CAPPADOCIA: OLD QUESTIONS, NEW APPROACHES—A HISTORIANS PERSPECTIVE

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ABSTRACT

Cappadocia has been a focus for historians of the Byzantine world and of Anatolia for many decades, a reflection both of its very distinctive landscape and geography as well as its importance as a "peripheral" province. Its so-called "underground cities"—numbering over 200 known sites—make it hardly surprising that Cappadocia has attracted the attention of historians, archaeologists, and more recently mass tourism. Research into the cultural history and the archaeology of the region has depended on well-established, tried-and-tested approaches rooted in the traditions of art and architectural history, textual analysis, and archaeological survey, with occasional excavation. From the 1940s and 1950s, improvements in natural scientific dating techniques helped to expand archaeological and scientific research horizons; but, in the last two decades, a revolution in both methods and approaches has greatly improved our knowledge of all aspects of Cappadocian history. Reflecting advances in fields such as numismatics and sigillography or shifts in method and approach among historians of late Roman and Byzantine art and architecture, it also results from increasing interest in broad-brush archaeological field survey aimed at capturing settlement profiles, as well as the landscape history of a region. More broadly, there has been a dramatic expansion in the technologies of data capture, processing, and interpretation relevant to the ancient environment, ecology, and climate of the region, as well as the development of new ways of working and integrating different specialisms that can be applied to historical and archaeological research. The application of an integrated approach combining traditional with up-to-the-minute methods and techniques has meant that, for Byzantine history in particular, Cappadocia has become something of a testing ground for new approaches to old questions. This brief introductory survey aims to describe these developments and provide a framework for the chapters that follow.

KEYWORDS

collaborative work, interdisciplinarity, new technologies, proxy data, pollen, Lake Nar, paleoenvironmental research

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Cappadocia has been a focus for the history and archaeology of the Byzantine world, and more especially the Byzantine world in Anatolia, for many decades—a fascination that goes back well beyond nineteenth-century travelers, a reflection of its very distinctive landscape and geography. But from the later years of the nineteenth-century interest in Cappadocia, its landscape, peoples, and languages expanded dramatically, expressed less through interest in the "fairy chimneys" and "underground cities" than as a reflection of the rapid growth of "Byzantine studies" as illustrated in the appearance of dedicated journals such as the *Byzantinische Zeitschrift* or *Vizantijskij Vremmenik*, as well as in publications concerned with the ancient and classical world more broadly, including such august publications as the *Journal of Hellenic Studies* or the *Bulletin de correspondance Hellénique.* Since then, the study of Byzantine culture in all its aspects, as well as of Byzantine society, economy, and politics, has flourished, even if at times we may lament its absence from many major academic institutions or bemoan its marginalization in many of those where it is present. Interest in the provinces and regions of the medieval East Roman empire has followed a similar pattern, although here local politics and national(ist) sentiment has often dictated how and what should be or was studied. Yet interestingly, the history of Cappadocia seems to have been largely free of such biases, perhaps because no one has tied a contemporary political or cultural identity to it. This is not to say that interest in the Cappadocian past has been free of subjective approaches and local (academic and political) vested interests. But that does not concern us here. My aim in what follows is briefly to comment on some recent changes in the way the study of the Cappadocian past is pursued and to connect these changes with broader trends in the study of the history of the pre-modern world.

The importance of Cappadocia for the peoples of the ancient Near East seems always to have been considerable. Its pre-Hellenistic name, Katpatuk(y)a, while for long thought to be of Iranian origin, seems in fact to derive from an ancient Semitic language, perhaps Elamite or Akkadian.[1] Whether as an independent kingdom or as a vassal or tributary state, it played an important role during the period of the Persian empire, throughout the period of the Hellenistic kingdoms, and finally for Rome itself. In extent, it varied enormously across the centuries. Greater Cappadocia, as described by Strabo in Bk. xii of his Geography, encompassed three regions—Kataonia, Taurike, and the inland zone—but the wider region up to the Black Sea could also be described as Cappadocia, consisting of "Pontic Cappadocia" and "Greater Cappadocia," or "greater" and "lesser" Cappadocia, as for example by Polybius.[2] The regions belonging to Strabo's Greater Cappadocia today make up an eighth of the landmass of the modern Turkish republic, a vast area of some 91,000 km² with an enormously varied geography and physical landscape, including the districts once constituting the Byzantine military provinces or *themata* of Kappadokia, Sebasteia, Charsianon, and Lykandos. The dramatic political changes of the late Roman and early Byzantine centuries transformed the geopolitical and cultural situation of Cappadocia and especially its southernmost districts, which, in the course of the seventh century became a frontier region, remaining so until the later tenth century. As their strategic significance increased and the importance of the whole area for the

1 See *Tabula Imperii Byzantini 2: Kappadokien (Kappadokia, Charsianon, Sebasteia und Lykandos)*, eds. Friedrich Hild and Marcel Restle, Denkschr. d. Österr. Akad. d Wiss., phil.-hist. Kl. 149 (Vienna: Austrian Academy of Sciences-Institute for Medieval Research Division of Byzantine Research, 1981), 63–64, n. 3 for discussion and literature.

2 Strabo, *The Geography of Strabo* XII, trans. Duane W. Roller, Loeb Classical Library (London, Cambridge MA: Cambridge University Press, 2014), i.1–2, ii.1–11; Polybius, *The Histories V*, trans. William Roger Paton, revised Frank William Walbank and Christian Habicht, Loeb Classical Library (London, Cambridge, Mass.: Harvard University Press, 2011), 43.

empire's political and military situation grew, so its cultural and social-economic situation also evolved.

