

BENJAMIN ANDERSON

Public clocks in late antique and early medieval Constantinople*

With 1 illustration

Abstract: The evidence for the location and date of the public clocks located in the monumental core of Constantinople in late antiquity and the early middle ages is presented and analyzed. Clocks were positioned at key points in the city center, including the Basilica, the entry to the imperial palace, and the Hagia Sophia. Although the horologion of Hagia Sophia is often assumed to date to the sixth century, the available sources can only provide a late ninth-century *terminus ante quem* for its construction. Continuing investment by elite patrons in the construction and maintenance of public clocks is explained in part by the devices' ability to inspire wonder in viewers and to convey an impression of technical mastery.

Public clocks, or horologia, were common elements of the urban landscapes of the ancient Mediterranean.¹ The best-preserved example is the Hellenistic Tower of the Winds in Athens, which, when fully functional, boasted nine sundials on its facade and an elaborate water clock in the interior.² The tradition was maintained in late antiquity. A horologion stood in the late antique forum of Antioch, and a sixth-century ekphrasis by Prokopios of Gaza is devoted to a horologion in the center of his home city.³

It is therefore not surprising that horologia were also found in Constantinople. Although there is no archaeological evidence for these structures, the textual sources are substantial and permit us to establish four relative locations for clocks, and to propose a hypothetical location for a fifth. As these sources have never been systematically assessed, the primary task of this paper is to present and evaluate the available evidence.⁴ The first section addresses four locations of public clocks in the monumental core of the city, understood here as the vicinity of the Augustaion and Hagia Sophia.⁵ The second section discusses the more complicated problem of the location and date of the horologion of Hagia Sophia. The conclusion contains preliminary remarks on the cultural-historical significance of these monuments.

* A version of this paper was delivered at the Thirty-Seventh Annual Byzantine Studies Conference, DePaul University, Chicago, Illinois, 20–23 October 2011. I am grateful to Ewald Kislinger / Vienna and to two anonymous reviewers for their comments on an earlier draft.

¹ See in general G. DOHRN-VAN ROSSUM, *Die Geschichte der Stunde. Uhren und moderne Zeitordnung*. Munich 1992, 24–34 and *DNP s.v. Uhr*.

² J. V. NOBLE – D. J. DE SOLLA PRICE, *The Water Clock in the Tower of the Winds*. *AJA* 72 (1968) 345–355; and H. J. KIENAST, *The Tower of the Winds in Athens: Hellenistic or Roman?* In: *the Romanization of Athens*, ed. M. C. Hoff and S. I. Rotroff. Oxford 1997, 53–65.

³ For Antioch see Malalas XIII 30 (261 THURN). For Gaza see H. DIELS, *Über die von Prokop beschriebene Kunstuhr von Gaza*. Berlin 1917. Further, B. BÄBLER – A. SCHOMBERG, *Prokop. Die Kunstuhr in Gaza*, in: *Rose di Gaza. Gli scritti retorico-sofistici e le Epistole di Procopio di Gaza*, a cura di E. Amato. Alessandria 2010, 528–559.

⁴ Previous discussions include: E. M. ANTONIADES, *Ἐκφρασις τῆς Ἁγίας Σοφίας*. Athens 1907, I 119–122; Ph. KOUKOULES, *Βυζαντινῶν βίος καὶ πολιτισμὸς II/2*. Athens 1948, 89–90; R. JANIN, *Constantinople byzantine. Développement urbain et répertoire topographique*. Paris 1964, 102–103; *ODB s.v. Horologion*.

⁵ There are limited references to further clocks. One in the Forum of Constantine is mentioned in *Parastaseis* 39 (43 PREGER) and in *Patria* III 11–12 (218 PREGER). In both cases the past tense is employed; the clock may be a phantom. By the tenth century there were clocks at the Church of the Holy Apostles and the neighboring Church of All Saints. See *De ceremoniis* II 7 (535–536 REISKE). The association between the Modion and a horologion in *Parastaseis* 12 (27–28 PREGER) and *Patria* II 51 (179 PREGER) results from a corruption. See A. BERGER, *Untersuchungen zu den Patria Konstantinupoleos (Poikila Byzantina 8)*. Bonn 1988, 339.

I. HOROLOGIA OF THE AUGUSTAION AND SURROUNDINGS

The earliest reference to a public clock in the monumental core of Constantinople comes from a late fourth-century protocol preserved in the Book of Ceremonies: the emperor enters Hagia Sophia after passing through the Augustaion opposite the horologion.⁶ Thus the horologion marks the point at which the emperor leaves the Mese and enters the Augustaion. This is presumably the same clock mentioned by John Lydos in a passage on the erection of a statue of Theodosius in the Augustaion “near the horologion of the city.”⁷ These two passages allow us to place the horologion at the western extremity of the Augustaion or in the space between the Augustaion and the basilica. It thus stood very close to the Milion, and just as that monument possessed an official status as a zero point in the measurement of road distances, John’s description of the horologion as the “clock of the city” (ὠρολόγιον τῆς πόλεως) suggests that it possessed an official status in the measurement of time.

