Adelard of Bath*, ed. Ch. BURNETT, K. YAMAMOTO and M. YANO, Leiden, 1994, pp. 40–41; AL-QABĪSĪ, *The introduction to astrology*, ed. Ch. BURNETT, K. YAMAMOTO and M. YANO, London, 2004, pp. 26–27.

²¹ J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²² J. THOMANN, Almanach für das koptische Jahr 707 (990/991 n. Chr.), in A. ZDIARSKY (ed.), *Orakelsprüche, Magie und Horokope: wie Ägypten in die Zukunft sah*, Wien, 2015, pp. 140–141; J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²³ J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²⁴ J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²⁵ J. THOMANN, An ephemeris for the year 931–932 CE, in A. KAPLONY, D. POTTHAST and C. RÖMER (eds.), *From Bāwīt to Marw: Documents from the Medieval Muslim World: Proceedings of the 4th Conference of the International Society for Arabic Papyrology, Vienna, March 26–29, 2009*, Leiden, 2015, pp. 115–153; J. THOMANN, Ephemeride für das persische Jahr 300 (931/932 n. Chr.), in A. ZDIARSKY (ed.), *Orakelsprüche, Magie und Horokope: wie Ägypten in die Zukunft sah*, Wien, 2015, pp. 124–135; J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope*, pp. 19–49; J. THOMANN, An Arabic ephemeris for the year 954/955 CE and the geographical latitude of al-Bahnasā/Oxyrhynchus (P.Stras. Inv. Ar. 446), *Chronique d’Égypte* 88, 176 (2013), pp. 385–396; J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²⁶ J. THOMANN, Ephemeride für das persische Jahr 413 (1044/1045 n. Chr.), in A. ZDIARSKY (ed.), *Orakelsprüche, Magie und Horokope: wie Ägypten in die Zukunft sah*, Wien, 2015, pp. 138–140; J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

This layout became standard for astronomical yearbooks.²⁷ An example of 1182 AD shows the aspects in a highly abbreviated form.²⁸ The earliest extant complete yearbook of this type was made for the year 727 AH / 1326–1327 AD.²⁹ Its form was in use until the late Ottoman epoch.³⁰ It was imitated in a Greek year-book for the year 1336 AD.³¹ It was also adapted in Western Europe in the 13th century AD.³² The “Ephemerides” of Johannes Regiomontanus, printed in 1474 AD had an analogous form.³³ The same layout is still found in the “Ephemerides of the nine heavenly motions” published by Johannes Kepler in 1617 AD.³⁴

The title of the astrological part in such combined tables was “*al-ikhtiyārāt*” (“choices”) in Arabic and “*electiones*” or “*aspectus*” in Latin.³⁵ The term *ikhtiyārāt* is also the name of a literary genre. Works with this title deal with a subdiscipline of astrology in which a technique is explained how to find a favorable time for a particular task. One of the earliest works is that of Sahl ibn Bishr (d. 845 AD).³⁶ He arranged his book by the twelve astrological houses. In this system the zodiac is divided into twelve sections with the ascendent at the beginning. Each house is devoted to a part in an individuals life. The houses one to six concern the private sphere of life. The houses seven to twelve concern the public sphere.

According to Abū Maʿshar the first six concern: 1. Life, 2. Wealth, 3. Brothers, 4. Fathers, 5. Children, 6. Illness; and the last six concern: 7. Women, 8. Death, 9. Journey, 10. Authority, 11. Good Fortunes, 12. Enemies.³⁷ Sahl ibn Bishr followed this scheme and discussed corresponding activities. Some of them are relevant for all people, as “When to form a partnership in property”, “When

²⁷ J. THOMANN, The Arabic ephemeris for the year 1149/1150 CE (P. Cambridge UL Inv. Michael. Charae D 58) and the Arabic Baḥnītas, Greek Παχvίτης and Coptic ΠΑΥΘΩΝC, *Chronique d’Egypte* 90, 179 (2015), pp. 207–224.

²⁸ J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

²⁹ D. KING, *In synchrony with the heavens I*, p. 421; J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

³⁰ G. KUT, *Kandilli Rasathanesi El yazmaları: 1. Türkçe yazmaları* (Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü astronomi, astroloji, matematik yazmaları kataloğu), İstanbul, 2007, pp. 199–279; G. KUT, *Kandilli Rasathanesi El yazmaları: 2. Arapça-farsça yazmaları* (Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü astronomi, astroloji, matematik yazmaları kataloğu), İstanbul, 2012, pp. 517–536; M. KURZ, *Ein osmanischer Almanach für das Jahr 1239/1240 (1824/1825)*, Berlin, 2007.

