

# 11 • Military, Administrative, and Scholarly Maps and Plans

AHMET T. KARAMUSTAFA

Ottoman geographical maps can profitably be classified into two broad categories: those drafted under state patronage for administrative use and those produced for private consumption. The presence of a colossal state apparatus that functioned as the single largest consumer of cultural goods in the empire shaped patterns of map production in decisive ways. It seems appropriate, therefore, first to review the corpus of administrative cartography before turning to cartography as private enterprise.

## CARTOGRAPHY IN THE SERVICE OF THE STATE

The Ottoman state, which was one of the largest administrative institutions in world history, had a pragmatic foundation that left much room for practical applications of cartography. Many areas of Ottoman administrative practice where one could expect to find signs of map use, however, seem to have been innocent of the manifold uses of cartographic representation. Periodic cadastral surveys of the empire's vast territories, for example, were recorded in writing only, with no resort to drawings.<sup>1</sup> Similarly, court registers reveal no sign that maps and other pictorial aids were used in settling land disputes. On another front, the major routes of the state's sophisticated courier and posting-station network were registered in verbal itineraries only.<sup>2</sup> In the important spheres of military operation and state-run architectural construction, however, there is ample evidence that graphic representations of space were used for administrative purposes.

## ORIGINS

Only a few Ottoman administrative map artifacts date from before the sixteenth century. These include two architectural plans, of an imperial mosque and a mausoleum,<sup>3</sup> and one siege plan, of the fortress of Kiev.<sup>4</sup> In spite of the dearth of surviving maps from this early period of Ottoman history, it is clear that the events of the second half of the fifteenth century in particular played a central role in the development of cartographic practice in the Ottoman Empire. The Ottoman takeover

of Byzantine territories, completed with the capture of Trebizond in 865/1461, and the consolidation and continual expansion of the holdings of the new imperial state in the Balkans led to the intensification of cultural contacts between the Turkish-Islamic and Latin-Christian regions of the Mediterranean. Even a partial listing of the non-Ottoman maps preserved in the Topkapı Sarayı Müzesi in Istanbul, the empire's administrative center, would be sufficient to demonstrate that the Ottomans came into close contact with contemporary cartographic practices of the Latin cultural areas of the Mediterranean. The record of the Ottoman encounter with Latin cartography is, however, not restricted to the interesting but largely opaque testimony of such a list, since literary sources of the era contain more revealing reports on the subject.

Independent evidence concerning growing Ottoman awareness of the practical importance of maps centers on the person of Mehmed II (r. 848–50/1444–46 and 855–86/1451–81). It is not known if he had recourse to military drawings in the siege of Constantinople, yet his appreciation for graphic representation must have been well known even outside Ottoman domains. Thus, when

---

1. For a general overview of these surveys, see Halil İnalçık, "Ottoman Methods of Conquest," *Studia Islamica* 2 (1954): 103–29, esp. 107–12; reprinted in Halil İnalçık, *The Ottoman Empire: Conquest, Organization and Economy; Collected Studies* (London: Variorum Reprints, 1978), and idem, *Hicri 835 tarihli Sûret-i defter-i sancak-i Arvanid* (Ankara: Türk Tarih Kurumu, 1954), xi–xxxvi (Giriş [Introduction]).

2. Colin J. Heywood, "The Ottoman *Menzilhâne* and *Ulak* System in Rumeli in the Eighteenth Century," in *Social and Economic History of Turkey (1071–1920): Papers Presented to the "First International Congress on the Social and Economic History of Turkey," Hacettepe University, Ankara, July 11–13, 1977*, ed. Osman Okyar and Halil İnalçık (Ankara: Meteksan Limited Şirketi, 1980), 179–86, with further references on the topic.

3. Gülrü Necipoğlu-Kafadar, "Plans and Models in 15th- and 16th-Century Ottoman Architectural Practice," *Journal of the Society of Architectural Historians* 45 (1986): 224–43, esp. 229–31.

4. Zigmunt Abrahamowicz, "Staraya turetskaya karta Ukrainy s planom vzryva Dneprovskikh porogov i ataki turetskogo flota na Kiev," in *Vostochnye istochniki po istorii narodov yugo-vostochnoy i tsentral'noy Evropy*, ed. Anna Stepanovna Tveritinova (Moscow: Akademiya Nauk SSSR, Institut Vostokovedeniya, 1969), 76–96 (French summary 96–97).

in A.D. 1461 the lord of Rimini, Sigismondo Pandolfo Malatesta (1417–68), decided, probably in an attempt to forge a political alliance with the “Turks,” to dispatch his secretary and advisor Roberto Valturio to Istanbul with a magnificent manuscript of Valturio’s own *De re militari* as a personal present to the sultan, he reportedly appended a carefully executed map of the Adriatic Sea to the principal gift. In the event, Valturio was intercepted by the Venetians and was returned to Rimini after being put on trial, though the manuscript and the map, presumably in other copies, evidently found their way to the Ottoman palace.<sup>5</sup>

Venetian misgivings concerning Malatesta’s real intentions seem to have been well placed, since Mehmed II is known to have taken a special interest, primarily for military purposes, in acquiring adequate and up-to-date information on the geography of the Italian peninsula in general and on Venice in particular. When the famous painter Gentile Bellini was in court residence in Istanbul from 1479 to 1481, Mehmed II reportedly asked him to prepare a map of Venice.<sup>6</sup> There is, in fact, a fifteenth-century map of the Venetian territory of the *Terraferma* in Istanbul, though the intriguing possibility that this map could be the work of Bellini has not yet been explored.<sup>7</sup>

The geographical interests of Mehmed the Conqueror of Istanbul were by no means restricted to the Italian peninsula. In the summer of 869–70/1465 he had the chance to examine a manuscript copy of Ptolemy’s *Geography*,<sup>8</sup> and he ordered George Amirutzes of Trebizond to combine all the regional maps in this work into a single world map. Amirutzes’ map, which is not extant today, must have been impressive, since Mehmed II rewarded him handsomely after reviewing the world map and encouraged him and his sons to prepare an Arabic translation of the *Geography* itself. This latter task was apparently completed during Mehmed II’s lifetime, and two different but related copies of this Arabic translation are today preserved in the Süleymaniye Kütüphanesi in Istanbul.<sup>9</sup> Mehmed II’s interest in Ptolemy’s *Geography* was apparently well known in Italy, so that Francesco Berlinghieri thought it appropriate to send a printed copy of his *terzarima* translation of the work to the Ottoman court with a personal dedication in late 1480.<sup>10</sup>

The significance of Mehmed II’s personal interest in cartography should not be overrated. His active patronage of mapmakers certainly did not lead to the formation of identifiable traditions of Ottoman cartography, and the impact of his activities on Ottoman mapmaking seems to have been minimal. His example, however, is symptomatic of larger cultural transformations that accompanied the formation of a major world empire in a border region between Christian Europe and Islamic world and thus points to the symbiotic roots of Ottoman cartographic practice.

#### MILITARY MAPS

The decisive Ottoman penetration into the Latin cultural areas of the Mediterranean during the reign of Mehmed II in the second half of the fifteenth century led to the development of a tradition of cartographic reconnaissance in the Ottoman army. This was to last up until the introduction of western European military cartography into the empire in the eighteenth and early nineteenth centuries. The corpus of surviving maps from this tradition is neither large nor homogeneous, yet its temporal range and geographic spread certainly attest to a high level of cartographic literacy in the military arm of Ottoman administration.

The two earliest extant Ottoman military maps, a pictorial sketch of the area around Kiev in Ukraine (fig. 11.1) and an elaborate siege plan of Belgrade in Yugoslavia (plate 14), date back to the turn of the sixteenth century. The former, a diagrammatic plan that was drawn without regard to scale, shows in pictorial elevation the fortresses and villages around the lower courses of the rivers Dnieper and Dniester. From the inscription near the bottom right corner, it appears that the draftsman, who identifies himself as “Ilyās of Morea the Reconnoiterer” (*kulaguz*

5. Franz Babinger, “An Italian Map of the Balkans, Presumably Owned by Mehmed II, the Conqueror (1452–53),” *Imago Mundi* 8 (1951): 8–15, and idem, *Mehmed the Conqueror and His Time*, trans. Ralph Manheim and ed. William C. Hickman (Princeton: Princeton University Press, 1978), 201, where it is stated that “Giovanni di Pedrino of Forlì, a contemporary chronicler, reports that the supposed map of the Adriatic actually covered all Italy and indicated every detail that might be of interest to the sultan” (reference not given, though to judge by his article in *Imago Mundi* (p. 12 n. 7), Babinger is relying for this point on A. Campana, “Una ignota opera de Matteo de’ Pasti e la sua missione in Turchia,” *Ariminum* (Rimini, 1928), 107.

6. Babinger, “Italian Map of the Balkans,” 12 (note 5), where more information is given to illustrate Mehmed II’s interest in Italy.

7. Topkapı Sarayı Müzesi Kütüphanesi, H. 1828–29; see Rodolfo Gallo, “A Fifteenth Century Military Map of the Venetian Territory of *Terraferma*,” *Imago Mundi* 12 (1955): 55–57.

8. There are two Greek and one Latin manuscript copies of the *Geography* in the Topkapı Sarayı Müzesi Kütüphanesi today; Gustav Adolf Deissmann, *Forschungen und Funde im Serai, mit einem Verzeichnis der nichtislamischen Handschriften im Topkapu Serai zu Istanbul* (Berlin: Walter de Gruyter, 1933), 68–69 (no. 27), 80–82 (no. 44), and 89–93 (no. 57).

9. Süleymaniye Kütüphanesi, Ayasofya 2596 and 2610. Neither copy is dated. Ayasofya 2610, which alone contains maps (twenty-six double-page and twenty-four single-page, all in color), was published in 1929 by Youssef Kamal in one hundred copies as an addition to his *Monumenta cartographica Africae et Aegypti*, 5 vols. in 16 pts. (Cairo: 1926–51). A reprint of this has recently been issued: *Klaudios Ptolemaios Geography: Arabic Translation (1465 A.D.)*, ed. Fuat Sezgin (Frankfurt: Institut für Geschichte der Arabisch-Islamischen Wissenschaften, 1987). The story of the translation is given in Babinger, *Mehmed the Conqueror*, 247 (note 5) and Abdülhak Adnan Adivar, *Osmanlı Türklerinde İlim*, 2d ed. (Istanbul: Maarif, 1943), 20–22.

