

Universität Basel

> Departement Altertumswissenschaften

# The End of the Roman Climate **Optimum and the Disintegration** of the Roman Empire

International Conference, 29 Aug-1 Sep 2022 (Binn)

The Roman Egypt Laboratory: Climate Change, Societal Transformations, and the Transition to Late Antiquity Institute of Ancient History, University of Base



University of Basel Department of Ancient Civilizations Institute of Ancient History Petersgraben 51 4051 Basel Switzerland

www.ancientclimate.philhist.unibas.ch

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## – Day One: August 29, 2022 – Keynote Lectures

## John Haldon (Princeton)

## Collapse, Complexity and Collaboration. How the East was not (quite) lost

One of the biggest challenges historians face is in scaling up from local- and regional-scale studies to a broader level of generalization in order to render their work more useful as a basis for comparison and/or to make it more accessible to a wider readership. The main difficulty is to retain the texture and granularity of the detailed cases out of which any general analysis must be constructed while at the same time locating elements in common across a number of different societal and political systems that can be identified as having similar causal impacts. There are many different approaches, but one that we have found particularly useful has been to look at states and the societies that support them and over which they rule as complex adaptive systems. Complex adaptive systems approaches first evolved in the fields of ecology and engineering and are well-established in the natural sciences, but have only recently begun to be applied to human societies. One reason for this has undoubtedly been that they tend to focus on empirically verifiable feedback mechanisms and, when all determining elements are built into a model, predictable outcomes under given sets of circumstances. The human agent, neither as an individual nor in a group, can be treated in the same way, even if some aspects of human societal responses can be forecast or assumed when we understand the determining features within which they operated. In spite of these methodological drawbacks, however, it is possible to apply adaptive systems approaches to state formations and societies on a large scale, so long as we remember to build into that larger scale the infinite variety of societal responses to different situations to which the historical and archaeological records point. To illustrate the possibilities I will look at the case of the east Roman state in the period from the 6th to the 10th c., with a comparative glance at the Roman empire in the west in the 5th century, among some other examples.

These cases are useful because they permit us to think about what constitutes societal or political resilience or fragility and how some systems fail while others survive. A complex adaptive systems approach offers a perspective that helps us locate the key systemic elements that contribute such resilience or adaptability or not and in particular to pinpoint the presence or absence of key factors making for resilience or its absence. It also, and perhaps most importantly, helps us to identify aspects and elements of our subjects about which we do not know enough and to which further research can be devoted.

## Paul Erdkamp (Brussels)

#### Climate, Population and Society in the Roman World from a Comparative Perspective

Paleoclimate studies show that climate change is a constant factor throughout the last millennia, but it is only for the second millennium CE that we have relatively good quantifiable data to study the causal link between societal processes and changes in climate. In terms of societal complexity, long-distance connectivity and land-use, the Roman world was not substantially different from early-modern Europe. In terms of population density and demographic trends, there were significant differences within the Roman world, as there were within early-modern Europe.

Lessons can be learned from the interaction in early-modern Europe between changes in population, climate and economic performance. Population density is in itself an important factor in economic development. Countries like Spain and Finland, whose population density was very low at the start of the early-modern period, responded differently to demographic trends or long-term changes in temperature and precipitation than countries like Italy, the Low Countries or Portugal, whose population density and intensity of landuse was much higher. Some countries show intensification of land-use, others expansion of land-use. Equally important are the social and economic factors that determined each society's scope for adapting strategies.

Trends in population levels and urbanization differed within the Roman world. In the West, population and urbanization generally declined from the late second century CE onwards, but in northern Africa both population and urbanization reached a peak in the 4th century, while in many parts of the East, population continued to grow and cities continued to prosper until the 5th/6th century CE. What factors determined these different trajectories, and what role did these factors play in changes in economic performance? How do these differences in trend and chronology interact with climate change and the ability of local societies to respond to changing environmental conditions? The comparison with the interplay of economic, demographic and climatological factors in early-modern Europe may help to answer questions regarding the disintegration of the Roman world.

