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The Ayyubid and Mamluk Revaluation of the Hinterland and Western Historical Cartography

Considering that a “boom” has taken place in Mamluk studies particularly during the past three decades,¹ research on the spatial conditions of the Sultanate—society, economy, culture, and science—is markedly lagging behind. Contributions both to the geographical and cartographic sources, as well as to the historical geography and cartography of the period, date mostly from the nineteenth and early twentieth centuries, as the *Chicago Online Bibliography of Mamluk Studies* shows.² Moreover, the lack of research reviews on these subjects shows that little has been added since.³ Although the general efflorescence of Mamluk studies has coincided temporally with a refinement of the notions of spatiality, map, and landscape in the social and cultural sciences,⁴ that development has not been responded to in a significant way.

This deficiency is even more conspicuous when we consider that the period of the

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This article results from a project in the framework of the Collaborative Research Center “Difference and Integration” (see n. 5), which is conducted by the Universities of Halle and Leipzig and funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). For various forms of aid I should like to thank Stephan Conermann, Stefan Leder, Bruce D. Craig, Ildikó Bellér-Hann, David Tucker, Stefan R. Hauser, Marlis J. Saleh, Thomas Eich, and Jens Kamlah.

¹Stephan Conermann, “Es boomt! Die Mamlükenforschung (1992–2002),” in *Die Mamlüken: Studien zu ihrer Geschichte und Kultur*, ed. Stephan Conermann and Anja Pistor-Hatam (Schenefeld, 2003), 1–2.

²<http://www.lib.uchicago.edu/e/su/mideast/mamluk> (all websites were last accessed on 18 April 2007).

³Peter Thorau, “Zur Geschichte der Mamluken und ihrer Erforschung,” *Die Welt des Orients* 20/21 (1989/90): 227–40; Ulrich Haarmann, “Mamlük Studies: A Western Perspective,” *Al-Majallah al-‘Arabīyah lil-‘Ulūm al-Insāniyah/Arab Journal for the Humanities* 51 (13th year) (1995): 328–47, but see 344, last paragraph; Li Guo, “Mamluk Historiographic Studies: The State of the Art,” *Mamlük Studies Review* 1 (1997): 15–43; W. W. Clifford, “*Ubi sumus?* Social Theory and Mamluk Studies,” in *ibid.*, 45–62; Robert Irwin, “Under Western Eyes: A History of Mamluk Studies,” *MSR* 4 (2000): 27–51; Conermann, “Es boomt!”; R. Stephen Humphreys, “The Politics of the Mamluk Sultanate: A Review Essay,” *MSR* 9, no. 1 (2005): 221–31.

⁴A text of seminal importance to the recent discussion of socially constructed spaces is Edward W. Soja’s *Postmodern Geographies: The Reassertion of Space in Critical Social Theory* (London, 1988). Criticism of geo-deterministic ideas, however, was practiced before, notably by French historians. See for example Fernand Braudel, *La Méditerranée et le Monde méditerranéen à l’époque de Philippe II* (Paris, 1949), 295–304; Henri Lefebvre, *La production de l’espace* (Paris, 1974), 39–53.

Article: http://mamluk.uchicago.edu/MSR_XII-2_2008-Franz-pp133-158.pdf

Full volume: http://mamluk.uchicago.edu/MamlukStudiesReview_XII-2_2008.pdf



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Mamluks and, to a lesser degree, their Ayyubid predecessors holds a considerable potential for analysis in these regards. Following the Crusaders' and Mongols' intrusions, the Sultanate saw a rise in military, political, and infrastructural action which pertained to its spatial cohesion and operability. At the same time, men of letters created a more substantial body of space-related literature than was produced in Arabic either before or after. It may be asked which actions these were and to what extent they connected to each other, or perhaps even answered to an overarching scheme; how factual developments bore on space perceptions; and how the course of Mamluk history was in turn affected by modifications of spatial thinking.

Today this subject is almost a blank—and a challenge to the historian to whom the narrative, geographical, and administrative sources in particular provide a fair point of departure. To begin with, I will address space relations and perceptions in a certain field, viz. nomad-state interaction. I will argue that the Mamluks, on the shoulders of the Ayyubids, pursued a policy intended to lend territorial depth to their rule, for which purpose some sort of expansion into the Bedouin areas in the long-neglected hinterland was of prime importance. While such a policy should be well-suited to mapping, the under-development of historical geography and cartography in Mamluk studies requires that some consideration of its causes and its consequences be examined first. In fact these prolegomena occupy most of this article. The discussion will be concluded by looking ahead to an attempt of mine at historical cartography on this subject.⁵

A GRIP ON THE STEPPE

The Frankish state-building in the Levant prompted changes in Muslim territory, inter-regional communications, and the spatial pattern of government. While the reactions of the two subsequent sultanates are well known, they are not yet understood in terms of potential alignment. I dare say that they signify a change in the attitude toward the spatial extension of rule, adopted by the Ayyubids and continued in an intensified manner by the Kipchak Mamluks.

Particularly overturning the existing geographic order was the fact that the land bridge between the African and Asian hemispheres of Islam, the Sinai Peninsula, was successively sealed by the Kingdom of Jerusalem. First, the northern route

⁵The ongoing project “Bedouin Groups in Syria and Egypt: Interplays between Nomads and the Ayyūbid and Mamlūk State Systems” is part of the Collaborative Research Center “Difference and Integration.” See <http://www.nomadsed.de>. My interest in nomad-state interaction is informed by my previous research in the center’s framework, the results of which are included in my *Vom Beutezug zur Territorialherrschaft: Das lange Jahrhundert des Aufstiegs von Nomaden zur Vormacht in Syrien und Mesopotamien 286–420/889–1029: Beduinische Gruppen in mittelislamischer Zeit I* (Wiesbaden, 2007).

across the coastal desert through al-Jifār fell out of use. Second, expansion southward into the Bilād al-Sharāh under King Baldwin I led in 510/1116 to the seizure of ʿAqabat Aylah. Elim, or Helim as the Crusaders called it thereafter, was fortified, as was the close-by Jazīrat Firʿawn (then Île de Graye) off the Sinai coast. These were the final links in a chain of castles which connected Latin Palestine by the Lordship of Oultrejourdain to the Red Sea. Consequently the Syrian lands were cordoned off from Egypt.⁶ The overland routes that had previously run through al-ʿAqabah were now altered to circumvent the Frankish reach. They were shifted up-country or replaced by maritime routes, which was conducive to Muslim sea transport.

In terms of perceived spaces, the century-old cultural designation of Bilād al-Shām, Greater Syria, was invalidated both as a basic constituent of the realm of Islam and as an entire framework of reference in itself (although that had been a reminiscence rather than a reality following the Ikhshidid-Hamdanid partition agreement some 180 years earlier). Muslim rule was reduced to a narrow strip of land between the Latin principalities to the west and south and the zone of Bedouin tribal domination to the east. Now that much of the arable land of Syria belonged to the Franks, the steppe areas in the hinterland deserved new attention. In fact, the term Bādiyat al-Shām (or Bādiyat al-Samāwah) had always signified that the area of predominantly nomadic use was adjacent to Syria (or to al-ʿIrāq) rather than forming part of it. Virtually squeezed in between the Latin principalities and the Bādiyah, the width of that strip was now, for the most part, only one day's journey on horseback, and access to Egypt and the Hijaz depended perforce more than before on transit through the autonomous sphere of the Bedouin.

The situation of al-ʿAqabah at the junction of the Egypt-to-Syria and Syria-to-Hijaz roads was of strategic value to Ṣalāḥ al-Dīn when shaping a Syro-Egyptian polity. In fact, he occupied the town in 566/1170, i.e., the very year after he had seized power in Cairo. Thus, in the moment of its creation the Ayyubid Sultanate put an end to more than half a century of an exceptionally disjointed situation and restored the territorial continuity of Egypt, Syria, and the Hijaz. It was reasserted, after a Frankish interlude in the town, in 578/1183. The approximate synchronicity of political and territorial change suggests a background on which to conceive several measures of a new space-constituting quality not only in a rough chronological sequence, but also as causally related. At least six sets of actions come to mind. Since all of these are well known, I limit myself here to a brief outline.

1. Stress on the Bedouin population resulted in efforts to stabilize relations with

⁶On this fact and the eventual countermeasures, see Andrew S. Ehrenkreutz, *Saladin* (Albany, 1972), 82–83, 100; Jean-Michel Mouton, “Saladin et les Bédouins du Sināi,” in *Le Sināi de la conquête arabe à nos jours*, ed. idem (Cairo, 2001), 197–206.

them instead of reiterating the policy of general neglect and sporadic repression to which all settled powers following the Umayyads had resorted. Shortly after Ṣalāḥ al-Dīn's reign, the institution of the *amīr al-ʿarab* or “Shaykh Superior of the (Syrian) Bedouin” was introduced.⁷ Conceptually, the amir was to serve as an addressee to the government and as an arbitrator in cases of conflict. Practically, he was to ensure adequate levels of military service by his people in the sultan's army, as well as the safeguarding of the roads of the interior. As this arrangement was accompanied by subsidies and land grants for the amir, it produced frictions among competing tribal groups, which may have been a welcome side-effect. The Āl Faḍl ibn Rabīʿ of the Banū Ṭayyīʿ emerged as the dominant family under this system and further consolidated their position during Mamluk times. Although the institutionalization of the amirate could not secure the Bedouins' good conduct at all times, it largely fulfilled the objective of providing an interface with them. The impression that both dynasties pursued a systematic policy towards the Bedouin is further supported by the fact that the office of *mihmindār* was established at the court in Cairo.⁸ Serving as counterpart to the *amīr al-ʿarab*, this official was responsible for receiving Bedouin representatives and regulating the Bedouin-state relations. For the first time in four centuries, the Bedouin were involved to some degree in state administration, and the Bādiyah became more closely linked to Syria proper (though in a still rudimentary way), thus essentially extending the territory of the Sultanate. The importance of the Bedouin even increased when the Mongols' first invasion of Syria in 657/1259 turned the Bādiyah into a buffer zone between Mamluk Syria and Il-Khanid al-ʿIrāq for three-quarters of a century—the Bedouins' supremacy over the steppe allowed them to adopt the role of the Mamluks' indispensable confederates, albeit rather unreliable ones.