For a whole range of reasons connected with both its physical geography and geology and its geopolitical location, its artistic and architectural heritage, and its relative isolation and apparent cultural distance from Constantinople, it became a focus of attention for scholars of Byzantine art and architecture in particular, as well as for archaeologists. Since much of its architecture is cut into the living rock, the number of Roman and especially Byzantine structures that have survived is relatively high, a fact that has naturally attracted attention.[3] Particularly important, because so different from settlements in other regions of medieval Anatolia, are the so-called "underground cities," the most well-known at Malakopea (modern Derinkuyu) now complemented by the recent discovery of another substantial subterranean settlement at Nevşehir. With some two hundred underground settlements of varying extent, many dating back many centuries before the Romans, it is hardly surprising that Cappadocia attracted the attention of historians, archaeologists, and more recently mass tourism—no doubt the first visitor, or at least the first to have left a detailed account of what he saw, the French diplomatic traveler Paul Lucas in 1712, would have been somewhat taken aback by the crowded tourist buses now doing the rounds between the major sites[4] —offering a remarkably visual history of new cultures building on those that preceded them. While their function in Byzantine times continues to be a topic for discussion and ongoing research, these impressive monuments remain one of the most significant aspects of Cappadocian archaeology while also offering important insight into the very varied nature of medieval urbanism in Anatolia.[5]

Aside from its particular characteristics, of course, Cappadocia is but one region of Anatolia, and so the research strategies and sources available to scholars, as well as the methodological issues they faced, were shared by all those working in this broader region. Until comparatively recently, research into the cultural history and the archaeology of Cappadocia, as well as the rest of Anatolia, depended on well-established, tried-and-tested approaches rooted in the traditions of art and architectural history, textual analysis, including the analysis of lead seals and inscriptions, archaeological field survey and excavation, and the study of the Anatolian road-system. Significant developments in the 1940s and 1950s, especially with the improvement in natural scientific dating techniques, expanded the archaeological and scientific research horizon considerably, techniques that continued to be refined, expanded and improved upon in the following decades. In the last 20–25 years, however, there has taken place a real revolution in both methods and approaches. In part, this reflects quite simply broader changes in the study of texts and advances in fields such as numismatics and sigillography, for example, as well as shifts in the focus of attention of historians of late Roman and Byzantine art and architecture. Additionally, a growing concern with broad-brush field

3 For the most recent study of Byzantine Cappadocia and survey of archaeological and related research in the region: Robert Ousterhout, *Visualizing Community: Art Material Culture, and Settlement in Byzantine Cappadocia*, Dumbarton Oaks Studies 46 (Washington D.C.: Dumbarton Oaks, 2017); Philipp Niewöhner, "Introduction," in *The Archaeology of Byzantine Anatolia. From the End of Late Antiquity to the Coming of the Turks*, ed. Philipp Niewöhner (Oxford: Oxford University Press, 2017); historical context also in J. Eric Cooper and Michael J. Decker, *Life and Society in Byzantine Cappadocia* (Basingstoke, New York: Palgrave, 2012), 1–48, with the useful introduction in J. Eric Cooper, "Cappadocia, Turkey's Mysterious Hinterland," *Current World Archaeology* 59 (2013), https://www.world-archaeology.com/features/cappadocia-turkeys-mysterious-hinterland/; older surveys in Robert Ousterhout, *A Byzantine Settlement in Cappadocia*, 2nd rev. ed. (Washington D.C.: Dumbarton Oaks Research Library and Collection, 2011); Catherine Jolivet-Lévy, *Cappadoce: mémoire de Byzance* (Paris: CNRS Éditions, 1997).

4 Paul Lucas, *Voyage du Sieur Paul Lucas, fait par ordre du Roi dans la Grèce, l'Asie Mineure, la Macédoine et l'Afrique* (Paris: Chez Nicolas Simart, 1712).

5 See *Tabula Imperii Byzantini* 2, 227 with further literature.

survey aimed at capturing the settlement profile and thus some of the demographic history of a region, as well as the landscape history of a region, has also played an important role. But this shift also reflects an enormous speeding-up in the development of technology more broadly affecting every aspect of data collection, processing, and interpretation, as well as the development of new ways of working and integrating different specialisms that can be applied to historical and archaeological research.[6]

Scientists have long been accustomed to working and publishing in teams. To a degree, so have archaeologists. Historians have been less ready to adopt teamworking approaches to their research, largely a reflection of traditional institutional ways of working in which individual publications have been the hallmark of academic profiles and achievement. But in recent years, this has begun to change quite rapidly, as historians begin to work alongside both archaeologists and—for example—palaeoenvironmental scientists on different aspects of the same set of questions about a given area or settlement or problem. There are a number of reasons for this shift. One obvious stimulus to collaborative work is the need to attract funding in order to finance fieldwork projects, and team-based projects provide resources for a number of specialists, each making a specific contribution to the whole offer a successful way for an individual to support their own research goals while at the same time contributing to a broader project. Another is simply the obvious advantage of working collaboratively with colleagues who are able to assess from their own expert perspective the ways in which the individual members of a research group are using data from outside their own specialism. Just as importantly, such collaborative enterprise offers the opportunity to generate a more balanced and grounded analysis of all the data derived from the study of a specific topic in a holistic way, in a way that properly accounts for all the different types of evidence and attempts to reconcile tensions and contradictions across the different datasets. It is much more difficult, and takes far longer, to do this working alone, even if in occasional consultation with specialists outside one's area of expertise.[7]

Of course, not every historical question needs to be addressed in this way. But the study of a historical landscape, its settlement geography, cultural, social, and economic history, its built environment, and the environmental and climatic conditions that have influenced the way human populations have interacted with it can only be done collaboratively. With the advent of a number of new scientific techniques, the application of which demand highly specialized technical skills, such collaboration has become essential. While historical sources can explain and account for possible human-derived changes in palaeoecological data, palaeoecological data have the potential to inform on the spatial extent and severity of human-induced impacts and can provide information on how landscapes recover after human-induced impacts have ceased or lessened. Historical or

6 See now the contributions to William R. Caraher, Kostas Kourelis, and Darlene B. Hedstrom, eds., *Beyond Icons. Theories and Methods in Byzantine Archaeology* (London: Cambridge University Press, forthcoming) for a survey of recent developments in (mostly) North American Byzantine archaeology; more generally: Kristian Kristiansen, "The Discipline of Archaeology," in *The Oxford Handbook of Archaeology*, eds. Barry Cunliffe, Chris Gosden, and Rosemary A. Joyce (Oxford: Oxford University Press, 2009); also A. Mark Pollard, "Measuring the Passage of Time: Achievements and Challenges in Archaeological Dating," in *The Oxford Handbook of Archaeology*, eds. Barry Cunliffe, Chris Gosden, and Rosemary A. Joyce (Oxford: Oxford University Press, 2009). For a summary and for the implications of some of these changes for Byzantine history and archaeology, see the chapters in Henriette Baron and Falko Daim, eds., *A Most Pleasant Scene and an Inexhaustible Resource. Steps towards a Byzantine Environmental History* (Mainz: Romisch-Germanisches Zentralmuseum, 2017); Adam Izdebski, *A Rural Economy in Transition. Asia Minor from the End of Antiquity into the Early Middle Ages* (Leiden: Taubenschlag Foundation, 2013), 13–44.