The same clock is mentioned by John Malalas, who writes that in the year 538 “the horologion by the Augustaion and the basilica was moved.”⁸ This sentence follows a description of the redecoration of the Chalke. The two statements may be related, in which case the horologion was moved to the palace gate.⁹ The clock originally installed in the Augustaion would then be the same clock described in a seventh-century Chinese account of Constantinople preserved in the royal annals of the Tang dynasty. The mechanism, which stood outside the palace, consisted of a series of twelve “golden” spheres that dropped on the hour, emitting a loud clang. Next to the spheres stood the “golden” figure of a man, who did not form part of the mechanism.¹⁰

One further text may refer to this clock. According to a patriographic account possibly dating to the tenth century, during the reign of Constantine V (741–775) a clock, “artfully crafted in copper”, fell and broke to the “consternation and despair of the entire senate.” The text attributes the repair of the clock to one Hypatios, the (possibly legendary) founder of the monastery of the Hodegoi.¹¹ The involvement of the senators, who in the eighth century still met in the so-called Magnaura by the Chalke, suggests that the reference is to the public clock in that gate.¹²

If all of these sources describe the same clock, then the story of Hypatios would represent the latest mention of the earliest public clock in Constantinople, which is first attested in the late fourth century and was moved to a new location in the sixth century. The story of Hypatios could be interpreted variously as a purely legendary account of a monument vaguely remembered but long gone, as an attestation of an actual repair in the eighth century that had disappeared by the tenth, or even as a reference to a monument still operating at the time of its composition in the tenth century.

⁶ De ceremoniis I 91 (414–415 REISKE). For the date of the protocol, see V. TIFTIXOGLU, Die Helenianai nebst einigen anderen Besitzungen im Vorfeld des frühen Konstantinopel, in: Studien zur Frühgeschichte Konstantinopels (ed. H.-G. BECK) (MBM 14). Munich 1973, 49–120, here 79–83.

⁷ John Lydos, De magistratibus III 35 (188 BANDY). For the location of this statue, see F. A. BAUER, Stadt, Platz und Denkmal in der Spätantike. Mainz 1996, 159, n. 81.

⁸ Malalas XVIII 85 (404 THURN). I understand Theophanes 216 (DE BOOR) as a corruption of this passage. Thus also C. MANGO and R. SCOTT, The Chronicle of Theophanes Confessor. Oxford 1997, 314, n. 4.

⁹ P. SCHREINER, Eine chinesische Beschreibung Konstantinopels aus dem 7. Jahrhundert. *IstMitt* 39 (1989) 439–505, here 501–502.

¹⁰ SCHREINER, Beschreibung 494–495, for a translation of the description; and 500–505 for an analysis, including a hypothetical reconstruction of the mechanism.

¹¹ C. ANGELIDI, Une texte patriographique et édifiant: le ‘discours narratif’ sur les Hodègoi. *REB* 52 (1994) 113–149, here 141–145; and at 113 for the tenth-century date.

¹² There is also a similarity of color between the “bronze” clock of the patriographer and the “gold” clock of the Chinese ambassadors. On the location of Senate meetings, see A. BERGER, Die Senate von Konstantinopel. *Boreas* 18 (1995) 131–142.

A second clock is described in an epigram preserved in the Palatine Anthology, which bears the lemma “on the base of the horologion in the ἄψις in the basilica.”¹³ The epigram describes the clock as the gift of Justin and his wife Sophia, placing us in the reign of Justin II (565–578). The ἄψις probably refers to a gate at the northeastern corner of the Basilica.¹⁴

The final distich of the epigram introduces a complication: “That which had been stolen, Julian found, he who guides the throne of justice with incorruptible hands.” This has been seen as a reference to the removal of the clock from the Augustaion related by Malalas, and the “Julian” has been identified with an urban prefect of 565–566.¹⁵ Here we may also note a passage in which John Lydos laments that the law courts of Constantinople no longer possess any means of telling the time of the day.¹⁶ This could suggest that the removal of the clock between the Augustaion and Basilica was perceived as a deprivation, and the gesture of Justin and Sophia as a restoration, although in this case the epigram would come uncomfortably close to labeling the recently deceased Justinian as a thief. A second possibility is that the epigram was originally four lines in length, and that the final distich records a theft and recovery that occurred between the initial installation of the clock and the epigraphic sylloge of Gregory of Campsa in the ninth century, probably the immediate source for the epigram’s entry into the Palatine Anthology.¹⁷

We cannot say if the horologion of Justin and Sophia was a sun-dial or a water-clock, but two further epigrams from the Palatine Anthology certainly describe a sun-dial.¹⁸ Both name a Sergios as patron of the clock, described in the first as “witness and initiate of the Trinity,” and in the second as “high priest” (ἀρχιερεύς). An identification with Patriarch Sergios I (610–638) seems assured.

The epigrams appear to describe different aspects of the same device.¹⁹ The first states that it “announces seven times the eternally revolving necessity of the vault of heaven.” The second epigram employs elaborate language to describe a small stone that embraces the day “by means of a clever dial and a dark engraving.” Both elements may be compared to the geared sundial-calendar in the collection of the Science Museum in London, roughly dated to the sixth century, whose front plate includes scales for marking the hours of the day and the seven days of the week.²⁰

The first epigram states that the clock’s site had formerly been a shady garden, but was now bright and sunlit. This is hardly sufficient to establish the clock’s location, although the open space may imply a public area. It may be worth noting that a seventh-century Patriarch named Thomas (either Sergios’s predecessor, Thomas I [607–610], or Thomas II [667–669]) is credited with the construction

¹³ *Anthologia Palatina* IX 779 (III 448 BECKBY).

