Materials, Materiality, and Knowledge:
Science, Innovation, and Labour in Antiquity

within the framework of the
Locally Crafted Empires Semper Ardens Advance Project

17-18 September 2026

Organized by Nathanael Andrade (Binghamton University), Rubina Raja (Aarhus University), William T. Wootton (King's College London)

The Royal Danish Academy of Sciences and Letters, Copenhagen



CARLSBERG FOUNDATION

AARHUS UNIVERSITY



Rock carved reliefs of two individuals, Cilicia, Anatolia (Dosseman, CC BY-SA 4.0, via Wikimedia Commons)

Front cover
Kline sarcophagus from Ashkelon, Israel (Bukvoed, CC BY 4.0, via Wikimedia Commons).

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Outline

The recently initiated Semper Ardens Advanced Grant project entitled Locally Crafted Empires (LoCiS) headed by Rubina Raja situates its point of departure in the region of the ancient world that provides undoubtedly the richest material for this purpose: the portrait cultures of Western Asia (defined here as the region from Anatolia to Egypt and the Arabian Peninsula, and from the river Tigris to the Mediterranean Sea) and will survey and chart those portrait cultures across six hundred years, from 100 BCE to 500 CE. Within the project research is undertaken on a range of aspects relating to locally produced representations of individuals in all materials (stone, mosaics, paintings, wood).
The project's third international conference will focus on materials, materiality and knowledge in the East and will do so to discuss how science, innovation and knowledge transfer changed over time and what implication changes and continuities had on local production practices.

How did working people in the eastern Roman empire find wage labour?
What did they need to know to control its value?
When did coercive labour find them?
What might archaeological evidence add to our knowledge about such questions where ancient historical sources are often vague or silent?

Recent years have witnessed leaps in our knowledge of ancient technologies, scientific knowledge, botanical techniques, and industrial practices. So have our knowledge of various forms of labour organization, including the itinerant, the unfree, or the conscripted. Within their matrices we can locate in generality the choices and the options of labourers.

But what can we say about these people specifically?
What can we say about their relationship with technology, environment, and the structuring of elite, local, regional and state organization?
What can we say about the communities they formed, the structures of peer support and knowledge that they crafted, or the resources at their disposal?
What can we say about the impact of gender, family structure, life paths, and occupational practice on all of these?

With the questions posed above in mind, this conference hosted within the framework of the Locally Crafted Empires Semper Ardens Advanced Grant Project aims to assemble scholars of classical archaeology, ancient history, epigraphy and philology with expertise in labour, technology, science, and environment in the late Hellenistic East, the eastern Roman empire, and adjacent regions and to bring their expertise to bear on the choices and options of labourers and workers. To this end, we invite inquiries into the impact of technologies on labour and its organization, the relationship between labour and environment, and workers' responses to coercion or predatory behavior. We also seek a range of approaches, methods, and evidence that span from the textual, material, and visual to the botanical, zoological, and genetic. Above all, we also hope to define and foreground the experiences and work of people from various walks of life and answer questions about the relationship between materials, materiality and knowledge and how that relationship was negotiated and lived by people.

Programme: Thursday 17 September

9:00–9:30 *Welcome and Introduction*
Nathanael Andrade (Binghamton University), Rubina Raja (Aarhus University) & William T. Wootton (King's College London)

Session 1: In front and behind the scenes: Labour, innovation and production practices
Chair: William T. Wootton

9:30–10:20 *His Master's Tools: Changing Modes of Making and the Avoidance of Risk*
Caspar Meyer (Bard Graduate Centre)

10:20–11:10 *Theorizing Tools: From Symbols of Profession to Mediators of Making in the Roman World*
Elizabeth A. Murphy (Florida State University)

11:10–12:00 *Representations of Labour and Crafting Processes: Lived Knowledge in Visual Representations*
Rubina Raja (Aarhus University)

12:00–13:00 Lunch for speakers (3rd floor)

Session 2.I: Sculpting the world
Chair: Nathanael Andrade

13:00–13:50 *Funerary Busts from Cilicia: Materials, Knowledge, and Local Production*
Giulia Vannucci (Aarhus University)

13:50–14:40 *Kline Sarcophagi in Roman Southern Levant: Materials, Forms, and the Making of Local Funerary Sculpture*
Giovanni Colzani (Aarhus University)