- Day Two: August 30, 2022 -

## Panel 1: Climate Proxies for the RCO

Chair: Sabine Huebner (Basel)

## Lee Mordechai (Jerusalem)

## Reflecting on Late Antique Climate Change. Seeking Causal Links, Evaluating Impacts, and Contextualizing Discourse

This contribution examines several aspects of late antique climate change in attempt to stimulate reflection on its past, current and future research. It begins with an investigation of the causal chains that scholars have used to understand climate change during late antiquity. The contribution surveys the different independent variables (e.g. temperature) and their supporting evidence (e.g. paleoclimate proxies) previous scholars have suggested for the climatic change before pointing to some of the perceived results of this process and the evidence supporting it. Closer attention is given to the middle part of the causal chain - the intervening variables that explain how the climatic change affected late antique societies. Although these variables feature less prominently in discourse, they play a major role in determining whether the connection between climate and societal change is causal or merely correlational. For this reason, the contribution critically examines the robustness of both these intervening variables and the evidence supporting them.

To offer a broader perspective, the contribution also contextualizes the scholarly discussions about premodern climate within the late 20th and early 21st century reality in which they proliferated. There is a vague sense that scholarly interest in the interactions between premodern societies and their environments is related to our contemporary increased attention to climate and environment. The contribution tests this hypothesis by examining the development of the discourse on late antique climate change, focusing among others on the networks, scholars and venues in which the discourse developed, and how these roots continue to frame our understandings of late antique climate change.

Markus Stoffel (Geneva) and Christophe Corona (Clermont-Ferrand)

## Potential and Limitations of Subfossil and Archaeological Wood Remains to Understand Temperature of Precipitation Changes in the Roman Period

Tree rings are often considered the backbone of climate reconstructions as they are one of the only natural proxies with annual (or even seasonal) resolution. They have therefore been used repeatedly to reconstruct temperatures, precipitation – and thereby also droughts – or modes of natural climate variability over the last millennia. European temperature reconstructions typically rely on trees from high-elevation or high-latitude sites where growth is limited by summer temperatures. Likewise, drought reconstructions were built from growth-ring records of precipitation-sensitive trees. Yet, both types of reconstructions may not necessarily reflect climate variability across the continent.

For the last centuries, proxy reconstructions – relying primarily on multicentennial living trees – are reliable and well replicated. Yet, they often become much less replicated – both in space and time – as one goes back to the first millennium of the Common Era. In addition, for the latter period, tree-ring chronologies usually include subfossil wood or archeological finds of unknown origin and limited length, which has hitherto limited the robustness of the climate reconstructions. In this paper, we will (1) discuss the above limitations, (2) show possible avenues on how to fill critical temporal gaps – especially during the Roman Optimum and the BCE/CE transition – and (3) outline ways on how to develop more robust climate reconstructions for key regions of the Roman Empire for which such data has hitherto been missing.

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## Joe McConell (Reno, NV)

## Indicators of Climate Drivers and Roman Economic Activity in Arctic Ice. 200 BCE to 600 CE

Mediterranean societies during antiquity were vulnerable to long and short-term climate variability, plagues, wars, and other drivers of social unrest. Understanding and quantifying these vulnerabilities is challenging, however, given the often thin ancient sources and across such a distance of time. Accurately dated chemical records archived in Arctic ice provide a means to evaluate potential linkages between climate drivers and economic activity.

Here we used synchronized annual records of fallout from volcanism and industrial pollution in an array of Arctic ice cores to explore linkages between climate variability and economic activity in the Mediterranean region from 200 BCE to 600 CE. Explosive volcanism is the primary driver of short-term climate variability and non-sea-salt sulfur, low-boiling-point heavy metals, and other chemical species preserved in polar ice reflect past changes in volcanism. In addition, prior to the widespread burning of fossil fuels starting in the late 18th century, atmospheric emissions of non-background lead and possibly other metals were closely linked to new silver production so fallout preserved in ice provides proxies of past changes in economic activity. Because the ice core sites were located far from potential anthropogenic sources during antiquity, we used detailed atmospheric transport and deposition modelling to understand the effects of long-range aerosol transport and so underpin interpretation of the proxy records.