³¹ MS Munich, BSB, graec. 525; R. MERCIER, *An almanac for Trebizond for the year 1336* (Corpus des Astronomes Byzantins 7), Louvain-la-Neuve, 1995.

³² MS Paris, BnF lat. 16210 and MS Vatican, Lat. 4572; for a description see F. S. PEDERSEN, *William of Saint-Cloud: Almanach planetarum: An edition of the canons, a few samples from the tables and a foray into the numbers* (Cahiers de l’Institut du Moyen-Âge grec et latin 83), Copenhagen, 2014, pp. 58–59.

³³ J. REGIOMONTANUS, *Ephemerides sive almanach perpetuus*, Nuremberg, 1474.

³⁴ J. KEPLER, *Ephemerides novae motuum coelestium, ab anno vulgaris aerae MDCXVII*, Prague, 1617.

³⁵ J. THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

³⁶ C. M. CROFTS, *Kitāb al-Ikhtiyārāt ‘alā l-buyūt al-iṭnai ‘aṣar by Sahl ibn Biṣr al-Isrā’īlī with its Latin translation De Electionibus*, PhD thesis University of Glasgow, 1985.

³⁷ ABŪ MAʿSHAR, *Abbreviation*, pp. 28–31.

to marry” or “When to make a testament”.³⁸ Other are only relevant for higher rank people, as “When to buy a slave”, “When to build a house” or “When to enhance your reputation to the ruler”.³⁹ Some are only relevant for the highest political and military elite, as “When to install a ruler into the seat of his power” or “The times for going out to war”.⁴⁰

What concerns the public sphere, there are historical records which indicate the use of *ikhtiyārāt* methods for planning important tasks. A famous case is the foundation of the new Baghdad by the Caliph al-Manṣūr in the year 762 AD. Al-Bīrūnī stated explicitly about this event that the time was chosen by an astrologer using the *ikhtiyārāt* practice:⁴¹ “It was Nawbakht who was in charge of the choice (*ikhtiyār*) of the time (*waqt*).” There is also another account of this event by Ibn al-Faqīh al-Hamadhānī, who wrote a century earlier than al-Bīrūnī.⁴²

There is a long chain of predecessors of the *ikhtiyārāt*. They start with a list of favorable and unfavorable days of the Egyptian Middle Kingdom, and continue in the Greek world with a Mycenaean day list.⁴³ In the first century BCE a new system based on astrological elements was invented and called *katarchai*. Its first description is found in book 5 of the astrological work of Dorotheus of Sidon.⁴⁴ There is also documentary evidence for the practical use of the *katarchai*. In three Greek ephemerides of the 4th century AD an additional column is found which contains astrological judgements of the days.⁴⁵ The system of *katarchai* found its way to Indian astrology, and from there it was introduced in early Abbasid time to the Islamic East, and became their name *ikhtiyārāt*. In the later tradition, most authors of astrological works wrote on the *ikhtiyārāt*. One of the most extensive texts is book 7 of the *Kitāb al-Bārī*’ of Ibn Abī Rijāl. In the 13th century it was translated into Spanish, and from that into Latin.⁴⁶ Abraham Ibn Ezra wrote on elections, the *mivḥarim* in Hebrew.⁴⁷

³⁸ CROFTS, *Kitāb al-Ikhtiyārāt*, p. 104 § 32a, p. 117 § 78a, 122 § 97a.

³⁹ CROFTS, *Kitāb al-Ikhtiyārāt*, p. 116 § 71a, p. 106 § 43, 129 § 124.

⁴⁰ CROFTS, *Kitāb al-Ikhtiyārāt*, p. 129 § 125a, p. 119 § 85.

⁴¹ AL-BĪRŪNĪ, *Chronologie orientalischer Völker*, ed. by C. E. SACHAU, Leipzig, 1878, p. 270; AL-BĪRŪNĪ, *The chronology of ancient nations: an English version of the Arabic text of the Athār-ul-Bākiya of Albīrūnī, or, “Vestiges of the Past”, collected and reduced to writing by the author in A.H. 390-391, A.D. 1000*, transl. by C. E. SACHAU, London, 1879, p. 262.

⁴² IBN AL-FAQĪH AL-HAMADHĀNĪ, *Kitāb al-buldān*, ed. by Y. AL-HĀDĪ, Bayrūt, 1996, p. 291.

⁴³ F. LL. GRIFFITH, *Hieratic papyri from Kahun and Gurob*, London, 1998, pl. XXIV–XXV; J. CHADWICK and M. VENTRIS, *Docuents in Mycenaean Greek* (2nd ed.), Cambridge, 1973, pp. 170–172.