¹⁴ Following AL. CAMERON, Theodorus τρισέπαρχος. *GRBS* 17 (1976) 269–286, here 271–273. For an argument identifying the ἄψις with both the Temple of Tyche and the Octagon, see P. SPECK, Die kaiserliche Universität von Konstantinopel (*Byzantinisches Archiv* 14). Munich 1974, 101–103.

¹⁵ For a relationship to the passage in Malalas, see SPECK, Universität 101, n. 58; followed by BERGER, Untersuchungen 272–273. For the prefect (*PLRE* III, Iulianus 15), see AL. CAMERON, Some prefects called Julian. *Byz* 47 (1977) 42–64, here 56–64.

¹⁶ John Lydos, *De magistratibus* II 16 (108 BANDY).

¹⁷ The epigram fulfills the two criteria for a derivation from Gregory’s sylloge provided by AL. CAMERON, *The Greek Anthology: from Meleager to Planudes*. Oxford 1993, here 110: “the poem should appear to be a genuine inscription (and so will normally be anonymous), and be equipped with a lemma noting its provenance ... which could not have been deduced from the poem.” CAMERON, Theodorus 269, explicitly proposes derivation of AP IX 779 from Gregory’s sylloge, but CAMERON, Some prefects 64, toys with an origin in the Cycle of Agathias.

¹⁸ *Anthologia Palatina* IX 806 and 807 (III 460 BECKBY). On these epigrams, see F. ANGIÒ, La meridiana del patriarca Sergio (*Anth. Pal.* IX 806 e 807). *Nea Rhome* 3 (2006) 123–130.

¹⁹ ANGIÒ, Meridiana 129–130 weighs the possibility that the second epigram is a “variation,” possibly competitive, on the first.

²⁰ J. V. FIELD – M. T. WRIGHT, Gears from the Byzantines: a Portable Sundial with Calendrical Gearing. *Annals of Science* 42 (1985) 87–138. See also J. V. FIELD – M. T. WRIGHT, Early Gearing: Geared Mechanisms in the Ancient and Mediaeval World. London 1985, 5–13 and 18–23.

of a major complex, the Thomaïtes, associated with the Patriarchate and located between Hagia Sophia and the Augustaion.²¹ An open space in the area between the Hagia Sophia and the Augustaion would be a fitting location for Sergios's commission, but this proposal must remain purely hypothetical.

Of the three clocks considered here, the first seems to have had an official character, as is indicated by Lydos's use of the phrase "clock of the city," its reinstatement at the Chalke, and its repair at imperial and senatorial behest in the eighth century. It must also have been the most impressive of the three, being a relatively elaborate mechanical clock with figural decoration. The second and third clocks, donations of an imperial couple and a patriarch, demonstrate the significance of this genre of dedication for very high-ranking patrons. The temporal span of these dedications, stretching from the fourth to the seventh centuries (and beyond?), is also noteworthy. With the exception of churches, it would be difficult to find another type of dedication that was consistently maintained over the same period.

II. THE HOROLOGION OF HAGIA SOPHIA

The earliest clearly datable source that refers to a horologion at Hagia Sophia is the protocol for a triumph celebrated by Basil I in 878. The procession moved from the Milion across the Augustaion to the horologion, after which the emperors removed their crowns in the changing room and entered the narthex of Hagia Sophia.²² This horologion is mentioned in numerous other texts collected in the Book of Ceremonies, and is usually set between the Augustaion and the narthex of Hagia Sophia.²³ Additional topographical indicators for the location of this horologion appear in the late ninth-century *Διήγησις περι τῆς Ἁγίας Σοφίας* (hereafter *Diegesis*), where the horologion is twice mentioned as standing next to the baptistery, and once as bordering upon the Augustaion.²⁴

The most extensive description of the horologion of Hagia Sophia appears in the account of Hārūn ibn Yahyā, who was in Constantinople as a prisoner around 881.²⁵ Two versions of Hārūn's account exist, both in tenth-century texts: the *Kitāb al-a'lāq al-naḥīsa* of Ibn Rusta, and the *Kitāb dalā'il*

²¹ For analysis of the sources, see R. GUILLAND, *Études de topographie de Constantinople byzantine*, I–II (*BBA* 37). Berlin 1969, here II 14–19. There is no consensus regarding the precise location of the Thomaïtes. Proposing an identification with the Justinianic Senate building on the Augustaion: R. H. W. STICHEL, *Sechs kolossale Säulen nahe der Hagia Sophia und die Curia Justinians am Augusteion in Konstantinopel*. *Architectura* 30 (2000) 1–25, here 24. Proposing an identification with a partially preserved complex at the southwest of Hagia Sophia: K. DARK – J. KOSTENEC, *The Hagia Sophia Project*, Istanbul. *Bulletin of British Byzantine Studies* 37 (2011) 48–68, here 57, n. 32. For discussion of the relation between the Thomaïtes and the Makron in the text of Nicetas Choniates, see A. PONTANI, *Niceta Coniata. Grandezza e catastrofe di Bisanzio*, II. Milan 2001, 573–574, n. 108.