14:40–15:10 Coffee (1st floor)

Chair: Kenneth Lapatin

15:10–16:00 *Granite portraits of the Rulers at the End of the Hellenistic Period and the Beginning of the Empire*
François Queyrel (École Pratique des Hautes Études)

16:00-16:50 *Artists and their Materials: Portraiture from Roman Egypt*
Julia Steding (Aarhus University)

16:50–18:30 **Visit to exhibition at *Cisternerne*, Søndermarken, Frederiksberg**

20:30 **Speakers' Dinner** (Restaurant Cofoco, Abel Cathrines Gade 7)

Programme: Friday 18 September

Session 2.II: Sculpting the world
Chair: Rubina Raja

9:00–9:50 *Funerary Sculpture from Oxyrhynchus: Knowledge Exchange and Local Continuity in Carving Practices*
Ines Ferjan (Aarhus University)

9:50–10:40 *From the Quarry to the Finger: The Fashioning of Engraved Gemstones*
Kenneth Lapatin (J. Paul Getty Museum)

Session 3: Experimenting with the evidence

10:40–11:30 *In the Group? Learning from Human and Artificial Approaches to Roman Mosaics*
Francesca Bologna (University of Edinburgh) & William Wootton (King's College London)

11:30–12:30 Lunch for speakers (3rd floor)

Chair: Caspar Meyer

12:30–13:20 *Reconstructing Roman Minting Technologies: Experimental Approaches to Flan Production and Striking Bronze Coinage in the Eastern Empire*
Francesca Lam-March (King's College London)

Session 4: Economy, labour and workshops

13:20–14:10 *Energetics in Pottery Production of Ancient Greece: The Convergence of Materiality, Labor, and Chaîne Opératoire*
Eleni Hasaki (University of Arizona)

14:10–14:40 Coffee (1st floor)

Chair: Elizabeth Murphy

14:40–15:30 *Workshops and Customer Loyalty at Palmyra*
Olympia Bobou & Rubina Raja (Aarhus University)

15:30–16:20 *Life on Loan: Working People, Killer Saints, and Contracts*
Nathanael Andrade (Binghamton University)

16:20–16:45 *Closing discussion*
moderated by Nathanael Andrade, Rubina Raja & William T. Wootton

16:45–18:00 **Reception at the Royal Danish Academy of Sciences and Letters**



Mummy Tag of Psentsenpshay, son of Thoteu, 2nd/3rd century CE? MET, 10.130.1134

His Master's Tools: Changing Modes of Making and the Avoidance of Risk

Caspar Meyer
Bard Graduate Centre

This paper examines how the material and infrastructural conditions of making shaped ancient knowledge practices by redistributing risk away from individual skill towards stabilized systems of production. Rather than treating craft as a sequence of expressive actions, I argue that many ancient technologies evolved toward production environments in which uncertainty was managed through moulds, dies, lathes, compasses, grids, modular templates and simple machinery such as rotational apparatus. These arrangements constrained variability, ensured repeatability and allowed accuracy to be achieved without exceptional manual dexterity. The paper contrasts two regimes of making. In one, production remains exposed to contingency due to its reliance on continuous judgment and embodied responsiveness. In the other, risk is displaced into infrastructural arrangements that stabilize outcomes by reorganizing expertise from gestural virtuosity into the design and operation of material systems. Such infrastructural ecologies enabled the incorporation of unskilled and coerced labor, including enslaved workers, and facilitated the scaling-up of production for large civic commissions as well as expanded markets of middling private patrons. In a slave-holding society, this relocation of risk also reconfigured relations between agency and authorship and allowed artistic autonomy to emerge alongside structurally unequal regimes of labor. Situating risk within broader cultural frameworks, the paper examines technical uncertainty through ancient philosophical accounts of chance and necessity and ritual practices that aimed to manage danger through cult and magic. It concludes by tracing how these changing ecologies of risk reshaped the material basis of art making itself, intensifying demands for raw materials and fuel, extending supply chains and linking artistic production to environmental extraction and degradation.