## Michael Sigl (Bern)

## New Insights on the Sources, Magnitudes and Climate Effects of Volcanic Eruptions During the Antiquity from Polar Ice Cores and Climate Model Simulations

Volcanic eruptions are considered the major climate forcing on interannual-todecadal timescales. Here we use geochemical techniques for analyzing a total of 10 ice cores from Greenland and Antarctica to determine between 800 BCE and 700 CE the dates and climate-impact potential of ancient volcanic activity sometimes down to the year or even season. We discuss how volcanic activity and resulting changes in the opacity of the atmosphere have changed remarkably throughout the course of human history, with the "Roman Quiet Period" c. 40 BCE-160 CE and the "Late Antique Little Ice Age" c. 536-690 CE forming endmembers within the wide range between quiet and intense volcanic activity. We use climate proxy evidence and climate model simulations to discuss how volcanic eruptions have influenced temperatures and precipitation in Europe, Northern Africa and the Near East and the streamflow of the Nile and Euphrates rivers. Specifically, we review the latest evidence of the sources, magnitudes and stratospheric sulphur injection of some key eruptions (e.g., Okmok II in 43 BCE or an unidentified eruption in 536 CE) closely coinciding with Nile River flood failures or with major pandemics that afflicated the Roman Empire (i.e. Antonine Plague c. 165-180 CE, Plague of Justinian c. 541-750 CE). and this could explain the apparent concentration of indicators of high-energy marine events on the southern peninsular coast during the late Roman Empire.

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## Panel 2: The Roman West

Chair: Brandon McDonald (Basel)

Dominik Fleitmann (Basel)

## The End of the Roman Climate Optimum Recorded in Stalagmites from Central and South-East europe and the Middle East

The timing and nature of the termination of the Roman Climate Optimum (RCO) is still not fully resolved and the timing, duration and magnitude of this transition remains elusive. The current uncertainties and limitations are also related to the fact that tree ring records are seasonally biased towards summer and strongly influenced by interannual variability. Many lacustrine and marine sediments covering this period suffer from considerable dating uncertainties and low temporal resolution. Precisely-dated Stalagmites from caves in Europe and the Middle East can provide additional and more detailed information on decadal to multi-year fluctuations in temperature and rainfall across the RCO. Based on our ongoing research in central Europe (Switzerland), southeast Europe (Serbia and Montenegro) and Middle East (Turkey, Iraq and Oman) we will provide new highly-resolved records of rainfall and temperature which cover this prominent transition.

Annalisa Marzano (University of Reading & Università di Bologna)

## Climate Change or Societal Factors? A View from Late-Imperial Roman Italy

The third century AD was a period of great political and economic instability in the Roman Empire. In Italy, starting with the second half of the second century AD, archaeologists have registered signs of 'decline' and 'crisis' at both rural and urban sites. Some scholars have taken this evidence as an indication that Italian agriculture, particularly viticulture, was in crisis; others have identified the cause in the demographic consequences of the Antonine Plague and in the 3rd-century political instability. Climate change has recently entered the picture and scholars have been asking, for instance, whether the growth, in late antiquity, of marshlands in certain areas was due to the end of the Roman Climate Optimum, followed by colder average temperatures and inconstant precipitation.

This paper will assess whether the decline in rural (and urban) settlements that can be observed in parts of Italy from the third century onwards was a result of post-Antonine plague demographic collapse, climate change, or the outcome of socio-political processes. The paper will focus on central and northern Italy and will draw on archaeological and archaeobotanical data. It will stress the high degree of regional differentiation and complexity that can be reconstructed for Roman imperial Italy. While it is not easy to identify the cause of the empirical phenomena that one can infer from the archaeological record, the data from the case studies that will be presented suggest that social and economic explanations reflecting different regional realities are in most cases the most plausible explanation of the phenomena discernible in the archaeological record.

