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Christophe Delage, John Webb

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Corresponding Author: Christophe Delage

Corresponding Author's Institution: Department of Prehistory, National Museum of
Natural History, Paris

Order of Authors: Christophe Delage, John Webb

Affiliated institutions of all authors:

Christophe Delage, Département de Préhistoire, Muséum National d'Histoire
Naturelle, Paris

John Webb, Department of Ecology, Environment and Evolution, La Trobe University

Correspondence details of all authors (including email addresses):

Christophe Delage, Département de Préhistoire, Muséum National d'Histoire Naturelle,
1 rue René Panhard, 75013 Paris / France (Email: delage.chris@laposte.net)

John Webb, Department of Ecology, Environment and Evolution, La Trobe University,
Victoria 3086, Australia (John.Webb@latrobe.edu.au)

CHERTS AND PREHISTORY IN THE NEAR EAST... RECENT ADVANCES: AN INTRODUCTION

Christophe DELAGE and John WEBB

1. Introduction

The Near East is an extraordinarily interesting (and challenging) region in terms of its geology and archaeology. These two disciplines intersect in the impressive array of fine-grained siliceous lithologies (a.k.a. flint or chert) that outcrop extensively throughout the region, and that have been preferentially used for artefact manufacture by prehistoric peoples for more than a million years (Childe, 1935, 225). Chert has been of primary interest to archaeologists in the Levant for over twenty years, as it is highly resistant to natural alteration and therefore provides one of the best (though obviously very fragmentary) lines of evidence to reconstruct the evolution of early prehistoric societies.

In the landscape of the Levant, cherts occur in limestone and marl formations of Upper Cretaceous to Eocene age, sometimes in abundance; most are Senonian (Aaronsohn, 1910, 11). In the late Eocene, movement along the Dead Sea transform fault created the Dead Sea Basin and at the same time deformed and disrupted the chert-bearing formations, so that the distribution of cherts is now very discontinuous, also due to burial by basalt lava flows in some areas. However, chert distribution was increased by erosion through the Neogene, as abundant chert pebbles accumulated within the conglomerates deposited around the margins of the lakes that filled the Dead Sea Basin. Thus both primary (outcrop) and secondary (conglomerate) sources of chert were available to prehistoric peoples in the region.

The available geological mapping of the Near East, which began several decades ago and is still ongoing in some regions, provides valuable details of the distribution of the chert-bearing formations, but the geologists did not map the chert horizons themselves. Instead it is archaeologists who have observed and precisely mapped the chert-bearing (primary or secondary) deposits. This was carried out to define the exploitation territory around particular sites, and to determine the characteristics of chert nodules as a fundamental reference for comparison with archaeological assemblages. The ultimate goal of this geoarchaeological dataset is to document the behavioral aspects of prehistoric chert procurement and exploitation patterns.

In 2007, when the edited volume *Chert Availability and Prehistoric Exploitation in the Near East* was published (Delage, 2007), chert research was still marginal to the study of prehistory in the Near East. However, over ten years later, numerous studies on Levantine chert have been published and research projects are still developing on different aspects of this theme, including the use of geochemistry to characterize chert (e.g. Ekshtain et al., 2014, 2017; Finkel et al., 2018, 2019). It is interesting to note that the search for extraction and quarry sites of rich primary deposits (often of Eocene age) has been appealing to prehistorians in the Southern Levant (e.g. Barkai and

Gopher, 2009; Barzilai and Milevski, 2015; Gopher and Barkai, 2011, 2014; Müller-Neuhof, 2013a, 2013b; Nadel et al., 2011; Oron et al., 2019; Shemer et al., 2019; Shimelmitz et al., 2019).

