Architectures of Fire

Processes, Space and Agency in Pyrotechnologies

edited by

Dragoş Gheorghiu

Cover: A furnace in Vădastra village. (Artwork: Mihaela Moţăianu)

This book is available direct from Archaeopress or from our website www.archaeopress.com

Contents

Contributors

Silje Evjenth Bentsen
School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa
SFF Centre for Early Sapiens Behaviour (SapienCE), University of Bergen, Post Box 7805, 5020, Bergen, Norway

Cecilia Conati Barbaro
Dipartimento di Scienze dell'Antichità, Sapienza Università di Roma, Italy

Giacomo Eramo
Dipartimento di Scienze della Terra e Geoambientali, Università degli Studi di Bari 'Aldo Moro', Italy

Vanessa Forte
McDonald Institute for Archaeological Research, University of Cambridge, UK

Dragoş Gheorghiu
Doctoral School, National University of Arts, Bucharest, Romania
Instituto Terra e Memória, Centro de Estudos Superiores de Mação
Centro de Geociências da Universidade de Coimbra, Portugal

Małgorzata Kot
Institute of Archaeology, University of Warsaw, Poland

Chiara La Marca
Dipartimento di Scienze dell'Antichità, Sapienza Università di Roma, Italy

Italo M. Muntoni
Soprintendenza Archeologia, Belle Arti e Paesaggio per le Province di Barletta - Andria - Trani e Foggia, Italy

Alberto Rossi
Università di Macerata, Italy

Jessica L. Slater
Department of Archaeology, University of Sheffield, UK
American Association of the Advancement of Science, Washington, DC, USA

Agostino Sotgia
agostino.sotgia@gmail.com

Michał Wojenka
Institute of Archaeology, Jagiellonian University in Kraków, Poland

Sarah Wurz
School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa
SFF Centre for Early Sapiens Behaviour (SapienCE), University of Bergen, Post Box 7805, 5020, Bergen, Norway

Introduction

Dragoş Gheorghiu

This book regroups papers from the session with the same title co-organized by Dragoş Gheorghiu and Derek Pitman at the 2015 Annual Meeting of the European Association of Archaeologists, as well as two new contributions.

In the last few decades fire archaeology has become an increasingly frequent topic of study, examining the indexical presence of fire (at macro or micro levels), as well as of pyro-instruments. But the study of fire is not only focused on the material analysis, but also on the human agency in relation to the phenomenon.

The French School of Anthropology was the first to deal with the body-technology relationship (Mauss 1936; Leroy Gourhan 1943-1945; Leroy Gourhan 1964-1965), and applied structuralism to analyse the technological stages, called *chaînes opératoires* (Cresswell 1976; Lemonnier 1983; Lemonnier 2002; Schlanger 1994). Since pyro-technological studies still neglect the human presence, namely ergonomics and the embodiment of the technology and the corporeality, the purpose of this book is to guide future research toward such a viewpoint.

Entanglement

The book attempts to present the entanglement of the physical phenomenon of fire, the pyro-technological instruments, i. e., its material supports, and the human being. It is a relationship which continues the one proposed by Ian Hodder (2012) between humans and things. In this perspective, the physical process of combustion, the material culture, as well as the development of human action in space, will be addressed together. Such an approach to materiality and performance is specific to the analysis of the architectural space.

The centrality of fire

Fire is located at the centre of any pre-modern architecture. It creates the living or the technological space. It is not surprising then that in Indian mythology the god Agni is a promoter of architecture (see *Agni-purana*, XXXVIII, 1-50, in Nath Dutt 1903: 142-146). In the Mycenaean dwelling the goddess Hestia, symbolized by the round hearth, holds the central place, as stated by the *Homeric Hymns* dedicated to Aphrodite (Richardson 2010).

The orientation of the body

All pyro-instruments that encapsulate fire, as opposed to the round hearths, require from the operator (or operators) a certain working position determined by the air-draught and the internal process of combustion. In order to be able to work with it, the operator is located in front of the pyro-instrument, facing the fire. In this way, pyro-instruments determine a space of activity with an anthropomorphic 'left – right' symbolism. From the sensory perspective, the workspaces around the pyro-instruments are thermal spaces of different intensities in relation to the openings of the respective devices.