2. A system of governmental postal communications, the *barīd*, was set up by Baybars I to serve again as the backbone of an all-regional intelligence network that had been defunct since the early Buyid period.⁹ By means of this institution,

⁷David Ayalon, “The Auxiliary Forces of the Mamlūk Sultanate,” *Der Islam* 65 (1988): 23–24, 27 (written in 1945); Mustafa A. Hiyari, “The Origins and Development of the Amirate of the Arabs during the Seventh/Thirteenth and Eighth/Fourteenth Centuries,” *Bulletin of the School of Oriental and African Studies* 38 (1975): 509–25; idem, *Al-Imārah al-Ṭāʿīyah fī Bilād al-Shām* (Amman, 1977).

⁸Abdel Hamid Saleh, “Mihmindār,” *The Encyclopaedia of Islam*, 2nd ed., 7:2.

⁹Richard Hartmann, “Politische Geographie des Mamlūkenreiches: Kapitel 5 und 6 des Staatshandbuchs Ibn Faḍlallāh al-ʿOmārī's,” *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 70 (1916), especially 477–500; Maurice Gaudesroy-Demombynes, *La Syrie à l'époque des Mamelouks d'après les auteurs arabes: Description géographique, économique et administrative, précédée d'une introduction sur l'organisation gouvernementale* (Paris, 1923), 239–49; Jean Sauvaget, *La poste aux chevaux dans l'empire des Mamelouks* (Paris, 1941); Donald S. Richards, “The Mamluk Barīd: Some Evidence from the Haram Documents,” in *Studies in the History and Archaeology of Jordan*, vol. 3,

Egypt and Syria moved closer together than ever before. This instrument was particularly helpful in informing and enforcing governmental decisions and lent greater effectiveness to centralized rule. To say that the territorial extension of the Sultanate was made operable is to imply that the issue of space had been identified and properly addressed. The most precarious *barīd* routes passed through areas over which Bedouin groups held sway. Bridging these stretches—namely between Cairo and Gaza through al-Jifār, between Damascus and al-Raḥbah across the Palmyrena, and between al-Karak and al-Shawbak through al-Sharāh—was of utmost importance for the proper functioning of the system. There the Bedouins' influence was to be encountered, and their areas could not be allowed to remain extra-territorial, as they had been since the early Abbasid period. Securing the postal service called for the political appeasement of the Bedouin, if not control of them, or in other words, for an extension of state authority into the Bedouin habitat.

3. Already one century earlier the pigeon post (*ḥamām*) had been set up, or rather revitalized, by Nūr al-Dīn Maḥmūd ibn Zangī, and an optical signaling system by means of beacons (*manāwir*) was now also employed.¹⁰ It may be presumed that these networks improved as the new postal service coincided with their routes for the most part, notably including the crossing of the Palmyrena towards al-Raḥbah. They were altogether instrumental for coping with the dimensions of the empire and allowed news to travel quickly. Although the pigeon post and the signaling system did not depend to the same extent on control of the terrain as did the postal system, the possibility of interference by the Bedouin could not be ruled out.

4. Another reiteration of Umayyad policies consisted in fortification works in a number of strategic places within the Bedouin sphere or within the zone of the nomads' contact with the agricultural area. Most notable among these are the constructions of Ṣalāḥ al-Dīn's uncle, Shirkūh I, and the Ayyubid prince of Hims, Shirkūh II, at Qal'at Shirkūh above Palmyra (only in the eleventh/seventeenth century renamed Qal'at Ibn Ma'n),¹¹ Qal'at Shumaymis near Salamīyah,¹² and

ed. Adnan Hadidi (Amman, 1987), 205–9. The recent study by Adam J. Silverstein, *Postal Systems in the Pre-Modern Islamic World* (Cambridge, 2007), 165–85, especially 169–70, convincingly argues that Baybars' introduction of the *barīd* was informed by its potential to strengthen the Mamluks' horse-based military system and to allow affiliation of the Sultanate to the Abbasid caliphate, but little mention is made of its bearing on geopolitics.

¹⁰Hartmann, "Politische Geographie," 500–2, 503–7; Gaudefroy-Demombynes, *La Syrie*, 250–54, 258–61; Sauvaget, *La poste aux chevaux*, 36–41, 77; Silverstein, *Postal Systems*, 176–79.

¹¹Janusz Bylinski, "Qal'at Shirkūh at Palmyra: A Medieval Fortress Reinterpreted," *Bulletin d'études orientales* 51 (1999): 151–208, 318–19.

¹²It is not yet comprehensively studied, but see now Janusz Bylinski, "Exploratory Mission to

Qal‘at al-Raḥbah on the Euphrates.¹³ These were still used or had been rebuilt in the time of the Kipchak Mamluks, namely by Baybars I. They belonged to an innovative sort of fortification (possibly adapted from the Crusaders), the free-standing hilltop castle, which is most significantly present in the Levantine coastal mountains.¹⁴ These elevated structures were better suited to the supervision of their surroundings than the previous Islamic ground-level building traditions of the *qaṣr* (as a citadel and refuge inside a settlement) and the Umayyad “desert castles” (as hybrid structures with military functions and functions for agriculture and livestock breeding). Each new fortification occupied a position of strategic value above an important town in or at the fringe of the Bedouin habitat; this allowed the authorities to exercise control over Bedouin movement in a considerable radius. Furthermore, some caravanserais of the *barīd* were fortified¹⁵ and, as a more general trend in architectural style, pseudo-fortification elements were applied to many non-military buildings.¹⁶

5. A number of Bedouin groups whose territory extended deep into the steppe or desert and was transected by a long-distance communication route were assigned the surveillance of the area along that route (*darak*).¹⁷ In such a precinct they acted as legitimate deputies of the sovereign and became agents of the state’s expanded territorial authority.

6. Bedouin military service was a widespread practice, loyal groups being collectively referred to as “the obedient Bedouin” (*‘arab al-ṭā‘ah*).¹⁸ Moreover, the groups that inhabited Egypt’s Western Desert and the Sinai Peninsula had a

Shumaymis,” in *Muslim Military Architecture in Greater Syria: From the Coming of Islam to the Ottoman Period*, ed. Hugh Kennedy (Leiden, 2005), 243–50, figs. 1–13. Its Zangid (re-)foundation in 628/1231 is mentioned by Ibn al-Athīr, *Chronicon quod Perfectissimum inscribitur* [= *Al-Kāmil fī al-Tārīkh*], ed. Carl Johan Tornberg (Uppsala, 1851/53, and Leiden, 1862–76), 12:329–30, reading *smys*. A previous castle there had been demolished by an earthquake in 552/1157, as noted by Ibn al-‘Adīm, *Zubdat al-Ḥalab fī Tārīkh Ḥalab*, ed. Sāmi al-Dahhān (Damascus, 1954), 2:306.

¹³Marie-Odile Rousset, “La Ville de Raḥba–Mayādīn et sa région, IXe–XIVe siècle,” *Bulletin d’études orientales* 52 (2000): 243–61.

¹⁴For example, see Andrew Petersen, “Two Medieval Castles and Their Position in the Military Architecture of Muslim Palestine,” in *Egypt and Syria in the Fatimid, Ayyubid and Mamluk Eras*, vol. 3, ed. Urbain Vermeulen and Jo van Steenbergen (Leuven, 2001), 383–406.

¹⁵Sauvaget, *La poste aux chevaux*, 63–67, pls. iv–vii; idem, “Un relais du barīd mamelouk,” in *Mélanges Gaudefroy-Demombynes* (Cairo, 1935–45), 44, pls. i and ii.

¹⁶Nasser O. Rabbat, “The Militarization of Taste in Medieval Bilād al-Shām,” in *Muslim Military Architecture in Greater Syria*, 84–105.

¹⁷Ayalon, “Auxiliary Forces,” 23, with n. 55.

¹⁸Ibid., 14; Maḥmūd al-Sayyid, *Tārīkh ‘Arab al-Shām fī al-‘Aṣr al-Mamlūki* (Alexandria, 1997), 130–73; idem, *Tārīkh al-Qabā‘il al-‘Arabīyah fī ‘Aṣr al-Dawlatayn al-Ayyūbiyah wa-al-Mamlūkiyah* (Alexandria, 1998), 77–118.

share in maintaining the postal system on a regular basis with mounts, fodder, and personnel, and they were thus called the “horse unit of the monthly service” (*khayl al-shihārah*).¹⁹ In Egypt the Bedouin were more closely drawn into state interaction than in Syria, due to their greater dependence on agriculture and to the government’s particularly tight control of the country.²⁰ The largest part of the nomadic population was compelled to seek the immediate proximity of the Nile Valley or the oases because the interior was considerably more inhospitable than the Syrian Bādiyah. It is clear from Jean-Claude Garcin’s study of Qūṣ and its zone of influence that Bedouin involvement was a function of confined provincial locales.²¹ However, no permanent pacification was accomplished, the political rationale of tribalism remaining largely intact in spite of the state’s attempt to supersede it. At times the Bedouin even gained the upper hand.