Theorizing Tools: From Symbols of Profession to Mediators of Making in the Roman World

Elizabeth A. Murphy
Florida State University

Tools in the Roman world appear as symbols of profession on street signs and on tombstones; within workplaces, hand tools exhibit inscribed names reflecting roles, responsibilities, and personal property within larger workgroups; in funerary contexts, the inclusion of professional toolkits as grave goods highlights enduring associations between the deceased and the material world of their work. In these regards, professional craft tools have been closely associated with social identity, economic development, and material culture traditions. Typological treatments of tools (as artifacts and objects) evaluate their forms and material properties according to economically oriented issues of functionality, specialization, and technological innovation. When studied as material culture, tools can be appreciated as part of the social life of Roman workers. However, tools are a particular type of artifact. They (in action) are mediators in the processes of making, and they interface between the embodied gestures of the craftsperson and the changing material properties and forms of products. The shapes and wear patterns of these tools are attestations of these material negotiations between learned traditions of craftspeople and product repertoire. In consideration of these varied theoretical perspectives, this paper examines Roman-period tools in order to socialize the material.

Representations of Labour and Crafting Processes: Lived Knowledge in Visual Representations

Rubina Raja
Aarhus University

The late Hellenistic and early Imperial periods in the Near East were periods in which numerous outstanding constructions were undertaken, including the palaces and fortresses of Herod the Great, large-scale sanctuaries across the region, and the general shaping of urban landscapes with colonnaded streets and other vast public buildings. Most of these monuments are gone today and so is most of any textual culture, which could have informed us about the construction processes, the cross-crafting procedures as well as the intellectual and practical considerations behind the development of crafts, cross-crafting and innovation. While the painted tomb from Beit Ras (Capitolias) in Jordan is today famous due to its well-preserved wall paintings, its paintings have not been investigated in the light of the practicalities involved in constructing a city. This presentation focusses on the paintings from the grave as on the one hand the fictive illustrations of the construction of the city that they are but situates the images within the broader actual physical landscapes of the region in which numerous cities were being constructed at the time the tomb was painted. In the presentation I ask whether we can and how we may learn about the lived knowledge of the contemporary societies from these paintings, when also drawing on the vast number of actual urban landscapes that were coming into being at the same time and what these might learn us about more general labour and (cross)-crafting processes?

Funerary Busts from Cilicia: Materials, Knowledge, and Local Production

Giulia Vannucci
Aarhus University

This paper examines local funerary busts from Cilicia as a case study to explore how materials, materiality, and knowledge were negotiated in artistic practice in the eastern Roman provinces. By comparing the distinct traditions of Cilicia Pedias and Cilicia Tracheia, it demonstrates how environmental conditions and access to resources shaped stylistic development, labour organisation, and technological choices. In Pedias, simplified and often impersonal busts point to serial production and standardised workshop practice, while in Tracheia more elaborate examples reflect different forms of technical knowledge, resource use, and workshop practice. These contrasts illuminate how local craftsmen worked with available resources, skills, and demand. Situated in a region characterised by strong cultural and economic interactions, Cilicia provides a valuable perspective on the interplay between materials, knowledge, and local production practices in the eastern Mediterranean.

Kline Sarcophagi in Roman Southern Levant: Materials, Forms, and the Making of Local Funerary Sculpture

Giovanni Colzani
Aarhus University

This paper examines a small but significant group of locally produced sarcophagi from the Roman southern Levant – particularly from Ashkelon, Nysa-Scythopolis, and Gadara – that combine kline-type lids, featuring a relief portrait of the deceased in a reclining pose, with an architectural, roof-shaped form crowned by acroteria.
Though limited in number, this corpus appears to be regionally specific and is notable for its replication across different materials, especially limestone and basalt. These monuments engage, on the one hand, with the import of marble kline sarcophagi into the region, produced in Attic and Asia Minor workshops and often circulating in a partially finished state; on the other, with the much richer production of funerary busts in limestone and basalt – attested by hundreds of examples and never depicting the full human figure – closely connected, in turn, to the local Büsten-typus sarcophagi.
Different categories of local funerary sculpture were most likely generated within overlapping workshop environments, where a variety of motifs and forms were combined in original ways, and adapted to regional needs, craft traditions, and available materials. From this perspective, the recurrence of the kline sarcophagus type across sites and media points to the transmission of knowledge and practices within a network linking the Levantine coast to the inland cities of the Decapolis, providing a focused case study for the interplay of resources, labour, and models in the Roman southern Levant.