⁴⁴ DOROTHEUS SIDONIUS, *Carmen astrologicum*, ed. by D. PINGREE, Leipzig, 1976, pp. 106–158, 262–322.

⁴⁵ A. JONES, *Astronomical papyri from Oxyrhynchus (P. Oxy. 4133-4300a)* (Memoirs of the American Philosophical Society 233), Philadelphia, 1999, p. 176.

⁴⁶ G. Hilty, *El libro conplido en los iudizios de las estrellas, partes 6 a 8: traducción hecha en la corte de Alfonso el Sabio* (Estudios árabes e islámicos 3), Zaragoza, 2005, pp. 87–190; Ibn Abī l-Rijāl, *Albohazen Haly filii Abenragel libri de iudiciis astrorum: summa cura & diligenti studio de extrema barbarie vindicati, ac latinitati donati*, Basilea, 1551, pp. 296–351.

⁴⁷ Sh. SELA, *Abraham Ibn Ezra on elections, interrogations, and medical astrology: A parallel Hebrew-English critical edition of the Book of elections (3 versions), the Book of interrogations (3 Versions), and the Book of the luminaries*, Leiden, 2011.

All these texts on the *ikhtiyārāt* differ in one respect significantly from the *ikhtiyārāt* part in the almanacs and ephemerides. The literary texts described methods which were based on a complete horoscope with the astrological houses. The almanacs considered only the daily aspects of the moon. A literary description of this system is found in a brief text ascribed to al-Kindī.⁴⁸ It describes a system based on the aspects of the moon, which has direct parallels in the judgments found in the almanacs. However, this system seems never have been integrated into the general literature on astrology were the top level system prevailed. Nevertheless, it had a literary predecessor in a Greek text, possibly by Theon of Alexandria (4th century AD), in which the process of producing an ephemeris is describe. For the astrological judgments the harmonious and disharmonious aspects of the moon with the planets are used as indicators, filled into a special column.⁴⁹

Besides the two systems, there was an even simpler method, which did not involve any astronomical data. The concept of the planetary week did not only attribute a planet as a ruler to each day of the week, but the planets were also thought to be the rulers of the hours of the day and the night.⁵⁰ This scheme was fixed and repeated itself every week. The concept of the planetary week is described in the astrological literature.⁵¹ However, traces are also found in documentary material. The ruler of the day and the ruler of the hour are written in the middle of a horoscope for the year 1002 AD.⁵²

These three levels of astrological methods, the *ikhtiyārāt* based on the individual nativity, as found in the astrological literature on the top, the *ikhtiyārāt* based on planetary aspects as found in the ephemerides and almanacs in the middle, and the planetary ruler of the hours, as found in the scheme of the planetary

⁴⁸ MS Leiden, UB, Or. 199; German translation: E. Wiedemann, Über einen astrologischen Traktat von al Kindi, *Archiv für Geschichte der Naturwissenschaften und der Technik* 3 (1912), pp. 224–226.

⁴⁹ N. B. Halma, *Ptolemaïou kai Theōnos procheiroi kanones: Tables manuelles astronomiques de Ptolémée et de Théon III*, Paris, 1825, pp. 38–42 (edition of the text and French translation); H. D. CURTIS and F. E. ROBBINS, An ephemeris of 467 A. D., *Publication of the observatory of the Univeristy of Michigan* 6,9 (1934), pp. 77–100, p. 83 (partial edition and partial English translation); A. TIHON, *Le "Petit Commentaire" de Théon d'Alexandrie aux Tables faciles de Ptolémée: Histoire du texte, édition critique, traduction* (Studi e testi 282), Rome, 1978, p. 359 (manuscripts); J. B. J. DELAMBRE, *Histoire de l'astronomie ancienne*, Paris, 1817, pp. 635–637.

⁵⁰ For the planetary week in Antiquity and in de Indian tradition see S. BENNEDIK, *Die Siebenplanetenwoche in Indien*, Diss. Univ. Bonn, 2007 (electronic publication: http://hss.ulb.uni-bonn.de/diss_online).

⁵¹ ABŪ MA'ŠAR, *Abbreviation*, pp. 66–69; QABĪŠĪ, *Introduction*, pp. 88–89; ABŪ MA'ŠAR, *Liber introductorii maioris ad scientiam judiciorum astrorum*, III, ed. R. LEMAY, Naples, 1995, pp. 417–418 [Arabic text]; for a German translation of this text see THOMANN, *Arabische Ephemeriden, Almanache und Horokope* [forthcoming].