10. Babinger, *Mehmed the Conqueror*, 506 (note 5) and Adnan Adivar, *Osmanlı Türklerinde İlim*, 22 (note 9).

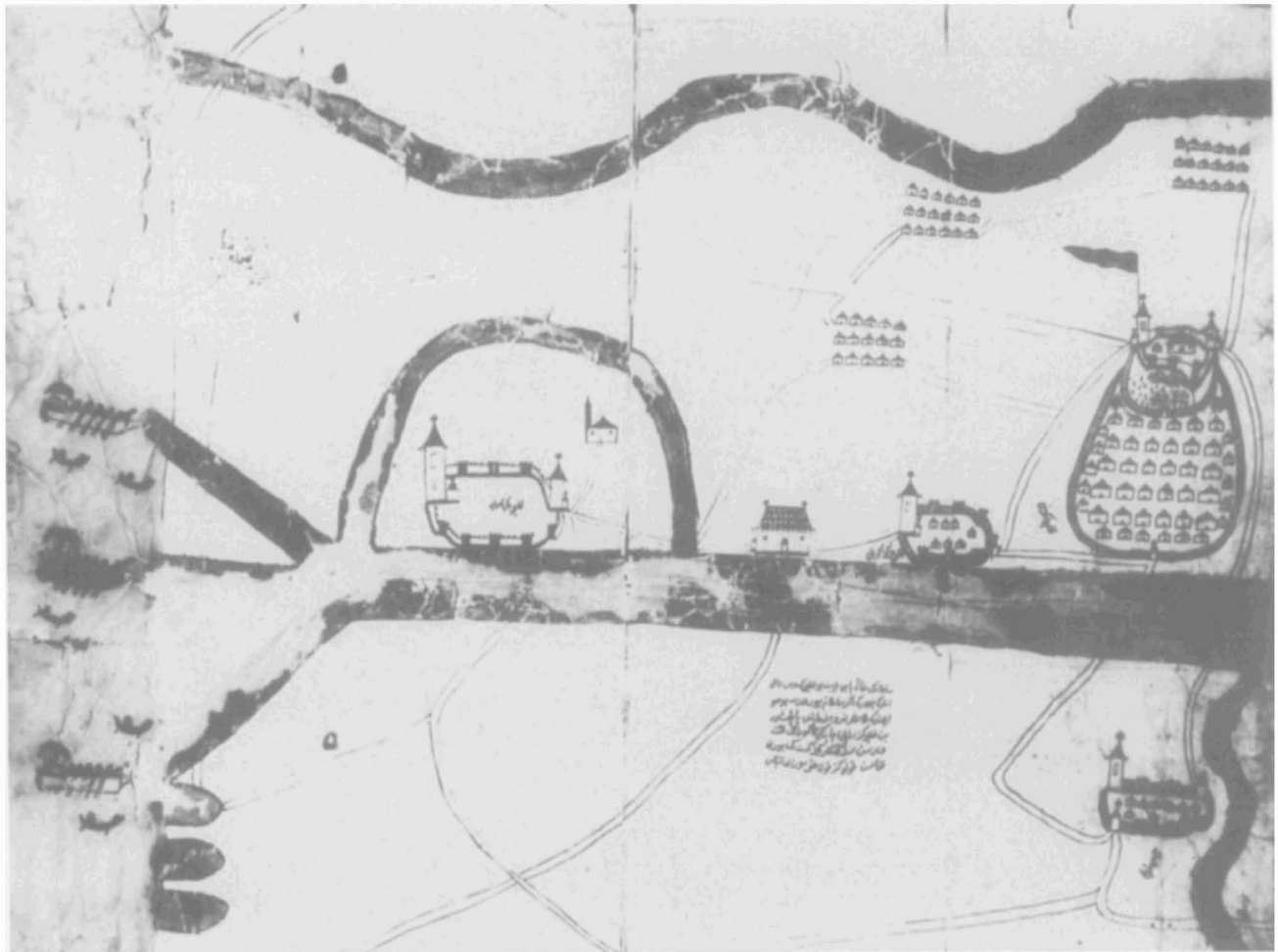


FIG. 11.1. PLAN OF KIEV AND SURROUNDINGS, CA. 1495–1506. This photograph is from a copy of the map made by İbrahim Kemal Baybora in June 1976. The original, held at

the same archive, is too fragile to be photographed. Size of the original: 44.5 × 58.5 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 12090/1).

*Morali İlyās*), made the map to bring to the sultan's attention his unspecified scheme to capture the fortress of Kiev through the use of the Ottoman navy. Its present location in the Topkapı Sarayı Müzesi in İstanbul suggests that the map did in fact reach the sultan, most probably Bāyezīd II (r. 886–918/1481–1512), though it is clear that the plan of İlyās the Reconnoiterer itself was not implemented, since Kiev was never captured by the Ottomans.<sup>11</sup>

It is possible that the much more elaborate siege plan of Belgrade was prepared for and actually used in the successful Ottoman siege of the town in 927/1521 under Süleymān I (r. 926–74/1520–66).<sup>12</sup> Produced in color with clear attention to detail, the map is a bird's-eye view of Belgrade at the confluence of the rivers Sava and Danube as well as the nearby fortresses of Avala and Zemun. It carries thirty-four separate inscriptions that serve to identify places and to present alternative strategies for

the siege of the fortress. Although the draftsman is not named in the inscriptions, they strongly give the impression that they were written by the same person who was responsible for the drafting, most likely a military reconnoiterer in Ottoman service. It is noteworthy that the primarily military nature of his objectives did not dampen the artistic ardor of the draftsman. The use—one suspects

11. Abrahamowicz, "Staraya turetskaya karta" (note 4). Abrahamowicz dates the map of Kiev and its surroundings, which does not carry a date, to between 1495 and 1506 on internal and external evidence. The text of the inscription in Ottoman Turkish is given on p. 84. An earlier reproduction of this plan appeared under the caption "MS. Turkish map of the Azov(?) Region" in Harald Köhlin, "Some Remarks on Maps of the Crimea and the Sea of Azov," *Imago Mundi* 15 (1960): 84–88, esp. fig. 6.

12. Fevzi Kurtoglu, *Türk süel alanında harita ve krokilere verilen değer ve Ali Macar Reis Atlası* (İstanbul: Sebat, 1935), 5–9, argues that the siege plan of Belgrade most likely dates from the reign of Bāyezīd II.

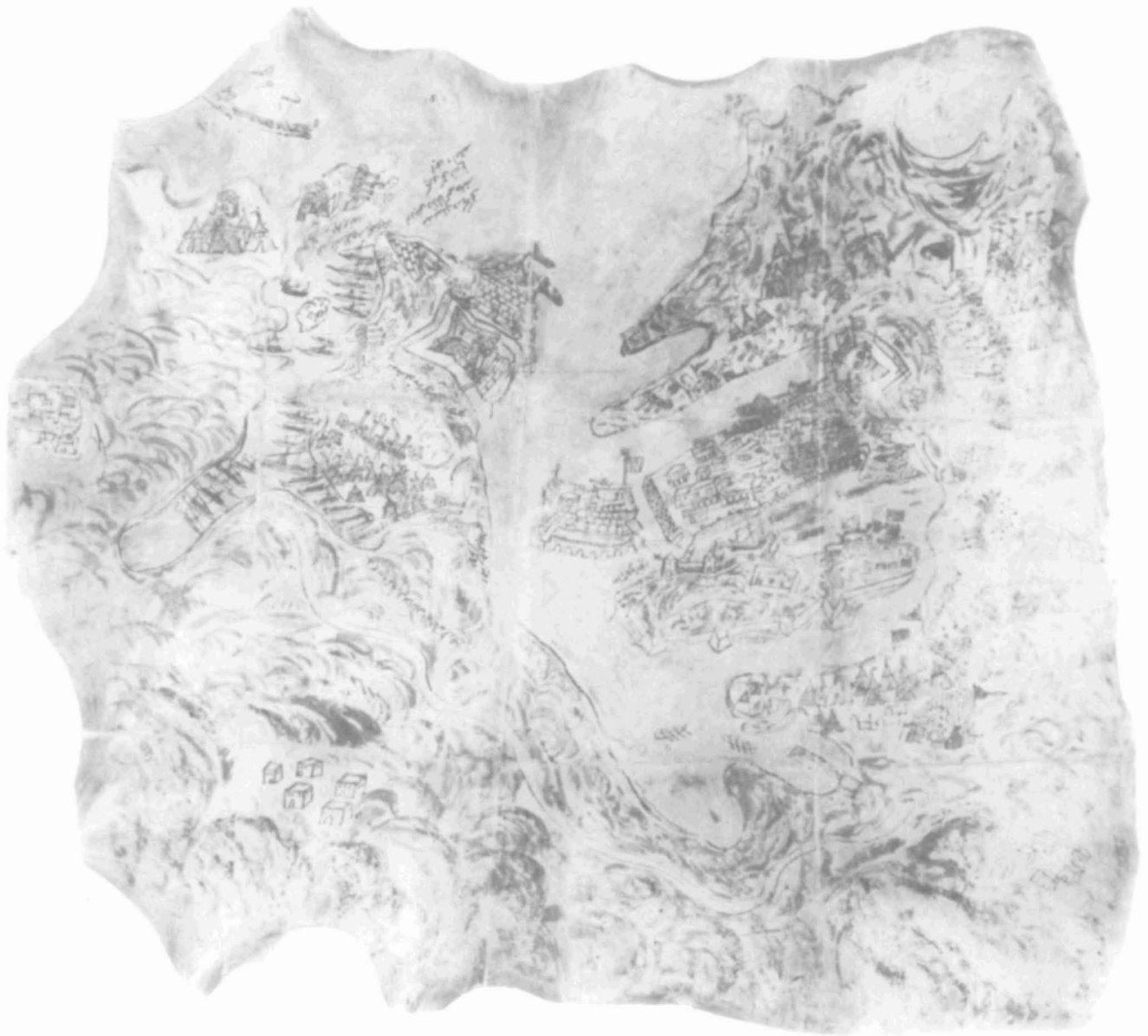


FIG. 11.2. PLAN OF THE OTTOMAN ATTACK ON MALTA, 972/1565.

for decorative purposes—of standardized tree and house signs on land and boat figures with banners and mounted cannons on the river Danube is striking.<sup>13</sup>

The same combined concern for detail in the coverage of militarily relevant information and for aesthetic presentation is evident in other maps. It appears, for instance, both in the map relating to the unsuccessful Ottoman attempt to capture the ports and major fortresses of Malta from the Knights of Saint John in 972/1565 (fig. 11.2) and in the siege plan of Szigetvár in Hungary that dates back to 974/1566, when the town fell to the Ottoman army following a short siege (fig. 11.3). The former depicts the two major ports of Malta and the castles of Saint Elmo, Saint Angelo, and Saint Michael that were situated around these ports and shows the positioning of

Size of the original: 55 × 65 cm. By permission of the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul (Y.Y. 1118).

the Ottoman forces in the area. An inscription facing the narrow peninsula between the two ports as well as the appearance of Ottoman flags over Saint Elmo indicates that the map was made after the capture of this latter

13. The siege plan of Belgrade was first noted by İbrahim Hakkı Konyalı, *Topkapı Sarayında Deri üzerine Yapılmış Eski Haritalar* (İstanbul: Zaman Kitaphanesi, 1936), 132–33 n. 2. Subsequent discussions and references include Kurtoğlu, *Türk süel alanında*, 5–9, with three line drawings (note 12); Fevzi Kurtoğlu, “Hadım Süleyman Paşanın mektupları ve Belgradın muhasara pîânı,” *Belleten* (Türk Tarih Kurumu) 4 (1940): 53–87, esp. 56–59, with a black-and-white reproduction (fig. II); Cavid Baysun, “Belgrad,” in *İslâm ansiklopedisi*, 13 vols. (İstanbul: Millî Eğitim, 1940–88), 2:475–85, esp. 476–77; and Babinger, *Mehmed the Conqueror*, pl. XIV (note 5), who interprets the map as “a little-known rendering . . . of Mehmed [II]’s unsuccessful attempt to take the city.”

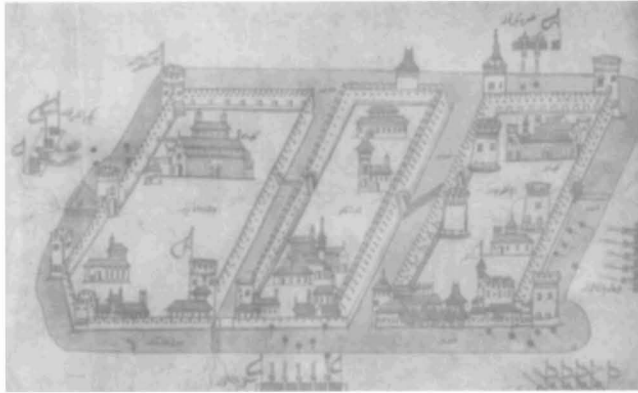


FIG. 11.3. SIEGE PLAN OF SZIGETVAR, CA. 974/1566. Size of the original: 25 × 40 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 12356).