²² *De ceremoniis*, Appendix to Book I (502 REISKE); newly edited in J. F. HALDON, *Three treatises on imperial military expeditions* (*CFHB* 28). Vienna 1990, text at 144, and see the commentary at 268 for the date of the procession. Two texts possibly dating from the reign of Michael III, but incorporating later revisions, also mention this horologion: *De ceremoniis* II 9 and I 27 (63–64 and 156 REISKE).

²³ *De ceremoniis* I 1 (14 REISKE), I 2 (38 REISKE), I 9 (63–64 REISKE), I 38 (192 REISKE), I 53 (268 REISKE), I 96 (439 REISKE). A partial exception is I 27 (156 REISKE), which names the Horologion as a station between the narthex and the western entrance to the church. Whether one adopts the localization of Schneider (as note 29) or my own alternative, both discussed below, this would be a slight detour.

²⁴ *Diegesis* 82 and 87 (PREGER), for the baptistery, and 104, for the Augustaion. For the date of the text, see G. DAGRON, *Constantinople imaginaire: études sur le recueil des Patria*. Paris 1984, 265–269, suggesting the reign of Basil I; A. BERGER, *Accounts of medieval Constantinople: the Patria* (*Dumbarton Oaks Medieval Library* 24). Cambridge 2013, xi with xix, n. 12 and 325, n. 18, suggesting a *terminus post quem* of 886.

²⁵ For the date of his visit, see J.-C. DUCÈNE, *Une deuxième version de la relation de Hārūn ibn Yahyā sur Constantinople*. *Der Islam* 82 (2005) 241–255, here 249–250.

al-qibla of Ibn al-Qāss.²⁶ The version in Ibn Rusta describes a construction (*majlis*)²⁷ above the west door of the church, consisting of twenty-four small doors, each being one *shibr* (span) square. There is thus a door for each hour of the day and night, which opens and closes by itself upon the passing of that hour.²⁸ The clock is said to be the work of Apollonios. The version relayed by Ibn al-Qāss is slightly shorter. It agrees in placing the structure above the west door of the church, in describing doors of one span's width that open and close by themselves, and in relating a local attribution of the mechanism to Apollonios. However, Ibn al-Qāss mentions only twelve doors.

Hārūn cannot be describing the clock of the Chalke, which, according to the Chinese account, possessed an entirely different mechanism. Nor can this be the sundial installed by Patriarch Sergios. Its location at the west of the church suggests that it is identical with the horologion of the Book of Ceremonies and the Diegesis.

The most extended discussion of the localization of this device is that of Schneider, who places it in a barrel-vaulted room (Illustration 1, Location A) to the west of the so-called southwest vestibule (Illustration 1, Location B).²⁹ Although this localization has recently been questioned, it has never been thoroughly evaluated, nor has an alternate location for the horologion been proposed.³⁰ As Dark and Kosteneč have argued in a series of recent publications, the barrel-vaulted room (Illustration 1, Location A) is contemporary with the Justinianic rebuilding of the church and originally served as an antechamber to a larger complex, since destroyed, that was associated with the Patriarchate.³¹ This need not contradict an interpretation of the room as the horologion, but there are further reasons for doubt. First, Schneider seems to have understood the horologion as a free-standing mechanism occupying a large space.³² In fact, Hārūn's description makes it clear that the device consisted of a series of small doors installed above a larger door.

Such a clock could conceivably have been installed above the eastern door of the barrel-vaulted room. However, by the ninth century this door was separated from the southwest vestibule of the church by a very small room (Illustration 1, Location C).³³ This cramped space cannot have accommodated the imperial ceremonies that occurred in front of the horologion. For example, a tenth-century

²⁶ Ibn Rusta: ed. M. J. DE GOEJE, *Bibliotheca Geographorum Arabicorum* 7. Leiden 1892, description of clock at 125–126. Translations by A. VASILIEV, Harun-ibn-Yahya and his description of Constantinople. *Seminarium Kondakovianum* 7 (1932) 149–163, here 160; and G. WIET, *Les Atours Précieux*. Cairo 1955, 141. Ibn al-Qāss: DUCÈNE, *Deuxième version* 245–246 (text) and 248 (translation).

²⁷ VASILIEV, Harun-ibn-Yahya 160 translates “structure”; WIET, *Atours* 141 “salle.” The passage could be literally translated as “a gathering of twenty-four small doors”

²⁸ A similar mechanism is included in al-Jazarī's description in the *Kitāb fī ma'rīfat al-hiyal al-handasiyya* of the clepsydra that he constructed in the early 13th century at the behest of the Artuqid ruler of Āmid: *The Book of Knowledge of Ingenious Mechanical Devices*, transl. D. R. Hill. Dordrecht 1974, here 18.

²⁹ A. M. SCHNEIDER, *Die Grabung im Westhof der Sophienkirche zu Istanbul (Istanbulischer Forschungen 12)*. Berlin 1938, here 41–44. Similarly S. EYICE, *Ayasofya horologion'u ve muvakkithanesi. Ayasofya Müzesi Yılığ* 9 (1983) 15–24.

³⁰ For skepticism see K. DARK – J. KOSTENEČ, *A new archaeological study of Hagia Sophia, Istanbul*, in: *Proceedings of the 22nd International Congress of Byzantine Studies, Sofia 2011. Volume 1: Plenary Papers*. Sofia 2011, 213–237, here 221; and DARK – KOSTENEČ, *Hagia Sophia Project 2011*, 57.