Summing up these measures, it appears that in combination they contributed to an overarching trend in Ayyubid and Mamluk governance. Both sultanates surpassed the older pattern of a state that is content with rule over urban-rural continua within the sedentary sphere. Instead, they also aimed at controlling the sparsely inhabited hinterland which was the sphere of nomadic groups. Seen against the background of state conduct following the Umayyad period, this revaluation of the steppe areas and its Bedouin population is strikingly different from previous practice. We may refer to it as a change in the perception and organization of space towards a new characteristic of extensiveness and cohesion. This shift was effective by the time of the early Ayyubids, supposedly as a remedy to the experience of territorial disconnection during the Fatimid/Börid/Zangid period, and it became a continuous trend that was sustained and pushed still further under the Mamluks. It seems to harmonize with another, though negative, trend in their attitude towards space, i.e., the renunciation and even willful degradation of the coastal space and of maritime connections, which Albrecht Fuess has elucidated in his study on the Levantine “burnt shore.”²² Both trends indicate that the Mamluks were more at ease with controlling the interior, even a vast hinterland, than they were with controlling its contested borders.²³

¹⁹Hartmann, “Politische Geographie,” 486. On the possible origin of this arrangement in the time of Ṣalāḥ al-Dīn, see Mouton, “Saladin et les Bédouins du Sināi,” 205.

²⁰Ayalon, “Auxiliary Forces,” 14, 24–26, 28–29.

²¹Jean-Claude Garcin, *Un centre musulman de la Haute-Égypte médiévale: Qūṣ* (Cairo, 1976), especially 359–410, 468–98, 574.

²²Albrecht Fuess, *Verbranntes Ufer: Auswirkungen mamlukischer Seepolitik auf Beirut und die syro-palästinensische Küste (1250–1517)* (Leiden, 2001).

²³A parallel process of spatial restructuring took place in Egypt alone, where an individual Egyptian totality had assumed shape since the fifth/eleventh century. It discontinued in the mid-eighth/fourteenth century (remarkably for some of the same reasons that undermined the permeation of

However, the Mamluk attempts at involving the Bādiyāh waned from the early eighth/fourteenth century onward, when they abandoned the Syrian beacon and pigeon services, seemingly due to the cessation of Mamluk–Mongol hostilities in about 720/1320, and the *barīd* went into decline. Moreover, they reduced their presence in Upper Egypt, owing to the outbreak of the Black Death in 748/1347. Half a century later, the intelligence network in Syria finally collapsed under Tīmūr’s invasion, and after his retreat in 803/1401 no attempt at renewing those mechanisms was made.²⁴

These six sets of actions should have helped to generate and perpetuate a new sort of spatial organization. More evidence of development could be collected, but some reservations will better inform the upcoming discussion of the subject. While the *barīd*, the amirate of the Bedouin, and other elements are clearly highlighted in the sources, the grip on the steppe as such is hidden between the lines. It is yet to be determined whether the alignment of these elements worked with or without a deliberate plan. For the moment it seems appropriate to assume a confluence of various measures that were nonetheless effective as if having been designed to work together. With regard to the Bedouin as pivotal actors, it is evident that the amirate emerged from a decidedly invasive governmental scheme. It affected them deeply enough to be perpetuated as a mode of inter-tribal organization and representation to the outside well into the first century of Ottoman rule.

Another difficulty of interpretation arises from our insufficient understanding of spatial thinking in this period. Unfortunately, there is no work comparable to André Miquel’s *Géographie humaine* (which ends a century before the rise of the Ayyubids).²⁵ Even central categories are rarely broached. Ralph W. Brauer’s exposition of how boundaries and frontiers were conceived by geographers also centers on pre-Mamluk times. However, his finding, for instance, that they were inclined to measure a given area of land by its width and length but disregard

the steppe). See Jean-Claude Garcin’s “Pour un recours à l’histoire de l’espace vécu dans l’étude de l’Égypte arabe,” *Annales E. S. C.* 35 (1980), reprinted in his *Espaces, pouvoirs et idéologies de l’Égypte médiévale* (London, 1987), pt. iii, 438, 442–45.

²⁴Silverstein, *Postal Systems*, 179–85, also shows that the decline of the *barīd* ensued from its demilitarization and bureaucratization in the course of al-Nāṣir Muḥammad’s reforms. A late effort to reorganize the *barīd* seems to be indicated by the construction of the *khāns* at Inqirātā (north of Ma‘arrat al-Nu‘mān) and Dannūn (south of Damascus) in the 770s/1370s. See Sauvaget, “Un relais du *barīd* mamelouk,” 48. For Egypt and the effects of the plague, see Robert Lopez, Harry Miskimin, and Abraham Udovitch, “England to Egypt, 1350–1500: Long-Term Trends and Long-Distance Trade,” in *Studies in the Economic History of the Middle East from the Rise of Islam to the Present Day*, ed. Michael A. Cook (London, 1970), especially 118–20 (Udovitch).

²⁵André Miquel, *La géographie humaine du monde musulman jusqu’au milieu du 11e siècle*, 4 vols. (Paris and the Hague, 1967–88). The work of Sayyid Maqbul Ahmad, *A History of Arab-Islamic Geography, 9th–16th Century A.D.* (Mafraq, 1995), is no match.

surface areas and square measures²⁶ brings to mind the potential otherness of historical spatial notions and sheds light on the difficulty of reconstruction. While we must consider mental maps a historically embedded phenomenon, we still have to tease out how the Ayyubids and Mamluks “mapped” their dominion.²⁷

NOTES ON HISTORICAL GEOGRAPHY AND CARTOGRAPHY

Knowledge of spatial contexts is critical to the historian. In the process of making an argument, multiple references are inevitably made to places, routes, landscapes, and bodies of water, as well as to distances and proximities. It is not surprising, therefore, that many studies are accompanied by one or more maps, which usually display a number of labeled dots for cities, battles, etc., as well as some lines for coasts and streams, communications and borders, plus perhaps shadings which represent mountains or some other feature. Yet more often than not, there is no such visual aid. We are then required to recollect locations and regional settings from previous knowledge. Obviously, it is expected that each reader should have a mental map, and not just an individual but a generally shared one. Such an implicit requirement is in part acceptable, as we ought to be grateful each and every story does not begin with Adam and Eve—or a “Cairo” dot and a “Damascus” dot in a largely unvarying sort of base map. On the other hand, the lack of a detailed map in any given study is painfully felt as soon as either minor or remote places or complex formations are mentioned. All too often in such cases, that presumed mental map will prove deficient in both topographical and thematic respects. One must return after all to previous works of historical geography and cartographic materials.²⁸

²⁶Ralph W. Brauer, *Boundaries and Frontiers in Medieval Muslim Geography* (Philadelphia, 1995), 36.

²⁷Compare the term “géographie de l’attention” in Garcin, “Pour un recours à l’histoire de l’espace vécu,” 438.

²⁸Cartography as we know it, and as it was prefigured for the most part by medieval Islamic authors in growing contrast to Ptolemaic standards, postulates a central problem. The surface of a spherical/ellipsoid body—technically speaking, a topology of geographic features that have coordinates in a curved graticule of meridians and parallels—must be transferred on a plane according to one of many possible procedures of geometric projection. This implies that some distortion of the real is unavoidable, while the rules of each projection determine which particular properties of the three-dimensional body are preserved on the plane. The achievement may pertain to the equal representation of angle, distance, and/or area, but cannot possibly reconcile the three of them at the same time. Compliance to modern standards is signified to the map reader in three definite ways: one, through a verbal projection statement; two, through a scale statement, either numerical, verbal, or in the shape of a bar graph; and three, through a grid which is referenced to a prime meridian (not necessarily the circle of longitude of Greenwich) and a prime parallel (not necessarily the equator). It will be shown why maps that do not comply with these principles may rather be termed sketch maps.

Mamluk studies are not only short on such helpful works, but there is also no review of what has already been produced. The following attempt to outline the development of historical geography and cartography of the Middle East so far is certainly preliminary, for it must not claim to bridge the gap at once. Yet, in the absence of a better alternative,²⁹ it may be helpful for the time being to acknowledge certain gaps and possible future tasks. Therefore, the scarcity of Mamlukist contributions requires adopting a more general point of view than one of strict chronological periodization. I should also point out that this article relates primarily to Western mapping activities. While Arab and Ottoman specialists had been at the vanguard since the early Middle Ages,³⁰ they lagged behind the advancement of cartography which some European countries experienced during the eighteenth century. At the heart of this progress was geodetic triangulation, i.e., the measurement of distances between positioned points with the objective of forming a network of triangles, practiced first in France in the 1740s by César François Cassini de Thury. Beyond scientific and technical progress, I believe that the reversal of leadership was an outcome of the Europeans' increasingly practical application of cartography to governance, administration, warfare, and commerce, whereas the Arab-Ottoman tradition of cartography was hardly challenged. With Asia Minor attracting the greatest Ottoman attention, the Sublime Porte neglected the mapping of its Arab provinces. This subject merits a closer look which is beyond the scope of the present article. Here I rather wish to keep to Western mapping of the Middle East, arguing that it has seen four more or less sequential stages which have affected the opportunities of historical mapping in specific ways. The technical side of mapping will not be considered to the same extent as the relationship between historians—formerly, “Orientalists”—on the one hand and cartographers on the other.