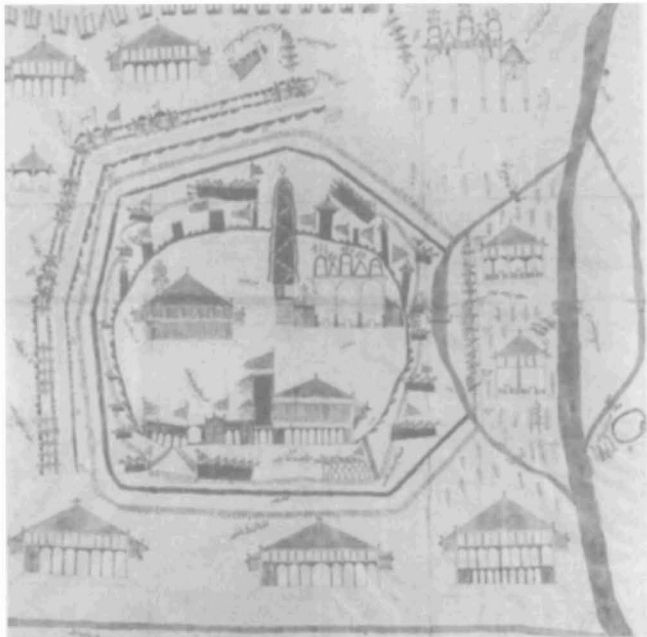


FIG. 11.4. SIEGE PLAN OF VIENNA, CA. 1094/1683. Size of the original: 85.5 × 89.5 cm. By permission of the Museen der Stadt Wien (I. N. 52.816/1).

castle by the Ottomans in June 1565. The plan itself was apparently prepared as part of a general report on the ongoing siege of Malta that was sent to Sultan Süleymân I in İstanbul by the commander of the Ottoman forces that carried out the attack. It thus testifies both to the presence of mapmakers in Ottoman military campaigns and to the routine inclusion of graphic representation in Ottoman military communication.<sup>14</sup>

To judge by the tone of its inscriptions, the siege plan of Szigetvár could also have been produced in the field during the Ottoman attack on the fortress in 974/1566, though it is not possible to verify this point since the map does not carry a date. The plan is relatively free of

ornamental features, and the draftsman apparently focused on depicting the major architectural features of the three castles that made up the Szigetvár stronghold, to the exclusion of other less essential material.<sup>15</sup> Compare this plan with figures 12.16 to 12.18, which appear in Ottoman imperial chronicles.

Further specimens of traditional Ottoman military cartography include a plan of the second siege of Vienna in 1094/1683 (fig. 11.4),<sup>16</sup> a plan of the fortress of Van in eastern Asia Minor (fig. 11.5),<sup>17</sup> a diagram of the Battle of the Prut from 1123/1711 (plate 15),<sup>18</sup> and a siege plan of the fortress on Adakale, the little island in the straits of Orsova on the Danube, from 1151/1738 (fig. 11.6).<sup>19</sup> All together, these plans and diagrams demonstrate that, though not institutionalized in the form of a separate corps of draftsmen, practical cartography was not unknown in the higher levels of the Ottoman military establishment even before Ottomans started to absorb contemporary military cartographic practice from Europe, especially during the eighteenth century.<sup>20</sup>

The adoption of European cartographic practice in the military sphere was to all indications a slow and uneven process that began toward the end of the seventeenth century and ended in the demise of traditional Ottoman military cartography about two centuries later, at the end of the nineteenth century. In the intervening transitional period, traditional Ottoman and contemporary European practice existed side by side. The first Ottoman military map artifacts drafted in accordance with contemporary European cartographic practice are a plan of the fortress

14. Tahsin Şükrü [Saraçoğlu], "Bir harp plâni," *Türk Tarih, Arkeolojya ve Etnografya Dergisi* 2 (1934): 255–57, and Kurtoglu, *Türk süel alanında*, 9–16, with a reproduction (note 12).

15. Kurtoglu, *Türk süel alanında*, 17–18, with a line drawing (note 12).

16. Richard F. Kretzel, "Ein zeitgenössischer türkischer Plan zur zweiten Belagerung Wiens," *Wiener Zeitschrift für die Kunde des Morgenlandes* 52 (1953/55): 212–28.

17. Jean Louis Bacqué-Grammont, "Un plan Ottoman inédit de Van au XVII<sup>e</sup> siècle," *Osmanlı Araştırmaları Dergisi/Journal of Ottoman Studies* 2 (1981): 97–122.

18. Akdes Nimet Kurat, "Hazine-i Bîrun kâtibi Ahmed bin Mahmud'un (1123–1711—Prut) seferine ait 'Defteri,'" *Tarih Araştırmaları Dergisi* 4 (1966): 261–426.

19. Kurtoglu, *Türk süel alanında*, 30–33 (note 12).

20. Other known traditional siege and battle plans not discussed here include the following:

- i. Plan of the Battle of Haçova/Mezőkeresztes, 1005/1596, Topkapı Sarayı Müzesi Arşivi, İstanbul, E. 5539. This is reproduced in İsmail Hakkı Uzunçarşılı, *Osmanlı Tarihi*, vol. 3, pt. 1, II. *Selim'in Tahta Çıkışından 1699 Karlofça Andlaşmasına Kadar*, Türk Tarih Kurumu Yayınları, ser. 13, no. 16<sup>c1b</sup> (Ankara: Türk Tarih Kurumu, 1983) (Reprint 3), pl. XVII at the end.
- ii. Plan, in color, of a naval encounter between the Ottoman and Russian fleets, possibly from the second half of the seventeenth century, Topkapı Sarayı Müzesi Arşivi, İstanbul, E. 9401.
- iii. Plan of the fortress of "Zădvărya" in Makarska, not dated, Topkapı Sarayı Müzesi Arşivi, İstanbul, E. 9495/3.

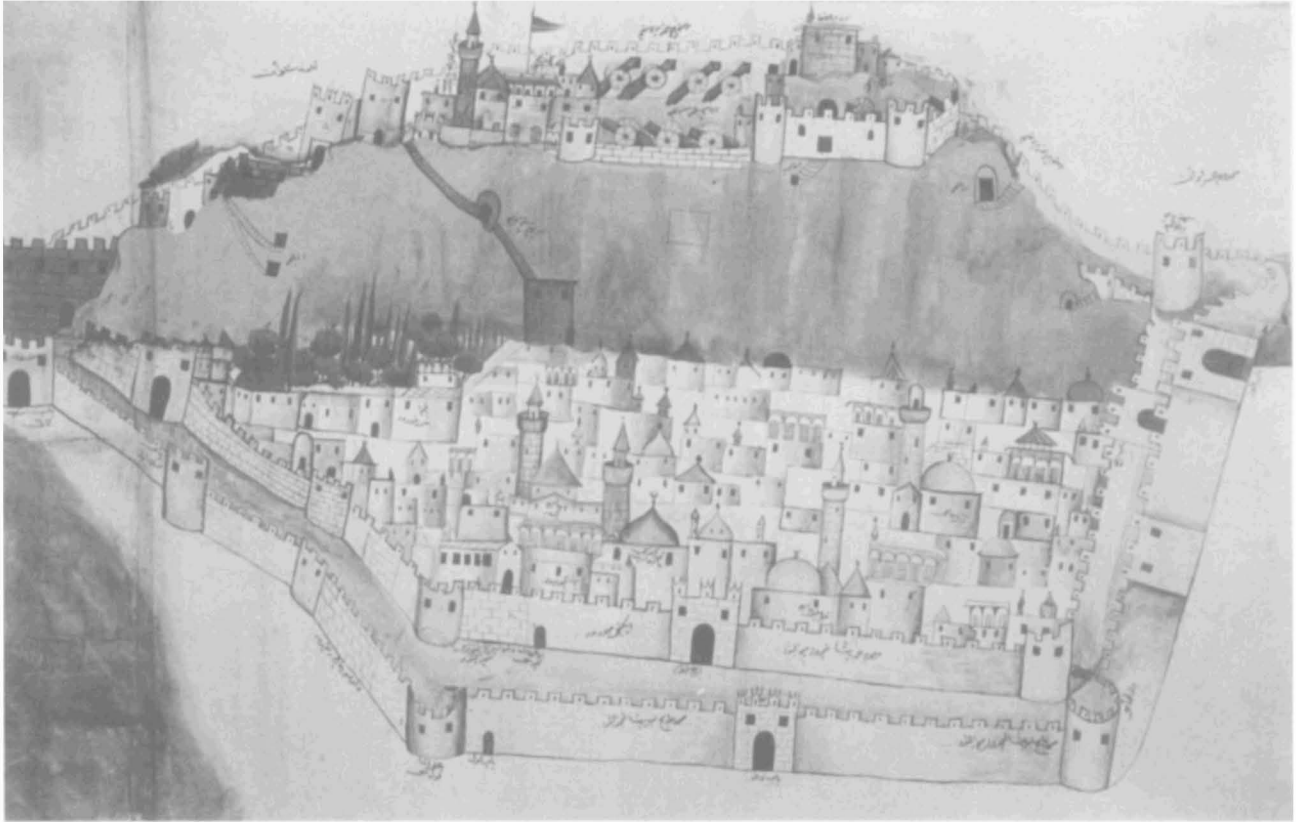


FIG. 11.5. PLAN OF THE FORTRESS OF VAN. Size of the original: 50 × 83 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 9487).

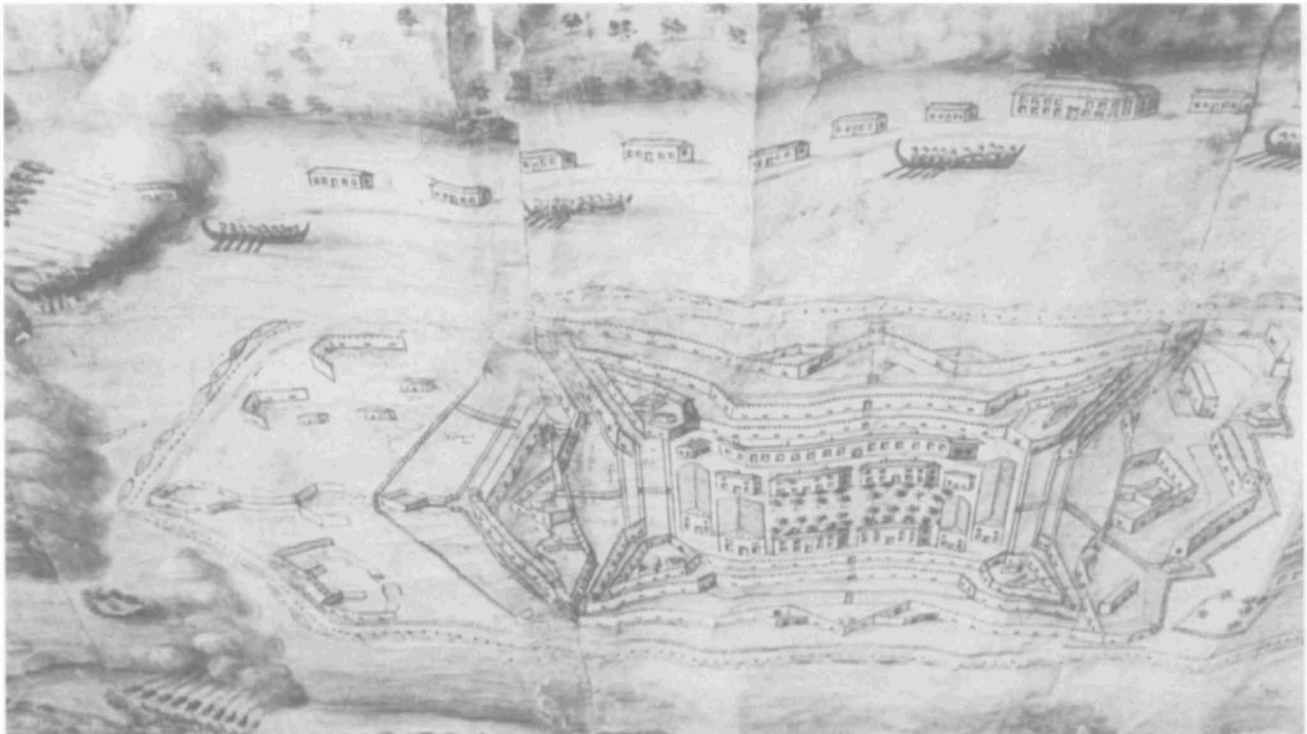


FIG. 11.6. DETAIL FROM THE SIEGE PLAN OF THE FORTRESS OF ADAKALE, 1151/1738.

Size of the scroll: 123 × 250 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 9439).