7 John Haldon et al., "History Meets Palaeoscience. Consilience and Collaboration in the 21st Century," *Proc. National Acad. of Sciences of the USA* 115, no. 13 (2018), www.pnas.org/cgi/doi/10.1073/pnas.1716912115; John Haldon et al., "The Climate and Environment of Byzantine Anatolia: Integrating Science, History, and Archaeology," *Journal of Interdisciplinary History* 45, no. 2 (2014); Adam Izdebski et al., "Realising Consilience: How Better Communication between Archaeologists, Historians and Natural Scientists can Transform the Study of Past Climate Change in the Mediterranean," *Quaternary Science Reviews* 136 (2016).

textual sources are often discontinuous, frequently not contemporary with the events or developments they describe, and may consist of unsupported, exaggerated, biased, or secondary information. In contrast, palaeoecological data by their very nature are typically time-continuous in the absence of breaks or hiatuses in sedimentation. They can inform on antecedent and subsequent events and generally do not suffer from information decay further back in time. As has been noted, there are no "dark ages" in the paleoenvironmental record.

Collaborative work brings with it a number of challenges, however. Historians think about causal relationships in terms of a range of interrelated social, economic, and political factors. In contrast, climate scientists think in terms of environmental impacts on agriculture, warfare, demographics, and long-term change and stability. They have a range of tools at their disposal—proxy data deriving from biological and geological climate archives, for example, such as tree rings, stalagmites, and marine and continental sediment sequences, and on both sides, there can often be an insensitivity to both the limitations of the data, one the one hand, and on the other to the limitations of historical interpretation. In spite of such challenges, much progress has been made, and in the last 20 or so years, this has become very clear in the case of Anatolia and more particularly of Cappadocia, where collaboration between archaeologists, historians, climate, and environmental scientists has permitted some really significant advances to be made.

Historians of Anatolia are confronted by a relatively limited and certainly patchy written record, both chronologically and spatially, and need to exploit as wide a range of sources as possible; archaeology likewise faces issues of spatial coverage in particular. Studying a specific settlement without also studying its wider context and without comparing cases inter- and intra-regionally has huge limitations, as much of the older literature on Anatolian urbanism in the Byzantine period has shown. But archaeology, which had long ago pioneered the use of aerial photography, has benefited substantially from a number of recent technical developments, beginning some decades ago with the use of ground-penetrating radar and magnetometry, now greatly enhanced by important developments in remote sensing technology, including the use of satellite imagery, lidar, and the use of balloons and drones, which have massively increased the potential for mapping a landscape, as well as patterns of human activity that may not be visible at ground level or even through regular aerial photographic techniques. At the same time, the rapid advances that have been made in the biosciences have also contributed to transforming what we think of as archaeology. The analysis of ancient DNA, for example, as well as isotope analysis of skeletal remains, permits us now to date human remains more precisely than ever, to extract information about mortality, diet, disease, origins, as well as affinities to the wider population, and thus to information about population movements and demography; scientific analysis of ceramic materials has enormously advanced our ability to understand both how and where pottery was produced; the analysis of charcoal, of pollen, of tree-rings, although well-established by the 1980s, have been enormously refined and improved in the last two decades and have massively increased the potential for understanding micro-level population changes, the evolution of landscapes, and land-use, as well as the dating of structures and artifacts.

Dendrochronology also helps in thinking about past environments, since it serves as a proxy for seasonal and annual variations in moisture. There are a number of other proxies for climate. Oxygen and carbon isotope analyses (to determine their proportion sediment samples from lakebeds, for example) are related to rainfall amount and effective moisture, respectively, and tell us about seasonal shifts in rainfall; mineralogical analysis can inform us

about the proportion of calcium to strontium (Ca/Sr) or magnesium (Ca/Mg) in the sediment, again indicative of degrees of aridity or humidity; analysis of speleothems—cave stalactites and stalagmites—similarly provides data on humidity. The chronology of a stalagmite is based on Uranium-series ages across a specific period, depending on the size and age of the stalagmite in question. But generating the data from these proxies is an immensely complex process requiring specialist technical facilities (including, for example, mass spectrometry) and dedicated expertise.[8]

Given the situation described above, therefore, it is clear that the history of Anatolia invites interdisciplinary cooperation, which has the added advantage of contributing at the same time to the building and testing of general models of the interaction and causal relationships between climate and environment and society. One massive advantage of this sort of collaboration is that the integration of high-resolution archaeological and textual data with longer-term, low-resolution paleoenvironmental data permits us to achieve much greater precision in identifying some of the causal relationships underlying societal change. One of the most significant developments in this respect in recent decades has been an expansion in the extraction of pollen from a range of sites across Anatolia and considerable improvements in dating techniques. The importance of this cannot be over emphasized, because the study of fossilized pollen grains provides the potential to reconstruct vegetation and environmental sequences back through time, as well as to provide evidence for the farming environment and the ways in which the landscape was adapted to human requirements and demands. But there is a substantial difference between the way archaeologists can exploit pollen data and the methods and aims of palynological research. The former aim to identify pollen preserved on excavated sites found in the context of settlements, such as within buildings or in middens, in order to throw light on the use of different plants by the residents of the settlement and to provide information about local ecological conditions. In the latter case, and along with spores and various micro- and macrofossils, pollen is recovered from sediments from lake basins and other waterlogged depressions.[9] Where this can be dated, it permits comparisons to be made with archaeological and settlement survey data for investigating human-environment interactions and long-term landscape dynamics and provides information about the ecological structure of a region.