1. NAPOLEON AND AFTER

During the opening stage of this cartographic advancement, the time of European exploration and colonial expansion, mapping was firmly tied to geodesy and served to document primary topographical stock-taking. For the first time, the terrain was to undergo systematic surveying so that points and linear objects, as a start, could

²⁹Since 2006, the carto-bibliography of the region is being addressed country by country on a website under the direction of Jean-Luc Arnaud, *La carto-thèque méditerranéenne*, <http://cartomed.mmsh.univ-aix.fr>. The focus is on French and British topographical map series produced after 1900. The site will soon expand its range and be renamed *CartoMundi*.

³⁰This is demonstrated throughout the massive work of Fuat Sezgin, *Geschichte des arabischen Schrifttums*, vols. 10–12, *Mathematische Geographie und Kartographie im Islam und ihr Fortleben im Abendland* (Frankfurt am Main, 2000). For a starting point, see the introduction to the map volume, vi–xiii.

be positioned on geo-referenced gridded maps. The initial and most important single scheme was carried out by a colonial body *par excellence*, a detachment of the Napoleonic Egyptian expeditionary forces. Formed on the spot in 1798, the Service topographique de l'armée d'Égypte worked as a veritable survey authority, although understaffed and obstructed by many external imperfections. By 1801 it had achieved the first triangulation of some parts of the region. The survey resulted in the first map of the Middle East along modern principles. Forming part of the *Description de l'Égypte*, 47 sheets were printed on a scale of 1:100,000 showing the settled areas along the Nile, the Mediterranean coast of Sinai, and the Levant up to Sidon in great detail and expressive graphic style.³¹

This pioneering work was recommenced in Egypt only after the establishment of the Egyptian Survey Authority in 1878—the very year the British and French disempowered the Khedive.³² Western Palestine saw an interlude from 1871 to 1878, when British military personnel mapped most of the area on behalf of the—specially founded—Palestine Exploration Fund (PEF),³³ before finally, in 1920, the British established the Survey of Palestine.³⁴ In Syria and Lebanon, large-

³¹Field work was conducted from 1798 to 1801, and the engraving of the plates in Paris was completed in 1803. Put to press in 1808, the map was guarded as a state secret and published only ten years later, then entitled “Carte topographique de l'Égypte et de plusieurs parties des pays limitrophes levée pendant l'expédition de l'armée française . . . à l'échelle de 1 millimètre pour 1000 mètres.” Together with a three-sheet version on a reduced scale, it constituted the *Atlas géographique*, ed. Pierre Jacotin (Paris, 1818), being part of the *Description de l'Égypte, ou Recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française*, édition impériale. The reprint of the atlas (Paris, 1826) within the 2nd ed. or édition royale is now also accessible through the DVD edition of the corpus by the Bibliotheca Alexandrina (Alexandria, 2004). This includes Jacotin's “Mémoire sur la construction de la carte de l'Égypte,” *Description de l'Égypte: État moderne*, 1st ed., vol. 2.2 (1822), 1–118 (= 2nd ed., vol. 17 [1824], 436–652), and the “Index géographique, ou Liste générale des noms de lieux de l'Égypte . . .,” in *ibid.*, 787–846 (= 2nd ed., vol. 18.3 [1830], 35–266). See Anne Godlewska, *The Napoleonic Survey of Egypt: A Masterpiece of Cartographic Compilation and Early Nineteenth-Century Fieldwork* (Toronto, 1988) = *Cartographica* 25 (1988), 1/2; Ghislaine Alleaume, “Entre l'inventaire du territoire et la construction de la mémoire: L'œuvre cartographique de l'expédition d'Égypte,” in *L'expédition d'Égypte: Une entreprise des lumières 1798–1801*, ed. Patrice Bret ([Paris], 1999), 279–94.

³²Its major mission to produce a cadastral survey did not progress well. Replaced by the Survey Department in 1898, activities regained momentum and resulted in a cadastral map series of more than 30,000 sheets on a scale of first 1:4,000, later 1:2,500 (Cairo, 1892–1918). See *La cartotheque méditerranéenne*, <http://cartomed.mmsh.univ-aix.fr/mmsh/Egypte/series/G16.swf> and [~/G98.swf](http://cartomed.mmsh.univ-aix.fr/mmsh/Egypte/series/G98.swf).

³³Claude Conder and Horatio Herbert Kitchener, *Map of Western Palestine in 26 Sheets from Surveys Conducted for the Committee of the Palestine Exploration Fund . . . during the Years 1872–1877*, scale 1:63,360, one inch to the mile (London, 1880), indexed by *Arabic and English Name Lists*, ed. Edward Henry Palmer (London, 1881).

³⁴Clifford W. Mugnier, “Grids and Datums: The State of Israel,” *Photogrammetric Engineering and*

scale³⁵ mapping languished until in 1918 the same rush for mandatory institution-building impelled France to set up the Bureau topographique de l'Armée française du Levant.³⁶ One need not be a Foucauldian to notice that the cartography of the Middle East was thus deeply rooted in the European struggle for domination.

In the meantime, the agents of mapping projects were individuals, or at most tiny companies of scholars and/or adventurers, who traveled on behalf of an inquiring princely Maecenas, an academic society, or on their own behalf. Following the example of Carsten Niebuhr, most traveler-explorers in the Orient were trained in the use of astronomic and geodetic devices, as well as the scrutiny of textual sources. They supplemented the positioning of sites by asking how historical place names preserved in ancient and medieval literature ought to be identified against the background of recent toponymy. Consequently, large-scale maps of selected small regions were often produced together with an onomastic commentary and tentative historical geography.

The better of these mapping projects not only appealed to the Orientalist but were on the cutting edge of geography and cartography. Hence, it is not surprising that researchers and professional cartographers encouraged and supported each other. Alois Musil's map "Northern Arabia"—companion to his four volumes of topographical itinerary—lent the crowning glory to that map-cum-text genre,³⁷ but even though he was a highly-trained and untiring map maker,³⁸ he had the map drawn by the Militärkartographisches Institut in Vienna, one of the most advanced institutions of its kind at that time. Probably the most productive liaison

Remote Sensing (abbr. PE&RS) 66 (2000): 915b; Dov Gavish, *A Survey of Palestine under the British Mandate, 1920–1948* (London, 2005), based on his *Qarqa' u-mapah: Me-hesder qarqa'ot le-mapat Erets Yisra'el, 1920–1948* (Jerusalem, 1991).

³⁵Even cartographers get confused once in a while about what is termed large and small. Thus it may be helpful to mention that scales are fractions; hence a scale of 1:10,000 (one ten-thousandth) is larger than a scale of 1:1,000,000 (one millionth).

³⁶Clifford J. Mugnier, "Grids and Datums: The Syrian Arab Republic," *PE&RS* 67 (2001): 1000–3.

³⁷Alois Musil, *Northern Arabia*, scale 1:1,000,000, on four sheets (New York, 1926), accompanying four of his monographs in the American Geographical Society's Oriental Explorations and Studies series, vols. 2–5 (previously published as *Karte von Nordarabien, nach eigenen Aufnahmen*, same scale [Vienna, no date]). Along the course of the Euphrates it adjoins the map "Southern Mesopotamia" on the same scale, attached to his *The Middle Euphrates: A Topographical Itinerary*, vol. 3 of the series (New York, 1927), while the southwestern sheet is elaborated by the map on a scale of 1:500,000 which is attached to his *The Northern Heğâz: A Topographical Itinerary*, vol. 1 of the series (New York, 1926).

³⁸E.g., his journey of 1908–9 yielded no less than 61 manuscript maps on a scale of 1:300,000 of 37 × 35.5 cm each with an approximate 3,000 place names. See Musil's communication in the Viennese *Anzeiger der Kaiserlichen Akademie der Wissenschaften: Philos.-hist. Kl.* 47 (1910): 188–89. The series merged in the map *Northern Arabia* (see n. 37).

across the disciplines was established between the distinguished geographers and cartographers Heinrich Kiepert (1818–99) and Richard Kiepert (1846–1915) and several scholarly explorers, among them Edward Robinson and Eli Smith, L. M. A. Linant de Bellefonds, Richard Lepsius, Johann Gottfried Wetzstein, Eduard Sachau, Carl Humann, and Max Freiherr von Oppenheim.³⁹ While the Kiepersts regarded their reports and drafts as full-fledged sources, the ensuing maps of the Middle East helped define the state of the art in regional cartography and in return cleared the way for other explorers to come. Despite many inevitable shortcomings, the best of these maps remained in use for decades and served as a basis for later topographical studies until World War I.⁴⁰

Understanding the contemporary topography was considered such an essential prerequisite to historical understanding that historiographic mapping itself was discouraged for most of the nineteenth century. As long as the determination of coordinates was the focus, stock-taking implied a tendency to absorb the remnants and toponymic substrata of different eras and blend them into area-specific maps. This has been demonstrated in the case of the Napoleonic scholars whose policy on toponymy was directed towards standardization.⁴¹ Although mapping seemed urgent enough to leave nothing undone, several regions remained difficult to access and therefore survey, and were thus even more aptly subjected to historical reconstructions. Such conditions prevailed beyond the Nile Valley and the Fertile Crescent. It is for this reason that Ferdinand Wüstenfeld, who had neither been to the region nor considered doing so, could dare to combine a tentative geographical outline with place names derived from medieval Arabic historians and geographers. The first such map was lent credence by having been

³⁹E.g., Heinrich Kiepert, “A New Map of Palestine Including also Phoenicia and Coelesyria,” scale 1:600,000, on two sheets in Edward Robinson, Eli Smith, et al., *Later Biblical Researches in Palestine and the Adjacent Regions: A Journal of Travels in the Year 1852* (London, 1856), following 664; H. Kiepert, eight maps on various scales in Richard Lepsius, *Denkmaeler aus Aegypten und Aethiopien*, plate vol. 1 (Berlin, [1859]), pls. i–vi, some based on Linant de Bellefonds and Lepsius himself; H. Kiepert, “Die Landschaften im Osten von Damaskus (Ḥaurân und Trachonen),” scale 1:400,000, in Johann Gottfried Wetzstein, *Reisebericht über Hauran und die Trachonen nebst einem Anhang über die sabäischen Denkmäler in Ostsyrien* (Berlin, 1860), preceding p. i; H. Kiepert, two maps on a scale of 1:750,000, attached to Eduard Sachau, *Reise in Syrien und Mesopotamien* (Leipzig, 1883); H. Kiepert, “Karte des nördlichsten Theiles von Syrien,” scale 1:300,000, in Carl Humann and Otto Puchstein, *Reisen in Kleinasien und Nordsyrien*, atlas (Berlin, 1890), preceding pl. i; Richard Kiepert, map on a scale of 1:850,000 on two sheets, attached to Max Freiherr von Oppenheim, *Vom Mittelmeer zum Persischen Golf durch den Ḥaurân, die Syrische Wüste und Mesopotamien* (Berlin, 1899/1900), also separately published (Berlin, [1915]).