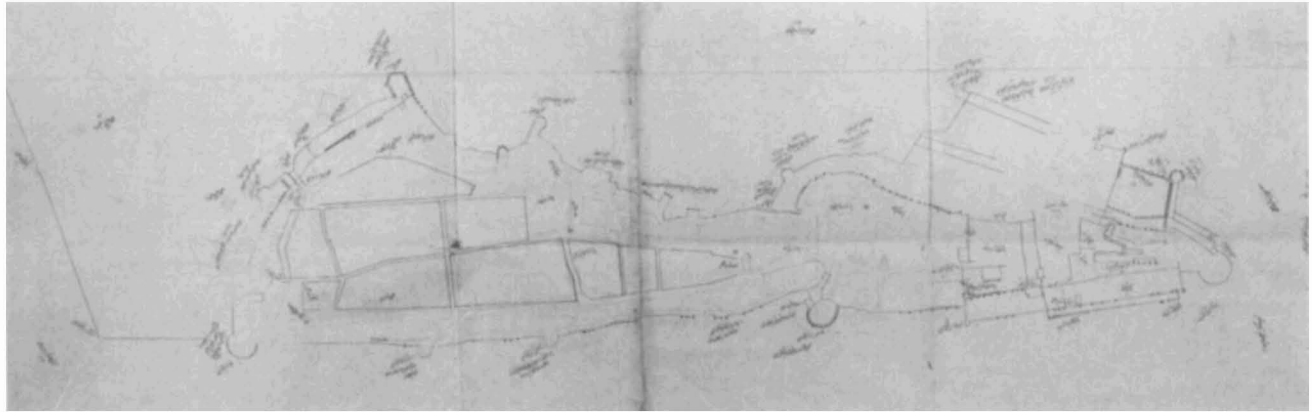


FIG. 11.7. PLAN OF THE FORTRESS OF BUDA, CA. 1095–96/1684.

Size of the original: 75 × 100 cm. By permission of the Biblioteca Universitaria di Bologna (MS. Marsili 8).

of Buda made shortly after 1095–96/1684 (fig. 11.7)<sup>21</sup> and a plan of the Battle of the Prut from 1123/1711 (fig. 11.8).<sup>22</sup> These are followed by an increasing number of similar military maps in subsequent decades, so that it becomes possible to trace many different maps of a single, identifiable draftsman like Ressām Muştafā (fig. 11.9) in the second half of the eighteenth century.<sup>23</sup> This early phase of the adaptation of European cartographic practice by the Ottoman military, hitherto not researched, is in need of close scrutiny.

#### ARCHITECTURAL PLANS AND WATERWAY MAPS

The Ottoman state employed a centrally directed group of royal architects (*haşşa mi'marları*) to administer and execute state-sponsored architectural projects. The exact nature of the way abstract architectural ideas were formulated and disseminated among this corps of royal architects is only imperfectly understood, since the great majority of the graphic aids that were used for these purposes seem to have perished. Close examination of the few surviving architectural plans suggests, however, that on-site “construction supervisors received only grid-based ground plans and sketchy elevations with some basic written measurements” from the office of the chief royal architect (*mi'marbaşı*) in Istanbul (figs. 11.10 and 11.11).<sup>24</sup> The supervisor then transferred this ground plan onto the previously flattened construction site before the actual foundation was laid. He was not, however, given detailed graphic instructions on the building's elevation and had to rely in computing height on “traditional formulae deriving from proportions inherent in the geometric ground plans with modular grids.”<sup>25</sup>

In his preference for a two-dimensional system of graphic representation, the Ottoman architect-draftsman was on essentially the same ground as his military counterpart in the Ottoman army. Indeed, a distinct set of

waterway maps produced mostly by royal architects provide decisive evidence that when the occasion arose the latter readily fell back on pictorial representation.

The construction and maintenance of the major water-supply systems of Istanbul, in particular those of the palace and several prominent pious foundations, was the responsibility of the inspector of waterways (*suyolu nāzım*). He was an architect by profession, and indeed, the office of the chief royal architect was normally filled by previous waterway inspectors.<sup>26</sup> It appears that either for his own personal use or for reporting to higher authorities, the inspector of waterways drafted topographical diagrams of the different water supply systems under his supervision. These usually took the form of long rolls on which were traced the major aqueducts from their origins near the springs well outside the city

21. Oktay Aslanapa, “Macaristan'da Türk Âbideleri,” *Tarih Dergisi* 1 (1949–50): 325–45, esp. 335 and fig. 27 at the end, who reproduces the plan from Fekete Lajos, *Budapest a törökörban*, Budapest Története 3 (Budapest, 1944). This last work was not available to me. See also Fekete Lajos and Nagy Lajos, *Budapest története a törökörban* (Budapest: Akadémiai Kiadó, 1986), figs. 199–200.

22. Akdes Nimer Kurat, *Prut Seferi ve Barışı, 1123 (1711)*, 2 vols. (Ankara: Türk Tarih Kurumu, 1951–53), 1:35, suggests that this plan is a translation from a French original.

23. Fehmi Edhem Karatay, *Topkapı Sarayı Müzesi Kütüphanesi: Türkçe Yazmalar Kataloğu*, 2 vols. (Istanbul: Topkapı Sarayı Müzesi, 1961), 1:475–77 (nos. 1447–58), are mostly the works of Muştafā; English translation: E. H. van de Waal, “Manuscript Maps in the Topkapı Saray Library, Istanbul,” *Imago Mundi* 23 (1969): 81–95.

24. Necipoğlu-Kafadar, “Plans and Models,” 242 (note 3). The plans that are reproduced here as figures 11.10 and 11.11 are discussed in detail in the article, 228–29 and 225–26, respectively.

25. Necipoğlu-Kafadar, “Plans and Models,” 242 (note 3).

26. Cengiz Orhonlu, “XVI. Yüzyılda Osmanlı İmparatorluğunda Suyolu kuruluşu,” in Cengiz Orhonlu, *Osmanlı İmparatorluğunda Şehircilik ve Ulaşım Üzerine Araştırmalar*, ed. Salih Özbaran, Ege Üniversitesi Edebiyat Fakültesi Yayınları, no. 31 (İzmir: Ticaret Matbaacılık, 1984), 78–82.

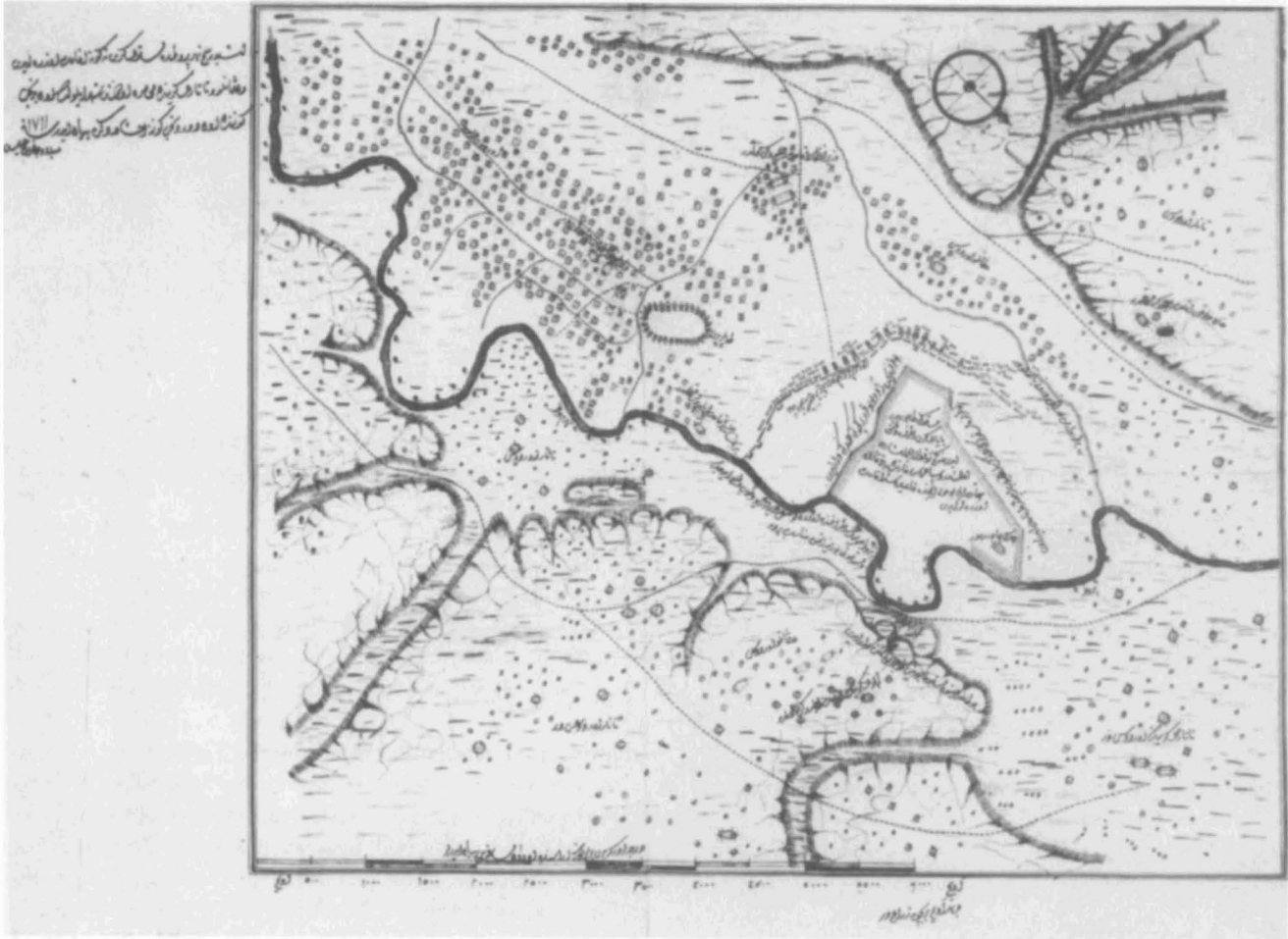


FIG. 11.8. PLAN OF THE BATTLE OF THE PRUT, 1123/1711.

Size of the original: 39.5 × 46.7 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 1551/1).

through central cisterns and distributive centers to their final destinations within the city walls. All relevant constructions such as feeders, collection areas, weirs, water towers, underground tunnels, and bridges, as well as some other architectural or natural features en route, were also shown in pictorial elevation.

Several waterway maps survive in Istanbul archives. The two clear examples of royal waterway cartography among these are the 1161/1748 map of the Kırkçeşme and Halkalı water supply network (fig. 11.12) and the 1016/1607 map of the same network by the inspector of waterways Hasan (fig. 11.13 and plate 16). The former is a bird's-eye view with some concern for ornamentation, while the latter is really nothing more than a graphic itinerary. Other examples of waterway maps vacillate between these two extremes (appendix 11.1).<sup>27</sup> Significantly, all architectural structures that appear on these maps are either pictorial representations or conventional symbols, with no trace of scientific proportion or perspective drawing.

#### CARTOGRAPHY AS PRIVATE ENTERPRISE

Outside the bounds of the state, terrestrial cartography seems to have been cultivated in Ottoman culture pri-

27. In addition to the maps listed in appendix 11.1, there seem to be some waterway maps contained in manuscript codices; one such double-page representation is noted in Vladimir Minorsky, *The Chester Beatty Library: A Catalogue of the Turkish Manuscripts and Miniatures* (Dublin: Hodges Figgis, 1958), 21 ("Panorama of the System of Aqueducts of Belgrad, near the Golden Horn in Constantinople," MS. Turkish 413, fols. 22b–23a).

There is a sizable body of literature on water-supply systems of Istanbul. Other than the studies listed in Wolfgang Müller-Wiener, *Bildlexikon zur Topographie Istanbul: Byzantion-Konstantinupolis-Istanbul bis zum Beginn des 17. Jahrhunderts* (Tübingen: Ernst Wasmuth, 1977), 517, see the following works of Kazım Çeçen: *İstanbul'da Osmanlı Devrindeki Su Tesisleri*, İstanbul Teknik Üniversitesi Bilim ve Teknoloji Tarihi Araştırma Merkezi, no. 1 (İstanbul, 1984); *Süleymaniye Suyolları*, İstanbul Teknik Üniversitesi Bilim ve Teknoloji Tarihi Araştırma Merkezi, no. 2 (İstanbul, 1986); *Mimar Sinan ve Kırkçeşme Tesisleri* (İstanbul, 1988).





FIG. 11.9. MAP OF RUSSIAN ARMY MANEUVERS ALONG OTTOMAN BORDERS WITH POLAND, MOLDAVIA, AND HUNGARY, 1768–69. This map is not dated, nor does it contain the name of the draftsman. However, a larger copy (69.5 × 64.5 cm) on silk of the same map is preserved in the Topkapı Sarayı Müzesi Kütüphanesi, Istanbul (A. 3625), which is clearly dated to 1768–69 and signed by Ressām Muşafâ. Size of the original: 32.5 × 35 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, Istanbul (E. 1551/2).

