
O

Observatories, Royal. See Greenwich Observatory (Great Britain); Paris Observatory (France)

Octant. See Instruments for Angle Measuring: Octant and Sextant

Officina Topografica (Topographical Mapping Office; Naples). The name *Officina Topografica* covers the various civil and military institutions in the Kingdom of Naples that, from 1781 to 1814, were responsible for producing the topographical and geographical maps used in the administration and defense of the realm (Valerio 1993, 99–217). The various phases and corresponding titles of the *Officina* can be summarized as follows: from 1781 to 1794, the *Commissione della Carta Geografica* was responsible for topographical surveys of the Kingdom of Naples; from 1795 to 1806, the *Commissione*, under military control, became the *Officina Geografica* and began surveying activities beyond the borders of the kingdom; finally, in 1807, the *Deposito Topografico*, under the direct control of the *Ministero della Guerra*, was active until 1814.

The *Commissione* was established by a royal decree of 22 October 1781 and comprised the geographer Giovanni Antonio Rizzi Zannoni, responsible for its scientific activities, and the economist Ferdinando Galiani, responsible for administrative affairs (Valerio 1993, 131). The original intent was that the *Commissione* would simply review and update the map of the kingdom prepared by Rizzi Zannoni and engraved in Paris in 1769. However, it immediately became clear that the map could not be revised without astronomical observations, geodetic calculations, and topographical surveys of the kingdom's territories. In 1781, a geodetic baseline of around thirteen kilometers was measured in the plain

near Caserta. Based on the hypothesis of the earth as a sphere with a geographical mile equal to 1,851.598 meters, calculations were made to establish the coordinates of various sites within the kingdom using a Cassini projection. The project resulted in a thirty-one-sheet map on a scale of 1.36 inches per geographical mile (ca. 1:114,000), titled *Atlante geografico del Regno di Napoli* (engraved, 1787–1812) (see fig. 270). The initial topographical work involved only three men: Antonio Moretti (geographer), Giovanni Ottone di Berger (draftsman), and Francesco Calogero (hydrographer). However, in 1784 two draftsmen and two engravers were added, and by 1794 the working team totaled ten people (Valerio 1993, 129–30).

In accordance with Galiani's wish, the *Commissione* had no links with scientific and academic circles in Naples, functioning as an outsider throughout its life. Only the draftsmen and engravers came from the Kingdom of Naples; the topographers and geographical mathematicians were all foreigners, from Austria, Venice, and the Piedmont (Valerio 1993, 122–24).

All the works produced by the *Commissione* concerned the Kingdom of Naples: in addition to twelve of the thirty-one sheets of the *Atlante geografico del Regno di Napoli*, there were surveys for a *Pianta della città di Napoli* (1790; ca. 1:11,000), the *Carta dei dintorni di Napoli* (1794; ca. 1:55,000), and the *Carta del littorale di Napoli* (1793–94; ca. 1:97,000). All were engraved by Giuseppe Guerra, master engraver within the *Officina*, who enjoyed a reputation beyond the Kingdom of Naples ([Soulavie] 1802–3, 91–92). Each map was published with an elaborate frontispiece designed by the best artists of the Bourbon court and submitted for approval to the brothers Georg Abraham Hackert and Philipp Hackert, German engraver and painter respectively, active at the Neapolitan court. In effect, these works of cartography were also instruments of political propaganda and affirmations of neoclassical taste.

The *Commissione* also produced the *Atlante marittimo delle Due Sicilie* (twenty-three sheets, ca. 1:90,000), based on the survey of the entire coast of the kingdom carried out from 1784 to 1792. The nautical maps were engraved while work proceeded on the surveys of the



FIG. 613. *ATLANTE MARITTIMO DEL REGNO DI NAPOLI, DETAIL FROM SHEET 8 (STRETTO)*. The Messina Straits between Sicily and Calabria, engraved in 1788 by Giuseppe Guerra.

Size of the entire original: 86.0 × 53.5 cm; size of detail: ca. 19 × 25 cm. Image courtesy of Vladimiro Valerio. Private collection.

coastlines and river mouths, and with the collaboration of the Neapolitan navy, soundings were taken of the sea bed. It was the first time that an extensive part of the Italian coast had been subject to such careful and precise surveys and soundings (fig. 613). The hydrographic map of the Kingdom of Naples was in fact the most important such work to be produced in eighteenth-century Italy; other Italian states relied on French and Dutch maps for coastal navigation, and only in the nineteenth century did they undertake hydrographical surveys of their own coastlines.

With the death of the *commissario* Saverio Mattei in August 1795, the cartographic workshop that had developed within the Commissione became a veritable *Officina Geografica*—a title that appears in a document of 1799 (Valerio 1993, 193)—which was entrusted with the task of producing maps of all the geographi-

cal areas involved in Napoleon's Italian wars. Topographical work on maps of the Kingdom of Naples was abandoned, and no more such works were engraved. Instead, under the direct control of General Giuseppe Parisi, the workshop prepared maps of boundaries and borders (1794–95) and carried out surveys within the Papal States (1795–97) and the Grand Duchy of Tuscany (1797). It was responsible for the engraving of two maps intended for military use: the *Nuova carta della Lombardia* (1795, four sheets, ca. 1:240,000) and the *Nuova carta dell'Italia settentrionale* (1799), whose five sheets in various formats covered the area from Geneva to Istria (Valerio 1985, 93–107) (see fig. 423).