## Krešimir Vuković (Munich)

## The Floods of the Tiber in the Imperial Period and the Roman Climate Optimum

The city of Rome was famously built on seven hills but also on the floodplain of the river Tiber. The river periodically covered large parts of the city from Campus Martius to the Tiber Island, sometimes reaching as far as the Forum Romanum (Aldrete 2007). According to our literary sources, episodes of excessive Tiber flooding occurred in all the periods of the Empire but most of our literary evidence records floods that took place between 30 BCE to 130 CE. Before drawing major conclusions one must account for the fact that most of our surviving historical sources date back to this period (while the later half of the second and the third century CE are scarcely attested). It has been argued that deforestation in the Tiber valley (needed to provide materials for construction projects in Rome) substantially contributed to Tiber flooding in the first and second century AD and archaeological evidence supports that conclusion (Hughes and Thirgood 1982). Dendrochronological data from the Arno river indicates episodes of severe flooding in 150, 375, 500-700 CE (Luterbacher 2012, 110-11). While proxy data for the Tiber valley is still lacking, Duncan Keenan Jones) forthcoming analysis of speleothems in central Italy promises to provide some data on precipitation in the Tiber valley. Using this limited available repertoire of archaeologica, literary, and scientific evidence, I argue that we should be very cautious in drawing conclusions as to the relationship between Tiber flooding and the so-called (Roman Climate Optimum). A range of factors contributed to Tiber flooding in the imperial period and one of the most important was deforestation in the Tiber valley, a phenomenon that can be compared to the early Modern period (for which much more data is available) when deforestation continued to cause frequent flash floods in the city of Rome, especially in the 15th and 17th century (Diodato et al. 2021).

## Juan Manuel Martín Casado (Málaga)

## Possible Relationship Between High-Energy Marine Events and Climate Change in Hispania During Late Antiquity

In latest years, there has been a continued increase in interest in the role played by natural processes in historical periods. A field characterised by the confluence of phenomena that have a major impact both in the short term (earthquakes and tsunamis) and in the long term (climate change), but which are also capable of projecting their long-term consequences in areas such as the resistance of political structures or collective mentalities. This panorama shows the suitability of grouping reflections on this type of phenomena, and to do so from the «multi-scale» temporal perspective defined by Fernand Braudel in his idea of longue durée (Braudel 1958).

The history of the Roman Empire has been one of the most interesting fields in which to situate this type of reflections (Martín Casado e.p.), where they have contributed to revitalising the old historiographical debate on the causes of the crisis and disappearance of its pars occidentalis (McCormick et al. 2012; Harper and McCormick 2018). The elaboration of solid explanatory models, integrating all other factors, economic, social, political, etc., and their mutual interrelation, has been one of the main claims made to these investigations (Haldon et al. 2018; Sessa 2019). I propose to address a related aspect, the feedback between natural factors. Marine flooding linked to high-energy events and climate change have been investigated in Late Roman Hispania, but so far they have not been related to each other. Recent studies suggest, however, a possible relationship between the two at the present time (Oliveira Tavares et al. 2021). Therefore, I intend to offer a first approximation to the possibility that both factors were related, and this could explain the apparent concentration of indicators of high-energy marine events on the southern peninsular coast during the late Roman Empire.

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## - Day Three: August 31, 2022 -

Panel 3: Roman Egypt

Chair: Matthias Stern (Munich)

Sabine Huebner (Basel)

## The Unruly River. Historical and Paleoclimatic Nile Flood Proxies and the End of the Roman Climate Optimum in Egypt

Egypt is a unique historical laboratory for studying human resilience, social vulnerability, and responses to abrupt and sustained climate change. The Nile, one of the largest rivers on Earth, is Egypt's lifeline - the fate of Egypt and Egyptians has always been closely linked to its annual summer floods. As in the past, the Nile's waters make life possible in the desert by providing irrigation and fertile soil along its banks. Any change in its annual flood had strong and very direct effects on livestock and crops along the river and delta, and indirect effects on food, livelihoods, migration, and conflict in a country where rainfall is virtually nonexistent south of the delta region.

This paper will look at historical and paleoclimatic proxies to reconstruct the summer floods of the Nile for the Holocene and especially for the Roman period. It will gather evidence that supports a decline in Nile floods and a general trend toward drying in the region, coinciding with the end of the Roman Climatic Optimum elsewhere in the Roman Empire. The preserved documentation will also allow us to understand what climate change and water stress meant on the ground for local populations and what adaptive strategies they employed to deal with the decline of the Nile's annual summer floods and their increasingly unpredictable nature.