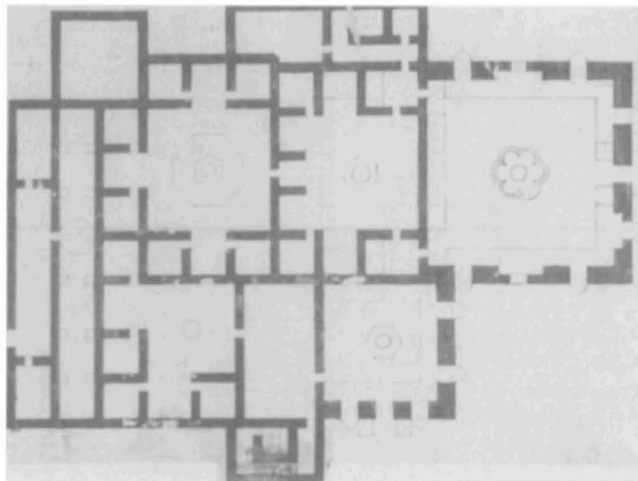


FIG. 11.10. PLAN OF A DOUBLE BATH, FIFTEENTH CENTURY. Executed in black and red ink, this plan can be dated to the second half of the fifteenth century based on watermark analysis. Size of the original: 39.5 × 55.8 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, Istanbul (E. 9495/7).

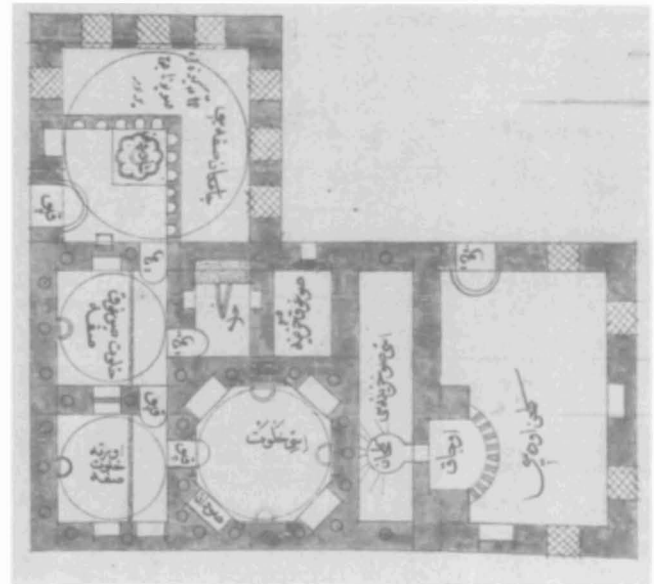


FIG. 11.11. PLAN OF A TURKISH BATH. This black-and-red-ink plan appears in a picture album compiled about 1584–86. Size of the image: 20 × 22.5 cm. By permission of the Bild-Archiv der Österreichischen Nationalbibliothek, Vienna (Cod. 8615, fol. 151a).

marily in an academic environment. The textual presentation of geographical and historical knowledge by individual scholars in the form of manuscript codices provided the main forum for producing and disseminating terrestrial maps. Apart from a few free-standing large-scale regional maps that are not engulfed in textual environments, the only other exceptions to this rule of textual context are numerous pictorial representations of the Ka'ba and of other sacred sites in and around the holy cities of Mecca and Medina (which, however, are also to be found in books), as well as various maps that appear as wall paintings in houses.<sup>28</sup>

The terrestrial maps that appear in Ottoman geographical texts reflect the scholarly orientation of their producers. Leaving aside marine geography and navigation as well as travel description,<sup>29</sup> the development of Otto-

28. Ottoman city views and itinerary maps are discussed in chapter 12. On Ka'ba representations, see Zeren Tanındı, "İslam Resminde Kutsal Kent ve Yöre Tasvirleri," *Journal of Turkish Studies/Türklük Bilgisi Araştırmaları* 7 (1983): 407–37, and Richard Ettinghausen, "Die bildliche Darstellung der Ka'ba im Islamischen Kulturkreis," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 87 (1934): 111–37. Wall paintings are studied by Günsel Renda, "Wall Paintings in Turkish Houses," in *Fifth International Congress of Turkish Art*, ed. Géza Fehér (Budapest: Akadémiai Kiadó, 1978), 711–35; to Renda's discussion should be added two panoramas (of Aleppo and Istanbul) that are reproduced from the palace of the al-'Azam family in Hama by John Carswell, "From the Tulip to the Rose," in *Studies in Eighteenth Century Islamic History*, ed. Thomas Naff and Roger Owen (Carbondale: Southern Illinois University Press, 1977), 328–55 and 404–5, esp. 339–40 (pls. 10 and 11).

29. Ottoman maritime cartography is discussed in chapter 14.

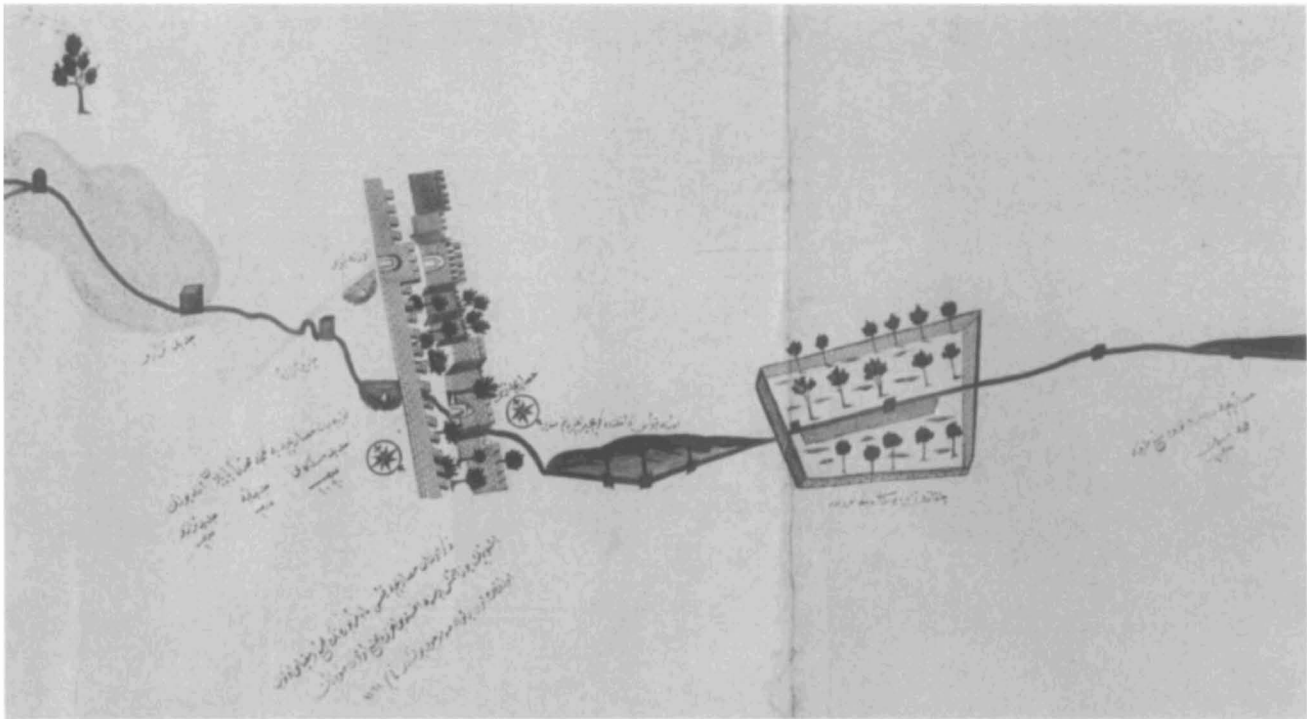


FIG. 11.12. DETAIL FROM THE MAP OF THE KIRKÇEŞME AND HALKALI WATER-SUPPLY SYSTEM (1161/1748).

Size of the original: 75 × 1,098 cm. By permission of the Topkapı Sarayı Müzesi Kütüphanesi, Istanbul (H. 1815).

man geographical literature can be divided into two broad phases. During the first phase, from mid-fifteenth century to the mid-seventeenth, Ottoman scholars largely devoted their energies to adapting previous Islamic geographical knowledge to Ottoman realities by translating into Ottoman Turkish, synthesizing, and updating classical manuals in Arabic and, to a lesser degree, in Persian. In the second phase, from the mid-seventeenth century onward, their attention turned increasingly to the West, and translations from European languages gradually became the norm.<sup>30</sup> The watershed in the Europeanization of Ottoman geographical literature came with the translation of Gerardus Mercator's *Atlas Minor* into Turkish by the well-known scholar Muştafâ ibn 'Abdallâh Kâtib Çelebi in 1064–65/1653–55 with the assistance of Meḥmed İhlâs, a French convert to Islam.<sup>31</sup> This was followed by the translation of Joan Blaeu's *Atlas Maior* by Ebū Bekr ibn Behrâm el-Dimāşki in 1086–96/1675–85.<sup>32</sup> These translations mark the entry of the European terrestrial atlas into Ottoman culture. There ensued a period of transition in which the Ottomans adopted Western geographical science and cartographic practice, a long process that can be said to have reached a higher level only during the nineteenth century. The only other point in this process that should be mentioned here is the introduction of printing, and hence of printed maps, into Ottoman society in the third decade of the eighteenth century. The person responsible for this significant

event, İbrâhîm Müteferrika (d. 1157/1745), took particular interest in geography, and besides a set of four maps that he printed, also left behind a manuscript map of the Ottoman Empire (fig. 11.18 below).<sup>33</sup>

30. Ottoman geographical literature is reviewed in Franz Taeschner, "Djughrafiya: The Ottoman Geographers," in *The Encyclopaedia of Islam*, new ed. (Leiden: E. J. Brill, 1960–), 2:587–90, and idem, "Die geographische Literatur der Osmanen," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 77 (1923): 31–80. The only available guide to primary sources is Cevdet Türkay, *İstanbul Kütüphanelerinde Osmanlı'lar Devrine Aid Türkçe—Arabça—Farsça Yazma ve Basma Coğrafya Eserleri Bibliyografyası* (Istanbul: Maarif, 1958).

31. The translation, based on the 1621 Arnheim edition of Mercator's work, was titled *Levâmi'ü'n-nûr fî zulmeti atlas minûr* (Rays of light in the darkness of Atlas Minor). The autograph copy of this work is preserved in the Nuruosmaniye Kütüphanesi, Istanbul, MS. 2998.

32. El-Dimāşki called his translation *Nuşretü'l-islâm ve's-sürûr fî takriri* [or *tahriri*] *Atlas mayûr* (The triumph of Islam and joy in the writing of Atlas Maior). Many versions, some abridged, are housed in Istanbul libraries; a complete set is available at the Topkapı Sarayı Müzesi Kütüphanesi, Istanbul, B. 1634.

33. Niyazi Berkes, "İbrâhîm Müteferrika," *Encyclopaedia of Islam*, new ed., 3:996–98 and Ulla Ehrensavrd with contributions by Zygmunt Abrahamowitz, "Two Maps Printed by Ibrahim Müteferrika in 1724/25 and 1729/30," *Svenska Forskningsinstitutet i Istanbul Meddelanden* 15 (1990): 46–66. A convenient list of the maps Müteferrika printed appears in Osman Ersoy, *Türkiye'ye Matbaanın Girişi ve İlk Basılan Eserler* (Ankara: Güven, 1959), 37. William J. Watson, "İbrâhîm Müteferrika and Turkish Incunabula," *Journal of the American Oriental Society* 88 (1968): 435–41, does not list printed maps.