Geometry

The circle is the geometric image of the efficiency (maximum surface area with minimum contour) and of the ergonomic use of space, because such a spatial organization creates a minimum surface of use.

Round hearths can still be identified from the Aurignacian, at the Klisoura Cave in Greece (Karkanas *et al.* 2004).

Fire creates architectures since it imposes geometry, from the simple circles of stone or clay, which control its spread (and which are the geometrical figures of the optimal efficiency), to cone trunks, cylinders, half-spheres, half-cylinders or parallelepipeds, circular geometric figures that efficiently control the air-draught process required for combustion. All these forms involving the circle are determined by the control and conservation of the thermal energy.

Architecture

We should not imagine that the term 'architecture' evokes only constructed objects that delimit human action. Architecture means not only the built space, but also the experienced space, in the present case, around the pyro-instruments.

Pyro-instruments involve an ergonomic, kinaesthetic and visual relationship, as well as rhythmic actions of feeding or maintaining fire at a certain technological tempo. The technological agency is structured both by the physics of the combustion phenomenon, and by the type of operation to be performed. 'In accommodating pyrotechnical structures as architecture, we open them up for what, in craft studies, would be novel forms of analysis' (J. Slater, this volume).

This phenomenological perspective of pyro-technologies has imposed the archaeological experiment as an instrument of investigation, with all the limitations of the sensorium and of our modern cognition, the experiment helping us to experience the 'architecture' of pyro-technologies.

Sinopsis of chapters

Silje Evjenth Bentsen and **Sarah Wurz** chapter, 'A Song of Space and Fire: Is There a Pyrotechnical Architecture of the African Middle Stone Age?', addresses a case of pyro-architecture in Middle Stone Age (MSA) Africa, presenting three cases of combustion features, or in the technological perspective 'three different operating chains for fire use'. The research is based on experiments that determine 'the wood mass, fire temperatures and the size of combustion features'.

Comparing the quantities of ash excavated from a cave at the Klasies River main site (KRM), South Africa, as well as the thermal alterations in quartzite stones, the authors present three different hearths, with different levels of energy investment for the humans who built those fires.

The ash is presented as an index of the magnitude and function of the fire, and the presence of stones with fire-cracks intended to retain as much heat as possible, is an indication of a longer and more intense use. Differences in intensity between the three hearths are seen as indices of short and long-term activities, the latter involving the collection of a large fuel mass. Although the authors do not consider the ash features to be the product of built pyro-objects, they state that 'the combustion features do represent pyrotechnical architecture in that they have fixed points in space that people moved by and around when the fires were active,' demonstrating that the human relationship with fire in MSA has a degree of complexity and dynamism.

The oven is a clay capsule for fire control with multiple functions, as demonstrated by the chapter of **Cecilia Conati Barbaro, Chiara La Marca, Vanessa Forte, Giacomo Eramo, Italo M. Muntoni,** and **Alberto Rossi**, 'Firing the Earth. The Early Neolithic Ovens of Portonovo (Marche, Italy)'. Their analysis covers a series of underground ovens dating from the Early Neolithic, at the Portonovo site, Italy. Due to the insulation provided by the soil, this type of pyro-instrument presents the advantage of

conserving more thermal energy, while the pit in front of it sometimes allows the operator access to two ovens. The grouping of ovens that existed for half a millennium, positioned outside houses or domestic structures, indicates a cyclical, joint activity that attracted scattered communities of the area. During the harvest period, the pyro-instruments created a space allowing intense activity, lasting for several days, as the different temperatures reached allowed the performance of different operations. Over time, the workspace saw its function change, becoming a funeral area, which infers a degree of sacredness of the ovens and the place.

The complex relationship with fire of the inhabitants of the *tell* settlements of the Chalcolithic Lower Danube area, is analysed by **Dragoș Gheorghiu** in the chapter 'Architecture and Fire: The Pyro-proximities of the Chalcolithic Dwelling', from the perspective of the combustion process both in pyro-instruments and in dwellings and settlements. In these cases one can discern a relationship between fire and geometry, from the shape of the objects to the spatial organization of the *tell* settlement. The proximal relationships with fire are analysed both inside the house and in the space of the settlement, both during daily activities and in times of arson. In the case of the interior architecture, the spatial organization and the ergonomic and ritual use of the different fixed or mobile pyro-instruments, such as ovens, fireplaces, fire-starters, and heaters, are presented in their daily and nocturnal use.