## Gabriele Cifani (Rome)

## Environmental History of Central Italy in the 'Roman Climate Optimum' (200 BCE to 150 CE)

The modern debate on the influence of geographical data and particularly of climate on history can be traced back to the 18th century in the works of Montesquieu. The recent new wave of scientific investigation in this field can be framed as a result of contemporary interest in climate change effects with the development of new research methodologies, and with a further rise of positivism in historical research. However, linking climate change directly to societal changes is problematic, because socioeconomic factors also play a large role, with climate being secondary or sometimes inconsequential. To address the recent historiographic concept of Roman Climate Optimum (200 BCE - 150 AD), this paper adopts a Braudelian approach to medium-long term history and will compare the data from systematic archaeological surveys of ancient rural landscapes in Central Italy between the early Republic and the late Empire (6th century BC - 5th century AD) with the evidence from literary sources and natural climate archives. The palynological data includes the evidence of lacustrine sediments from many lakes in Central Italy (Lago di Vico, Maccarese, Lago Lungo) and data from the most southern glacier in Europe (Ghiacciaio del Calderone). Furthermore, this paper will critically discuss the results of recent international fieldwork carried out in the Reate basin (2012-2014) to reconstruct climate changes across 2700 years, thanks to a close interdisciplinary collaboration between archaeologists and palaeobotanists.

This project has combined paleolimnological, historical, and archaeological methods to provide a secure basis for the interpretation of past impacts of climate on society. Pollen, non-pollen palynomorph, geochemical, paleomagnetic and sedimentary data from a high-resolution 2700 year lake sediment core from central Italy have been compared with local historical documents and archaeological surveys to reconstruct a record of environmental change in relation to socioeconomic history and climatic fluctuations.

## François Blondel (Geneva)

## Mummy Labels from Roman Egypt. Dendrochronological Potential for a Climatic Reading

Mummy labels are relics that are found in large quantities in Egypt, often in a very good state of preservation (like most wood preserved in arid environments). As a result, they are widespread in Roman Egyptian collections in many museums. Sometimes made of stone, green glazed or bone, but most often made of wood, mummy labels reflect funerary practices that were both Egyptian and Roman in influence. As such, they represent an important archaeological, epigraphic, and also dendrochronological source.

Most often known through their inscriptions (notably thanks to the international project: «Death on the Nile»), mummy labels offer many other possibilities, still little developed, notably for their dendrochronological potential. Beyond the varied choice of species used to make the mummy labels, it's possible to chronologically frame the wooden support thanks to dendrochronology and to highlight a practice of reuse that was very common in Egypt. Only certain species offer this potential, mainly imported wood and in particular softwoods, because of their legible and therefore exploitable rings. The cross-referencing of anatomical and dendrochronological data for the labels makes it possible to broaden the reflections on the provenance of the selected species, but above all offers the possibility of having a dendroclimatic reading on a large territory that concerns at least the eastern part of the Mediterranean basin.

This ongoing work aims to contribute to the interaction between climatic changes, environmental stress and societal transformations in the Roman Empire, particularly during the 3rd century AD, a pivotal period for the Empire. Even if the first results do not yet provide a complete answer to the problem, it's important to present the full potential of this type of study in a multidisciplinary approach.

## Brandon McDonald (Basel)

## Instability in the Western Desert of Egypt. Transitions in Climate, Environment and Settlement in the Roman Period

The oases of the Western Desert of Egypt were crucial agricultural, economic and administrative districts from Pharaonic times to the Roman period. The oases of Bahariya, Farafra, Dakhla and Kharga (the latter two making up the "Great Oasis") were (and still are in most areas) highly fertile areas situated in one of the harshest climatic regions of the world, receiving, on average, only 5mm of rain annually. What makes these areas so fertile are extensions of the Nubian Sandstone Aquifer System (NSAS) – the world's largest known fossil water aquifer which spans 2 million km2 beneath south-eastern Libya, north-western Sudan, north-eastern Chad, and nearly all of Egypt. From the Pharaohs to the Romans, the oases were exploited agriculturally, and irrigation techniques evolved over time, as those who controlled the region sought to tap into the great pool of water lying beneath their feet. While ganats – a type of underground aqueduct designed to draw from such aquifers – were employed in late Pharaonic and Ptolemaic times, Rome ramped up qanat-digging in the oases early on in its control of Egypt, and the Empire reaped the benefits, seeing economic and urban growth that seems incongruous with the terrain in which it blossomed.