Although there is still much to be done, the arrival of a new generation of younger scholars has been a major stimulus to chert studies in the Near East. Adam Nazaroff and Sonia Ostaptchouk have been working on the lithics at Çatal Höyük, respectively on the Neolithic and Chalcolithic components (Nazaroff et al., 2013, 2014; Ostaptchouk, 2016). Ferran Borrell first worked in the Northern Levant (i.e. Turkey and Syria), but more recently in Jordan and Israel (Borrell, 2010; Borrell and Vicente, 2012). Bernd Müller-Neuhof (Müller-Neuhof, 2013a, 2013b) has been analyzing Chalcolithic mining sites in Eastern Jordan; Hannah Parow-Souchon and Christoph Purschwitz are both working in the Petra area, respectively on Upper Paleolithic and Neolithic lithic assemblages (Purschwitz, 2013a, 2013b, 2017, 2019a, 2019b, 2019c). Ravid Ekshtain (Ekshtain, 2014; Ekshtain et al., 2014, 2017) and Meir Finkel (Finkel et al., 2016, 2018, 2019) are working on the west side of the Jordan Valley, and Sandra Rosendahl is focusing on the early prehistory of Cyprus (Rosendahl 2010, 2012). Some of these researchers have contributed to this special issue.

This volume is thus intended to offer an appropriate framework to document recent advances and new explorations in this field.

2. The papers in this issue

The thirteen papers included in this issue cover a wide array of topics. In terms of geography, most involve detailed exploration and research at key prehistoric sites in the Southern Levant, which is the best studied region. In Southern Jordan, Parow-Souchon and Purschwitz's project in the Greater Petra region and Henry and Mraz's long-term project (Wadi Hisma, Wadi Rum, Rift Valley) have characterised the availability and distribution of chert resources in this region. Recent research in the Azraq basin is now filling a gap in that area (Beller et al.; Sanchez et al.). On the west side of the Jordan Valley, Druck's extensive survey of Mount Carmel draws a clear picture of chert availability there. Finkel's research on prehistoric extraction sites in northern Israel provides an important synthesis on chert procurement and primary reduction.

The geo-political tension in the Near East in the last few years has profoundly impacted archaeological research in the Northern Levant (Syria, Lebanon), so we could not include any papers that offered new insights from this area. By contrast, there are promising new projects in Turkey and Iraq, areas that are relatively less explored and less well known. Ostaptchouk's review of the geo-archaeological literature (including her own research) provides a better picture of chert availability and characteristics in Turkey. The contribution by Moscone and his colleagues in Northern Mesopotamia is in a region that has rarely been approached from this angle. They have discovered a chert mining complex associated with the Chalcolithic Canaanite blade phenomenon. Sarah Stewart and her colleagues are still carrying on much needed geo-archaeological research on the island of Cyprus.

Of the chronological periods considered in this special issue, we are pleased that all are covered by one or more case studies: the Lower Paleolithic (Beller et al.; Delage et al.; Druck; Finkel); the Middle Paleolithic (Druck; Finkel; Finkel et al.; Henry and Mraz); the Upper Paleolithic (Delage et al.; Druck; Parow-Souchon and Purschwitz); the Epipaleolithic (Delage et al.; Druck; Sanchez et al.); the Neolithic (Delage et al.; Henry and Mraz; Parow-Souchon and Purschwitz; Stewart et al.; Yegorov et al.); and even post-Neolithic periods, i.e. Chalcolithic and Bronze Age eras (Moscone et al.; Ostaptchouk). Some of these studies also made interesting comparisons between periods in terms of raw material procurement and exploitation: Lower/Middle Paleolithic and Neolithic/Chalcolithic (Finkel); Middle Paleolithic and Neolithic (Henry and Mraz); Upper Paleolithic and Neolithic (Parow-Souchon and Purschwitz); Lower Paleolithic to Late Epipaleolithic (Druck).

The papers in this issue focussing on the provenance of chert artifacts at a prehistoric site acknowledge the benefits of the detailed geological maps (1:50,000 scale) available for most of the Near East, the result of fieldwork and research by numerous geologists over the past 30 years.

To assess chert availability, many papers used a site catchment analysis (Beller et al.; Delage et al.; Druck; Finkel; Finkel et al.; Moscone et al.; Ostaptchouk; Parow-Souchon and Purschwitz; Sanchez et al.; Stewart et al.), although Henry and Mraz considered this "undoable" and instead their approach focused on the sourcing of the lithics present at a site.