Only with the arrival of the French in 1806 did the *Officina* become a formally recognized institution under the direct control of the Ministero della Guerra, with its own budget and personnel. Royal decrees es-

tablished its title as *Depositio Topografica* and subsequently *Burò Topografico*. The *Burò* produced various important military and civil maps of the kingdom: the *Atlante del Regno di Napoli ridotto in VI. fogli* (1807, ca. 1:415,000), the *Carta del Regno di Napoli indicante la divisione delle XIV sue provincie* (1807, ca. 1:763,000), and the *Carta delle stazioni militari* (1810, ca. 1:1,142,000). In 1812, the engraving of the *Atlante geografico* was complete. Then in 1814—just a few months after the death of Rizzi Zannoni—the new *Officio Topografico del Regno di Napoli* would rise from the ashes of the defunct *Officina Topografica*.

VLADIMIRO VALERIO

SEE ALSO: Map Trade: Italian States; Topographical Surveying: Italian States

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Ogilby, John. Remembered primarily for his innovative and influential road book of England and Wales—*Britannia* (1675)—John Ogilby had a long and intriguing career before becoming a geographer and cartographer at the age of sixty-six. He was born near Dundee, in Scotland, on 17 November 1600, perhaps into impoverished gentility. Trained as a dancer, he eventually worked as a dancing master at court. As the king's master of revels in Ireland (1633–41), he founded the first theater in Ireland. Returning to London some time in the mid to late 1640s, during the Interregnum, he turned to poetry, translation, and publication, with lavish editions of the classics, including Virgil, Aesop, and Homer. He reentered court circles with the Restoration. Among several favors from Charles II (r. 1660–85), he received special privileges to print his own works. The Great Fire of London (1666) destroyed most of his stock and ruined him financially (Van Eerde 1976, 86).

Ogilby restored his fortunes by working as an arbitrator of disputes during the reestablishment of prop-

erty boundaries in the postfire city and by successfully exploiting the print marketplace through his pioneering use of lotteries, subscription publishing, and unorthodox advertising. He implemented his plan for a five-volume "English atlas" covering the whole world. Ogilby modified this project even as he carried it out. He first adapted and translated recently published Dutch works by Joan Nieuwhof, Arnoldus Montanus, and Olfert Dapper to produce a series of lavishly illustrated travel books: *Africa* (1670); *Atlas Japonensis* (1670); *Atlas Chinensis* (1671); *America* (1671); and *Asia, the First Part* (1673). While not atlases in the strict sense of a structured collection of maps, these works offered maps together with an enticing mix of narrative and travelers' tales.

Ogilby soon proposed to cover Britain not in one volume, but in six. In 1671, newly appointed to the formal title of cosmographer to the king, he secured a royal license to survey the country. This authorized his collection of topographical and historical materials, as well as a comprehensive survey of the roads. Ogilby's surveyors completed a number of regional surveys, including the work underpinning *A Large and Accurate Map of the City of London* (1676), the first surviving conscientiously detailed and accurate large-scale map of London; this was published by his kinsman and successor William Morgan shortly after Ogilby's death in London on 4 September 1676 (Hyde 1980, 7–8). But the only volume from the survey work to be published was Ogilby's folio atlas of the roads of England and Wales: *Britannia*, published in 1675. Distances were measured with the waywiser, a perambulator or pedometer improved if not actually invented by Robert Hooke; the principal highways were depicted in the form of decorative scrolled strips (see fig. 866), some having pictorial titles showing the pedometer in motion. Too large for use in actual travel, *Britannia* defined the image of late seventeenth-century England and Wales (fig. 614, overleaf). Wholly original in style and execution, *Britannia* provided a pattern for numerous later publications and imitations, many in pocket form intended for travelers.

LAURENCE WORMS

SEE ALSO: Atlas: Enlightenment; Map Trade: Great Britain; Transportation and Cartography: Road Map; Travel and Cartography

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Ottoman Empire, Geographical Mapping and the Visualization of Space in the. The overwhelming majority of Ottoman cartographic productions emerged in response to, or in anticipation of, the needs of the Ottoman state. The two major achievements of Ottoman descriptive geography and cartography that flank the eighteenth century, Muṣṭafā ibn ‘Abdullāh Kātib Çelebi’s “Cihānnümā” (World mirror) (1067/1657, unfinished) and the *Cedīd aṭlas tercümesi* (Translation of the new atlas) of Maḥmūd Rā’if Efendi (1218/1803–4), are both linked to political turning points. Thus, they require a brief consideration of selected political, social, and intellectual contexts of these one hundred and fifty years, which were once described as a period of decline but which are now more appropriately viewed as an era of transformation in response to economic integration and modernity.