Growth and prosperity did not sustain, however, as many urban centres and villages of the oases experienced degradation, both environmentally and economically, in the Middle and Late Roman periods. The archaeology is not entirely clear, and further excavation is needed; however, the evidence broadly indicates that many sites shifted cultivation and settlement patterns in attempt to combat seeming agrarian stagnation, while others were totally abandoned in the face of both cultivation problems and wind-erosion that, in some cases, abraded and buried entire settlements in short time. These transitions were caused by either climatic forcing that led to environmental change, or Rome's overexploitation of Nubian Aquifer extensions – a common environmental response in the oases to anthropogenic subterranean pressure. The question is, which is more responsible, or, from the available evidence, is it impossible to tell?

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## **Panel 4: The Roman East** Chair: Markus Stoffel (Geneva)

Petra Vaiglova (Gold Coast)

## Building an Animal Stable Isotope Proxy for Inferring the End of the Roman Climate Optimum in Egypt

This talk will present an analytical framework for investigating climatic fluctuations across the Roman Climate Optimum in Egypt through an assessment of changes in the local vegetation cover recorded in faunal tooth enamel. The methodology will integrate assessment of seasonal dietary and mobility patterns elucidated through stable carbon and nitrogen isotope analysis of sequential tooth enamel samples obtained along the axis of tooth growth, and recording the dietary and water intake of animals during the first 1–2 years of their lives. The usefulness of this framework will be discussed with regards to site location and topography, likelihood that animals at a given location would provide natural–rather than anthropogeically influenced–proxies of precipitation and vegetation changes, as well the applicability of inferring inter– and intra–annual variability in climate signals from samples representing distinct chronological sequences. The discussion will outline deliverables that this framework can achieve through careful integration of zooarchaeological and stable isotope datasets.

Charlotte Pearson (Tucson)

## Tree-Ring Tales from the Theodocian Harbour, Istanbul

In 2004 the Marmaray construction project to improve underground rail networks in modern day Istanbul was begun. Within a few weeks of digging, excavators from the Istanbul Archaeological Museum hit upon the extraordinary remains of an ancient harbor at Yenikapı. As excavations continued, stratigraphies revealed a sequence at the site ranging from the Neolithic to the present day, with a massive concentration of artifacts interspersed with shipwrecks and over 4000 wooden posts from docks dating to the first millennium CE. The Theodosian Harbour, first mentioned in the Notitia urbis Constantinopolitanae (a list of the city's most significant structures dating to c. 425 CE), was the largest of Constantinople's four main commercial harbors between the 4th and early 7th centuries CE, and a massive center for trade with Egypt, Africa, and the wider Mediterranean and Black Sea regions. Tree-ring evidence from the site ranges back to before the time of Constantine and cross-dates with contemporary wood samples from other sites across the city and beyond. These data offer new insights into the expansion of the harbor and open possibilities to further explore and refine chronologies of human and environmental interactions in the early-mid first millennium CE.

## Paolo Cimadomo (Haifa)

## A View from the East. The Impact of Climate Change on the Life of the Roman Near East

The pressure exerted by human activity has inevitably transformed the landscape. Conversely, we could wonder if the climate and environment have had any impact on human demography and on human lifestyles, in particular for people who lived in adverse environments, such as arid and semi-arid areas. The interactions and interdependence between nomads and agriculturalists in the Near East are an important topic of world history, but our knowledge of the phenomenon is very much hindered by a dearth of information on nomads, especially their early history, as they left few literary sources and often very shallow archaeological remains for historians to explore. Sedentary societies sometimes provide information about them. Furthermore, archaeology can provide us several hints of this interaction thanks to the support of studies about ancient environment. This paper aims to analyse the archaeological, climatic, and geographical aspects of the area between Southern Syria and Northern Jordan during the third and fifth centuries CE. In fact, this period is characterised by a drier climatic phase. This period may have caused troubles between nomads and sedentary people, as both sought to retain control of the steppes on the fringes of the desert.