This sounds very good, but the accuracy and therefore the reliability of palaeoenvironmental or palaeoecological chronologies are problematic, because many sequences, particularly those established before the 1980s (when radiocarbon—14C—dating was expensive) are often based on a limited number of radiocarbon ages, with interpolation between adjacent 14C ages, which often implies or assumes a constant sediment accumulation rate. For example, where a phase of landscape disturbance is highlighted in a palaeoecological dataset, sediment accumulation rates may have varied considerably, and this significantly affects the duration of the recorded phases. In addition, the upper stratum of the core is often as-

8 For a more detailed survey of paleoenvironmental science, see Neil Roberts, *The Holocene. An Environmental History* (Oxford: Blackwell, 2007), 8–54; the methodological-technical surveys in Michael McCormick et al., "Climate Change during and after the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence," *Journal of Interdisciplinary History* 43, no. 2 (2012): 169–220, https://10.1162/JINH_a_00379; and, relevant entries in Brian M. Fagan, *The Oxford Companion to Archaeology* (Oxford-New York: Oxford University Press, 1996); Timothy Darville, *The Concise Oxford Dictionary of Archaeology* (Oxford: Oxford University Press, 2008).

9 Anna Elena Reuter, "Die byzantinische Kulturlandschaft – Kulturpflanzen als Indikatoren für byzantinische Mensch-Umwelt-Interaktionen," in *A Most Pleasant Scene and an Inexhaustible Resource. Steps towards a Byzantine Environmental History*, eds. Henriette Baron and Falko Daim (Mainz: Romisch-Germanisches Zentralmuseum, 2017); Warren John Eastwood, "Paleoecology and Landscape Reconstruction in the Eastern Mediterranean: Theory and Practice," in *General Issues in the Study of Medieval Logistics: Sources, Problems and Methodologies*, ed. John Haldon (Leiden: Brill, 2006), 119–58.

sumed to date to the present day, which may not be the case and which introduces further uncertainty in any age-depth modeling. The accuracy and precision of the 14C ages themselves can also be a problem; chronologies based on age-depth modeling may have a precision that is several times better than standard or bulk 14C radiometric ages, but once calibrated to calendar ages, the resulting age range may still be unsuitable for direct comparison with historical and textual data sources at sub-centennial resolution. This in turn can produce problems with the elucidation of possible cause and effect relationships. The problem can be ameliorated to a degree if there are tephra layers present. These originate from volcanic eruptions and when present in the sediment core or archaeological context, and accurately attributed to a particular dated eruption, produce well-dated chronological horizons and therefore have the potential to significantly increase the temporal precision of palaeoecological and archaeological data.[10]

Thus, many earlier studies that have been published for Turkey report uncalibrated (that is to say, "raw") radiocarbon ages (14C age yr BP [before the present]) derived from the analysis of bulk samples of sediment submitted for radiocarbon dating. Since the 1980s, however, things have improved, with more dated samples per core, and with recent studies reporting calibrated or conventional radiocarbon ages (Cal yr BP) to facilitate direct comparison with archaeological and historical datasets. Thus, in spite of the problems noted above, age-depth modeling does permit the dating of very minute amounts of sediment and offers the potential to increase the number of dated horizons and hence improve the chronology of anthropogenic activity, landscape use, and settlement history.[11] Paleoenvironmental data retrieved from records with seasonal increments (such as ice cores, tree-rings, speleothems, corals, and annually-laminated sediments) can generate considerable chronological precision and may often be as good as that extracted from historical and textual sources and dateable archaeological material. When this is the case, it is possible to compare palaeoecological and historical/archaeological data directly.[12]

One of the most convincing illustrations of this is from Lake Nar in Cappadocia. It will be worth revisiting this case to illustrate the potential that the sorts of proxy data described above have, together with the rich historical and archaeological data sources for the region, to draw some very significant palaeoecological inferences about landscape ecological changes and human history over the last 1,700 years. Nar Gölü is unique in Cappadocia in having continuous deposition of annually laminated sediments back from the present day to ca. 300 CE. This provides a very robust time scale based on continuous annual counts of varves (the layers of sediment accumulated seasonally/annually) and offers a detailed record of vegetation and landscape change for comparison with historical data sources. The annually laminated nature of the sediments retrieved from Nar Gölü also provides the basis for rigorous statistical analysis (e.g., rate of change analysis) in order to support quantitatively palaeoecological inferences.[13]

I will mention just two types of analysis that are of particular importance here. First, high resolution stable isotope analyses were carried out on the core

10 Trausti Einarsson, "Tephrochronology," in *Handbook of Holocene Palaeoecology and Palaeohydrology*, ed. Bjorn E. Berglund (Chichester: Wiley-Interscience, 1986); Warren Eastwood et al., "Recognition of Santorini (Minoan) Tephra in Lake Sediments from Gölhisar Gölü, Southwest Turkey by Laser Ablation ICP-MS," *Journal of Archaeological Science* 25 (1998); Giovanni Zanchetta et al., "Tephrostratigraphy, Chronology and Climatic Events of the Mediterranean Basin during the Holocene: An Overview," *The Holocene* 21 (2011).

11 For a very accessible, well-informed account, see Izdebski, *Rural Economy*, 109–43.

12 E.g., Adam Izdebski, Grzegorz Koloch, and Tymon Słoczyński, "Exploring Byzantine and Ottoman Economic History with the Use of Palynological Data: A Quantitative Approach," *Jahrbuch der Österreichischen Byzantinistik* 65 (2016), https://doi.org/10.1553/joeb65s67.