⁴⁰E.g., see Gavish, *A Survey of Palestine*, 12, 14–15.

⁴¹Alleaume, “Entre l’inventaire du territoire et la construction de la mémoire,” 282–85.

executed by Heinrich Kiepert,⁴² but as the successive maps bear only Wüstenfeld's name it is conceivable that the venture had proven unrewarding to the specialist.⁴³ After all, intense and fruitful cooperation between cartographers and historians, philologists, and others lasted only as long as the political situation on the ground did not allow for regular surveying along technical lines.

2. DIVERGING PATHS

The turning point in the relationship between topography and historiographic mapping was reached when the example of Egypt was followed in the establishment of survey authorities all over the region at the beginning of the British and French mandatory administrations. A bifurcation took place. On the one hand, hosts of professional engineers, geodesists, and cartographers took up work in a field which was now pacified. At the same time, the heterogeneous national or mandatory mapping activities in the region began to adapt—due to the first internationally agreed-upon mapping scheme, the *Carte internationale du monde/International Map of the World*⁴⁴—to a system of divisible metric scales and sheet lines.⁴⁵ The cartographers applied ever better scales and more sophisticated techniques to the areas previously mapped and set about filling in the blanks. Only part of the interior of the Arabian Peninsula retained for some time the air of

⁴²Heinrich Kiepert, map on a scale of 6 cm to 150 *mīl* or 50 *farsakh* (i.e., ca. 1:5,000,000) in Ferdinand Wüstenfeld, "Die Strasse von Baġra nach Mekka mit der Landschaft Dharīja, nach arabischen Quellen bearbeitet," *Abhandlungen der Königlich-Gesellschaft der Wissenschaften zu Göttingen: Hist.-philol. Cl.* (abbr. *AGWG*) 16 (1871): following 89.

⁴³Ferdinand Wüstenfeld, map on a scale of 6.7 cm to 140 *mīl* (i.e., ca. 1:4,000,000) in his "Das Gebiet von Medina, nach arabischen Geographen beschrieben," *AGWG* 18 (1873): facing 86; idem, map not to scale in his "Baġrein und Jemâma, nach arabischen Geographen beschrieben," *AGWG* 19 (1874): facing 222. Both maps as well as that in n. 42 were also included in the monographic offprints (Göttingen, 1871, 1873, and 1874).

⁴⁴The framework of the World series on the millionth scale, published from 1913 on, sprung from a proposal of 1891 and was agreed upon by international conferences at London 1909, Paris 1913, and Cambridge 1928. It was projected under the combined aegis of national, colonial, and mandatory survey authorities and published accordingly by a multiplicity of bodies. The Middle East was the responsibility of Great Britain's Ordnance Survey, Southampton, except for Egypt which was covered by the Survey Department, later Survey of Egypt, Giza. Collaboration broke off during World War II at a state of about a sixth of the planned number of sheets; it was resumed in 1945 and continued from 1953 on under the auspices of the United Nations until it petered out in the mid-1980s while still less than half of the sheets had been achieved. The relative importance which was attributed to Egypt, Palestine, Syria, and Iraq is illustrated by the fact that they counted among the well covered areas of the World series even before World War II.

⁴⁵As the pace of integration was slow, the various grids (Egyptian quadrant/standard and kilometric/normal grids, Palestine grid, Lambert Levant grid, etc.) remained in use well into the mid-twentieth century.

terra incognita to the Western observer.⁴⁶ As now even many remote and sparsely settled areas could be surveyed, it became possible to expand the representation of the topography beyond the river valleys and densely populated areas onto the entire region. Only then did maps attain a fully two-dimensional quality. Furthermore, the replacement of old-style provisional hachures, form lines, and hillshades by contour lines and elevation coloring allowed map-makers for the first time to shape a consistent and reliable overall picture of the region's three-dimensionality. In the case of Egypt, coverage had proceeded so far as to allow the compilation of atlases.⁴⁷ As professional cartography outgrew its dependence on the contribution of semi-skilled enthusiasts, the physical aspect became dissociated from the historical.

On the other hand, specialization, as well as technical and organizational progress, could not leave the mapping activity of men of letters untouched. In fact, it suffered badly. The publication of Musil's map of Northern Arabia in 1926, though marking the apogee of the older one-man business, was belated, the basic inquiries having been conducted between one and almost two decades earlier. Consequently, it was also anachronistic in that it mirrored pre-World War I requirements of primary exploration.⁴⁸ Only in the field of historical geographies and gazetteers could advantage be taken of the European preeminence over the region in the period until the end of World War II. Several works of lasting value were compiled on that background, e.g., by René Dussaud on Syria and Lebanon⁴⁹ and by the British Naval Intelligence—for official use only—in its geographical handbook series on most of the region.⁵⁰ The way had been paved in pre-1900 Egypt by 'Alī Bāshā Mubārak's geographical lexicon and the country's surveyors.⁵¹

⁴⁶The first modern map series superior to the millionth scale, a work of collaboration between the U.S. Geological Survey and the Arabian American Oil Company, was executed only from the late 1950s on: *Geographic Map . . . , Kingdom of Saudi-Arabia*, scale 1:500,000, 21 maps (Washington, D.C., 1956–62), accompanied by *Arabian Peninsula: Official Standard Names Approved by the United States Board on Geographic Names* (Washington, D.C., 1961).

⁴⁷*Atlas of Egypt*, scale 1:50,000, 2 vols. (Cairo, 1914); *Atlas of Egypt: A Series of Maps and Diagrams with Descriptive Text Illustrating the Orography, Geology, Meteorology and Economic Conditions*, scales 1:500,000 to 1:7,500,000 (Giza, 1928).

⁴⁸For an exemplary description of his mapping method that also concedes various sources of inaccuracy see Alois Musil, *Arabia Deserta: A Topographical Itinerary* (New York, 1927), xiii–xvi.

⁴⁹René Dussaud, *Topographie historique de la Syrie antique et médiévale* (Paris, 1927).

⁵⁰Originally, only a few classified copies were sent to press. They are now accessible through two series of reprints: *A Collection of First World War Military Handbooks of Arabia, 1913–1917*, 9 vols. (Farnham Common, 1988), and *The Middle East Intelligence Handbooks 1943–1946*, 5 vols. (Gerrards Cross, 1992).

⁵¹'Alī Bāshā Mubārak, *Al-Khiṭaṭ al-Tawfiqīyah al-Jadidah li-Miṣr al-Qāhirah wa-Mudunihā wa-Bilādihā al-Qadimah wa-al-Shahīrah*, 20 vols. (Bulāq, 1887–89). A selection of the older Orientalist research

There, historical geography flourished so much that a voluminous special bibliography could be compiled as early as 1929.⁵²

A special point must be made about Palestine as the initial focus of Western Middle East mapping. The country's special place as the Holy Land has nourished a prolific mutual relationship between men of letters and cartographers ever since the Middle Ages. Recalling that Palestine already formed part of the Napoleonic survey and that the 1880 PEF map of Western Palestine marked another groundbreaking step, it became virtually over-mapped in both topographical and historical regards, although Muslim affairs were dealt with far less than Biblical and Crusader matters. Accordingly, Palestine was also the first and only part of the region that attracted continuous carto-bibliography.⁵³

Aside from the Holy Land, however, the individual scholarship of Orientalists could not maintain its importance opposite the advancement of surveys on a regional scale. The interest of Orientalists in mapping declined and simultaneously focused *volens nolens* on historical matters. As the status of cartography sank to the point that it was deemed an ancillary science, that which remained to be done was taken over by non-cartographers—a fact which proved detrimental to quality. It is not necessary to focus on any particular specimen of Orientalist (not to mention Mamlukist) research to illustrate this point, nor would it be fair to do

has been assembled in *Texts and Studies on the Historical Geography and Topography of Egypt*, 5 vols., ed. Fuat Sezgin (Frankfurt am Main, 1992). Besides, the constriction of Egypt to the banks of the Nile together with the intensity of cultivation there conditioned a cadastral—and thus chiefly contemporary—approach to geography. See *Dictionnaire des villes, villages, hameaux, etc. de l'Égypte* (Bulāq, 1881); [Albert Boinet], *Dictionnaire géographique de l'Égypte*, and its Arabic version, *Qāmūs Jughrāfi lil-Quṭr al-Miṣri* (both Cairo, 1899); [idem], *Géographie économique et administrative de l'Égypte*, vol. 1 (Cairo, 1902, no more published). See also, in the historical field, Jean Maspero and Gaston Wiet, *Matériaux pour servir à la géographie de l'Égypte*, vol. 1 (Cairo, 1919, no more published).