THE OTTOMAN STATE Polymath and geographer Kātib Çelebi shared with many contemporary observers a sense of existential crisis in the Ottoman Empire. Military weakness coincided with a loss of legitimacy of the Ottoman dynasty as manifested by various rebellions and succession crises. These, however, were only the superficial indicators of more profound transformations that ultimately affected all levels of governance of the empire and many circles of society. In the classical understanding of the Ottomans, power rested with the sultan and was exercised with the help of an imperial household of military slaves. Such slaves, recruited from the Christian population, constituted the inner palace service as well as a standing infantry (janissaries) and an elite cavalry; the highest ranks of the military-administrative elite traditionally hailed from these backgrounds. This structure intersected with a feudal provincial administration (integrating remnants of older aristocracies), in which soldiers were given the right to extract dues from a fief (*tumār*) in return for their military services. This dual basis of the Ottoman order underwent numerous changes and transformations beginning long before the period under consideration here but was never directly questioned, reexamined, or redefined. As a result, many profound changes occurred that were “gradual, unintended, usually unrecorded and therefore poorly understood” (McGowan 1994, 658). Innovations introduced in response were similarly nonsimultaneous and organic, due

to local or momentary improvisation, and were manifest in contradictory ways.

Decentralization became the inherent weakness of a minimal state based on personal loyalty as control over territories and resources shifted from the sultan and the central government to provincial governors who replicated the model of the sultanic household as the basis of government at the provincial level, hiring their own militias, usurping revenues, and occasionally openly disobeying sultanic orders. The center lost much of its coercive power as the janissaries, while maintaining their claims to status and influence in politics, deteriorated into a largely unpaid militia of urban craftsmen in search of tax exemption and protection. Hired as mercenaries locally or for larger campaigns, but disbanded in peacetime, large numbers of malcontents armed with cheap firearms frequently resorted to banditry, contributing to insecurity and deprivation of large swaths of land.

Protracted military campaigns and territorial losses exacerbated fiscal problems to which the empire reacted by debasing coinage, imposing new forms of taxation, making one-time taxes permanent, and reassessing the poll tax paid by non-Muslims. In the course of modernizing the Ottoman economic and fiscal system, revenues from fiefs were reassigned to be used for wages of the standing and mercenary troops. Tax farming (the assignment of sources of revenue to individual investors in return for prepayment of the anticipated tax sum, with the investor recuperating the sum—and a substantial surplus—from the population) was an efficient form of collection and alleviated problems of the central treasury in the short term but opened the door for widespread oppressive exploitation. A solution appeared to have been found in the transition from short-term tax farming to lifetime leases, which would provide incentive for sustainable taxation (Darling 2006, 126–30; Salzmann 2004, 29–30, 122–25). Under these circumstances, lifetime tax farms also contributed to decentralization and the rise of a class of local intermediaries between the state and its fiscal and military representatives on one side and the taxpaying subjects on the other. This class, collectively called *a’yān* (notables), formed from local capitalists, dignitaries, large landowners, and military commanders, increasingly formed a regional aristocracy invested in tax farming, pursuing its own local interests and continuously negotiating its relations with the cen-

(facing page)

FIG. 614. FRONTISPICE TO OGILBY’S *BRITANNIA* BY WENCESLAUS HOLLAR. Travelers on horseback consult one of the volume’s strip maps as they survey the route before them, a scene that includes surveyors with perambulator on the ground and geographers with their tools at the table. Three cherubs hold examples of Ogilby’s work: a strip road map, the city plan of London, and a regional map of English counties.

From John Ogilby, *Britannia, Volume the First: Or, An Illustration of the Kingdom of England and Dominion of Wales: By a Geographical and Historical Description of the Principal Roads Thereof* (London: Printed by the Author, 1675).

Size of the original: 46 × 31 cm. Image courtesy of the David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

tral government (Khoury 2006, 152–55). With certain differences based on regional traditions, this class gave rise to local dynasties of governors, few of which lasted longer than three generations, but also brought forth warlords who managed under the title of governor to carve out veritable principalities for themselves. The most prominent examples from our period are Tepedelenli ‘Alī Paşa in Epirus, Pazvandoğlu ‘Osmān in Vidin, Cezzār Aḥmed Paşa in Acre, and Meḥmed ‘Alī Paşa in Egypt. Their position as officials of the sultan, as vassals with internal autonomy, or as rebels and secessionists is hard to distinguish. Typically, however, they sought to participate in the power of the Ottomans, rather than to overthrow them. Several *a’yān* managed to implement reforms similar to those attempted by the center: to create prosperity by creating security and encouraging trade and early forms of industrialization.

A small number of families of scholar-jurists formed an increasingly closed aristocracy that monopolized the highest legal-administrative offices and also contributed to the gap between the capital and the rest of the empire. While European modernizing states typically curbed or eliminated intermediary powers like aristocracies to gain more or less immediate control of their subjects, the pendulum in the eighteenth-century Ottoman Empire was swinging in the opposite direction. The *a’yān* as intermediary powers met their demise only in the course of authoritarian centralization in the course of the nineteenth-century reform era.