13 See Ann England et al., "Historical Landscape Change in Cappadocia (Central Turkey): A Palaeoecological Investigation of Annually-Laminated Sediments from Nar Lake," *The Holocene* 18, no. 8 (2008), http://hol.sagepub.com/cgi/content/abstract/18/8/1229.

sequence taken from the lakebed (some 3.76 m long). The record from the $\delta^{18}O$ material reflects regional variability in precipitation and evaporation and indicates marked shifts in isotope values. A major change to more negative isotope values indicates higher rainfall, and a shift in this direction was dated ca. 530 CE, while major changes to more positive isotope values, indicating less rainfall, are dated to ca. 800 CE and ca. 1400 CE. Analysis of mineralogical data supported these readings, showing more positive isotope values (prior to ca. 530 CE and in the period ca. 1400–1960 CE).[14]

The stable isotope data thus clearly indicate drier periods (300–500 CE and 1400–1960 CE) and wetter intervals (ca. 560–750 CE, 1000–1400 CE, and after 1960, all of which can be related to the intensity in summer drought and changes in the amount of spring and winter precipitation. They are important because they also indicate which periods in the past were better suited to agriculture with respect to moisture availability. Precipitation values for much of the region are only a little above the limit for extensive dry farming, where a crop such as wheat taps into moisture preserved in the soil from winter precipitation and grows to maturity and harvested during the early summer. The free-draining volcanic-derived soils of Cappadocia are very permeable, so that moisture stress would have been of particular importance.[15]

This evidence for climate is important, not just for Cappadocia, but in a much broader geographical context. It indicates that central Anatolia, including Cappadocia, experienced a slightly different range of climatic shifts from the southern Levant and from southwestern Anatolia, emphasizing the need for caution in generalizing across wider regions, as well as the importance of local and regional, including sub-regional, variation.[16] It is important also, as we shall see, because shifts in annual precipitation do not necessarily have to impact agriculture negatively.

The pollen data from Lake Nar are important for a number of reasons, first because analysis of the sources and distribution area of the pollen shows that most pollen deposited in the lake has been regional rather than local in origin, although local land-use changes in the immediate vicinity of the lake (~5 km2) are indicated by the pollen assemblage composition. In other words, the pollen record reflects primarily landscape and vegetation changes across much of Cappadocia, an area of ~5000 km2 or more in extent, and beyond. This extensive representation is also reflected in the quite high levels of pine pollen recorded throughout the last two millennia at Nar, most of which (since there is no pine in Cappadocia itself) has been the product of long-distance transport, presumably mainly from the Taurus Mountains some 70 km to the south and southeast. The Nar material can thus serve as a proxy for much of Cappadocia and central Anatolia and beyond.[17]

14 C. Neil Roberts, Giovanni Zanchetta, and Matthew D. Jones, "Oxygen Isotopes as Tracers of Mediterranean Climate Variability: An Introduction," *Global and Planetary Change* 71 (2010); Matthew Jones et al., "A Coupled Calibration and Modelling Approach to the Understanding of Dry-Land Lake Oxygen Isotope Records," *Journal of Paleolimnology* 34 (2005); Matthew Jones et al., "A High-Resolution Late Holocene Lake Isotope Record from Turkey and Links to North Atlantic and Monsoon Climate," *Geology* 34 (2006); Melanie J. Leng and Jim D. Marshall, "Palaeoclimate Interpretation of Stable Isotope Data from Lake Sediment Archives," *Quaternary Science Reviews* 23 (2004).

15 England et al., "Historical Landscape Change," 1232.

16 For a summary of the climate history of Anatolia in its wider Late Antique and early medieval context: Haldon et al., "Climate and Environment;" for a good example of the importance of regional and micro-regional variation, see Matthew J. Jacobson, Jordan Pickett, Alison L. Gascoigne, Dominik Fleitmann, and Hugh Elton, "Settlement, Environment, and Climate Change in SW Anatolia: Dynamics of Regional Variation and the End of Antiquity," *PLoS ONE* 17, no. 6 (2022): e0270295, https://doi.org/10.1371/journal.pone.0270295.

17 For detailed technical analysis: England et al., "Historical Landscape Change," 1233–38; summarized in Warren Eastwood et al., "Integrating Palaeoecological and Archaeo-Historical Records: Land Use and Landscape Change in Cappadocia (Central Turkey) since Late Antiquity," in *Archaeology of the Countryside in Medieval Anatolia*, ed. Tasha Vorderstrasse and Jacob Roodenberg (Leiden: Peeters, 2009)

The pollen data were broken down chronologically into four zones or periods.[18] Zone NG I covers the period 300–670 CE and records a mixed landscape with a strong anthropogenic presence, together with areas of deciduous oak woodland and grassy steppe. The presence of key anthropogenic indicators from cultivated olive, walnut, sweet chestnut, vine, rye, wheat, and barley, together with a range of other secondary anthropogenic indicators (e.g. salad burnet and ribwort plantain) indicates intensive agriculture that included arboriculture (or fruticulture) and pastoralism. NG I can be further divided into two sub-zones, the first from 300–450 CE in which vine is present almost continuously, and the second from ~450–670 CE, in which vine is absent, but during which grass pollen percentages increase.

The second zone, NG II, 670–950 CE, shows some particularly interesting characteristics, most important of which is a rapid and marked increase in tree pollen and a decrease in all anthropogenic indicators, suggesting a substantial increase in tree cover and/or density that commenced relatively abruptly. Together, these data indicate the rapid onset of a period of marked decline in agricultural activity and a corresponding expansion of scrub and woodland. The sustained increase in pine pollen percentages during this period is also typical of many western Anatolian pollen diagrams for the same period and seems to reflect an expansion of pine forests across the Taurus and Pontic mountain chains, at some distance from Nar Gölü. An increase in deciduous oak pollen, in contrast, most probably resulted from an expansion in oak woodland more locally within Cappadocia, since it has been shown that oak pollen, although produced abundantly, did not disperse far from oak woodland. Also important is the fact that percentages for pollen for steppic grasses also decline in the same period, implying that some areas previously maintained as steppe vegetation by livestock grazing were likewise recolonized by woody vegetation.

The third zone, for the period 950–1830 CE, indicates a gradual return of human activity in Cappadocia during the late ninth and early tenth centuries. By 950 CE, grazing grass indicators had returned to the same levels that had been recorded in zone NG I. In contrast, there took place some important shifts in land-use. For the period ~950–1090 CE, the pollen of olive and other tree crops is almost completely absent, replaced instead by a much greater emphasis on cereal and pastoral activities. Agro-pastoral activities reached a maximum intensity during the eleventh century, when tree pollen percentages reach their lowest, and cereal pollen types their highest, values. This phase in turn came to an abrupt end around ~1100 CE, after which tree pollen increases again, while pollen percentages from steppic grasses decline along with those indicative of cereal agriculture, before recovering again in the thirteenth century. Thereafter and until the 1830s, there were minor fluctuations in vegetation cover and composition, with strong continuity in land-use from Middle Byzantine and Selcuk times into the Ottoman period. The final period is represented by Zone NG IV, for 1830–2000 CE. This is the period of the late Ottoman Empire and the Turkish Republic. It is marked by a rise in cereal pollen to its highest values within the record and an accompanying sustained decrease in other grass and steppe pollen. All this certainly reflects the progressive ploughing up of steppic summer grazing land, or yayla, for dryland cereal cultivation on the Anatolian plateau.