⁵²Henri Munier, *Bibliographie géographique de l'Égypte*, vol. 2, ed. Henri Lorin (Cairo, 1929). Carto-bibliography was as well restricted for a long time to either Palestine or Egypt. See n. 53 and Alfred L. Fontaine, *Monographie cartographique de l'isthme de Suez, de la péninsule du Sinaï, du nord de la Chaîne Arabique, suivi d'un catalogue raisonné sur les cartes de ces régions* (Cairo, 1955).

⁵³Reinhold Röhricht, *Bibliotheca geographica Palaestina: Chronologisches Verzeichniss der auf die Geographie des Heiligen Landes bezüglichen Literatur von 333 bis 1878 und Versuch einer Cartographie* (Berlin, 1890), 2nd ed. procured by David H. K. Amiran (Jerusalem, 1963), especially 598–662. Materials published between 1878 and 1945 were recorded by Peter Thomsen, *Die Palästina-Literatur: Eine internationale Bibliographie in systematischer Ordnung mit Autoren- und Sachregister*, 5 vols. (Leipzig and Berlin, 1908–38), sections 4 and 5, and three posthumous supplementary volumes (Berlin, 1956–72). The quarterly Jewish (later, Israeli) national bibliography *Qiryat Sefer* has continued the report (Jerusalem, 1924/25–2003), first without a special rubric, later in section 14. It now works as an online resource, http://aleph500.huji.ac.il/F/?func=file&file_name=find-b&local_base=nnlqrs&con_lng=eng.

so, as any choice of cartography would display similar mapping tendencies.

As a rule, a map of Egypt or the Levant in a historical context was a monochrome line-drawing in an unskilled hand. Most probably it was page-sized and contained in a book. Owing to regular octavo and quarto formats, such a page-size map, if we use that term for the moment, typically would have a very small scale.⁵⁴ Moreover, it would have displayed a limited sample of features and a rudimentary symbology and legend, if any at all; it would have no relief, no grid,⁵⁵ and no mathematical descriptors. Only a scale statement or graph bar would usually maintain the map's geometrical foundation. Given projective distortion, neither of these two features alone allows for the satisfactory determination of distances and location of places. Hence, any two maps of this kind tend to be incompatible by cartographic standards. This does not mean that such maps are dysfunctional; it may be rightly assumed that the observer is able to perceive topologic constellations and to recognize them on another map thanks to spatial thinking. But a map that is vague enough to demand this ability and to evoke a variety of personal understandings casts doubts on whether or not it actually deserves to be called a map. Instead, it is advisable to speak of a sketch map whenever the extrinsic aspect of a cartographic specimen prevails over the intrinsic. Sketch maps, thus understood, work as diagrams rather than as maps.

The first general historical atlases of Islam, published in 1951, 1957, ca. 1960, and 1969, were drawn up with the help of cartographers and represented true maps, but they did little to improve the situation with regard to our period of concern. Although their broad claim made it inevitable that the Mamluk realm be treated, a look at the relevant plates—at best two or three per atlas⁵⁶—betrays the perfunctory attitude towards the Mamluks which was so common before David

⁵⁴The elongated shape of both Egypt and the Levant, as well as the perpendicular axis of each—in the tradition of north-south oriented maps—seems to demand an upright map face such as would fit in an ordinary single-page layout. Thereby an unsatisfactory five millionth scale is suggested (1 cm to 50 km). An even more limited area such as the Sinai Peninsula allows at best for a two millionth scale. The larger formats of fold-outs and independently published map sheets could have resolved the inconvenience, but have been rarely utilized.

⁵⁵Sometimes the grid is not shown but indicated by border ticks only. This method basically suits projections that represent the graticule in an orthogonal way. Yet, in contrast most maps of that kind are evidently based on a projection which produces a curved grid, so that figuring the position of some place without fully plotted grid lines relies on guesswork.

⁵⁶Harry Williams Hazard, *Atlas of Islamic History* (Princeton, 1951), 21, 23, 25; Roelof Roolvink, *Historical Atlas of the Muslim Peoples* (Amsterdam, 1957), 21[a], 26[b], 27; 'Abd al-Mun'im Mājid, *Al-Atlas al-Tārīkhī lil-Ālam al-Islāmī fī al-ʿUṣūr al-Wuṣṭā* (Cairo, [ca. 1960], 2nd ed. 1967); Rolf Reichert, *Atlas histórico regional do mundo árabe (Mapas e resumo cronológico)/A Historical and Regional Atlas of the Arabic World (Maps and Chronological Survey)* (Salvador da Bahia, 1969), 82 map 26, 84 map 27.

Ayalon's time. Moreover, the map contents deserve criticism. While topographical minima were included, the relief and the composition of historical landscapes were left out. This, it seems, is due to a uniform preoccupation with the delineation of political entities on the state level (though not even the drawing of boundaries was consistently achieved).

Another characteristic of both the atlases and the maps contained in books and articles was—and still is—a disregard of the fact that natural environments change and are mutable under human influence. Almost as a rule, historical settlements are placed within recent topography and hydrography as borrowed tacitly from present-day cartography. The findings of earlier generations of scholars, regarding for example the hydrography of the Nile as studied by Prince Omar Toussoun,⁵⁷ are not always appropriately taken into account. A look into any of the more recently produced general atlases on Islamic history shows that the issue has not been addressed. Likewise, the majority of (sketch) maps in books and articles continue to be produced today along modest lines.

A last point shall be made about the distinction between maps and plans, as it answers to a prominent strand of Mamlukist research. For the sake of clarity, cartographic materials that show the ground-plan of a locality like a city, an archaeological site, or a battlefield may best be termed plans. Because they are drawn on a very large scale, say of 1:5,000, plans do not require a format beyond the regular page-size and still allow the depiction of a medieval city, for example, with expedient resolution. It is not surprising that these premises have favored the drawing up of a considerable number of city plans, given the fact that urban research, connected to the history of architecture, is prominent in Mamluk studies. Cairo, of course, figures first. Many of these plans depict certain historical issues, be they, for instance, shifts in demography and topography, professional and social composition, fortification and the architectural representation of power, or the distribution of religious institutions, thus counting among the best cartographic materials that we possess for the period.⁵⁸ However, disparities between plans and maps are such that more plans will not necessarily aid the progress of mapping on a more expanded topographical basis. This is again due to the implications of large scales. Plans, first of all, are in practice not subject to

⁵⁷Omar Toussoun, *Mémoire sur les anciennes branches du Nil*, 2 pts. (Cairo, 1922/23); idem, *Mémoire sur l'histoire du Nil*, 3 pts. (Cairo, 1925); idem, *La géographie de l'Égypte à l'époque arabe*, pt. 1 (Cairo, 1926–36, no more published).

⁵⁸E.g., see the plans in Susan Jane Staffa, *Conquest and Fusion: The Social Evolution of Cairo A.D. 642–1850* (Leiden, 1977), facing 12, 100, and 228; reworked in *An Historical Atlas of Islam/Atlas historique de l'islam*, ed. Hugh Kennedy (Leiden, 2001), 30–31. On Damascus, Jerusalem, and Aleppo, plus Middle Eastern cities outside the Mamluk Empire (*ibid.*, 17, 19, 26–28), see Kennedy's notes on map sources, xiv–xv.

projective distortion and thus do not require mathematical descriptors. Secondly, there is neither a need nor an opportunity to plot the graticule, lest the reader go astray amongst meaningless infinitesimal calculations. Thirdly, representation of the relief is mostly dispensed with. Only a scale statement reminds one of geometry. Notwithstanding the sound geometric sub-construction that is inherent in a good plan, plans as a genre facilitate comparatively quick production and forgive one technical flaw or another. As plans resemble sketch maps in these respects, it shows that, and explains why, historical maps take a middle position in between the extremes of either minimum-scale sketch maps or maximum-scale plans.