The principal goal is to find proofs of the relationships between (semi-)nomads and sedentary peoples and to analyse their nature. Were they conflictual or peaceful? This paper will try to give an answer through the analysis of the palaeoenvironmental context, of the human impact on the area, and of Roman political choices.

## Paolo Maranzana (Istanbul)

## Roman Cities in Times of Change. Environment and Urbanism in Western-Central Anatolia

This paper aims to explore the impact of climate change on the development of Roman cities in Galatia, a province located in western-central Turkey (roughly bordered by the modern cities of Eskişehir, Ankara, Konya, and Isparta). This landlocked region, situated on average at ca. 1000 m asl and characterized by low precipitation, represents a marginal land for agriculture, where changes in availability of water may have significant impact on agricultural productivity. Additionally, the geomorphology of the area, high plateaus bordered by mountain ranges, made heavy reliance on long distance-trade unfeasible, and, thus, exposed Galatia even more significantly to climatic fluctuations. Recent archaeological research based on three main Galatian cities (Amorium, Ankara, and Pessinus), however, revealed that urban centers developed irrespective of climatic factors; cities expanded in three waves; during late 1st c. BCE (during so-called Roman Climate Optimum), in the early 3rd c. CE (at a time of relative climatic fluctuation), and in the course of 6th c. CE, when the Justinianic Plague and the Little Late Antique Ice Age should have lowered population numbers and crippled agricultural productivity. These waves of urban development in the region seems, on the other hand, to be a direct response to intervention from the central authority, such as the creation of the Province of Galatia by Augustus, the Severan visits in the early 3rd c. CE, and the administrative and military reforms occurred from the 3rd c. CE onward. The ultimate "end" of these cities also occurred as a result of the new administrative system put in place after the Arab invasions (later 7th c. CE), rather than environmental change.

## Haggai Olshanetsky (Basel) and Lev Cosijns (Oxford)

## Understanding Trends and Climate in Late Antiquity. The Use of Settlement Patterns in Syria-Palestina as a Case Study

In the last few decades, there is growing interest in the effects of climate on ancient societies, such as the end of the Roman Climate Optimum in the 2nd to 3rd centuries AD, and the LALIA in the 6th century AD. Often, specific archaeological finds are used as evidence to claim and support hypotheses on the large-scale effects of climate change in antiquity. However, a single or a select few sites is not sufficient evidence for such claims. The best method to analyse both the effects of climate and its impact on society, is by first examining geographical units for both climatic data and settlement fluctuations. The current presentation will offer such an examination and will use Israel and the West Bank as a case study. This is because this area is heavily surveyed and excavated, with a wealth of climatic data from speleothems, lake cores and isotopic analyses of fauna. The key information on settlement patterns will be constructed from the numerous surveys conducted in the area from the last 50 years, consisting of more than 70% of the surface area, which amounts to more than 20,000 square kilometres. We will also present and show the ambiguous climatic data which is often interpreted in contradicting ways. Through this combination of data, we can show that there is no correlation between the two in Late Antiquity, and the changes in settlement patterns can be explained through the historically well-documented geopolitical changes in the area.

## Timothy Newfield (Washington, DC)

## What's a Plague Without a Diagnosis? The Impulse to Diagnosis and the Influence of Diagnoses in Histories of Ancient Disease and Climate

Most ancient plagues have been diagnosed. Many have been diagnosed multiple times. The impulse to diagnosis is, to put it lightly, hard to resist. Armchair historians (physicians namely) and historians interested in the Athenian plague have superimposed diseases of their own era onto fifth-century-BCE Greece since at least the sixteenth century. But what purposes do these diagnoses serve our histories of ancient disease outbreaks? What do we do now with the diagnoses already advanced? How secure is any diagnosis? And on what grounds do we establish whether an old diagnosis is 'good' or 'bad'? This paper does not again diagnosis an ancient plague. Rather, it reconsiders diagnoses advanced for the Antonine and Cyprianic plagues and the roles those diagnoses have played in histories of those outbreaks. The paper argues that it is essential for ancient historians to reflect on the practice of diagnosing and how diagnoses have informed histories of ancient plagues. Diagnoses can influence the way we read the sources and construct disease outbreaks. They can carry authority far beyond the fields of archaeology and history, and they very much shape attempts to tie ancient plagues to climate.