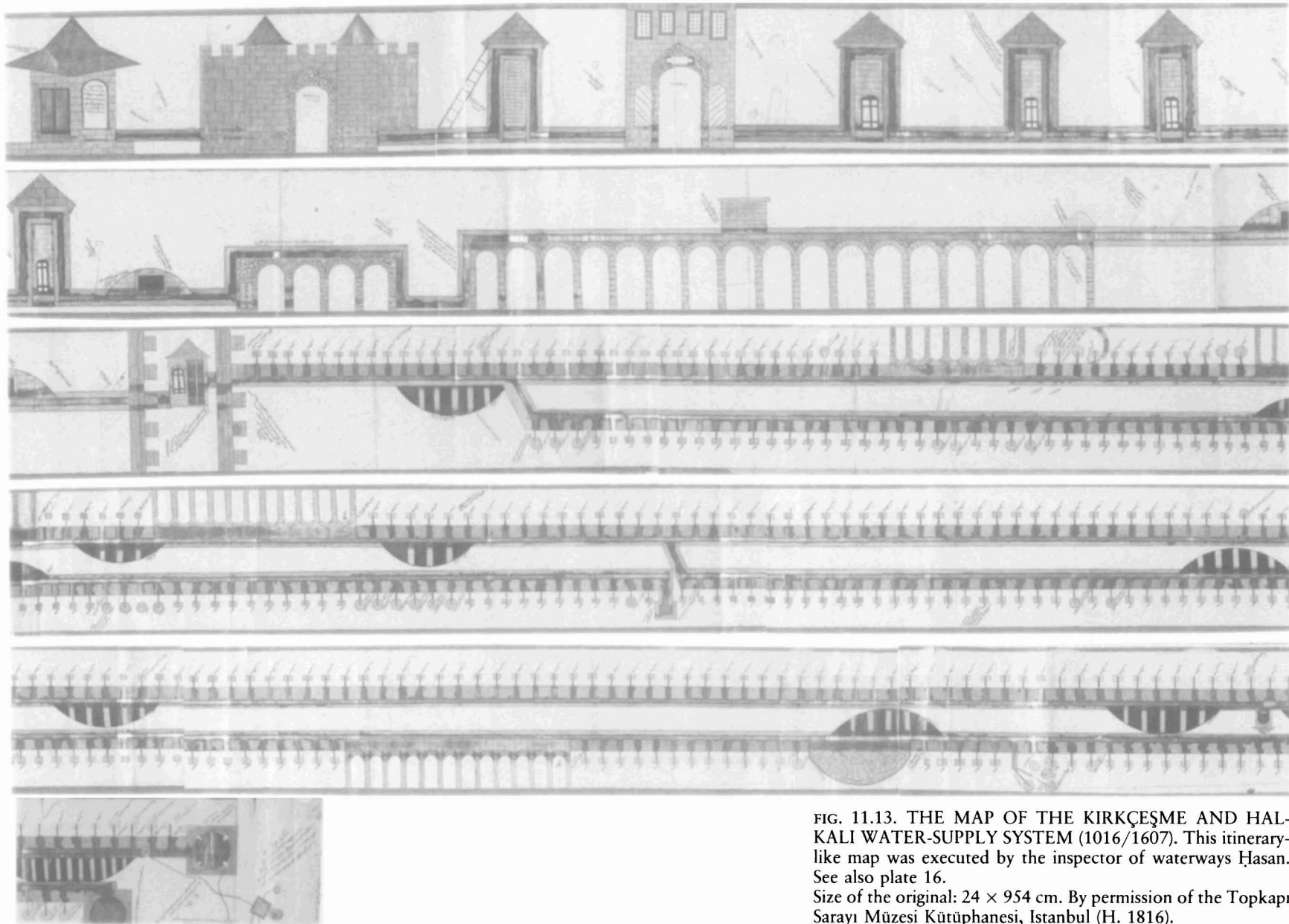


FIG. 11.13. THE MAP OF THE KIRKÇEŞME AND HAL-KALI WATER-SUPPLY SYSTEM (1016/1607). This itinerary-like map was executed by the inspector of waterways Hasan. See also plate 16.  
Size of the original: 24 × 954 cm. By permission of the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul (H. 1816).

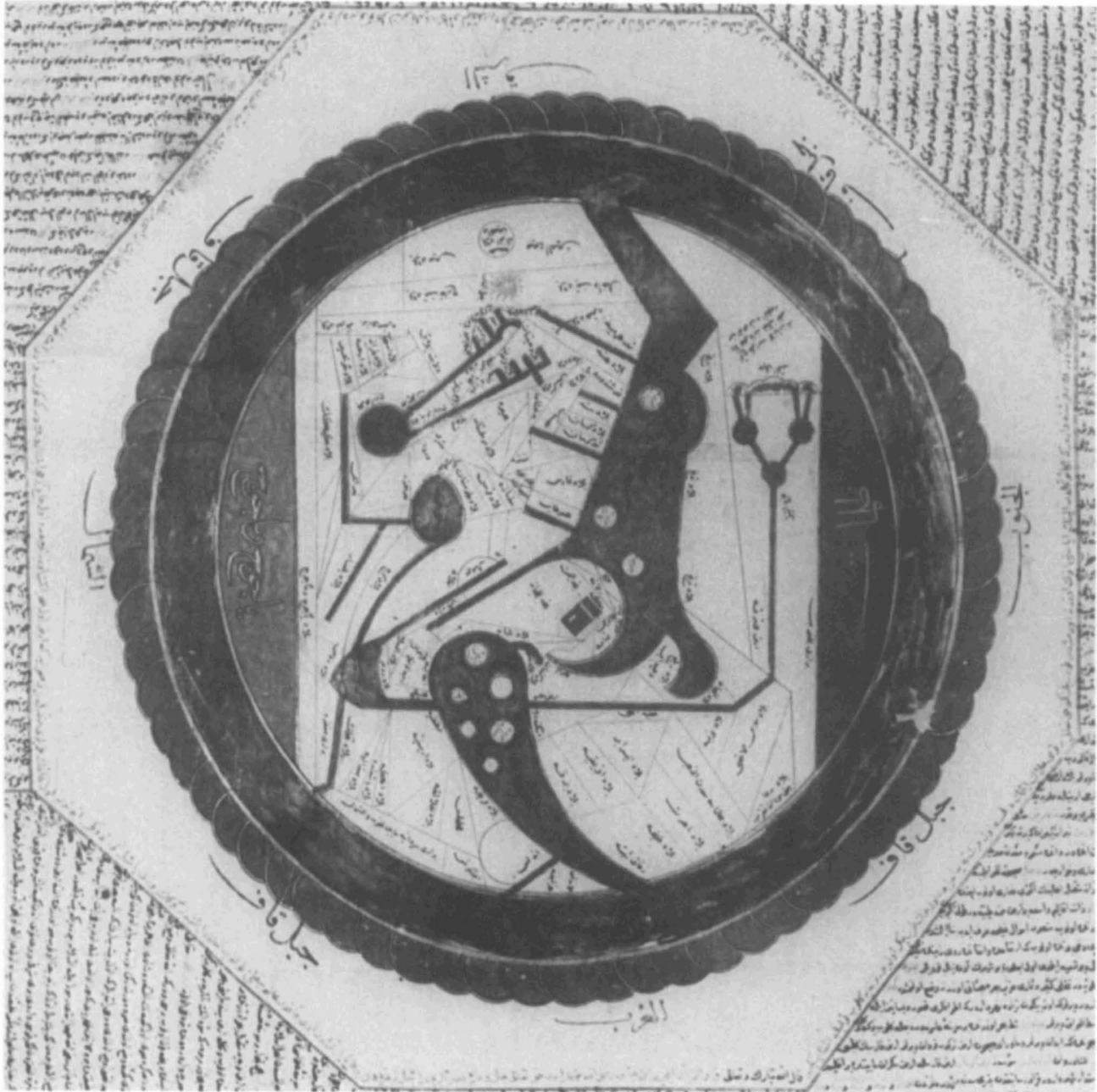


FIG. 11.14. AN OTTOMAN VERSION OF THE WORLD MAP OF IBN AL-WARDĪ. This map is contained in a genealogical scroll titled *Zūbde't-tevārih* (Cream of histories) by Seyyid Loḳmān ibn Hüseyin ibn el-<sup>2</sup>Aṣūri el-Urmevi. The scroll was started during the reign of Süleymān I (926–74/1520–66) and was taken over by Loḳmān in 977/1569 when he officially became the court historiographer. The map is in the first part

of the roll; the author who started the roll is not known. The work is also called the *Silsilename* (Book of genealogy), and there are at least three manuscripts produced between 1583 and 1588 (for other works of cartographic interest by Loḳmān, see chapter 12).

Size of the original: not known. By permission of the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul (A. 3599).



FIG. 11.15. WORLD MAP FROM LOĶMĀN'S ZÜBDETÜ'Ŧ-TEVĀRĪH, CA. 1003/1595. From a manuscript of the same work as fig. 11.14. The name of the draftsman is given as Şun'ī. Size of the original: 39.5 × 25 cm. Reproduced courtesy of the Trustees of the Chester Beatty Library, Dublin (MS. Turkish 414, fol. 34a).

#### WORLD MAPS

Terrestrial maps contained in geographical and historical works that derive from earlier Islamic texts are invariably world maps. Like the textual material that surrounds them, these maps are derivative of previous Islamic geographical traditions and can be viewed as further examples of the different trends of mapping the world that existed in the Islamic Middle Ages (fig. 11.14).<sup>34</sup> Significantly, the world maps used to illustrate the texts begin to reflect European influence much earlier—in the second half of the sixteenth century—than the texts themselves, which gradually assume a Western outlook from the mid-seventeenth century onward.<sup>35</sup> In the interim, alongside attempts to combine traditional ideas with European material (fig. 11.15), there is a marked inclination to copy available European maps freely.<sup>36</sup> The inclusion of a terrestrial globe, of clear European origin, in a miniature painting that depicts the workshop of the short-lived

observatory in Istanbul (built in 985/1577), demonstrates that Ottoman familiarity with European world maps was not negligible in scope.<sup>37</sup> (With the possible exception of the terrestrial globe connected with Jamāl al-Dīn,<sup>38</sup> this

34. Only a few examples out of the many that are extant will be cited here:

- i. *Takvīm* (Almanac), prepared during the reign of Murād II (r. 824–55/1421–51), the Chester Beatty Library, Dublin, MS. Turkish 402, fols. 12b–13a, as described by Minorsky, *Chester Beatty Library*, 4 (note 27).
- ii. The translation (970/1562) of Ibn al-Wardī's (d. 861/1457) *Kharīdat al-'ajā'ib wa-farīdat al-gharā'ib* (The unbored pearl of wonders and the precious gem of marvels) by Maḥmūd el-Ḥaṭīb er-Rūmī (at least four Turkish translations of this work are known), Topkapı Sarayı Müzesi Kütüphanesi, Istanbul, B. 179 (dated 1092/1681), fols. 2b–3a.
- iii. The translation (after 1006/1597–98) of 'Abd al-Raḥmān al-Biṣṭāmī's (d. 858/1458) *Miftāḥ al-jaf'r al-jāmī' wa miṣbāḥ al-nūr al-lāmī'* (A key to the comprehensive *jafr* and a lamp of brilliant light) by Şerif ibn Seyyid Meḥmed, the Chester Beatty Library, Dublin, MS. Turkish 444, fol. 234b, as described by Minorsky, *Chester Beatty Library*, 82 (note 27).

35. An interesting example, both the text and the maps of which reflect European material, is the Ottoman work known as *Tarih-i Hind-i garbi* (History of the West Indies) from about 988/1580; see Thomas D. Goodrich, "Ottoman Americana: The Search for the Sources of the Sixteenth-Century *Tarih-i Hind-i garbi*," *Bulletin of Research in the Humanities* 85 (1982): 269–94, esp. 289–91; also idem, "*Tarih-i Hind-i garbi*: An Ottoman Book on the New World," *Journal of the American Oriental Society* 107 (1987): 317–19.

36. Most revealing in this connection are the world maps that appear in surviving sea atlases, which are discussed in chapter 14. A good example of a traditional geographical text illustrated by European world maps is Meḥmed ibn 'Alī Sīpāhizāde's (d. 997/1588) *Awḍaḥ al-masālik ilā ma'rīfat al-buldān wa-al-mamālik* (The clearest path to the knowledge of countries and empires); the earliest copy I have seen is in Süleymaniye Kütüphanesi, Istanbul, İsmihan 298, dated A.D. 1569–70, with a world map at the beginning. Another European-style world map, the so-called map of Ḥācī Aḥmed of 967/1559, formerly believed to be the work of an Ottoman geographer, has now been proved to be an Italian production published by Marc' Antonio Giustinian; see Victor Lewis Ménage, "The Map of Hajji Ahmed' and Its Makers," *Bulletin of the School of Oriental and African Studies* 21 (1958): 291–314; cf. George Kish, *The Suppressed Turkish Map of 1560* (Ann Arbor, Mich.: William L. Clements Library, 1957), and Rodney W. Shirley, *The Mapping of the World: Early Printed World Maps, 1472–1700* (London: Holland Press, 1983), 118–19 (no. 103).