Granite Portraits of the Rulers at the End of the Hellenistic Period and the Beginning of the Empire

François Queyrel
École Pratique des Hautes Études)

In Egypt, the Ptolemies were both Greek kings and Egyptian pharaohs. The Roman emperors followed in this tradition with their pharaonic images. Throughout the Hellenistic period, portraits in the Egyptian style were produced using traditional techniques and materials, and were given the functions of pharaonic statues; at the same time, works in the Hellenistic style were produced using imported marble for Greek purposes. The material and iconographic scheme thus distinguish the two iconographies at first glance.
Granite is frequently used for the full-relief portraits of pillar statues, which follow the pharaonic tradition. Its origin in Aswan makes it a quintessentially Egyptian material, occupying a privileged place among local materials such as diorite, basalt and grauwacke. The characteristics of granite indeed allow for the carving of colossal effigies, examples of which will be presented in the talk.
A study of this documentation raises questions about the intercultural phenomena it reflects. The granite pillar statues of rulers also display distinctive features, particularly in the hairstyles, which set some of them apart from the traditional pharaonic model: are these differences confined to works intended for display in Alexandria, within a Hellenistic context?

Artists and their Materials: Portraiture from Roman Egypt

Julia Steding
Aarhus University

Roman Egypt presents a remarkable diversity in portrait production, with funerary and public portraiture co-existing in different materials and made using different techniques, such as stone carving, painted wooden panels, and plaster work. While the portraits themselves remain and are well studied—mainly through questions about the deceased's identity—the artists who created them and the organizational structures surrounding their production remain understudied. This extends to questions regarding the materiality of the portraits, how certain images were adapted to locally available materials, and the involvement of local craftspeople in this process.

This paper examines the archaeological evidence for artist identities and workshop organization in Roman Egypt. Documentary sources from papyri provide fragmented glimpses into the artistic community, for example with references to apprenticeship systems and professional specialization. However, these textual records alone offer an incomplete picture of how artistic labor was structured and transmitted, not only from a master to a student level in terms of knowledge transfer and labor experience. They also fail to provide a complete view from an iconographic viewpoint, spanning from an imperial to a regional level. By integrating archaeological evidence with literary sources, this study seeks to reconstruct the social and economic organization of portrait production and the interaction of artists with the material and imagery that was asked of them.

Funerary Sculpture from Oxyrhynchus: Knowledge Exchange and Local Continuity in Carving Practices

Ines Ferjan
Aarhus University

The city of Oxyrhynchus in Middle Egypt has received both scholarly attention in archaeological discourse and prominence in Roman world studies owing to its abundance of papyri sources. Nevertheless, the city also produced funerary sculptures of remarkably high craftsmanship, which have been somewhat neglected.

This paper turns to Oxyrhynchus as a centre of funerary sculptural production. It presents a corpus of limestone funerary sculptures, which are today dispersed across numerous museum collections worldwide and have not yet been fully catalogued; they present a compelling body of evidence for intercultural knowledge exchange and the transmission of craft traditions in Roman-period Egypt. These monuments, broadly categorised as stelai, relief panels, and so-called special forms, represent Roman citizens, who are frequently depicted wearing Greek-style clothing and bearing attributes of diverse cultural origins. The study analyses sculptures comparatively, first against regional funerary traditions of limestone carving within Egypt, and subsequently in relation to trans-provincial comparanda across the broader Roman world. Particular attention is given to how carving knowledge and workshops practices were transmitted, and to the role of cultural background in shaping the representations of the deceased. Where does local carving meet pan-imperial tradition? This paper argues that the sculptors of Oxyrhynchus were not passive recipients of external influences, but active participants in a dynamic process of cross-cultural knowledge transfer, adapting their practices to communicate the identity and status of the city's inhabitants.

From the Quarry to the Finger: The Fashioning of Engraved Gemstones

Kenneth Lapatin
J. Paul Getty Museum

Although today largely a subject of specialist research, ancient engraved gems were highly valued in antiquity for particular characteristics of their materials, perceived and real, as well as the craftsmanship involved in their fashioning. While much modern scholarship has focused on stylistic taxonomies or "magical powers", this paper attempts to reconstruct the chaîne opératoire, from the quarry to the finger, as it were, paying special attention to the often unacknowledged labour of individuals beyond the carvers themselves, including those involved in prospecting, mining, and enhancing the colours of stones, goldsmiths and others who mounted them, and caravan drivers, shopkeepers, and other "middlemen" who transported and marketed them to the hands of their ultimate possessors.