3. A RECONCILIATION

The next stage was initiated by the *Tübinger Atlas des Vorderen Orients*, an unrivalled corpus of regional maps acknowledged as a standard reference in many fields. Being a multidisciplinary research program conducted from 1969 to 1989 by the University of Tübingen, the *TAVO* constitutes a loose-leaf atlas, in German and English, that finally comprised 121 sheets in series A, natural sciences, and another 174 sheets in series B, humanities. This tremendous work met the most exacting technical standards of the time and is a study in aesthetic balance.⁵⁹ Among its historical maps, those on Islamic subjects figure prominently and provide the most sophisticated and variegated set of cartographic materials we have in the field of Islamic Studies. Leaving aside for a moment the achievements of any individual *TAVO* map, the main general improvements observed in the atlas are that, first, cartography was brought back into the purview of historians of Islam and collaboration with fully trained cartographers was reestablished. Second, thoroughly georeferenced topographical mapping and thematic mapping could thus be reconciled. As a result, the conventional limitation to cities and polities was overcome and attention was drawn to spatial formations such as confessional distribution, fortification patterns, juridical institutionalization, rural settlement, etc. Third, an unprecedented precision of content was achieved by manifold symbologies, carefully arranged legends, and the clear delimitation of each map's

⁵⁹The atlas proper (Wiesbaden, 1977–93) is accompanied by two monograph series: *Beihefte zum Tübinger Atlas des Vorderen Orients* (abbr. Beihefte), series A and B, of hitherto 28 plus 98 volumes in altogether 161 parts (Wiesbaden, 1972 to date), and by the *Register zu den Karten/General Index*, ed. Horst Kopp and Wolfgang Röllig (Wiesbaden, 1994). The concluding volume *Von der Quelle zur Karte: Abschlußbuch des Sonderforschungsbereichs*. . . , ed. Wolfgang Röllig (Weinheim, 1991), 252–82, records the maps and volumes published until that year. The maps on Biblical history were recollected in an extra series as *Tübinger Bibelatlas, auf der Grundlage des Tübinger Atlas des Vorderen Orients (TAVO/Tübingen Bible Atlas)*, ed. Siegfried Mittmann and Götz Schmitt (Stuttgart and Wiesbaden, 2001). A comprehensive list of publications may be obtained from Reichert publishers.

temporal range. Of course, the comparatively large sheet format and thus large scale of the maps (here, up to a millionth) was critical to these achievements. Fourth, the premise of undertaking only such research as suits the objective of mapping effected, in some cases, the spelling out of methodology.⁶⁰ Moreover, the technical aspects of atlas cartography were explained.⁶¹

Although it must be said with regret that the Mamluk period does not constitute a focal concern of the atlas, two maps in particular touch upon the Ayyubid and Mamluk Sultanates. Heinz Halm mapped the distribution of Islamic law schools until the end of the Kipchak Mamluks⁶² and, more relevant to the readership of this journal, the record of fiefdoms in Egypt as registered in 777/1376 by the military *dīwān* and preserved in the *Kitāb al-Tuḥfah al-Saniyah bi-Asmā' al-Bilād al-Miṣriyah* of Ibn al-Jī'ān (d. 885/1480).⁶³ The latter map also reflects the administrative divisions and the density of settlement and agriculture in the Nile Valley and the Delta during the time of al-Malik al-Ashraf Sha'ḥbān. Together with Halm's two-volume companion and the fifty basic location maps contained therein, the work can serve as a historical gazetteer of Egypt in the period of the Kipchak sultans in general and as a master index to its medieval and nineteenth-century sources.⁶⁴ Otherwise, Egypt and Syria are but superficially touched upon,⁶⁵

⁶⁰E.g., Heinz Gaube, "Die Quellen zur Karte B VII 6: 'Die Kernländer des 'Abbāsidenreiches' und ihre Auswertung," in *Von der Quelle zur Karte*, 199–216.

⁶¹Wolfgang Denk, *Atlaskartographie: Theoretische und praktische Probleme dargestellt am Beispiel des "Tübinger Atlas des Vorderen Orients (TAVO)"* (Wiesbaden, 1990).

⁶²TAVO B VIII 16 = Heinz Halm, *Die islamischen Rechtsschulen: Palästina, Syrien und Ägypten/ Islamic Law Schools: Palestine, Syria and Egypt*, scale 1:4,000,000 (Wiesbaden, 1977).

⁶³TAVO B VIII 13 = Heinz Halm, *Ägypten unter den Mamlūken/Egypt under the Mamlūks*, scale 1:1,000,000 (Wiesbaden, 1984).

⁶⁴Heinz Halm, *Ägypten nach den mamlukischen Lebensregistern*, 2 vols. (Wiesbaden, 1979), including 50 monochrome maps on a scale of 1:200,000; see 1:35–36. Another convenient key to identify one of the anonymous smaller settlements of the map—and a proof of toponymic continuity—is his map of Egypt in an earlier period, based on the name list of Ibn Mammāti (d. 606/1209): TAVO B VII 13 = Heinz Halm, *Ägypten unter den Fāṭimiden (969–1171)/Egypt under the Fāṭimids (969–1171)*, scale 1:1,000,000 (Wiesbaden, 1984).

⁶⁵TAVO B VIII 1 = Heinz Halm and Verena Klemm, *Der Vordere Orient um 1200/The Middle East around 1200*, scale 1:8,000,000 (Wiesbaden, 1985), is an overview map of the wider region's political setting and must not be expected to offer local detail. TAVO B VIII 15 = Dorothea Krawulsky, *Īrān: Das Reich der Īlḥāne 656–736 h/1258–1336 n. Chr. (Westteil)/Īrān: The Īlḥānid Empire 656–736 h/1258–1336 A.C.*, scale 1:4,000,000, two sheets (Wiesbaden, 1984), also shows the itineraries of Ibn Baṭṭūṭah in Syria, Egypt, and the Hijaz with a fair number of cities and villages he passed through, but hardly anything beyond his path. As a gazetteer to the map including its Middle Eastern reaches, see idem, *Īrān—das Reich der Īlḥāne: Eine topographisch-historische Studie* (Wiesbaden, 1978), containing 11 monochrome location maps mostly on a scale of 7.1 cm to 100 km (i.e., ca. 1:1,400,000).

while maps of Oriental Christendom and of conflict with the Latin principalities and the Mongols are preponderant.⁶⁶ As these foci show, little is to be learned from the maps about the interior of the two sultanates.

While the factual results and appraisal of the *TAVO* are tremendous, it is noteworthy that it did not reverse the general attitude towards mapping. Since its newly established technical and heuristic standards have been difficult to meet, the *TAVO* has remained an exceptional case instead of encouraging further mapping activities in the field. For the most part, the drawing of piecemeal sketch maps, which was induced by the transition from the first to the second stage of development, is still going on. It is likely that there will be no cartographic endeavor of comparable magnitude and variety with relevance to Islamic studies for quite some time to come.

4. RECENT DEVELOPMENTS

Since the 1980s, the sciences and humanities have seen an intensification of spatial thinking and mapping activities which place Islamic and Mamluk studies in a changed intellectual environment. On the one hand, new concepts of social space, space perceptions, and mental maps are emanating from geography, sociology, cognitive psychology, and other fields.⁶⁷ Whether or not one is inclined to subscribe to the vogueish labeling of a “spatial turn,” it is apparent that these concepts have heralded a renunciation of the older, basically topographical, understanding of space and have instead promoted notions of a socially and culturally encoded space. This is illustrated for instance by a shift in archaeology from site towards landscape archaeology, part of which is *nota bene* a growing regard for the embedding of urban cultures in nomadic contexts.⁶⁸

On the other hand, the information revolution since the 1990s has promoted spatial issues. Researchers are now confronted with an ever-expanding field of electronic spatial data, information retrieval and mapping tools, and opportunities

⁶⁶On Christendom, see *TAVO* B VIII 2 and 5; on conflict with the Franks, B VIII 6, 8, 10, and 12; and on the invasion of Timūr, B VIII 6, 19.1, and 19.2.

⁶⁷In addition to n. 4, special mention may be made of the collective volume *Image and Environment: Cognitive Mapping and Spatial Behavior*, ed. Roger M. Downs and David Stea (Chicago, 1973), and of Pierre Bourdieu, “Espace social et genèse de ‘classe,’” *Actes de la recherche en sciences sociales* 52/53 (1984): 3–14.

⁶⁸Kurt F. Anschuetz, Richard H. Wilshusen, and Cherie L. Scheick, “An Archaeology of Landscapes: Perspectives and Directions,” *Journal of Archaeological Research* 9 (2001): 157–211; Stefan R. Hauser, “Archaeological Approaches to Nomadism,” in *The Visibility of Nomads and Seasonal Occupation in the Archaeological Record: Multi-Disciplinary Approaches to a Methodological Problem*, ed. idem (Wiesbaden, forthcoming) (for the time being, see his introduction to *Die Sichtbarkeit von Nomaden und saisonaler Besiedlung in der Archäologie: Multidisziplinäre Annäherungen an ein methodisches Problem*, ed. idem (Halle, 2006), 1–26).

to discuss, collaborate, and publish. Mainly for extra-scientific reasons, spatial data has become virtually ubiquitous because a plethora of maps, aerial photography, and space imagery that had been patronized for decades by the military and by military-associated companies was disclosed to the public, for the most part via the internet and other channels of electronic distribution.⁶⁹ Taking advantage of this, online 3-D-mapping earth viewers make topographical information available on both the global and local scale in previously unseen quantity and quality.⁷⁰ This has the effect, among others, that governments in the region can no longer hope to protect their territory from outsiders' eyes by concealing maps and survey data, now that access to georeferenced high-resolution imagery of any location from above has become technical child's play.⁷¹ Hence, habits of spatial thinking and expectations in printed materials have undergone a radical change in all areas. Responding to this, specialized library map collections have begun to grant online access to their catalogues and holdings.

Rather than dwelling on the overwhelming range of services and tools, one may note that a basic operation such as determining the geographical location of some given place or learning which place names exist in the vicinity of a particular location meant considerable hardship one generation ago—whereas now online gazetteers, remote sensing data, and some historical maps allow one to check coordinates and toponymy in a short time. With regard to Egypt, for instance, one official U.S. online database alone puts 42,759 place names (including variants) plus coordinates at one's fingertips.⁷²

Certainly, the technical side of innovation must not be overstressed, as it is not

⁶⁹Crucial to this is high-resolution space imagery generated through international cooperation on the basis of public funds which is therefore distributed freely, e.g., via NASA's *Global Land Cover Facility*, <http://glcf.umiacs.umd.edu>. Another source of "new" information is the dissemination of Soviet military maps some time after the end of the Cold War. By this, topographical maps on scales of 1:1,000,000 up to 1:50,000 that were quite timely, having been compiled mainly during the 1970s and 1980s, became available for almost the entire Middle East, be it in the print version or as electronic resources. Now the tide has ebbed away and libraries have reduced online access to these maps.