³¹ K. DARK – J. KOSTENEČ, *The Byzantine Patriarchate in Constantinople and the Baptistery of the Church of Hagia Sophia. Architectura* 36 (2006) 113–130, here 116–123; K. DARK – J. KOSTENEČ, *The Hagia Sophia Project, Istanbul: Report on the 2009 Season. Bulletin of British Byzantine Studies* 36 (2010) 40–49, here 43–44 (for the Justinianic date); DARK – KOSTENEČ, *New Archaeological Study 220–222*; K. DARK – J. KOSTENEČ, *Paul the Silentiary's Description of Hagia Sophia in the Light of New Archaeological Evidence. BSI* 69, *Supplementum* (2011) 88–105, here 90–94; DARK – KOSTENEČ, *Hagia Sophia Project 2011*, 56–58.

³² SCHNEIDER, *Grabung 44*: “Die ... Kunststuh muss in einem größeren Bau untergebracht gewesen sein: der tonnenüberwölbte Raum würde sich dazu ganz gut eignen.”

³³ For an account of this area, see DARK – KOSTENEČ, *The Hagia Sophia Project 2009*, 44–48.

protocol from the Book of Ceremonies describing the Christmas celebrations relates that the rulers stand “at their customary spot, that is in front of the horologion,” where they are acclaimed by the singers and the people (ὁ λαός): “The singers say ‘Many, many, many.’ The people: ‘Many years, for many years.’”³⁴ An assembly of this size (the emperors and their attendants, a choir, and a body large enough to count as ὁ λαός) can hardly have squeezed into the tiny chamber before the door of Schneider’s “Horologion.”³⁵ Nor does it seem likely that a horse, stated in one protocol to await the eparch at the horologion, would have been permitted within the vestibule.³⁶

It seems more likely that the horologion was installed above the southern door of the southwest vestibule (Illustration 1, Location D).³⁷ This entryway, today partially obscured by a late Ottoman roof, opened onto a space to the west of the baptistery and north of the Augustaion.³⁸ This area would have been large enough for the acclamations described in the Book of Ceremonies. The wall above the lintel, which is slightly over five meters in breadth, could accommodate the clock’s twenty-four doors of one *shibr* each, as described in Ibn Rusta’s version of Hārūn’s account.³⁹ This location also better fits the statement of the Diegesis that the horologion stood next to the baptistery (Illustration 1, Location E).

Schneider, among others, assumed that the horologion of Hagia Sophia was Justinianic.⁴⁰ The textual sources can only provide a *terminus ante quem* of 878 for its construction. The archaeological evidence is more ambiguous. If, as argued here, the clock stood at the southern door of the southwest vestibule, then the question of that vestibule’s construction becomes important. The structure is usually assumed to be post-Justinianic, but varying opinions have been expressed on its precise date. Cormack and Hawkins, relying on the hypothetical identification of the room above the vestibule with the “large sekreton” of the sources, argued for a date in the reign of Justin II (565–578).⁴¹ Schneider, on the other hand, believed that it was contemporary with the metal and wood doors bearing the monogram of Theophilos (829–842) installed in its southern entrance.⁴²

These doors merit our special attention, as they would have stood beneath the horologion in the reconstruction proposed here. Some authors have considered them a pastiche of late antique and medieval elements, while others see them as a newly fashioned work of the ninth century.⁴³ They are dated by monogrammatic inscriptions set in silver inlay, which originally invoked the Emperor Theophilos, the Empress Theodora, and the Patriarch John, and provided the date of 838/39. Shortly

³⁴ De ceremoniis I 2 (38 REISKE).

³⁵ Note also e.g. De ceremoniis I 96 (439 REISKE), the emperor acclaimed by both factions at the horologion.

³⁶ De ceremoniis I 53 (268 REISKE).

³⁷ A similar location is indicated by the map in C. MANGO, *The Brazen House. A Study of the Vestibule of the imperial Palace in Constantinople* (*Arkaeologisk-kunsthistoriske Meddelelser* 4,4). Copenhagen 1959, fig. 1.

³⁸ On the location and limits of the Augustaion see recently STICHEL, *Säulen*.

³⁹ EYICE, *Ayasofya* 16 estimates that one *shibr* equals ca. 22–24 cm. This accords with the standard measurement of a handspan.

⁴⁰ SCHNEIDER, *Grabung* 44. Thus also GUILLAND, *Études* I 224 (applying the account of the Diegesis to the sixth century); F. B. FLOOD, *The Great Mosque of Damascus: Studies on the Making of an Umayyad Visual Culture*. Leiden 2001, here 160–162. At 162, n. 110, he cites (via C. STRUBE, *Die westliche Eingangsseite der Kirchen von Konstantinopel in justinianischer Zeit. Architektonische und quellengeschichtliche Untersuchungen* [*Schriften zur Geistesgeschichte des östlichen Europa* 6]. Wiesbaden 1973, here 68, n. 242) the twelfth-century chronicle of Ralph of Diceto (ed. W. STUBBS, *The Historical Works of Master Ralph de Diceto*. London 1876, I 94) as evidence for a sixth-century date. The passage in question is a translation of the Diegesis.

⁴¹ R. CORMACK – E. J. W. HAWKINS, *The Mosaics of St. Sophia at Istanbul: the Rooms above the Southwest Vestibule and Ramp*. *DOP* 31 (1977) 175–251, here 199–201.