The military fate of the Ottoman Empire was intertwined with the structural problems of the decentralized state, as the empire transitioned “from expanding to fixed and finally to shrinking borders” (Aksan 2006, 111). Expansion peaked with the conquests of Crete (1079/1669) and Kamianets-Podilskyi (1083/1672), but the Vienna campaign of 1095/1683 led to a disastrous collapse and the loss of Hungary (Treaty of Karlowitz, 1110/1699). Russia in particular, strengthened by the reforms of Peter I, emerged as a competitor of the Habsburgs and Ottomans in the Balkans. Further losses appeared to be mostly temporary, as an Ottoman Danubian frontier extending from Belgrade to Azov was maintained for much of the eighteenth century. Similarly, Ottoman expansion in the Caucasus and Iran, partly in consensus with Russia, was reverted when Nādir Shah replaced the Safavid rulers. Treaties with the Habsburgs in 1152/1739 and with Iran in 1159/1746 consolidated borders in the northwest and east respectively, which were still close to those of the beginning of the century. Realizing the difficulties and the cost of warfare, the Ottomans increasingly pursued peace, while exploring new alliances in concert with European powers, such as Sweden and Prussia. The empire enjoyed the longest period of peace in its history, almost one generation, before the

war faction in 1182/1768 attempted to push back Russian interests in Crimea. In the subsequent war, lasting until 1188/1774, the empire lost not only Crimea but also its status as a European great power while Russia took on the role of protector of all Orthodox subjects, giving her unprecedented pretexts to interfere in internal Ottoman affairs. Confrontations with Russia continued; French and British invasions in Egypt after 1213/1798 met with minimal resistance, paving the way for the de facto separation of Egypt, while the decentralization observed earlier intersected with protonationalism in southeastern Europe (e.g., Serbian uprising, 1219/1804; Greek War of Independence, 1237–48/1821–32).

Militarily, the Ottomans lagged behind their rivals in terms of recruitment and discipline of troops, as the traditional feudal army and janissaries resisted modern reorganization, and fiscal problems resulted in continuing underinvestment in firepower (Aksan 2006, 102). On the other hand, they closely followed developments of military technology, partly with the help of foreign experts such as Ḥumbaracı Aḥmed Paşa (formerly Claude-Alexandre, comte de Bonneval), or the cartographer-engineers François Kauffer (Hitzel 2000) and Enderūnlu Muştafā. The institutionalization of a strictly scientific approach to warfare occurred with the establishment of a mathematical school, Hendeseḥāne, in 1189/1775 (in 1781 renamed Mühendishāne and in 1209/1795 Mühendishāne-i Baḥrī-i ḥümāyūn, the imperial school of naval engineering) and the imperial school of military engineering, Mühendishāne-i Berrī-i ḥümāyūn, also in 1209/1795. With instruction in military technology, sciences, and mathematics, they laid the foundation for the creation of a new, technocratic, secular military elite, which would determine the future of the country later in the nineteenth century. Meanwhile, the first serious attempt to organize modern troops met with fierce resistance, costing Selīm III (r. 1203–1222/1789–1807) his throne and his life, and was only realized after Maḥmūd II (r. 1223–1255/1808–39) succeeded in eliminating the militarily long-obsolete janissaries in a massacre in 1826.

In the realm of foreign relations, Kātib Çelebi had already argued in the mid-seventeenth century that the Ottomans should adopt Western science and technology in order to overcome their military inferiority (Kātib Çelebi 1913, 3). While access to European books and foreign informants was difficult in his time, cultural contacts had multiplied by the end of the eighteenth century. Most prominently, the Ottomans began to regularly send out embassies to European cities, who added cultural explorations to their diplomatic duties; beginning with Yirmisekiz Meḥmed Çelebi Efendi’s account from Paris in 1134/1721, the new literary genre of the embassy report provided information about French, German, Rus-

sian, and Spanish culture and civilization, which often served as arguments for bureaucratic reform. The process was facilitated by the “‘civilianisation’ of government”—the increasing empowerment of the scribal service at the expense of the military and the Islamic scholarly elite (Findley 2006, 71).

Contacts were not limited to the diplomatic level. The eighteenth century was characterized by the vivid movement and exchange of cultural items in both directions. Europeans reveled in Turkicizing costumes and music, while Ottomans adopted European material culture as well as baroque and rococo elements in decorative arts and architecture. The increasing prosperity of the age, fostered by economic integration, facilitated cultural experiments.

Intellectual life in the Ottoman Empire from the mid-seventeenth to the early nineteenth century was far from its common characterization as stagnant; on the contrary, it was shaped by a search for new forms of knowledge, new means of dissemination, and experimentation with new artistic forms and contents, paralleling in more ways than one the rise of the Enlightenment. Openness for innovation did not, however, result in the discarding of the classical canon. Kātib Çelebi’s most important endeavor was a set of encyclopedic works, historical, geographical, biographical, and bibliographical, that were designed to make the essential knowledge of all times easily available to scholars as well as political decision makers. His effort corresponds well to the reforms beginning in 1656 associated with the Köprülü family of viziers, which combined efficiency of administration with an emphasis on rationality and discipline. The Köprülüs patronized translations of geographical and astronomical works (Joan Blaeu, Bernhardus Varenius, the first discussion of the Copernican system, 1075/1664; İhsanoğlu 1992, 69). Their promotion of a puritanist form of Islam met resistance from Ottoman mystical Islam, which reached new levels of theological and philosophical sophistication (Niyāzī-i Mişrī, ‘Abdülḡanī ibn İsmā‘īl Nāblusī, İsmā‘īl Ḥaḡḡı Bursevī). A generation later, in the mystical encyclopedia of İbrāhīm Ḥaḡḡı Erzurumī, spiritual and scientific knowledge, including astronomy, geography, and medicine, were finally unified into one comprehensive explanation of the world, “Ma‘rifetnāme” (Book of gnosis) (İhsanoğlu 1992, 87–96).