⁵² J. THOMANN, An Arabic horoscope on parchment with a square diagram for AD 1002 (P. Vind. Inv. A. Perg. 236), in T. DERDA, A. ŁAJTAR and J. URBANIK (eds.), *Proceedings of the 27th International Congress of Papyrology, Warsaw, 29 July – 3 August 2013* (The Journal of Juristic Papyrology, Supplement 28), Warsaw, 2016, pp. 1085–1094.

week at the bottom correspond to different levels of competence on the side of the astrologer. These levels of competence were well described in a special treatise by al-Qabīṣī.⁵³ On the top level the astrologer must have been trained to operate with general astronomical tables, the *Zīj*es, and to do heavy calculations. In the middle it sufficed to be able to read an almanac. At the bottom everybody could count the hours with his fingers in order to find the ruler of the hour. On the side of the costumers, the three levels could well correspond to a certain degree to his social status.

The documentary examples have no archaeological context. We know only that they were probably found in the region of the Fayyūm or further to the South. However, a number of almanacs were found among the documents from the Cairo Geniza.⁵⁴ They are very similar in layout and content to the almanacs shown earlier. There is one singular case in which an astrological document was found in a regular excavation. Some hundred Arabic documents were excavated in al-Fustat, among them an astrological responsory.⁵⁵ The building where it was found belonged to a group of houses, which have been characterized as “the worker’s quarter” and “low-income housing”.⁵⁶ These houses had less stable fundaments and were lacking any ornaments. The presence of an astrological document at such a place seems to indicate that astrology of a middle level was not limited to the elite or the rich bourgeoisie but found its way to the proletarians.

In conclusion, some further thoughts shall be briefly outlined. This study has taken as its starting point the concept of two types of time, “ritual time” and “civil time”, which were displayed in the public sphere by clocks. In the following, documentary evidence made it clear that a third type of time has to be taken into consideration: “cosmic time”. It had its public appearance too. On the Talisman Gate in Baghdad the divine person of the moon as the dominant ruler of “cosmic time” was presented, between the divine beings of the lunar nodes.⁵⁷ In this model “civil time” serves interaction with society, “ritual time”

⁵³ S. SHALHŪB and N. AL-QĀDIRĪ, Taḥqīq naṣṣ “Risāla fī imtiḥān al-munajjimīn” li-‘Abd al-‘Azīz ibn ‘Uthmān al-Qabīṣī al-munajjim, *Journal for the History of Arabic Science* 15, 1 (2011), pp. 105–186; see also J. THOMANN, The Second Revival of Astronomy in the Tenth Century and the Establishment of Astronomy as an Element of Encyclopedic Education, *Asiatische Studien* 71 (2017), pp. 907–957, especially pp. 923–928.

⁵⁴ B. GOLDSTEIN and D. PINGREE, Astrological almanacs from the Cairo Geniza, *Journal of Near Eastern Studies* 38 (1979), pp. 153–175, 231–256.

⁵⁵ D. S. RICHARDS, Written documents, in W. B. KUBIAKL and G. T. SCANLON (eds.), *Fuṣṭāt excavation final report II* (American Research Center in Egypt Reports 2), Wiona Lake, 1989, pp. 64–80, especially p. 68.

⁵⁶ G. T. SCANLON, Fustat, in *The Oxford encyclopedia of archaeology in the Near East*, New York, 1997, pp. 365–368, especially p. 367; W. B. KUBIAKL and G. T. SCANLON (eds.), *Fuṣṭāt excavation final report II*, p. 11.

⁵⁷ F. SARRE and E. HERZFELD, *Archäologische Reise im Euphrat- und Tigris-Gebiet* III (Forschungen zur islamischen Kunst 1), Berlin, 1911, pl. X–XI.

is directed towards the transcendental, and “cosmic time” keeps contact with the cosmos, but is directed to the individual itself. Each type of time has its own rulers, structures and management targets. Concerning rulership “civil time” is implicitly atheistic, “ritual time” is decidedly monotheistic, and “cosmic time” is glaringly polytheistic. In structure “civil time” is homogeneous, “ritual time” is dichotomic, and “cosmic time” is highly inhomogeneous. “Civil time” serves to manage interpersonality, “ritual time” serves to manage otherworldliness, and “cosmic time” promises to manage self-fulfillment.⁵⁸

⁵⁸ For the “egocentric perspective” of astrology see S. M. MOZAFFARI, The effect of astrological opinions on society: A preliminary view, *Trames* 4 (2012), pp. 359–368, especially p. 359.