

## Water and Power in Past Societies

Speaker	Paper Title	Abstract
<p><b>Leigh-Ann Bedal</b></p> <p>Penn State Erie, The Behrend College</p>	<p>From Urban Oasis to Desert Hinterland: The Decline of Petra's Water System. The Case of the Petra Garden and Pool Complex</p>	<p>During the height of the Nabataean kingdom (mid-1st century BCE through 1st Century CE), its capital city, Petra, reflected its increasing wealth and status with all of the trappings of power and prestige-monumental religious and secular architecture, an imposing entrance, orchestrated views, luxury gardens, and water display-exhibited in political and ceremonial centers in the Hellenistic-Roman World. The Petra Garden and Pool Complex, a luxury garden with a monumental pool located in the city center, exemplifies the use of the conspicuous consumption of water as a symbol of success and abundance.</p> <p>The Nabataeans exploited perennial springs beyond the city limits as their primary dependable water source, supplemented by catchment of water runoff, to serve the practical needs of Petra's population and to supply installations of water display. Their skills as hydraulic engineers are well testified by the remnants of aqueducts, rock-cut channels, pipelines, cisterns, pools, and nymphaea visible at the site today.</p> <p>As Petra's economy began to wane in Late Antiquity, transforming from capital city to hinterland, maintenance of its elaborate hydraulic system ceased. While the springs continued to flow, channels, cisterns and pools filled with sand and debris. Remnant semi-nomadic populations and periodic settlers constructed small-scale localized systems and reused old elements of the Nabataean water system but the potential of its spring resources was never again fully exploited. This paper reviews the decline of Petra's hydraulic infrastructure with special attention to evidence from the Petra Garden and Pool Complex, which served as an agricultural plot from Late Antiquity through the modern era.</p>
<p><b>Matt Edgeworth</b></p> <p>University of Leicester</p>	<p>Making Visible the People Who Are Part of River History</p>	<p>This paper examines rivers as confluences of human and non-human forces. Through archaeological analysis on different scales, the status of the river as 'natural' is challenged, to be reconfigured as a hybrid entity which is part-geomorphological, part-biological, part-cultural, part-political. There are human as well as non-human streamlines merged together in river currents. Rethinking rivers in this way involves not only re-mapping them in space, but also reconfiguring them in time as historical entities, bringing to light socio-political riverine elements that are missing from so many cartographic representations.</p> <p>Here the River Great Ouse in England is examined on two different scales: first, on the scale of the river as a whole, then zooming in to look at a particular locality on the river. In both cases the aim is to make hitherto invisible human strands of past river development visible to our analytical gaze. The local case-study concerns evidence for a riverside weaving and dyeing settlement on the downstream side of a town in the late medieval/early post-medieval period. Partly due to its liminal status and association with polluting activities, its former</p>