37. The miniature is contained in the first volume of the *Şāhan-şāhnāme* (Persian *Shahanshah-namah*), completed in 989/1581; a good version is in Istanbul Üniversitesi Kütüphanesi, FY. 1404, fol. 57a. For more on the observatory and a reproduction of the miniature, see pp. 27–28 and fig. 2.10. The existence of this terrestrial globe is confirmed by the testimony of Salomon Schweigger, who was in Istanbul between 985/1578 and 989/1581, *Ein neue Reysbeschreibung auss Teutschland nach Constantinopel und Jerusalem* (Nuremberg: Johann Lantzberger, 1608; facsimile reprint, Graz: Akademische Druck- und Verlagsanstalt, 1964), 90; also quoted by Adnan Adivar, *Osmanlı Türklerinde İlim*, 92 (note 9). The map on the globe is studied in some detail by Aydın Sayılı, "Üçüncü Murad'ın İstanbul Rasathanesindeki Mücessem Yer Küresi ve Avrupa ile Kültürel Temaslar," *Belleten* (Türk Tarih Kurumu) 25 (1961): 397–445.

38. The globe of Jamāl al-Dīn was connected with a mission the Ilkhans sent to China to assist in establishing an astronomical observatory

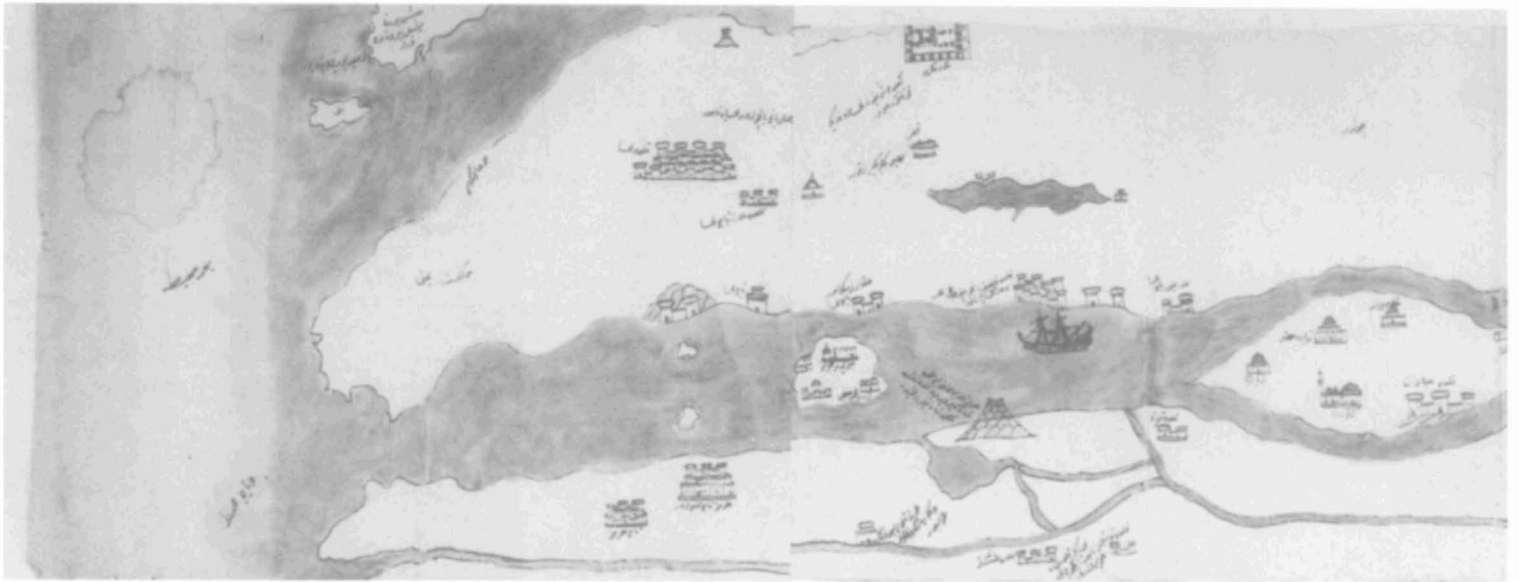
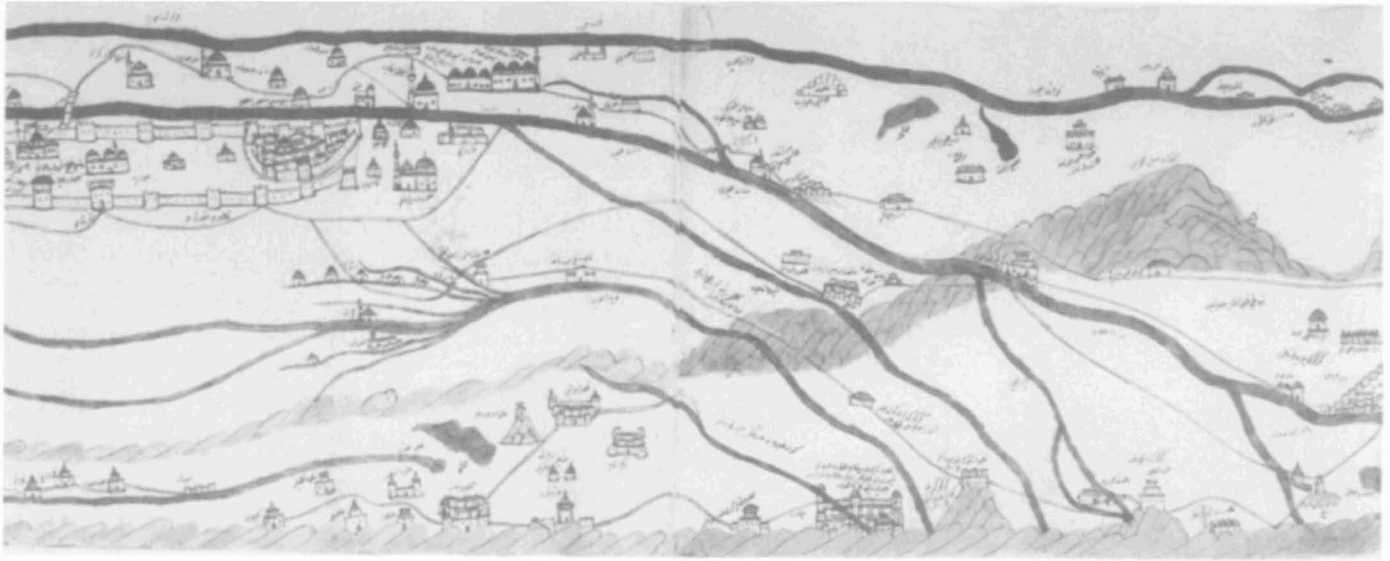


FIG. 11.16. MAP OF THE TIGRIS AND THE EUPHRATES, MID-SEVENTEENTH CENTURY. Map begins in the upper right corner.

Size of the original: 43 × 343.5 cm. By permission of Bernard Quaritch, Ltd., London (Add. 143).

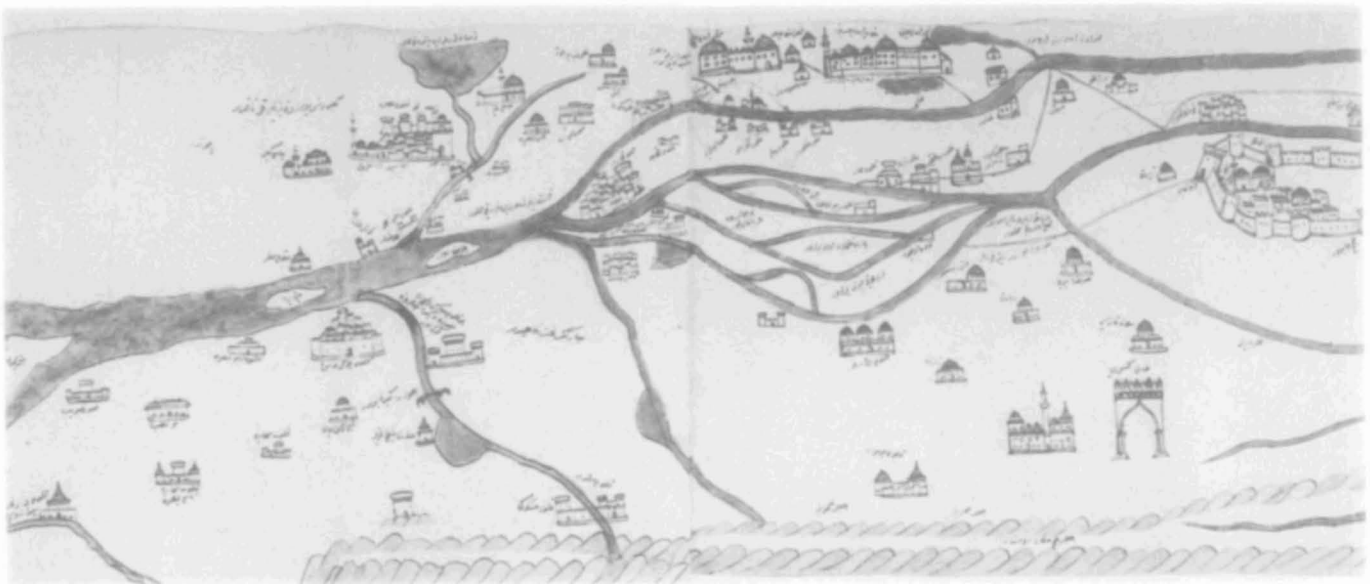
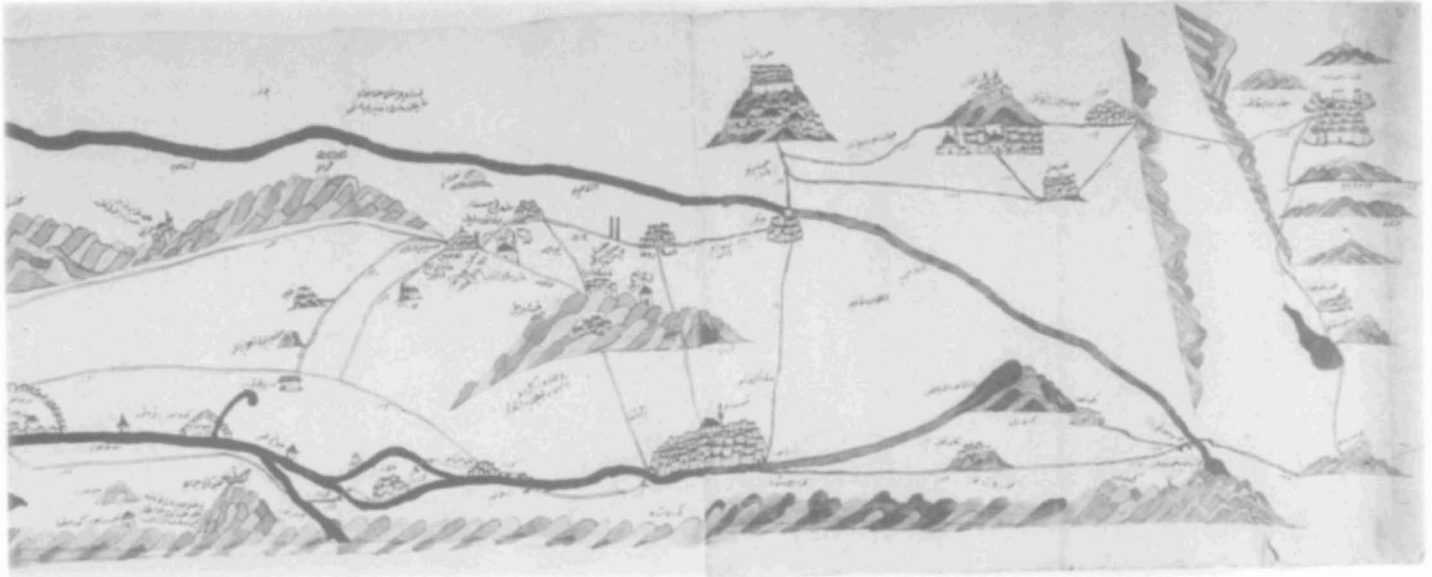
is the only terrestrial globe attested to in the history of Islamic cartography.) On balance, however, the extent of Ottoman knowledge of contemporary European mapping of the world was limited, and the reproduction of a small number of world maps in many different historical and geographical texts leaves little doubt that there was much borrowing not from European works but from much more readily available Islamic books.