⁴² SCHNEIDER, *Grabung* 42 with 7, n. 1.

⁴³ For the former, see E. H. SWIFT, *The Bronze Doors of the Gate of the Horologium at Hagia Sophia*. *Art Bulletin* 19 (1937) 137–147. For “a single campaign,” see L. BRUBAKER – J. HALDON, *Byzantium in the Iconoclast Era, c. 680–850. A History*. Cambridge 2011, here 435.

thereafter John's name was replaced with that of Theophilos's newborn son, the future Emperor Michael III (842–867), and the year was updated to 840/41.⁴⁴

Thus the clock stood above a door that was either installed or substantially renovated around 840. The clock itself is first mentioned in connection with a triumph of 878, and the most extensive description of its mechanism known to us derives from a visit of ca. 881. Given the present state of knowledge regarding the date of construction of the southwest vestibule, it remains possible that the clock was installed in the later sixth century and simply went unmentioned for three centuries. But I propose that a date in the ninth century, especially in the reign of Theophilos, is more plausible. This proposal finds circumstantial support from three sources.

The first is the association in the sources between Theophilos and the patronage of clocks and other mechanical devices. According to the chronicle of Pseudo-Symeon, Leo the Philosopher installed a clock in the imperial palace during the reign of Theophilos.⁴⁵ A clock in the lower palace is mentioned in numerous passages in the Book of Ceremonies, from which a localization by the Chrysotriklinos may be derived.⁴⁶ A further mechanical commission of Theophilos is described in the chronicle of Symeon the Logothete, according to which his master of the mint constructed two golden organs and a gold tree in which birds “warbled musically by means of some device.”⁴⁷

The second is Hārūn's statement that the doors were attributed by his local source to Apollonios. While Apollonios was frequently associated in medieval lore with magic and, in particular, the enchantment of statues, it is also noteworthy that two ninth-century sources, the Life of the Empress Theodora and the chronicle of George the Monk, label Theophilos's Patriarch John, named in the original inscriptions of the bronze doors, “the new Apollonios.”⁴⁸ John began his career at the monastery of the Hodegoi, the same monastery whose founder, according to the patriographic text discussed above, was a clocksmith.⁴⁹

Third is the development of the middle Byzantine rituals for imperial entrances to and exits from Hagia Sophia. It has been argued by Brubaker and Haldon that Theophilos was responsible for “the reconfiguration of the imperial transit space of the Great Church,” creating new transitional points at the southwest vestibule and the Holy Well at the southeast.⁵⁰

Whether the horologion of Hagia Sophia was constructed as early as the sixth or as late as the ninth century, the ninth and tenth centuries were the moments of its greatest ideological significance, when it found most frequent mention in the sources. I know of only one later text that mentions it. The thirteenth-century geographical treatise of al-Qazwīnī contains an account of Constantinople attributed to the twelfth-century traveler al-Harawī. While Harawī may have visited Constantinople, the text describing the horologion is closely related to Ibn al-Qāss's version of Hārūn's account.⁵¹

⁴⁴ C. MANGO, When was Michael III born? *DOP* 21 (1967) 253–258.

⁴⁵ Pseudo-Symeon, *Chronographia* 681–682 (BEKKER).

⁴⁶ *De ceremoniis* 91, 119, 122–123, 518, 526–527, 529–530, 580, 586, 605, 618, 622, and 625 (REISKE). For the relative location of this clock, see J. M. FEATHERSTONE, The Great Palace as Reflected in the *De Ceremoniis*, in: *Visualisierungen von Herrschaft: Frühmittelalterliche Residenzen – Gestalt und Zeremoniell*, ed. F. A. Bauer (*Byzas* 5). Istanbul 2006, 47–61, here 52.

⁴⁷ Symeon Magister, *Chronicon* (218 WAHLGREN).

⁴⁸ Life of Theodora, chapter 5 (ed. A. MARKOPOULOS, Βίος τῆς αὐτοκράτειρας Θεοδώρας [*BHG* 1731]. *Symm* 5 (1983), 249–285, here 261); Georgius Monachus 798 (DE BOOR).

⁴⁹ For John's beginnings see the Letter of the Three Patriarchs (ed. J. A. MUNITIZ *et alii*. Camberley 1997, 111–113 and 177). On John, see especially P. MAGDALINO, L'orthodoxie des astrologues: la science et la divination à Byzance (VIIe–XIVe siècle) (*Réalités Byzantines* 12). Paris 2006, 56–60. For Hypatios, founder of the Hodegoi, see n. 11 above.

⁵⁰ BRUBAKER – HALDON, *Byzantium* 435–439.

⁵¹ *Kosmographie*, ed. F. WÜSTENFELD, Göttingen 1848, here II 407. Translation in A. VASILIEV, Quelques remarques sur les voyageurs du Moyen Âge à Constantinople, in: *Mélanges Charles Diehl*. Paris 1930 I 293–298, here 296. The fragment

III. SIGNIFICANCE

The above discussion presents a picture of continuity in the construction and maintenance of public clocks from the fourth through the tenth centuries, including substantial activity in the seventh, eighth, and ninth centuries. Whatever crises may have struck the city during the early middle ages, maintenance of public clocks remained a priority. The significance of clocks in the reigns of Heraclius, Constantine V, and Theophilos raises an obvious question: why did these monuments continue to command imperial and patriarchal patronage during a period when other types of monumental dedication, such as public portrait monuments and baths, were abandoned?