In the chapter 'Italian Pottery Kilns and Production Areas from the Bronze Age to the Archaic Period (2200-500 BC). A Typological Approach', **Agostino Sotgia** proposes a model for the organization of craft contexts from the Bronze Age to the Archaic period, offering a chrono-typological classification, which, not only reflects the technical developments in the kilns' technology, but can provide data on the organization of the production of ceramics. The production areas research was based on both the archaeological evidence and ethno-archaeological research and experimental reconstructions. One finding concerned the use of simple archaic technologies alongside more technically advanced ones. The production areas revealed complex workspaces, with sets of kilns, water tanks, workshops with drying rooms, and pits for extracting clay.

Jessica L. Slater's chapter, 'Shifting Focus: Expanding the Potential of Experimental Metallurgical Reconstructions' advocates for expanding the concept of 'architecture', which should also include the 'technological architecture' of the pyro-instruments that structure the human action, and that would offer 'a novel form of analysis' in craft studies. Such a perspective would shift the focus of research from *processes* toward the study of the *practice* and *experience*. In the experimental study on metallurgical practice Slater used time-slice photographs to record the actions in space. The analysis method used highlights the 'timing and rhythm of metallurgical activities', proximities to the pyro-instruments, and the way 'the loci of production are organized'. The space is 'an essential aspect of craft', as well as the place, being revealed by the *practice*, through routinised behaviours. As a result, the craft creates a spatial relationship between the furnace and the cumulative structured deposition of residues that can be approached through a time / geography approach.

Michał Wojenka and **Małgorzata Kot**'s chapter 'Ergonomics as a Tool for Fire Structures Reconstruction. Case Study of a Kiln Located in the Garncarskie Rockshelter in Polish Jura Chain' is a demonstration of the use of ergonomics for archaeological inferences, applied when determining the shape of a Post-Medieval kiln for pottery built under a rock shelter. Using ethnographic data combined with ergonomic measurements of the space between the pyro-instrument and the rock wall, the authors propose different configurations of the kiln and of the ceramic production operations. We are here in front of a case of natural architecture, in which the advantages of a rock shelter for the use of the pyro-instrument, such as air-draught due to a natural flue, or low moisture, were exploited through the development of a context-oriented design. In this case the normal space of the kiln was adapted to the constraints of a natural space.

Bibliography

Cresswell, R. 1976. Avant-propos. *Techniques et culture* 1: 5-6.

Hodder, I. 2012. *Entangled. An Archaeology of the Relationships between Humans and Things.* Chichester: Willey-Blackwell.

Karkanas, P., M. Koumouzelis, J. K. Kozlowski, V. Sitlivy, K. Sobczyk, F. Berna and S. Weiner 2004. The earliest evidence for clay hearths: Aurignacian features in Klisoura Cave 1, southern Greece. *Antiquity* 78(531): 513-525.

Lemonnier, P. 1983. La description des systèmes techniques. Une urgence en technologie culturelle. *Techniques et culture* 1: 11-26.

Lemonnier, P. 2002. Introduction, in P. Lemonnier (ed.) *Technological choices. Transformations in material cultures since the Neolithic*: 1-35. London: Routledge.

Leroy Gourhan, A., 1943-1945. *Evolutions et techniques.* Paris: Albin Michel.

Leroy Gourhan, A. 1964-1965. *Le geste et la parole.* Paris: Albin Michel.

Mauss, M. 1936. Les techniques du corp. *Journal de psychologie* 32(3-4): 5-23.

Nath Dutt, Manmatha 1903. *A Prose English Translation of Agni Puranam*, Volume I, Calcutta.

Richardson, N. (ed.) 2010. *Three Homeric Hymns: To Apollo, Hermes, and Aphrodite.* Cambridge, UK: Cambridge University Press.

Schlanger, N. 1994. Mindful technology: unleashing the *chaîne-opératorie* for an archaeology of mind, in C. Renfrew and E. B. Zubrow (eds) *The Ancient mind: Elements of cognitive archaeology*: 143-151. Cambridge, UK: Cambridge University Press.