		existence goes unrecorded and unmarked on any map. Making visible the part played by such river communities in the past has ramifications for how rivers are perceived and mapped today.
<p><b>Jennifer L. Gaynor</b></p> <p>University at Buffalo, State University of New York</p>	Maritime power and sea people's networks in Southeast Asia's 17th century spice wars	Maritime-oriented populations in archipelagic Southeast Asia have generally been considered peripheral to the politics, trade and kin networks of the region's major polities. However, during the 17th century, sea people played a vital role in trade and war, both at the very heart of the important port-polity of Makassar, as well as through their non-urban networks. Heretofore virtually invisible, in fact sea people were essential to Makassar's nautical efforts to oppose the Dutch East India Company (VOC) and its allies during two major wars over control of the spice trade. When the tide turned in the region's political-economy, sea people were on its leading edge. Through their intergroup connections, their skills and maritime networks, a nautical hub called Tiworo, and its fortifications, sea people—neither newcomers nor foreigners—proved vital to the archipelago's 17th century political developments.
<p><b>Emily Hammer</b></p> <p>The University of Chicago</p>	Water Management by Transhumant Pastoralists in Southeastern Turkey	<p>Ancient water management is typically studied through the surviving material manifestations of irrigation schemes and run-off systems. However, these and other ways of artificially transporting and collecting water are only half the story of long-term sustainable water management in the Middle East. The other component to water sustainability in the past was population mobility, in particular by transhumant pastoral groups. On the large scale, mobile pastoralism is about bringing animals to the best available/accessible water and pastures rather than bringing water and fodder to animals. Animals served to transform moisture stored in the soil and in wild vegetation into products (milk and meat) that fulfilled human water and caloric needs. I discuss pastoralism as a water management strategy that involves a different conception of landscape, space, and resources than dry farming or irrigation agriculture.</p> <p>Although transhumant pastoralists may follow precipitation patterns, they also sometimes construct water-harvesting features in their pasture and camping areas to increase the amount of water available. Archaeological survey work in southeastern Turkey provides an example of sustainable local water manipulation schemes by pastoral nomads of the last 600-700 years. Transhumant groups in this region have altered marginal areas to improve water availability and pasture quality for themselves and their animals. Water collection and soil enhancement structures can be best understood as landscape anchors: geographic foci that structured the spatial organization of local landscapes. Although small-scale and locally managed, the water and pasture improvement features examined by the archaeological survey in Turkey have had enduring impacts on local land-use that are demonstrable through archaeological and environmental analysis.</p>
<p><b>Ömür Harmanşah</b></p> <p>University of Illinois at</p>	Geologies of Belonging: Place Politics and the Political Ecology of Water in Central Anatolia	Spanish director Icíar Bollain's 2010 movie También la lluvia (Even the Rain), set right in heat of the Bolivian water wars of Cochabamba (1999-2000), collapses two episodes of political ecology for indigenous communities in the context of the making of a movie: the early years of colonization in Latin America and the social movement

Chicago		<p>that erupted in Cochabamba for water rights. The multi-temporality of the conflict between political power and the local communities over water and other resources is novel and insightful. Political ecology is a growing field of engaged research, allowing academics to link with local communities around the world in their struggles for natural resources, land, biodiversity and cultural heritage. Archaeological field projects have much to offer to this burgeoning field, not only because of the very contexts of neoliberal development they operate in, but also for its insights into the deep history of contestations of land and water. During the last centuries of the Late Bronze Age (roughly 1400-1200 BCE) on the Anatolian peninsula, Hittite kings and other competing rulers transformed prominent springs into dynastic monuments with rock-carved inscriptions and pictorial imagery as well as by building monumental pools with ashlar masonry. Yalbur Yaylası Mountain Spring Monument in west-central Turkey (near Ilgın in Konya Province) is a prominent example as a sacred pool embellished with a long Hieroglyphic Luwian inscription, commemorating the Hittite Great King Tudhaliya IV's military campaigns to southwestern Anatolia. Since 2010, Yalbur Yaylası Archaeological Landscape Research Project has been investigating the broader landscape in the lowlands, river and lake basins and karst highlands around the monument. Preliminary results of this regional survey has shown that this frontier region bordering the Hittite Lower Land witnessed a comprehensive program of agricultural rehabilitation, water management, and new settlement which coincided with the construction of Yalbur Yaylası sacred pool as well as an impressive earthen dam at Köylütolu Yayla, east of the Ilgın Plain. The survey team's geomorphological work also documented the contemporary manipulation of water in the region during the 20<sup>th</sup> century especially through the projects of the government's waterworks department. This paper will compare ancient (Late Bronze Age) and modern politics of water ecologies in the survey region, from the perspective of place-making, changing patterns of land use, and the ritual significance of springs.</p>
<p><b>Michael J. Harrower</b>  Johns Hopkins University</p>	<p>Spatial Archaeology, Hydrology and the Historical Dynamics of Water in Ancient Southern Arabia (Yemen and Oman)</p>	<p>Environmental and political circumstances and variability are central to understanding water and power in past societies. This presentation compares the spatial patterning of water in Southwest Arabia (Yemen) and Southeast Arabia (Oman) and considers how environmental conditions interconnected over millennia with major societal transformations, including agricultural origins and state formation. The flashflood (<i>sayl</i>) irrigation systems that supported pre-Islamic kingdoms of ancient Yemen differ widely from the oasis (<i>falaj</i>) irrigation systems that sustained early complex polities in Oman. These technologies and their various social, logistical and ideological involvements offer a range of insights on ancient water use worldwide.</p>
<p><b>Eva Kaptijn</b>  Royal Belgian Institute of Natural</p>	<p>Exploring the dialectic relationship between irrigation and social stratification: A longue durée perspective from the Jordan Valley</p>	<p>Water is of vital importance for survival. Not only a lack or excess of water, but also the form and the timing of water availability determine the success of water management and subsistence. The way in which people in arid regions have secured their water supply is not only determined by aspects like the topography, environment and level of technology, but can also affect the structure of the society that created</p>