A third type of data that I have left until last in this brief account is derived from the analysis of charcoal. Charcoal is found along with pollen in the sediments and reflects the amount of burning within a landscape. Before the twentieth century, landscape burning was most frequent at times of diminished human

18 England et al., "Historical Landscape Change," 1238–40.

impact, when fuel biomass increases. The greater the human impact on the landscape, in particular with regard to control of landscape burning, the less the percentage of charcoal found in the sediments.[19]

At Nar, as at many other sites in Anatolia, more charcoal is a proxy for lower human impact and significant reforestation. Lower levels of land-use indicate fewer people, and as the availability of fireable fuel increased, so did the number of resulting wildfires. In this case, the levels of charcoal present in the sediments rise or decline very clearly as the pollen evidence for human activity declines or increases.[20] Thus, compared with the charcoal presence in the first period—up to ~670 CE—there is a significant increase in the eighth and ninth centuries, with peaks indicated at ~746 and ~826 CE. These levels then gradually decline thereafter, with a minimal presence from 1100–1600 CE, but with some evidence of continued landscape burning, with a peak at ~1400 CE, followed by a further gradual decline in charcoal influx up until ~1700 CE.

The importance of these data for Anatolian and for Cappadocian history cannot be emphasized enough. Not only do they provide an absolute and firmly dated chronology for land-use and climate changes in the region, they also show that land-use changes, with the possible exception of the decline in viticulture after the middle of the fifth century, were not associated with changes in the climate regime, since major pollen zone boundaries (e.g., between zones NG I to NG II at ~670 CE) are not matched by any significant stable isotope changes. At the same time, they challenge some of the interpretations and assumptions that have been grounded in the archaeological or historical record alone. Until quite recently, indeed, it had been assumed that although there were no historical records for Cappadocian agriculture and aristocracy in the period from the early Arab-Islamic conquests until the ninth century, this silence could be interpreted as an unattested continuity.[21] It has now been very clearly demonstrated that this was definitely not the case, and it has been palynological studies in Cappadocia that have proved the point.[22] On the other hand, for example, they show that the Justinianic plague of the mid-sixth century had no impact on Cappadocian agricultural production and land-use; they also show that the sudden and dramatic collapse of agriculture and pastoral farming does not coincide with any climate shift, took place across a fairly short period of some 15 years from 670 CE, and coincides with a particularly intense period of Arab raiding across the region. Even if the archaeological record shows continuing occupation of some fortified sites and the historical record the presence of Byzantine soldiers at times, the marked ~80-year absence of cereal pollen types from the 670s CE indicates a dramatic collapse of the regional economy and population, with only very limited evidence of human farming activity thereafter, from ~750–950 CE. The re-appearance of cereals, along with grasses associated with pastoral farming then coincides with the recolonization of the region by imperial forces and the provincial elite in the course of the second half of the tenth century but at the same time shows that the cultivation of vines was not revived in this

19 Johan Bakker et al., "Climate, People, Fire and Vegetation: New Insights into Vegetation Dynamics in the Eastern Mediterranean since the 1st Century AD," *Climate of the Past* 9 (2013), www.clim-past.net/9/57/2013/doi:10.5194/cp-9-57-2013.

20 England et al., "Historical Landscape Change," 1238.

21 See, for example, Micahel Kaplan, "Les grands propriétaires de Cappadoce (VIe-XIe siècles)," in *Le Aree Omogenee Della Civiltà Rupestre Nell'ambito Dell'impero Bizantino: La Cappadocia, Atti Del Quinto Convegno Internazionale Di Studio Sulla Civiltà Rupestre Medioevale Nel Mezzogiorno d'Italia (Lecce-Nardò, 12–16 Ottobre 1979)*, ed. Cosimo Damiano Fonseca (Galatina: Univ. Lecce-Dip. scienze st. soc. Testi, 1981), 152–58.

22 England et al., "Historical Landscape Change;" Çetin Şenkul et al., "Late Holocene Environmental Changes in the Vicinity of Kültepe (Kayseri), Central Anatolia, Turkey," *Quaternary International* 486 (2018), https://doi.org/10.1016/j.quaint.2017.12.044; Asa Eger, *The Islamic-Byzantine Frontier: Interaction and Exchange among Muslim and Christian Communities* (New York: IB Tauris, 2015).

area. Subsequent shifts suggest first the impact on this agrarian economy of the arrival of the Selcuks, but secondly its recovery as the situation stabilized in the later twelfth and thirteenth centuries.[23] Importantly, other Anatolian data for the later eleventh–twelfth centuries show a significant contrast between central and eastern Anatolian records and those in the west, where the pollen record shows much stronger signs of landscape disturbance—very likely related to the fact that the economic disruption caused by Turkish-Byzantine warfare lasted longest in western Anatolia, with the situation stabilizing only with the establishment of a new border zone in the 1140s CE.[24] The Lake Nar data supports this interpretation.