The early eighteenth century also saw a distinct “new worldliness” in outlook (Berkes 1964, 26–30). In the so-called Tulip Era, the first three decades of the century, the lavish spending on luxury goods and leisure in the capital added to social discontent, but also opened the door for new creativity. Knowledge was created and disseminated in new ways. From the 1650s, the number of institutions of higher education in Istanbul almost dou-

bled; public libraries supported by pious foundations were characteristic of the eighteenth century (Erünsal 1988, 57). The office of court historian was created to produce an accurate, often document-based, and coherent narrative of state affairs. A state-appointed commission translated several of the most famous works of Islamic historiography into Turkish, despite the fact that Arabic and Persian continued to be essential for the educated elite of the empire. This intellectual climate was favorable to the endeavor of Hungarian convert İbrāhīm Müteferriḡa, who used his affiliation with the court to establish the first printing press with movable Arabic letters in the Ottoman Empire. Historical and geographical works, including Kātib Çelebi’s *Kitāb-i Cihānnümā* and his other works, constituted the bulk of the output of the press, preceded by a few single-sheet maps. Operating between 1141–42/1728–29 and 1158/1745, and heavily dependent on non-Muslim collaborators, such as map engravers, this press remained a strictly state-controlled enterprise of very limited economic success (Sabev 2006, 296–99; on the maps, Ehrensverd 1990). The aesthetic deficiencies of printing text with moveable type did not apply to maps, which seem to have sold better, although many fewer survive. The next printing enterprise, based in the Mühendishāne-i Berrī-i hümāyūn, was also state controlled, although it produced not only textbooks for the school (frequently translated from French), but also religious works for a broader public (Beydilli 1995, 223ff). An Ottoman “print revolution,” with its economic ramifications, as well as an Enlightenment-like intensification of public discourse through press came about only in the nineteenth century, facilitated partly by cheaper and more flexible lithography.

GEOGRAPHICAL MAPPING IN THE OTTOMAN EMPIRE

Even if we assume that the majority of maps and atlases in private hands may have perished in the innumerable fires that have ravaged Ottoman cities, it is remarkable that those extant are so strongly concentrated in the library of the Topkapı Sarayı and a few other libraries connected to prominent statesmen and sultans of our period, such as the Köprülü family (Goodrich 1993). Documented patronage relations also suggest that Ottoman maps were typically produced in the immediate proximity of the state and therefore have to be considered in the framework of social, political, and intellectual conditions outlined above. In contrast to the European embrace of state-sponsored mapping endeavors, going back at least as far as Niccolò Machiavelli, the Ottoman Empire seems to have had only scarce and selective recourse to maps as a specific device for storing and transporting knowledge.

Geography and mapmaking were never part of the curriculum of the *medrese*, the Ottoman version of



FIG. 615. EBÜBEKİR İBN BEHRÂM ED-DİMAŞKÎ, WORLD MAP IN TWO HEMISPHERES, 1685[?]. Taken from European sources, this manifest world map is rendered in a south orientation.

Image courtesy of the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul (B 325).

the Islamic institution of higher education, which until the nineteenth century maintained a monopoly position. The term “geographer” in this period denoted only a focus of personal interest, never a profession. A number of Ottoman maps were certainly copied or handed down from one scholar to another, such as the autographs of Kâtib Çelebi’s works, which passed through the hands of Ebübekir ibn Behrâm ed-Dımaşkî and İbrâhîm Müteferrika (Hagen 1998, 109, 113). Next to nothing is known about the readership of ed-Dımaşkî’s own work, his translation of Joan Blaeu’s *Atlas maior*, beyond the original initiative for the translation; the presentation copy is in the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul, but several abridgments in Turkish and Arabic are also known elsewhere (Goodrich 1993). The primary addressee of both works, however, was the sultan (fig. 615).

Evlîyâ Çelebi, whose *Seyâhatnâme* (Book of travels) is a rich but not always reliable source for Ottoman society, mentions maritime cartographers working with Latin sources among the guilds of İstanbul (2006, 256). In the absence of any institutionalized study of geography, or collection of geographical information, the obvious dependence on wholesale adaptation of Western knowledge is noteworthy, although Kâtib Çelebi and especially ed-Dımaşkî integrated original information about the Ottoman Empire into their works. It is not known if the manuscript maps in such atlases were made by professional mapmakers or by miniature painters producing cartographic illustrations; calligraphers were also involved in the copying of maps (Brentjes 2005). It is difficult to determine when artistic production of manuscript maps ceased and maps began to be either printed or drawn by specialists trained in math-

ematics and engineering, but the mid-eighteenth century is a likely period. Copies of atlases with manuscript text and printed maps (from the Mütferrika press) indicate new preferences.