The public clocks of Constantinople probably played a liturgical role. The primary function of the horologion of Hagia Sophia, at least, may have been to ensure proper observation of the liturgical hours. The horologion of Hagia Sophia also played a role in imperial ritual, serving as a backdrop for the acclamation of the emperors and as a point of transition between the Augustaion and the church. A handful of passages in the Book of Ceremonies cite numerical hours demarcating both daily and occasional rituals. All relate to events in the lower palace, and therefore must have been regulated by the clock of the Chrysotriklinos.⁵²

It is much harder to determine what role, if any, public clocks played in the daily rhythms of urban life outside church and palace. According to the Book of the Eparch, tavern-keepers were forbidden to open their establishments before the second hour of the day on important festivals and on Sundays. They were also enjoined to close daily before the second hour of the night, so that committed drinkers would not end up fighting in the streets.⁵³ So there was a last call in Constantinople, but it is difficult to imagine that it was systematically enforced, much less by reference to an official clock. Otherwise we should have to imagine the eparch's lackeys riding out from Hagia Sophia after the second hour had struck and checking on the taverns. In general it does not seem that daily life in Constantinople was as closely regulated by horology as, for example, in Tang-era Chang'an.⁵⁴

It is more likely that horologia were intended to create the impression of technical mastery. The mechanical clocks of the Chalke and Hagia Sophia were impressive feats of engineering, in addition to any practical functions that they may have served. It is telling that the most extensive descriptions of these two clocks were written by foreign visitors: a Chinese ambassador, in the case of the Chalke clock, and an Arab prisoner, in the case of the horologion of Hagia Sophia. The clocks were clearly a source of local pride. Hārūn's mention of the popular attribution of the clock to Apollonios, a prototypical figure of the magician in medieval Byzantine lore, indicates that it was also a source of wonder, as if its operation depended on an arcane and potentially dangerous sort of wisdom.

Perhaps the most telling source on Byzantine horology is the account of the Byzantine fire telegraph preserved in the chronicle of Pseudo-Symeon, according to which Leo the Mathematician

in Qazwīnī has been justly described as “largely dominated by legends and travel guides’ stories,” to which we would add passages from earlier travelers: A. BERGER, *Sightseeing in Constantinople: Arab Travellers, c. 900–1300*, in: *Travel in the Byzantine World*, ed. R. Macrides. Aldershot 2002, 179–191, here 181.

⁵² The daily audience of the emperor with his high officials occurred between the first and third hours of the day (*De cerimoniis* 519 and 521 [REISKE]). When receptions are held in the Magnaura, the emperors exit the lower palace around the end of the second hour (*De cerimoniis* 566 [REISKE]). The dining table for the feast of the Brumalia is set up at the eleventh hour (*De cerimoniis* 602 [REISKE]).

⁵³ *Book of the Eparch IX 3* (132 KODER). On this passage cf. E. KISLINGER, *Dall’ubriacone al krasopateras*, in: *La civiltà del vino: fonti, temi e produzioni vitivinicole dal Medioevo al Novecento (Atti delle biennali di Franciacorta 7)*. Brescia 2003, 139–163, here 142.

⁵⁴ On public time telling in Tang Chang’an, see W. HUNG, *Monumentality of Time: Giant Clocks, the Drum Tower, the Clock Tower*, in: *Monuments and Memory, Made and Unmade*, ed. R. Nelson – M. Olin. Chicago 2003, 107–132, here 115–117.

constructed two clocks for the Emperor Theophilos. One was set up at Loulon, a fortress in Cilicia, and the other was set up in the imperial palace. Each hour of the day was associated with some event that might occur on the frontier: thus Arab raids were associated with the first hour, full-on war with the second, and so forth. Whenever one of these things occurred, a beacon was lit at the corresponding hour in Loulon, and the signal was relayed along a chain of fortresses leading to Constantinople. When the imperial stewards spotted the signal from the balcony of the Pharos, the hour on the Constantinopolitan clock was checked, and the message decoded.⁵⁵

Opinions are divided about the plausibility of this account.⁵⁶ As we have seen, there was a horologion in the Chrysotriklinos of the palace, directly next to the balcony of the Pharos, which is mentioned in numerous passages in the Book of Ceremonies.⁵⁷ However, the system described by the chronicler would have been hindered by numerous practical challenges, such as gathering sufficient fuel to create large enough fires quickly enough at each successive fortress.

Nevertheless, the story of the fire telegraph tells us a lot about the impression of mastery that a successfully functioning clock might impart. The horological genius of Leo, pressed into the service of the empire, contributes to a figure of near omniscience: the emperor, although he remains at home, learns immediately of events at the empire's furthest reaches. Functioning clocks were signs of maintenance of the knowledge necessary to run the empire, and this is probably the primary explanation for their enduring significance.

Alongside this diachronic continuity, we may also set a topographical continuity. The monumental core of the city, the area framed by Hagia Sophia in the north, the imperial palace in the east, the Hippodrome to the south, and the basilica to the west, remained the preferred location for the installation of public clocks.⁵⁸ The various attested locations are united by their association with the most powerful institutions of the city, including the palace, the church, and the Senate. This general topographical continuity, however, is qualified by two shifts in the location of the most prominent monumental clocks of Constantinople. The first is the removal of the "clock of the city" from the area of the Basilica to the gate of the imperial palace in the sixth century. The second is the rise of prominence of the clock of Hagia Sophia in the ninth and tenth centuries, a period in which the only possible mention of the clock of the Chalke is the puzzling story of Hypatios. Thus while interest in maintaining knowledge of horology persisted, the architectural setting with which it is primarily associated in the sources shifted over time, first from the law courts to the palace, and then from the palace to the church.