Sciences		<p>it as well as that of future societies. A gravity based canal irrigation system, for example, fosters inequality of upstream areas at the expense of downstream areas, but this does not necessarily occur in every society.</p> <p>In the Zerqa Triangle, a region located in the eastern Jordan Valley midway between Lake Tiberias and the Dead Sea, a canal irrigation system has been documented that can be traced back for over four millennia. This system was not in use permanently, but was reinstated several times. While the physical character of the irrigation system remained relatively unchanged, it functioned under very different socio-economic systems and power relations in the different periods. This provides the rare opportunity to compare the role and impact of the same system under different social circumstances.</p> <p>In this presentation the relationship between irrigation and social stratification will be explored using the Zerqa Triangle as a <i>longue durée</i> case study. Additionally, attention will be given to the way people have attempted to overcome the high seasonal and annual variability in water availability and how their solutions affected the robustness of the subsistence economies.</p>
<b>Necmi Karul</b> Istanbul University	The Effects of Changes in Rivers and Coastlines on Prehistoric Settlements in Anatolia	<p>With a mainland surrounded by seas and quite rich in rivers, Anatolia constitutes the richest water geography of the Near East. High mountain masses, and especially the Taurus Mountains in the South and Black Sea Mountains in the North of Anatolia, feed many large rivers with a high flow rate, flowing with an irregular regime. Settlements representing all stages of prehistory, from the oldest farming villages of the Near East to developed rural populations, exist in the valleys of these large streams, such as the Fırat and Dicle rivers in the East and Küçük Menderes and Büyük Menderes rivers in the West. Admittedly, although the settlements in question always benefited from the water resources, these valleys were not the best or only option for settlement. And there is even much archaeological evidence showing that these rivers lead to devastating floods that inspired legends of deluge.</p> <p>In addition to this dynamic nature of the rivers, the oscillations and tectonic movements of world sea levels are also among the determinant factors in the geomorphologic structure of Anatolia. This complex structure also led to radical movements in the coastline of the peninsula, which is surrounded by the sea on three sides. And both the salt and fresh waterside settlements, with the potential importance of maritime resources, came not to benefit from these resources effectively due to environmental factors. The access of settlements of the Neolithic period in Northwest and west Anatolia to these resources especially had to change as a result of the advancements of the river deltas.</p>
<b>Justin Leidwanger</b> Stanford University	The Power of Coastal Access: Assessing Maritime Economic Opportunity in the Roman Mediterranean	<p>Though clustered along its sinuous shores like “ants or frogs around a pond” (Plato, <i>Phaedo</i> 109b), the inhabitants of the ancient Mediterranean harnessed the power and potential of the sea to widely varying degrees. For the Roman era, considerable emphasis has been placed on the expansive port networks and large-scale directed</p>