Maps and globes provided a symbolic device for the sultan and elite members of society. Ottoman miniatures of the late sixteenth century show the sultan (symbolically) shooting arrows at a globe suspended in the imperial *divan* chamber, where day-to-day decisions were made and petitions from the population received (Necipoğlu 1991, 82). The action may be understood as indicating the universal reach of sultanic justice in protecting his subjects from oppression. Belvedere towers as parts of Ottoman palaces in Istanbul and Edirne suggest a similar symbolism of the imperial gaze as a guarantee of justice. The title of Kâtib Çelebi's world geography, "Cihānnumā," alluding to one such tower, connects the physical gaze with the symbolic through the representation of geography. Its practical use as a basis for the administration of justice, however, is doubtful, given its universal scope and suprahistorical outlook (Hagen 1995–96).

Ottoman sultans and princes more than once in the sixteenth century requested maps from Venice for representative or edifying purposes. No seventeenth- or eighteenth-century maps have yet been identified with similar purposes, although the existence of several large wall maps preserved in the Topkapı Sarayı Müzesi Arşivi makes it seem rather likely. The 1218/1803–4 *Cedid atlas tercümesi* was an extremely expensive work printed in only fifty copies in the Mühendishâne-i Berrî-i hümayûn; three copies on special paper were presented to the sultan and grand vizier (fig. 616). Kemal Beydilli (1995, 169–70) suggests that the project was more concerned with demonstrating the feasibility of map printing than with actual dissemination of geographical knowledge among military officers or beyond. Just as in the case of Mütferrika's first maps, Viennese engravers collaborated to produce the first plates for printing. The school also purchased a large set of maps from a former envoy to Vienna for teaching purposes, suggesting that domestic products were not available. Maps became common sights in imperial classrooms only after the establishment of a system of public education in the nineteenth century (Fortna 2002, 165–201).

Maps did not seem to serve the tax administration of the empire. Ottoman tax records of the sixteenth century were unique in their comprehensiveness and detail, but they did not provide any information as to how the various villages and fields taxed were situated in relation to each other (see the resulting modern maps in Göyünç and Hütteroth 1997). Information of this kind was irrelevant in the context of taxation; disputes over property were solved locally. For this reason, the only spatial rep-

resentation, so-called border descriptions (*hudûdnâme*), provided instructions on how to walk along the property line on the ground, rather than a graphic image to be read without performative reference to the place or boundary (Singer 2002, esp. 141–42). After 1008/1600, central tax records were no longer updated by regular censuses; instead, the tax allocation was done locally, often in response to lump sum demands. In the Ottoman Empire, infrastructure projects were undertaken by functionaries of the state in the framework of charity, lacking central coordination and planning. Thus, while Western European states collected and mapped broad sets of data on roads, canals, public health, population growth, and allocation of water resources as the basis of planning, such information was irrelevant for the central Ottoman state because the corresponding decision making had moved to the local level of the *âyân*. If maps had ever been used in this "government in the vernacular" (defined by Salzmann 2004, 153, as "like a dialect that consists of an imperial syntax and a local vocabulary"), they have not survived, but given the limited horizon of provincial administration it is doubtful they would have been necessary.

During the search for a person to translate the *Atlas maior* into Turkish, the French ambassador was told that the sultan was only interested in information about cities and soil qualities, i.e., in things relevant for revenues, while the extensive references to Greek mythology were to be left out (Wurm 1971, 43). There is no evidence that the Sublime Porte initiated a collection, let alone mapping, of this and other administrative information before the nineteenth century. Geodesy seems to have been limited to military surveying as taught in the Mühendishâne-i Berrî-i hümayûn, which owned several instruments for this purpose (Beydilli 1995). Results of their use have yet to come to light.

Geographical maps did play a role in the military domain. Kâtib Çelebi had produced his atlas (largely based on the Mercator-Hondius *Atlas minor*) arguing for the political necessity of geographical knowledge, and he repeated similar arguments in his history of Ottoman maritime wars (Kâtib Çelebi 1732, 16). The use of maps in the latter points to the documentary value of maps in visualizing accounts of military campaigns. Examples are known from as early as the sixteenth century in the form of miniatures. Several well-known military maps of the following periods, such as the siege map of Vienna or the map of the Battle of Pruth, appear to have been designed as narrative maps, not for the planning of a campaign but as supporting information for later reports or directly for the use of the historian (Karamustafa 1992, 210–15).

On the other hand, even narratives of past campaigns were considered by Europeans as potentially revealing



FIG. 616. MAP OF EUROPE FROM *CEDİD ATLAS TER-CÜMESİ*. The atlas was published in Istanbul in 1218/1803–4 with an introductory text by Maḥmūd Rā'if Efendi. The maps are based on the *General Atlas* of William Faden.

Image courtesy of the Geography and Map Division, Library of Congress, Washington, D.C. (G 1019 .T2 1803).

military secrets and therefore were restricted in circulation. The Venetian ambassador in Constantinople viewed the Dutch gift of a full set of Blaeu's *Atlas maior* to the sultan in 1079/1668 with great concern (Wurm 1971, 31). Although the Turkish translation was not commissioned until 1086/1675 under the aegis of Köprülü Fāzıl Aḥmed Paşa, an excerpt made during the preparation for the Austrian campaign suggests that the Ottomans indeed were making use of the atlas for military purposes (Taeschner 1926, 107). The fatal Russian campaign of 1182/1768 was prepared with a series of maps by Enderünlü Muştafâ, presumably translations of published maps rather than new works based on reconnaissance of the area. A decree of 1209/1794 charged the Mühendishâne with keeping all relevant maps, not-

ing that previously several had been lost due to lack of an appropriate office (Beydilli 1995, 292, 425).