⁵⁵ Pseudo-Symeon 681–682 (BEKKER). See further HALDON, Three treatises 254–255, with references to additional sources. For Loulon, see F. HILD – M. RESTLE, Kappadokien (Kappadokia, Charsianon, Sebasteia und Lykandos) (*TIB* 2). Vienna 1981, 223–224.

⁵⁶ Arguing for plausibility P. PATTENDEN, The Byzantine Early Warning System. *Byz* 53 (1983) 258–299. For implausibility V. ASCHOFF, Über den byzantinischen Feuertelegraphen und Leon den Mathematiker (*Deutsches Museum. Abhandlungen und Berichte*, 48. Jahrgang [1980]), Heft 1). Munich–Düsseldorf 1980. See also the commentary of P. V. CODESO, Miguel III (842–867): construcción histórica y literaria de un reinado. Madrid 2009, 166–167.

⁵⁷ See n. 46 above.

⁵⁸ For references to clocks in other locations, see n. 5 above.

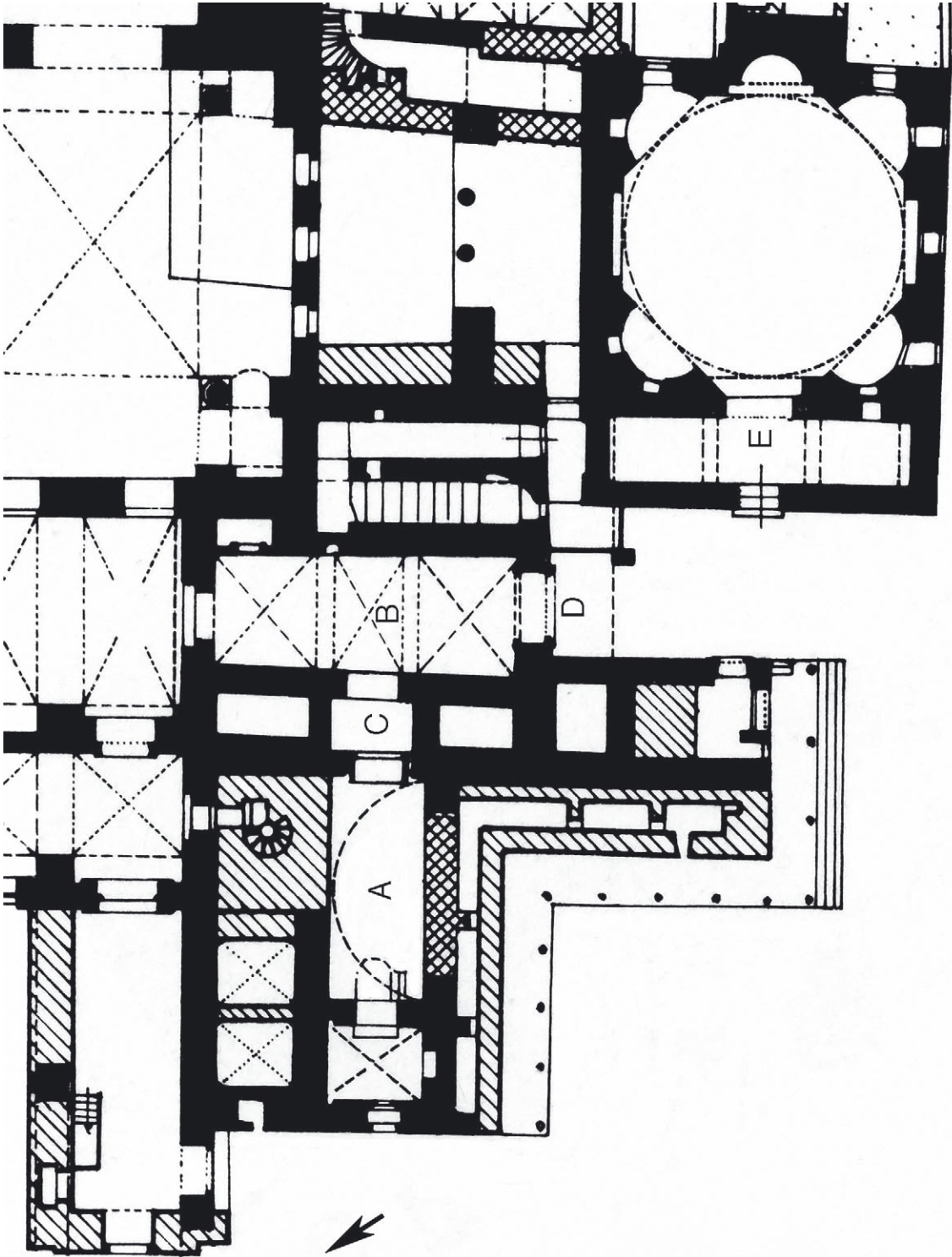


Illustration 1: Hagia Sophia, South-west corner, with locations referred to in the text