I have spent some time on this particular example simply because it exemplifies the enormous potential of collaboration between historians and palaeoscientists. Today, this is not news: indeed, the collaboration between archaeology, history and the palaeoenvironmental and other palaeosciences is increasingly part of day-to-day practice within the study of Byzantium and many other pre-modern societies. But it has had a particular importance for the student of Cappadocia, both in terms of showing how far Cappadocia was part of a greater whole, Anatolia, but also how different it was in respect to its own particular regional character and developmental trajectory, a lesson that applies to the history of the Byzantine world more widely—while it is important to be able to make generalizations, we cannot ignore the high levels of regional and subregional variation in micro-climates, environment, settlement patterns, societal structure, and responses to challenge that characterize the Roman state, and indeed other Mediterranean states and socio-economic systems. But it is in large part a result of our ability and willingness to combine and integrate all these different disciplines that this point has been brought home as forcibly as it has been over the last decade or so. One of the key results of some of this work is, of course, that we now have a reliable and well-dated chronological profile for Cappadocian climate from the fourth to the twentieth century, which enables historians and archaeologists to situate their own findings in a clear and unambiguous environmental context across almost two millennia, something that does not yet exist for much of the Byzantine world, although climate modelling is making an important contribution for the western and northwestern parts of Anatolia and the Balkans in this respect.[25]

There are many aspects I have not commented upon: advances in modeling the processes of construction of buildings, of mapping and planning archaeological and architectural sites, in the use of Geographical Information Systems (GIS) to help understand connections and associations both between settlements, as well as within them, and to understand and model roads and communications, to reconstruct the visual world of pre-modern people—how sites and settlements were connected by line of sight or other means, for example, through the study of viewsheds

23 For a historical interpretation: John Haldon, "'Cappadocia will be Given over to Ruin and Become a Desert'. Environmental Evidence for Historically-Attested Events in the 7th–10th Centuries," in *Mediterranea. Festschrift Johannes Koder,* eds. Klaus Belke, Ewald Kislinger, Andreas Külzer, and Maria A. Stassinopoulou (Vienna: Böhlau, 2007).

24 Detailed discussion with data: Adam Izdebski, "The Environmental Consequences of the Coming of the Turks," in *Winds of Change. Environment and Society in Anatolia*, eds. Christopher Roosevelt and John Haldon (Istanbul: ANAMED, Koç University Research Center for Anatolian Civilizations, 2021), 229–49; England et al., "Historical Landscape Change," 1240–43.

25 For example, Elena Xoplaki et al., "The Medieval Climate Anomaly and Byzantium: A Review of the Evidence on Climatic Fluctuations, Economic Performance and Change," *Quaternary Science Reviews* 136 (2016).

and the application of interpretative models such as least-cost path analyses.[26] New approaches to settlement survey analysis and demographics are also evolving, often requiring less technology than new ways of thinking about older material and data.[27] Similar points apply in the case of the hydrology of the region; indeed, the study of late Roman and Byzantine water management has seen some of the most exciting advances.[28] Yet Byzantine archaeology still lags in several respects behind the archaeology of western Europe and of the pre-Columbian Americas, for example.[29] Retrogressive Landscape Analysis (RLA) is a case in point, an approach that has proved to be a vital tool for helping understand the process through which a landscape evolved. RLA is at one level a relatively straightforward procedure, in essence a progressive stripping away of successive sets of features from a defined zone to reveal any underlying, and thus older, features such as tracks, field boundaries, terracing, and both minor and major earthworks, thus establishing a relative sequence or chronology. While applied at a general level, as in Rackham and Moody's analysis of the landscapes of the island of Crete, and adopted more recently for survey work carried out in Pisidia and in Turkish Thrace, it remains still relatively underexploited

26 See the contributions to Adam Izdebski and Michael Mulryan, eds., *Environment and Society in the Long Late Antiquity* (Leiden: Brill, 2019); the chapters in John Haldon, Hugh Elton, and James Newhard, eds., *Archaeology and Urban Settlement in Late Roman and Byzantine Anatolia. Euchaïta-Avakt-Beyözü and its Environment* (Cambridge: Cambridge University Press, 2018); as well as the case studies of sites and topics in Niewöhner, "Introduction;" also Jorden Pickett, "Beyond Churches: Visualizing Byzantine Economies in Action with Architectural Logistics," in *Beyond Icons: Theory and Methods in Byzantine Archaeology*, eds. William R. Caraher, Kostas Kourelis, and Darlene B. Hedstrom (London: Cambridge University Press, forthcoming); James Newhard, Hugh Elton, and John Haldon, "Assessing Continuity and Change in the Sixth to Ninth Century Landscape of North-Central Anatolia," in *Winds of Change: Environment and Society in Anatolia*, ANAMED Series, eds. Christopher H. Roosevelt and John Haldon (Istanbul: Koç University Press, 2021); Giacomo Titti, Jacopo Turchetto, and Giuseppe Salemi, "Genetic Algorithms Based Road Analysis in Cappadocia, Turkey," *Rendiconti online della Società Geologica Italiana* 46 (2018); Jacopo Turchetto and Giuseppe Salemi, "Hide and Seek. Roads, Lookouts and Directional Visibility Cones in Central Anatolia," *Open Archaeology* 3 (2017); Jacopo Turchetto and Giuseppe Salemi, "Slope and Distance Analysis in Southern Cappadocia (Turkey): Geomatic Approach for Archaeological Research," *Agri centuriati. An International Journal of Landscape Archaeology* 10 (2013).

27 E.g. for the Peloponnese: Maria Papadaki, "Church Construction as a Proxy for Economic Development: the Medieval Settlement Expansion Phase in the Peloponnese," *Journal of Greek Archaeology* 6 (2021): 358–90; for Anatolia: Newhard, Elton, and Haldon, "Assessing Continuity and Change;" William Anderson, "The Medieval Afterlife of Ancient Mounds," in *Context and Connection. Studies on the Archaeology of the Ancient Near East in Honour of Antonio Sagona*, eds. Attila Batmaz, Giorgi Bedianashvili, Aleksandra Michalewicz, and Abby Robinson (Leuven: Peeters, 2018), 359–79. ; and Tymon De Haas, "Beyond Dots on the Map: Intensive Survey Data and the Interpretation of Small Sites and Off-Site Distributions," in *Comparative Issues in the Archaeology of the Roman Rural Landscape*, eds. Peter A. J. Atterna and Günther Schörner, *Journal of Roman Archaeology* supplementary series 88 (Portsmouth, RI, 2012), 55–79; Robert E. Witcher, "Missing Persons? Models of Mediterranean Regional Survey and Ancient Populations," in *Settlement, Urbanization, and Population*, eds. Alan Bowman and Andrew Wilson (Oxford: Oxford University Press, 2011), 36–75.