		<p>exchange that linked cities across the tamed waters of the Mediterranean, yet the extent and practical impact of direct maritime access and opportunity beyond urban centers remains a critical question for a population that was still overwhelmingly rural. How might the agricultural communities that formed a productive backbone of the Roman Empire have engaged with the sea? To what extent were their economic impact and social connections mediated through large city centers and harbor networks? What role did smaller, secondary and opportunistic ports play in structuring maritime interaction and socioeconomic life in their hinterlands? Were different communities in different localities tied into different seaborne networks? In what ways, if any, did coastal access change the structure of rural economic life and exchange?</p> <p>Drawing on Cyprus as a case study, this paper incorporates a GIS-based analysis of maritime and terrestrial topography as a means of exploring the spatial patterning of settlements and ports, providing a clearer picture of how dense maritime facilities and ease of mobility on and around the island created a low threshold for seaborne connectivity. The maritime networks that developed formed dense but distinctly regional scales in which most communities engaged directly with one small portion of a larger world and its multiple regions. These scales of activity reflect the diverse needs of different communities, the complex movements of goods and people, and the varied agents involved. The surge in utilization of simple coastal facilities during the Roman and especially the late Roman period opened new maritime opportunities, counterbalanced the earlier economic centrality of the island's coastal cities, and in doing so fundamentally restructured the rhythm of rural exchange and socioeconomic life.</p>
<p><b>Kim Van Loefferinge</b> Stanford University</p>	<p>Water and workshops: Inequality among mining sites in ancient Laurion (Greece)</p>	<p>The archaeological remains of the Athenian silver industry in the Laurion area offer a unique opportunity to study power relations among mining sites. The silver mines were exploited intermittently from the Final Neolithic until modern times, with a peak in the Classical period. This last phase in particular left dramatic traces in the landscape: industrial features, such as mine shafts, spoil heaps and ore processing workshops, were scattered throughout the Laurion.</p> <p>Ore processing workshops played a crucial role in the silver industry. Nearing their point of exhaustion, the Laurion mines yielded only low-grade silver ores in the fourth century BCE. Miners addressed this issue by purifying poor minerals in washeries, but this operation confronted them with an environmental constraint: washeries are water-consuming installations in an area that is virtually waterless. This triggered the development of well-organized water management, dependent on rainwater harvesting in large cisterns. The distribution of workshops in the Laurion valleys suggests that the competition for appropriate water catchments was fierce, causing both regional and local inequalities between the sites.</p> <p>This paper explores how and why differential access to water sources in the Laurion contributed to such inequalities by performing</p>

		hydrological analyses on water availability and the water use of workshops. In order to reach a general understanding of both regional and local interactions, the focus will be on the inland Soureza and Agrileza valleys on the one hand, and the coastal area of Thorikos on the other.
<b>Brenda Longfellow</b> University of Iowa	From Elite Villas to Public Spaces: The First Monumental Fountains in Ancient Rome	<p>For the Romans, an individual's ability to harness and control nature was an essential expression of manly virtue and authority, and elite authors like Pliny the Elder placed a high value on enhancing nature through human learning and technology. Powerful men expressed their prowess at bending nature to their will not only in public works projects like aqueducts but also in how they incorporated hydraulic elements into their townhomes and villas. In the second and first centuries BCE, wealthy Romans built opulent country homes in the suburbs around Rome and along the coast south of Rome that showcased ever more spectacular water features ranging from evocative canals to artificial waterfalls in manmade caves.</p> <p>Even though the technology and urban water supply was available for contemporary public water displays in the second century BCE, it was not until the last generation of the Republic that grandiose water features began to be incorporated into public spaces. In almost every instance, these elements were intrinsically linked to larger spaces associated with an individual elite patron, from the theater complex of Pompey to the forum of Julius Caesar. This paper examines the elite origins of the first civic monumental fountains in ancient Rome and the social, political, and cultural expectations that accompanied the dramatic conversion of artistic water displays associated with villa culture into spectacles experienced by the entire Roman populace. In Roman society, where land ownership and political power went hand in hand, an individual's grandiose display of water in a public arena could augment his authority while simultaneously reaffirming or challenging the existing social hierarchy.</p>
<b>Sturt Manning</b> Cornell University	Drought and history in the Mediterranean: known knowns and known unknowns	<p>This paper will review what we currently know about the history of precipitation (rainfall) in the Mediterranean looking at the sources of information particularly from the sciences for proxy reconstructions of past climate - and comparing to the historical/archaeological record. The bias will be towards the east Mediterranean. The paper will consider what we know with reasonable certainty and precision, and over what period, and what, based on this, we might reasonably surmise given available constraints for earlier periods where there is more partial (or little) information. The focus will be on whether we can identify either especially favourable periods, or especially unfavourable ones, where we might speculate about (mega-droughts of the sort identified from palaeoclimate work for North America and for southeast Asia. If such events seem to occur, then with what likely periodicity, and of what actual significance? In particular, the question of macro-region versus regional impact will be explored - noting the variability in impact of climate forcing episodes in different parts of the Mediterranean, east to west and north to south. How might apparent differences play into historical trends and contingencies? The Little Ice Age period offers us some potential analogies that might inform prehistoric period syntheses and interpretations (for example</p>