Identifying the processes used to extract chert at a quarry site is often difficult, but two contributions in this issue (Finkel; Moscone et al.) retrieved material remains that provided information on the practice of mining/quarrying chert nodules from primary sources.

Regarding chert characterization, the papers in this issue reflect a wide range of approaches. Visual (naked-eye) observation is still -- arguably -- the most common procedure, because it is non-destructive, cheap and can be readily applied to a large assemblage (Delage et al.; Druck; Henry and Mraz; Ostaptchouk; Sanchez et al.). Although archaeologists often report observations based on relatively small artifact samples, Parow-Souchon and Purschwitz analyzed whole assemblages (> 25,000 artifacts); this could only be achieved with visual observation. Nevertheless Moscone and his colleagues prefer a more analytical approach to chert characterization, based on geochemistry. Although this has been applied for the past four decades in other parts of the world (not always with the results expected), in the Near East it is a rather recent trend. It requires a detailed understanding of chert variability and thus a rigorous protocol of chert sampling, and we seem to be only at the beginning of assessing the potential of this analytical approach. Several contributions in this issue applied a variety of analytical techniques: ICP-MS (Finkel); LA-ICP-MS (Beller et al.; Sanchez et al.); INAA (Stewart et al.), Fourier Transform Infrared (FTIR) reflectance spectroscopy (Ostaptchouk) and non-destructive Raman micro-spectroscopy (Moscone et al.). The FTIR technique was also used by Yegorov and

his colleagues to characterize PPNB heat treatment of chert. Thus it is an exciting time for the development and testing of all kinds of techniques and approaches in order to better characterize the cherts themselves and assess their geographical origin.

On a methodological level there may be difficulties when comparing procedures or results between scholars, even when working in the same region or at the same site. For instance, in the analysis of lithic assemblages at Çatalhöyük, Nazaroff focussed on the Neolithic whereas Ostaptchouk dealt with the Chalcolithic period, and both encountered problems in the comparison of their respective results. By contrast, Parow-Souchon and Purschwitz, working respectively on the Upper Paleolithic and the Neolithic of the Greater Petra Region, have harmonized their methodologies and put together a similar chert typology for chronological comparisons of chert procurement. This has produced a very valuable -- but rare -- collaborative work.

We are now at a stage of research where very specific questions regarding chert geo-archaeology can be addressed. Several papers in this issue assess the impact of natural phenomena like tectonics and erosion on the availability and characteristics of chert. Deformation in Central Anatolia and along the Dead Sea Transform has modified the mineralogical characteristics and physical properties of chert nodules at some localities, making the chert unsuitable for knapping (Delage et al.; Ostaptchouk; Parow-Souchon and Purschwitz). Delage et al. suggested that the battered cortex on subspheroid chert nodules in the Central Jordan Valley is due to beach erosion during a Miocene marine transgression.

Several contributions shed light on another problem with lithic provenance studies: that artifacts present in prehistoric sites could originate from outside the exploitation territory, implying long-distance transport of lithic raw materials. Several chert types absent in the local environment of the sites in southern Jordan studied by Henry and Mraz are thought to be of a non-local origin, and archaeological lithics at other sites in this region could come from the other side of the Dead Sea Rift (Delage et al.; Parow-Souchon and Purschwitz). Many siliceous rocks exploited at Çatalhöyük West during the early Chalcolithic may be non-local (Ostaptchouk). A similar pattern is hypothesized by Beller and his colleagues for the Azraq basin.

In fact there has been very little progress in documenting long-distance transport of chert. A step in this direction would be to identify particular types of chert that could act as lithic "tracers". The visual illustrations of chert types in the supplementary material in this issue are important in this respect, and could be used to map the distribution of specific chert types (see Delage, 2018, for a synthesis of this approach).

Finally, Yegorov and his colleagues address another issue common in later prehistoric periods, namely the practice of intentional heating of chert to improve its flaking properties. This is a complex phenomenon that requires a rigorous methodology to document it. Here the authors have applied various

analytical procedures to identify heat treated chert in the PPNB.

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