As to the determination of regional boundaries, Evliyâ Çelebi described the demarcations at the Ottoman-Habsburg border as a series of artificial hill-ocks with high posts, that is, directly imposed upon the landscape, and controlled and verified locally in a frontier area of frequently fluctuating domination. Large areas of no-man's-land previously made exact borders unnecessary; not until the eighteenth century were border delineations based on exact measuring and mapping of disputed territory. During that process after the peace of Belgrade (1153/1740), the members of the Ottoman delegation had to admit to themselves that they had neither the technical knowledge nor the instruments to

match the measurements of the Austrians, until one of the Ottomans devised an imitation of their method and tools (Nu'mān Efendi 1972, 40–47). Still in 1245/1829, the Ottoman delegation at the Edirne peace negotiations with Russia was unable to verify toponyms named by their Russian counterparts on their maps (Beydilli 1995, 359).

GEOGRAPHICAL MAPPING TECHNIQUES The technique of most small- to medium-scale maps produced between 1067/1657 and 1218/1803 was derived from European models and thus anything but original. To appreciate the maps produced, it is useful to review fundamental concepts of space in Ottoman culture.

The spatial schema communicated in Ottoman views of the universe by and large maintained a geocentric view well into the nineteenth century; the astronomical concept of a spherical earth (resulting in the division of the surface into climes, following Ptolemy) was competing with so-called “Islamic cosmology,” which consists of a layered earth and sky supported by mythical beings: an angel, a bull, a fish (Heinen 1982, 85–88). Maps in cosmologies were circular, but a mountain around its periphery suggested a flat rather than a spherical earth. The division into continents meant little to the Ottomans, who first learned about it from Kātib Çelebi (Hagen 2003, 181, 219). A cultural division of the world was structured in three concentric circles, with the familiar at the center, a foreign periphery, and beyond that, an exotic, even miraculous margin, which, however, in the course of the eighteenth century shrank considerably, when, for example, the Americas lost much of their exoticism and were firmly included in the periphery (Bonner and Hagen 2010, 476). Smaller units, such as regions, were equally defined by the essentialized culture of each, a fact that precluded exact delineation of boundaries, as is evident in Kātib Çelebi's early sketched maps (in a copy of an earlier work that he used to compile information for his “Cihānnumā”; Hagen 2006).

In the absence of visual representations, the mental map of the Ottoman Empire was organized along the main roads radiating out from Istanbul, three on the Asian side and three on the European. Their respective names of right, center, and left arm reflect the vantage point of Istanbul. A place was situated in relation to the roads and its distance from the center, which provided an orientation sufficient for literary or archival contexts, but not as a coherent map of the empire (e.g., Özergin 1976).

Maps separate from texts, other than portolan charts, did not appear in the Ottoman context until the eighteenth century. Historical texts were sometimes accompanied by a world map, as were world geographies, while only the long-outdated works of the Balkhī school

of geographers, collectively known as *Atlas of Islam*, came with a set of regional maps (see Pinto 2016, 233–50). Ottomans were familiar with larger-scale maps through the tradition of the *isolario* as represented by Pīrī Re'īs, but had seen smaller scales applied for the first time to larger regions by Kātib Çelebi, whose early geographical work included miniature maps drawn in the margin of the text. Only in the second manuscript version of his “Cihānnumā,” adapted from Gerardus Mercator and others, did he make space for half-page maps, thereby increasing the scale. The later printed edition by Müteferriķa increased the maps to full folios as much for technical reasons in printing as for legibility. Regional maps for the European part of the empire are known, but appear to be exceptional (examples in Gökbilgin 1956). Large-scale maps appeared in specialized contexts such as building projects, water distribution, or for narrative purposes, such as documentation of a battle or siege. A wall map attributed to Müteferriķa shows the entire Ottoman Empire (fig. 617), but this small-scale framework seems to be the exception, as wall maps used in schools in the nineteenth century showed all of a continent, such as Asia without Europe, and consequently only a part of the Ottoman Empire (Fortna 2005, 25–30).

Visual languages with different genealogies were employed on Ottoman maps from the middle of the seventeenth century. Maritime maps followed the style of the larger group of Mediterranean maps and portolans; the flurry of imagery in the context of court historiography employed town views from an elevated vantage point; the stark geometrical, abstract forms of medieval maps continued in cosmographies and histories (see vol. 2.1 of the *History of Cartography*, 1992). With Kātib Çelebi and his use of European models, the Ptolemaic perspective controlled by a rectangular grid began its domination. Yet, in his early maps, and later, if his models were insufficient, Kātib Çelebi employed an alternative representation that privileged one linear dimension over the others. By structuring his map along a road, river, or coastline, he produced an image that could often not be read from a central perspective in the Ptolemaic way but by the imagined movement of the viewer along such a central axis. The basis of such maps is textual, but they cannot be explained exclusively as an inadequate compromise necessitated by lack of reliable data. Instead, they represent an established form of encoding spatial information. Since distances measured sideways from this central axis are no longer to scale, such maps could be called not two-dimensional but one-and-a-half-dimensional (Hagen 2012). A seventeenth-century route map of Mesopotamia (Tigris and Euphrates), structurally similar to the Peutinger map (Tabula Peutingeriana), is a prominent example but unfortunately is entirely



FIG. 617. MAP OF THE EASTERN OTTOMAN EMPIRE WITH IRAN, CA. 1138–39/1726–27. Attributable to İbrâhîm Müteferrika, this manuscript map shows a contemporary vision of the Ottoman Empire and its eastern extent on an im-

plied Western European grid of longitude and latitude marked along the map's outer borders.