		about the end of the Late Bronze Age), and give some indications of the issues and thus what is both known and what is unknown when climate is proposed as a significant element in historical reconstructions.
<b>Christopher Morehart</b> Arizona State University	Chinampas y Chinamperos: The Political Ecology of Raised Field Farming and Water Management in the Basin of Mexico	Reconstructing the institutional dynamics of ancient land and water systems in complex societies is a challenging endeavor but has significant implications for contemporary socio-ecological issues. The historical and archaeological study of chinampas offers researchers an unusual opportunity to understand the organizational milieu of intensive agriculture and water management in the context of state political economies. A form of raised field farming found in the lacustrine environment of the Basin of Mexico, chinampas have supported local populations as well as financed political economies for over 1000 years. This paper examines the institutional dynamics that shaped the organization and history of chinampas by comparing two different systems and their association with ancient states: first, the chinampas in the southern Basin of Mexico that were expanded and intensified after the formation of the Aztec empire (ca. 1431-1521 C.E.) and, second, the chinampa system that surrounded the pre-Aztec kingdom of Xaltocan in the northern Basin of Mexico (ca. 1000-1400 C.E.). Aztec chinamperos' cultivation of land in a freshwater lake permitted a high degree of autonomy in management, though their relationship to the Aztec empire was mediated through several social, political, and economic institutions. Chinamperos in Xaltocan, by contrast, cultivated a brackish lake environment, dependent on canalized freshwater from springs, which increased the degree of interdependence between farmers and the need for collective institutions to administer water. The differences between these cases highlight how organizational variation in socio-ecological systems affects long-term sustainability.
<b>Christopher Prescott</b> University of Oslo	The Sea and Bronze Age transformations in western Scandinavia	In Scandinavian archaeology, the sea is important in terms of chronology, geography, environment, events and conceptualization of history and anthropology. Since the earliest settlements, the sea has provided food, materials and transportation. With the transformation of Scandinavian societies in the mid-third millennium, the role of the sea and waterways is vital, and also develops and is transformed. The spread of new social, economic and cultural institutions were dependent on sea travel, regional networks were reliant on communication across open stretches of the sea, control of maritime nodal points is a source of power, and maritime realization is a driving societal force. The importance of the sea is manifested in symbols of power and identity, like the emplacement of monuments, the furnishing of elite graves or in rock art. The role of the sea and waterways is central to the increasingly sophisticated theoretical and empirical understandings of the complex societies of the Nordic Late Neolithic and Bronze Age (2400-300 BCE). The present paper explores some of these aspects to outline a comprehensive understanding of the Late Neolithic and Early Bronze Age in western Scandinavia.
<b>Vernon Scarborough</b>	Water Uncertainty: A Primal Organizing	Early complex societies developed in many environmental settings globally. Two cultural zones with diametrically different ecologies

University of Cincinnati	Principle in both the Wet and the Dry	were the semitropical Maya of the Yucatan Peninsula and the semiarid Puebloans of Arizona and New Mexico. The abundance of life's diversity made possible by the high seasonal rainfall in the Maya Lowlands can be juxtaposed with the more constrained levels of life forms identifiable in the US Southwest. This presentation will contrast two focused areas in these respective regions—the site area of Tikal, Guatemala as opposed to Chaco Canyon, New Mexico—to illustrate why water and climate matter, and to what degree we can use the past to inform our expectation about the future.
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