#### REGIONAL MAPS

The corpus of traditional Ottoman terrestrial maps reviewed above seems to be curiously lacking in examples

of regional cartography. Military and architectural maps produced under state patronage are overwhelmingly local in scope, while maps contained in scholarly books are invariably world maps until the introduction of European terrestrial atlases in the seventeenth century. However, there are at least two surviving examples of large-scale regional maps in a traditional style, which suggests that the mapping of extensive terrain was not unknown to the Ottomans.

atory in A.D. 1267; Willy Hartner, "The Astronomical Instruments of Cha-ma-lu-ting, Their Identification, and Their Relations to the Instruments of the Observatory of Marāgha," *Isis* 41 (1950): 184–94, and volume 2, book 2 of *History of Cartography*.



Both of the two known extant regional maps chart rivers. The map of the Euphrates and the Tigris (fig. 11.16) seems to date from the mid-seventeenth century. Drawn in color on eight double-folio sheets of paper attached in strip form, this map resembles, physically and conceptually, the scroll maps of Istanbul waterways discussed earlier. It is arranged like a graphic itinerary, and important sites along the course of the two rivers are noted in pictorial elevation. Major routes in the area depicted are schematically indicated. The topography of the terrain itself is left uncharted, with only major mountains being shown in conventional wave patterns. Every feature in the map is clearly identified in writing. The artifact is not

dated, nor is the name of the draftsman given. Distances between major towns are given (in *konak*s), which suggests a possible commercial use, and the fact that holy sites along the routes are also included as likely entries in the itineraries of Muslim merchants does not contravene a primarily commercial function. Nonetheless, the legends of the map do not allow us to venture much beyond such elementary speculation.<sup>39</sup>

The second extant large-scale regional map is of the river Nile (fig. 11.17). This large artifact, drawn in color

39. This map was brought to my attention by Dr. Robert Jones, Bernard Quaritch, London.



FIG. 11.17. MAP OF THE NILE, CA. 1685. The Nile Delta is also shown in detail (above).  
Size of the original: 543 × 88 cm (greatest width). By permission of the Biblioteca Apostolica Vaticana, Rome (Vat. Turc. 73).

on cloth, is datable to shortly after A.D. 1685 on internal evidence. The map charts the course of the Nile from its legendary origins at the foot of the Mountains of the Moon in the south all the way to its delta at the Mediterranean in the north. The drawing is heavily annotated, and the text that runs through the map evinces genetic affinity with the description of Egypt, Nubia, and Sudan that appears in the tenth volume of the most celebrated travelogue in Ottoman Turkish literature, the *Seyāhat-nāme* (Book of travels) of Evliyā Çelebi (d. ca. 1095/1684). Since Evliyā Çelebi is known to have spent the last part of his life in Egypt and died there, there is a distinct possibility that he played a role in producing this map, though there is no proof of such a connection.<sup>40</sup> Conceptually, the map itself should be viewed as an attempt

40. Ettore Rossi, "A Turkish Map of the Nile River, about 1685," *Imago Mundi* 6 (1949): 73–75; idem, *Elenco dei manoscritti turchi della Biblioteca Vaticana* (Rome: Biblioteca Apostolica Vaticana, 1953), 55–57.



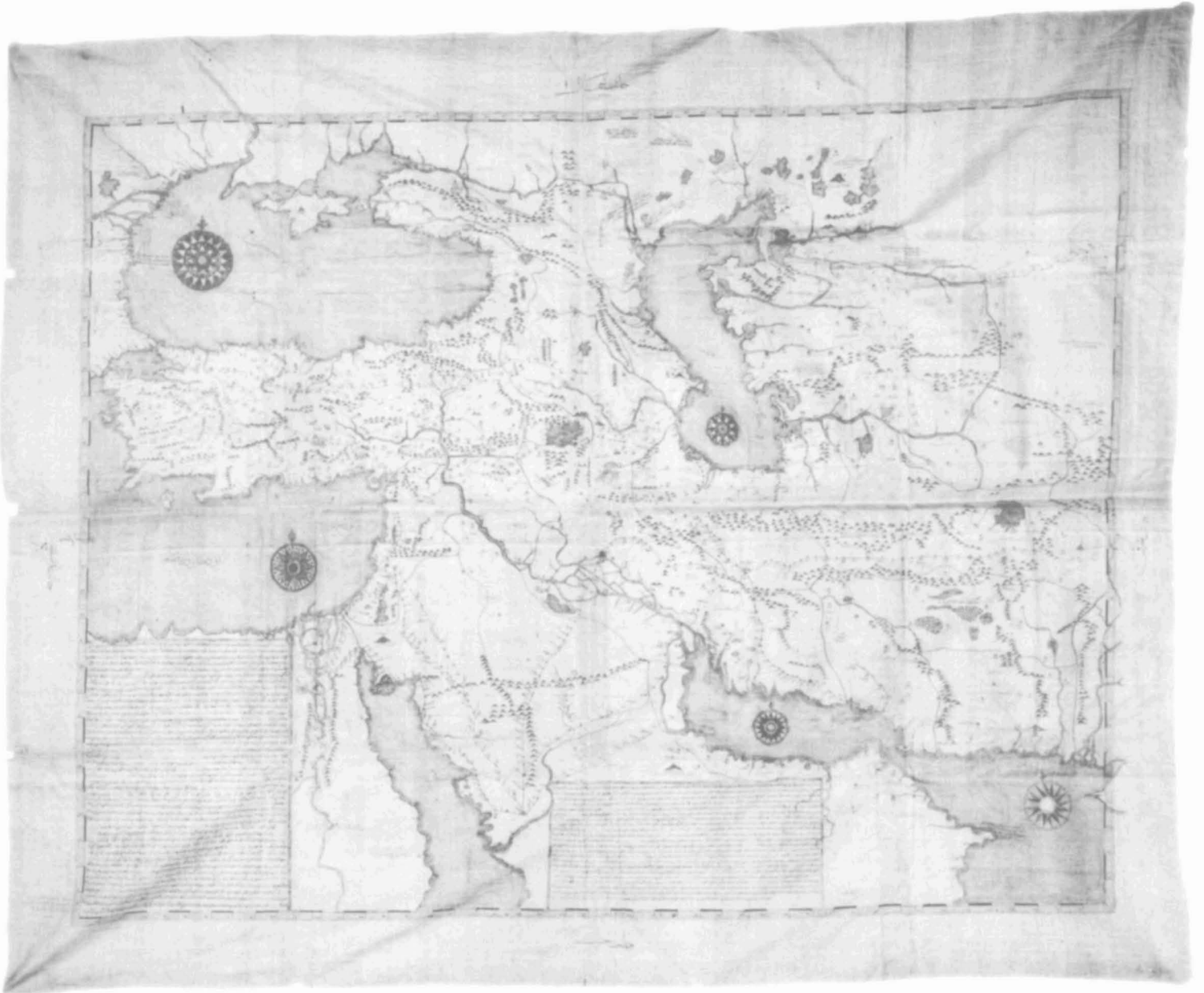


FIG. 11.18. MAP OF THE OTTOMAN EMPIRE, 1139/1726–27. This “European” map is attributable to İbrâhîm Müteferrika, founder of the first printing press in the Ottoman Empire. A cloth copy of the same map is preserved in the Topkapı Sarayı

Müzesi Kütüphanesi, İstanbul (H. 447).

Size of the original: 180 × 220 cm. By permission of the Österreichisches Staatsarchiv-Kriegsarchiv, Vienna (E a 178).

to illustrate legends, historical or otherwise, that surrounded the river Nile in Islamic literature. In execution and style, it is somewhat reminiscent of the earliest extant Islamic map, namely al-Khwārazmī’s map of the Nile.<sup>41</sup>

The replacement of such traditional regional cartography by European theory and practice was a long and uneven process. Throughout the eighteenth century, and even in the nineteenth, mediocre and impressive regional maps continued to be produced concomitantly within the Ottoman Empire. Examples of the former include an eighteen-folio atlas of color maps from before 1114/1702–3<sup>42</sup> and a large cloth map of Europe, Asia, and

North Africa made by a certain ‘Abdūlazīz ibn ‘Abdūlgānī el-Erzincānī in 1228/1813<sup>43</sup> that show fundamental deficiencies in execution. Among the better maps produced in this period one can mention the manuscript map of the Ottoman Empire, dated 1139/1726–27 and attrib-

41. Al-Khwārazmī’s cartographic contribution is discussed in chapter 4.

42. Topkapı Sarayı Müzesi Kütüphanesi, İstanbul, B. 339; Karatay, *Türkçe Yazmalar Kataloğu*, 1:466 (no. 1412) (note 23).

43. Topkapı Sarayı Müzesi Kütüphanesi, İstanbul, H. 448; Karatay, *Türkçe Yazmalar Kataloğu*, 1:470–71 (no. 1429) (note 23), where the date of the map is incorrectly given as 1128/1715–16.



FIG. 11.19. MAP OF THE REGIONS NORTH OF THE BLACK SEA ON SILK BY RESSĀM MUŞTAFĀ, 1768-69.

Size of the original: 69 × 100.5 cm. By permission of the Topkapı Sarayı Müzesi Arşivi, İstanbul (E. 8410/2).

utable to İbrāhīm Müteferriḳa (fig. 11.18), and a map of the regions north of the Black Sea signed by Ressām Muştafā and dated 1182/1768-69 (fig. 11.19). A detailed study of this period of transition would naturally require a close scrutiny of surviving Ottoman maps, comparing

them with their sources whenever these can be identified.<sup>44</sup>

44. A recent attempt in this direction is G. J. Halasi-Kun, "The Map of *Şekli-Yeni Felemenk maa İngiliz* in Ebubekir Dimişki's *Tercüme-i Atlas mayor*," *Archivum Ottomanicum* 11 (1986): 51-70.

### APPENDIX 11.1 WATERWAY MAPS

Waterway maps, almost all in the form of scrolls, known to me are the following:

1. Map of the Kırkçeşme and Halkalı Water-Supply System, dated 1161/1748, 75 × 1,098 cm, Topkapı Sarayı Müzesi Kütüphanesi, İstanbul, H. 1815.
2. Map of the Kırkçeşme and Halkalı Water-Supply System, dated 1016/1607, 24 × 954 cm, Topkapı Sarayı Müzesi Kütüphanesi, İstanbul, H. 1816.
3. Map of the Halkalı Water-Supply System, inspector of waterways Dāvūd on the demand of Sultan Murād III, before 992/1584, 27 × 286 cm, two copies: Millet Genel Kütüphanesi, İstanbul, Ali Emiri 930; Türk ve İslam Eserleri Müzesi, İstanbul.
4. Süleymāniye Waterway Map, not dated, 30 × 2,572 cm, Türk ve İslam Eserleri Müzesi, İstanbul, MS. 3337.
5. Köprülü Waterway Map, dated 1083/1672, Köprülü Kütüphanesi, İstanbul, MS. 1027.
6. Üsküdar Waterway Map, after 1177/1763–64, 30 × 1,800 cm, Türk ve İslam Eserleri Müzesi, İstanbul, MS. 3336.
7. Map of Bāyēzid II's Waterway, probably from 1225–29/1810–14, a total of four pieces of 140 × 185, 150 × 311, 103 × 345, and 103 × 188 cm, Türk ve İslam Eserleri Müzesi, İstanbul, MS. 3337–39.
8. Köprülü Waterway Map, not dated, 43 × 676 cm, Köprülü Kütüphanesi, İstanbul, MS. 1/2441.
9. Köprülü Waterway Map, not dated, 100 × 370 cm, Köprülü Kütüphanesi, İstanbul, MS. 2/2442.
10. Köprülü Waterway Map, dated 1275/1859, 143 × 685 cm, Köprülü Kütüphanesi, İstanbul, MS. 2/2443.
11. Ayvaldere Waterway Map, not dated, İstanbul Vakıflar Başmüdürlüğü (Directorate of İstanbul Waqfs), MS. 334 (included here on the authority of Kazım Çeçen, *İstanbul'da Osmanlı Devrindeki Su Tesisleri*, İstanbul Teknik Üniversitesi Bilim ve Teknoloji Tarihi Araştırma Merkezi, no. 1 [İstanbul, 1984], 192).
12. Unidentified waterway map, 41 × 256 cm, in the private possession of M. Douglas McIlroy, United States.