28 See, e.g., James Crow, "The Imagined Water Supply of Byzantine Constantinople, New Approaches," in *Constantinople réelle et imaginaire : autour de l'oeuvre de Gilbert Dagron (Travaux et mémoires 22/1)*, eds. Cécile Morrisson and Jean-Pierre Sodini (Paris: Association des Amis du Centre d'Histoire et Civilisation de Byzance, 2018); James Riley Snyder, "Exploiting the Landscape: Quantifying the Material Resources used in the Construction of the Long-Distance Water Supply of Constantinople," in *A Most Pleasant Scene and an Inexhaustible Resource. Steps towards a Byzantine Environmental History*, eds. Henriette Baron and Falko Daim (Mainz: Romisch-Germanisches Zentralmuseum, 2017), both with further literature.

29 While the general remarks on the state of Byzantine archaeology in James Crow, "Archaeology," in *The Oxford Handbook of Byzantine Studies*, eds. Elizabeth Jeffreys, John Haldon, and Robin Cormack (Oxford: Oxford University Press, 2008), 47–58 now require revision, many of the points made there remain valid.

30 See Katie Green, "Rural Byzantine Landscapes of the Eastern Mediterranean: New Approaches to Characterization and Analysis," in *A Most Pleasant Scene and an Inexhaustible Resource. Steps towards a Byzantine Environmental History*, eds. Henriette Baron and Falko Daim (Mainz: Romisch-Germanisches Zentralmuseum, 2017); James Crow and Sam Turner, "Silivri and the Thracian Hinterland of Istanbul. An Historic Landscape," *Anatolian Studies* 59 (2009); Oliver Rackham and Jennifer Moody, *The Making of the Cretan Landscape* (Manchester: Manchester University Press, 1996).

in Byzantine archaeology more generally.[30] Similar considerations apply to assessments of persistence and change in landscape features through the application of mathematical modeling using field survey data for ceramic distributions and other built features of the landscape[31] or to the application of Historic Landscape Characterization, through which key aspects of a landscape, regardless of origin, can be identified and analyzed within a GIS in order to generate a model of the dominant landscape character across a particular area over time.[32]

All these techniques or approaches are now beginning to be deployed by archaeologists of the Byzantine world, and much has changed, often dramatically so, in the course of the last thirty or so years; indeed, the speed of change, when one stops to reflect for a moment, really is remarkable. Cappadocia, at least in the world of ancient and medieval history, has been at the heart of these developments and will no doubt continue to be so for the foreseeable future.

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31 E.g., as presented in Newhard, Elton, and Haldon, "Assessing Continuity and Change."

32 Sam Turner, and Graham Fairclough, "Common Culture: The Archaeology of Landscape Character in Europe," in *Envisioning Landscapes: Situations and Standpoints in Archaeology and Heritage*, eds. Dan Hicks, Graham Fairclough, and Laura McAtackney (New York: Routledge, 2007); Sam Turner, "Historic Landscape Characterization. A Landscape Archaeology for Research, Management and Planning," *Landscape Research* 31, no. 4 (2006); for application in Byzantine archaeological contexts, see Sam Turner and James Crow, "Unlocking Historic Landscapes in the Eastern Mediterranean. Two Pilot Studies using Historic Landscape Characterization," *Antiquity* 84 (2010); also James Crow, Sam Turner, and Athanasios Vionis, "Characterizing the Historic Landscape of Naxos," *Journal of Mediterranean Archaeology* 24, no. 1 (2011), for the island of Naxos.

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ÖZET

Kapadokya hem kendine özgü peyzajı ve coğrafyası hem de önemli bir "periferik" eyalet olması nedeniyle Bizans ve Anadolu tarihçilerinin uzun yıllar boyunca ilgi odağı olmuştur. 200'ü aşkın yerleşmeden bilinen "yeraltı şehirleri" ile Kapadokya'nın tarihçiler, arkeologlar ve son yıllarda kitle turizminin dikkatini çekmesi şaşırtıcı değildir. Bölgenin kültürel tarihi ve arkeolojisine yönelik araştırmalar, sanat ve mimarlık tarihi geleneklerinden, metinsel analiz, arkeolojik yüzey araştırmaları ve belirli kazılardan beslenen tecrübe ile sabit köklü yaklaşımlar üzerine inşa edilmiştir. 1940'lar ve 1950'ler itibarıyla bilimsel tarihleme yöntemlerinde meydana gelen gelişmeler, arkeolojik ve bilimsel araştırmaların ufkunu genişletmiştir. Bununla birlikte, son yirmi yılda hem yöntem hem de yaklaşımlarda yaşanan devrim, Kapadokya tarihinin bütünsel olarak anlaşılmasına büyük bir katkı sağlamıştır. Numismatik ya da mühürbilim gibi alanlardaki gelişmeleri veya Geç Roma ve Bizans sanatı ve mimarisi çalışan tarihçilerin kullandığı yöntem ve yaklaşımlardaki dönüşümleri yansıtan bu ilerlemeler, bölgenin peyzaj tarihi ve yerleşme profillerini anlamayı hedefleyen geniş kapsamlı arkeolojik saha araştırmalarına yönelik ilginin artmasıyla da ilişkilidir. Dahası, bölgenin geçmişteki çevresi, ekolojisi ve iklimine ilişkin veri toplama, işleme ve yorumlama teknolojilerine ek olarak tarihi ve arkeolojik araştırmalara uygulanabilecek farklı uzmanlıkların bir araya getirilmesi ve yeni çalışma yolları geliştirilmesinde çarpıcı bir ilerleme kaydedilmiştir. Geleneksel yöntem ve teknikleri, güncel yöntem ve tekniklerle harmanlayan bütünleşik bir yaklaşımın benimsenmesi, Kapadokya'yı—bilhassa Bizans tarihi özelinde—eski soruların yeni yaklaşımlarla ele alındığı bir laboratuvar haline getirmiştir. Bir giriş niteliğinde olan bu kısa araştırma, söz konusu gelişmeleri tanımlamayı ve müteakip çalışmalar için bir çerçeve oluşturmayı hedeflemektedir.

ANAHTAR KELİMELER

ortak çalışma, disiplinlerarasılık, yeni teknolojiler, proxy verileri, polen, Narlıgöl, paleoçevresel araştırma