In the Group? Learning from Human and Artificial Approaches to Roman Mosaics

Francesca Bologna
University of Edinburgh
William Wootton
King's College London

Many art forms have been the subject of connoisseurship. This traditional form of study uses visual analysis to classify artefacts based on similar patterns, layouts and styles. Identified groupings have been attributed to individuals (termed 'artists') or groups (often called 'schools' or 'workshops'). Their interpretation has sometimes been enhanced by location and date or been used to complete such data where it is missing. In the case of Roman mosaics, finds from Britain have been collected, illustrated and grouped since the 1960s by scholars such as David Smith, David Neal, and Stephen Cosh. There continues to be much debate, however, over the nature of these groups, the reasons for the similarities and their meaning, especially in social and economic terms.

This paper explores these issues by comparing the mosaic groupings identified by scholars with those produced by supervised and unsupervised ML. The ongoing project uses computer vision techniques to investigate the only complete country-wide corpus, *The Roman Mosaics of Britain*. The results offer an important opportunity to reassess biases within previous scholarly analysis (e.g. geographical proximity) while also exploring the underlying reasons for why things might resemble each other. The results focus on questions around craft practice, from making processes to the organisation of labour and the mobility of makers. We also consider knowledge transfer amongst craftspeople and the integral role of the commissioner. The paper reflects on the impact of new technologies and the degree to which they add to the (human) scholarly perspective. We also examine the extent to which this approach can be applied elsewhere, especially in the eastern Mediterranean, where connoisseurial approaches have not been rigorously applied and the evidence is found in disparate publications.

Reconstructing Roman Minting Technologies: Experimental Approaches to Flan Production and Striking Bronze Coinage in the Eastern Empire

Francesca Lam-March
King's College London

This paper addresses a significant gap in the study of coin production in the eastern provinces of the Roman Empire. Little is known about the organization of mint labour, or the precise locations and spatial arrangements of minting workshops across the eastern provinces. Despite an abundance of coins, we have little evidence of coin manufacture in the eastern empire. This paper seeks to address the following questions: 1. What were the practical processes of Roman flan production? 2. Was there a technical relationship between flan production and coin striking? 3. What do these processes imply about the organisation of labour and workshop environments.

To address these gaps this paper takes an experimental approach to evidence from three case studies of flan molds from Cyprus, Isreal and Egypt. The reconstruction of these materials will highlight the practicalities and realities of this stage of the minting process. As well as this it will provide a dataset for coin striking both hot and cold. This will establish the relationship between flan production and coin striking and whether it is possible or necessary for this to occur in proximity when producing bronze coinage.

Reconstructions though this experimental approach offer new perspectives on labour organization, workshop layout, and the logistical demands of sustained coin output. Ultimately, this approach contributes to a more concrete understanding of minting as an industrial process in the eastern Roman Empire and offers a framework for reassessing archaeological evidence for the location of mints and the people who worked within them.

Energetics in Pottery Production of Ancient Greece: The Convergence of Materiality, Labor, and Chaîne Opératoire

Eleni Hasaki
University of Arizona

In this paper I will employ energetics, the method of converting the labor expanded on production to person hours, to reframe the organization of pottery production. The study integrates aspects of chaîne opératoire, materiality, and labor to more accurately estimate how potters and painters in Ancient Greece allocated their tame when producing basic forms while also emphasizing the increasing difficulty of different surface treatments and decoration. Drinking cups and lekythoi from the Archaic and Classical times serve as case studies, as they represent varied complexity in form and decoration.

The materiality and structural integrity of the vessel form largely determines the quality of its decoration. A batch-production model for shaping and painting allows for a more nuanced application of energetics, as the timetable for a single vase only approximates that of batch production and highlights the business model for workshop organization. In this new entrepreneurial-focused context, all products of pottery workshops, from the mundane ones to the masterpieces, are best understood as a convergence of skilled expertise and savvy business management. By scaling up production timetables for each vessel type, we can address the broader topic of overall production capacity more concretely and situate the niche sector of figured ceramics within the wider ceramic industry of Ancient Greece.