Size of the original: 150 × 210 cm. Image courtesy of the Topkapı Sarayı Müzesi Kütüphanesi, İstanbul (H 447).

without context (Karamustafa 1992, 222–23). Water distribution maps obviously lent themselves to this form; the format of the scroll, which was used as late as the mid-eighteenth century, represented only distances along the main axis correctly, but flattened out the turns and bends. Reading spatial relations through dynamic movement may be proposed as an older Ottoman visual tradition that underpinned some earlier representations, like the maps of Maṭrākçı Nāşūḥ in the sixteenth century. Such movement along an axis is also at the heart of interpretation of Ottoman architectural expression, which contrasts with a central perspective required by Renaissance and later architecture in Western Europe (Rogers 1992, 235–45; Necipoğlu 1991).

The juxtaposition of one-and-a-half-dimensional maps with two-dimensional Ptolemaic maps in Kātib

Çelebi's work and the increasing dominance of the latter suggest that the Ottomans recognized the advantages of multiple observations and consistency of scale as superior. Yet there is no indication that any Ottoman cartographer of the period concerned himself with the mathematical challenges of projection or the shape of the earth. Straight or curved meridians gave only approximate orientation; many maps of the period indicate the grid only on the frame, thus evading the question. Sonja Brentjes (2005, 127, 131) points out that both Kātib Çelebi's and ed-Dīmaşkī's maps in the respective autographs appear as freehand drawings, showing little sign of mathematical construction. Did the close nexus between Ptolemaic cartography, the rectangular grid as a principle to order the world, and the central perspective of the Renaissance, as suggested by Samuel

Y. Edgerton (Gautier Dalché 2007, 335–36), repeat itself in the Ottoman context? In contrast to the conventions of miniature painting, experiments with perspective representations of landscapes appeared on murals and frescoes in the residences of the new provincial elites before they were used as book illustrations (Renda 1988, 69).

Throughout the period geographical maps never became a natural form of visual representation, and no binding convention existed among Ottoman cartographers. World and regional maps were usually oriented south, and in addition to lines dividing land and water, few maps included more than cities and mountains in silhouette. Only maritime maps, for obvious reasons, were accustomed to showing shoals, reefs, rocks, and fresh water supplies. That larger maritime maps in turn were often oriented north, while the detailed maps in the *isolario* of Pīrī Re'īs lacked unified orientation, indicates their different cultural origins. The advent of European maps finally established the north orientation as the default for Ottoman mapping. Western cartographers in Ottoman service were not shy about introducing the entire range of cartographic symbols of their time, although, as far as can be ascertained, none of the new maps included a separate legend explaining the symbols used.

The astronomic clime or the culturally defined region had been the basic unit of geography as well as cartography in the Ottoman world, while European atlases since Mercator at the latest divided the world along political boundaries. This approach was initially rejected by Kātib Çelebi in his adoption of Mercator, thus creating a distinctly timeless map image, but later cartographers of the period not only used the political divisions but also comfortably drew political boundaries as lines on maps. Other artificial lines, especially contour lines, were not introduced until much later, as Ottoman cartographers did not have elevation data.

Despite the graphic proximity of maps and miniatures, which was a sophisticated and highly developed art in Ottoman elite culture (culminating in the eighteenth century with the work of Levnī), and although portolans and maritime maps especially had previously attracted considerable artistic effort, the new maps of the seventeenth and eighteenth centuries usually were devoid of artistic embellishment. Translations from European models were stripped of the elaborate frames as well as symbolic and mythological figures and decorative elements, the maps of the *Cedīd aṭlas tercümesi* being an exception. On ed-Dimaşķī's map of New England only the ships were retained (Halasi-Kun 1986).

At the end of the eighteenth century, maps based on the scientific principles of projection, longitude and latitude grid, and repeatable observation became more or less the only cartographic genre accepted by the Otto-

mans, all other traditions having been abandoned. However, this “modern” cartography was borrowed, not appropriated, and the full range of its expression was not explored. The late adoption of printing in movable types, previously understood as an Ottoman failure, has more recently been explained by the lack of actual necessity. Arguably, the necessity for the Ottoman state to use maps to represent the space of the empire and the world around it was aroused only in the nineteenth century, during a period of rapid modernization. Even then, cartography remained firmly in the domain of the state.

GOTTFRIED HAGEN

SEE ALSO: Administrative Cartography; Boundary Surveying; Geographical Mapping; Karlowitz, Treaty of (1699); Map Collecting; Marine Charting; Military Cartography; Property Mapping; Topographical Surveying; Urban Mapping

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