⁷⁰*Google Earth*, <http://earth.google.com>; *NASA World Wind*, <http://worldwind.arc.nasa.gov>; *Microsoft Virtual Earth*, <http://local.live.com>.

⁷¹The Middle Eastern national survey and mapping authorities are still adapting to this change after a long period of secrecy, the forerunners being the Survey of Israel/ha-Merkaz le-Mipuy Yisra'el and the Royal Jordanian Geographic Center/al-Markaz al-Jughrāfī al-Malikī al-Urdunnī.

⁷²*Geographic Names Server*, hosted by the United States National Geospatial-Intelligence Agency, <http://earth-info.nga.mil/gns/html>. It incorporates and refreshes the inventories which before were furnished in the Gazetteer series of the United States Board on Geographic Names (Washington, D.C., 1955–97). The country file on Egypt referred to above was last modified in February 2007, <~/namefiles.htm>. Note also the *Getty Thesaurus of Geographic Names Online* at http://www.getty.edu/research/conducting_research/vocabularies/tgn.

sufficient in itself. The abundance of new spatial data and methods of processing them could create a maelstrom unless appropriate research designs make use of them. Fortunately, this is what seems to have happened most recently. A multitude of electronic and often web-based scientific initiatives in the field of space relations are springing up everywhere. The *Chicago Online Encyclopedia of Mamluk Studies* is scheduled to be supplemented by a set of high-resolution “interactive online and freely printable maps of the Mamluk Sultanate and the wider region during the Mamluk period”—an intent which proves that a need for such material exists.⁷³ I understand that these will not be static but account for diachronic shifts in trade routes, etc. However, this is not yet nearing completion.

Besides, relevant activities may for the most part be found in neighboring branches of research. A few may be named here, without any criticism of the many that are omitted. A newly posted website on the anonymous fourth/tenth-century *Kitāb Gharā'ib al-Funūn wa-Mulaḥ al-ʿUyūn*, which surfaced only in 2000, is a study in the online presentation of a manuscript source that pertains through both maps and text to astronomy, cartography, and geography⁷⁴—similar source digitizations of just a few years back prove to be comparatively unwieldy.⁷⁵ Classical scholars have recently published the *Historischer Atlas der antiken Welt*, English edition forthcoming.⁷⁶ Biblical scholars are collaborating on a *Digital Archaeology Atlas of the Holy Land*,⁷⁷ and in Central Asian studies an *Archaeological Information System of Central Asia* is being undertaken.⁷⁸ The *Electronic Cultural Atlas Initiative* aims to serve as a clearing house for projects that range, so far, between China and Egypt.⁷⁹ As already mentioned, *La carto-thèque méditerranéenne* (soon becoming *CartoMundi*) explores the modern regional carto-bibliography,⁸⁰ and a promising attempt is now being made to register the modern literature

⁷³For the announcement see <http://www.lib.uchicago.edu/e/su/mideast/medoc.html>.

⁷⁴*Medieval Islamic Views of the Cosmos: The Book of Curiosities*, ed. and trans. Yossef Rapoport, Emilie Savage-Smith, and Jeremy Johns, <http://cosmos.bodley.ox.ac.uk>.

⁷⁵See for example *La Géographie d'Idrīsī: Un atlas du monde au XIIe siècle*, CD-ROM (Paris, 2000). For a modern subject, see the DVD edition of Jacotin's atlas to the *Description de l'Égypte* (Alexandria, 2004), mentioned in n. 31.

⁷⁶*Historischer Atlas der antiken Welt*, ed. Anne-Maria Wittke, Eckart Olshausen, and Richard Szydlak (Stuttgart, 2007) (= Der Neue Pauly; Supplemente, 3). The English edition by Brill Publishers is scheduled for 2010.

⁷⁷The atlas is being prepared by the Levantine Archaeology Laboratory of the University of California, San Diego; see http://www.anthro.ucsd.edu/~tlevy/index_files/Digita_Arch.htm.

⁷⁸AISCA is directed by Bernardo Rondelli and Sebastian Stride. For an abstract, see http://www.uam.es/otroscentros/asiriologiayegipto/5icaane/ws4_prog.html.

⁷⁹ECAI is a community of affiliates hosted by the University of California, Berkeley, <http://ecai.org>.

⁸⁰See n. 29.

on Islamic cartography.⁸¹ Research in the scientific traditions of both Western and Islamic cartography is vital to an understanding of medieval perceptions of space and physical space relations and of how these may account for present-day biases.

Initiatives of this kind would equally hold that the visual items they produce are not mere reworkings of previous results. Instead, mapping is conceived as a heuristic means that allows one to address issues, if spatially related, along more suitable lines than textual treatment could. This is because maps can best take advantage of that potential which is specific to the visual sense, namely the perception of a multitude of distributed contents synoptically. Hence, maps may serve not only as a secondary visualization but as a clue to historical understanding in its own right. The requirements of mapping even modify the foregoing study of the sources. It is inherent in the two-dimensional nature of maps that they reveal their contents at once and betray blanks and inconsistencies to the observant reader in a pitiless manner. The observer of a map beholds its positive contents and at the same time interprets the vacant stretches in between, which impose themselves on him much more than gaps within a text would. Map-makers therefore need to exercise exhaustive and unequivocal criticism of content. They share the experience of having to decide whether a matter is appropriate to mapping at all, i.e., whether it is possible to represent it in all parts of the mapped area with similar meaningfulness—and to refrain from mapping when source evidence is too scant or too confined to one place. This caution is imperative in order for historical mapping to attain the value of cartography in showing the spatial condition of a certain matter. We should demand this care all the more as the necessities of localization and identification are widely realized, and as the way is open for considering more complex spatial issues.

A THEMATIC ATLAS

The above notes are the prolegomena to a substantial undertaking: the making of a series of maps that shed light on the interaction of nomads and sedentary people in Syria and Egypt during the Ayyubid and Kipchak Mamluk periods. They are part of a study in the textual sources in progress.⁸² This combined work aims at expounding the development, possible structure, and impact of that mutual relationship, thus highlighting a hitherto little-known period in the history of

⁸¹Tarek Kahlaoui, *Islamic Cartography: A Bibliography of Modern Literature*, <http://islamic-cartography.blogspot.com>, an offshoot of the author's still ongoing doctoral thesis, having proceeded to date to the letter B.

⁸²See n. 5. The maps are drawn up by the cartographer Martin Grosch with the collaboration of the Institute for Geo Research (geo3) of the University of Applied Sciences, Berlin, and the Leibniz Institute for Regional Geography, Leipzig.

Middle Eastern nomadic-sedentary relations. It will perhaps also help in assessing the initial suggestion that both dynasties devised a new attitude toward space and adequately engaged in a heightened spatial organization that should have expanded over the hinterland and brought the Bedouin population under state supervision.

Drawing on lessons to be learned from the course of historical cartography, the work is characterized by the following properties. First, the separation of topographical and historical mapping has proven detrimental to the latter, and here they are merged again. Placing historical content on a topographical background will reveal the visual properties of the map. As the relief, bodies of water, etc., help to envision the setting of some historical matter on the ground, they moreover provide a yardstick as to whether there is relevance to space and thus whether it is appropriate to map a particular object. This is best achieved with large-scale colored maps which suggest folio size, except for the smallest regions.

Second, thematic mapping is needed, which takes the conventional geography of settlement and large political entities as a starting point and proceeds to focus on more specific issues. While some contexts require the static exposure of aspects in multiple synchronic maps, sequences of maps on a diachronic scale better highlight developments and changes over time. At the same time, relevant efforts of an older date, now often difficult to access or sunk into oblivion, deserve reassessment and mapping according to present-day standards, including historical topography and hydrography.

Third, a historico-critical approach is to be reintroduced after a long time in which mapping activity has failed to explicate its methodological foundations. This also basically holds true for those maps which accompany historical gazetteers, since even the most accurate reference to textual sources does not make it clear why some item was placed on a particular spot on the map. The two Kiepert, already mentioned, may serve as an example in that they often made detailed references to their source materials. They evaluated them, discussed their subtle decisions closely, and pointed out uncertainties.⁸³ This way, the reader's attention is drawn to the fact that maps are not bearers of positive facts to which they are secondary, but rather are constructs of the map-maker.

Last but not least, the profound change in cartographic techniques since the making of the *TAVO* seems to lend itself to thematic cartography, as it has an immediate impact on which spatial issues may be addressed and how. In

⁸³E.g., H. Kiepert, "Zu den Karten," in Humann and Puchstein, *Reisen in Kleinasien und Nordsyrien*, text volume, 407–12; R. Kiepert, "Zu den Karten," in Max von Oppenheim, *Vom Mittelmeer zum Persischen Golf*, 2:389–414. See also, though to a lesser extent, *An Historical Atlas of Islam*, ed. Kennedy, xi–xix.

fact, electronic mapping on the basis of georeferenced remote sensing data is invaluable for the achievement of a precise topography in which history can be embedded soundly. Speaking in general, combination with a digital elevation model (DEM) allows for a three-dimensional impression with a vast potential to fuel one's spatial imagination and is yet technically impeccable. Furthermore, the integration of electronic maps in a geographical information system (GIS) opens up unforeseen possibilities of thematic analysis, interpretation, and presentation.⁸⁴ Finally, distribution of the results in electronic form is a welcome opportunity to advance the recognition and further study of spatial contexts in history.

⁸⁴See *Islamic Area Studies with Geographical Information Systems*, ed. Okabe Atsuyuki (London, 2004).