Workshops and Customer Loyalty at Palmyra

Olympia Bobou
Aarhus University
Rubina Raja
Aarhus University

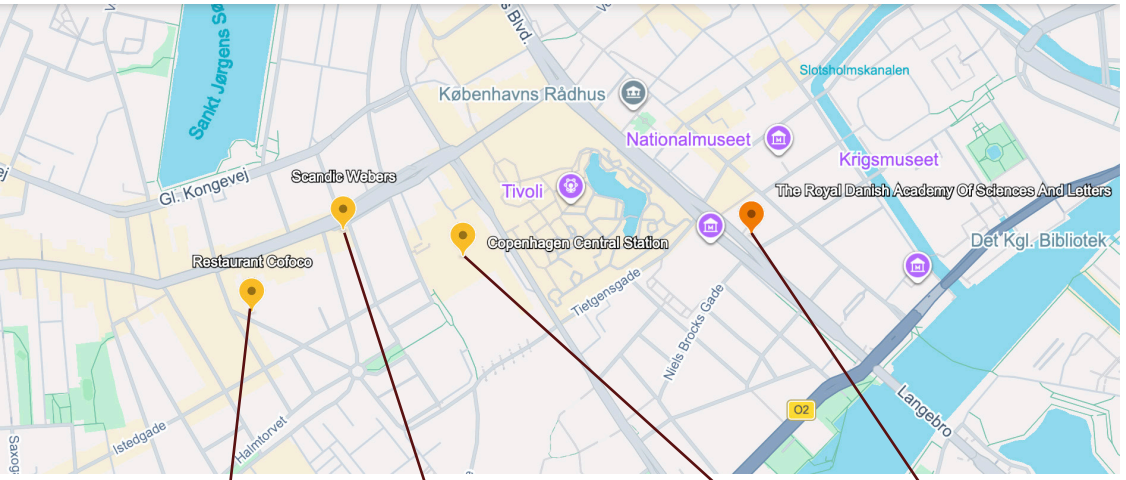
Of the ca. 450 funerary monuments known from Palmyra, the best preserved in terms of objects and as sources for studying the funerary culture of the city are not the impressive tower tombs of the elites but the underground chambers built by those who belonged in the lower social strata of society, including freedmen.
These tombs have revealed, among other matters of use, tomb construction, and spatial arrangement, important information on the process of the sculptural production of Palmyra. Building on the seminal work by Julia Steding on the relation between carvers and customers, it is possible to add more nuance to the phenomenon of individual families commissioning works from specific workshops for their tombs, thanks to the re-examination of the sculpted material from all the tombs of the city.
In this paper, we add to the knowledge about the relationship between commissioners and workers, and the longevity of such relationships, through the study of specific hypogea.

Life on Loan: Working People, Killer Saints, and Contracts

Nathanael Andrade
Binghamton University

According to the sixth-century hagiographer John of Ephesus, a popular saint living in the hinterland of Amida was obsessed with loan contracts. He continually demanded them from creditors or lenders. His miracles killed those who did not comply.
In the ancient world, working people and the poor often relied on loans and fronted wages. It is perhaps not surprising that Christian hagiographies would credit saints with championing them. But intriguingly, the theme is particular to saints lives written in Syriac in north Syria and upper Mesopotamia during the late 5th and 6th centuries, including the Syriac Life of Symeon the Stylite and a letter preserved in one of its key codices. What explains this pattern? Why do these texts exhibit concern not only with practices of credit and collection, but also with control over legal documents as objects? What do they tell us about how working people understood the social lives and agency of loan contracts and those who possessed them? This presentation explores such questions.

Venues



Restaurant Cofoco
Abel Cathrines Gade 7
1654 Copenhagen

Scandic Webers
Vesterbrogade 11B
1620 Copenhagen

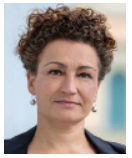
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Conference Webpage

https://projects.au.dk/locally-crafted-empires/events/show/artikel/materials-materiality-and-knowledge-science-innovation-and-labour-in-antiquity



Marble relief of a chisel and mallet, 2nd century CE. MET, 23.160.81

Book of abstracts Materials, Materiality, and Knowledge: Science, Innovation, and Labour in Antiquity

Organizers: Nathanael Andrade (Binghamton University), Rubina Raja (Aarhus University) & William T. Wootton (King's College London)