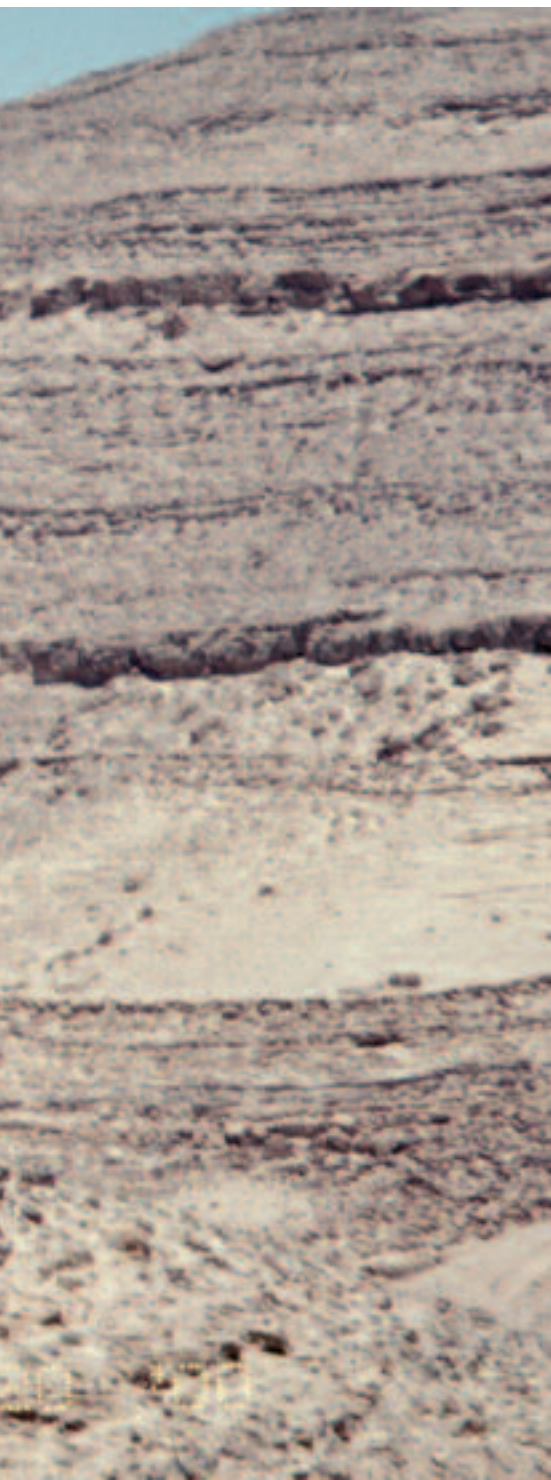




We surveyed the steep terrain characteristic of most of the Wadi al-Hasa drainage.



When Stone is More Than Stone

Clues to Prehistoric Resource Use in Jordan

BY DEBORAH I. OLSZEWSKI
AND MAYSOON AL-NAHAR

SCATTERED ACROSS THE world on the surface and in buried deposits are billions of prehistoric stone artifacts—the most durable evidence of humanity’s past 2.6 million years. Public interest and research on such artifacts often focuses on the forms of arrowheads, handaxes, drills, and other recognizable tools and on how they were made by prehistoric flintknappers. Stone artifacts also hold vital clues to how ancient groups moved across landscapes and managed their raw material resources. Extracting this information requires the careful investigation of stone artifacts, naturally occurring stone, and the landscapes from which this raw material was procured. Over the last five years, our research in Jordan has pursued this objective—using stone to understand prehistoric resource use during the late Pleistocene and early Holocene.

THE WADI AL-HASA REGION

The Wadi al-Hasa region of Jordan has been the focus of archaeological exploration for more than 20 years. We have identified and investigated numerous sites ranging in date from 23,000 to 8400 BP (all dates are in uncalibrated radiocarbon years). Before 10,000 BP the prehistoric peoples of the region were hunter-gatherers, attracted to the Wadi al-Hasa by the presence of a Pleistocene lake with spring-fed pools and marshes. Such well-watered spots were ideal locations for hunting animals and birds and for exploiting wild plant foods, a subsistence strategy which led some groups to adopt farming at the beginning of the Holocene around 10,000 BP (see *Expedition* 44(1):16-23).



Sites in the Wadi al-Hasa region.



Chert normally fractures in highly predictable ways when struck; an example of a core (right) and flake (left).

The artifacts that survive from this 15,000-year period were those made of stone, and we find these at sites that served as short-term camp sites. The most frequent type of stone used was chert, a sedimentary rock which forms either in beds or as nodules (small lumps) within a chalk or limestone matrix. The siliceous (glass-like) nature of chert makes it ideal for manufacturing stone tools—when struck chert normally fractures in highly predictable ways.

By examining the outer surface, or cortex, of chert cores (blocks from which flakes or blades have been removed) found at Wadi al-Hasa sites, we know that these people obtained most of their chert from nodular sources. Our goal therefore was to identify these sources and understand how these ancient hunter-gatherers and later farmers moved across the landscape to procure the chert they needed to make their tools. By surveying the geological formations of the Wadi al-Hasa and its surroundings and sampling the cherts available, we hoped to find sources of nodular chert to compare to the cherts used to make stone artifacts at particular sites. Ultimately, this will help us understand how they managed natural resources and whether or not their behavior changed over time.

GEOLOGICAL FORMATIONS AND CHERT SOURCES

In this part of Jordan, there are six major geological formations dating from the Cretaceous (144–66 million years ago) and Tertiary (66–2 mya) periods that could potentially yield chert: the Wadi es-Sir Limestone, the Wadi Umm Ghudran,

the Amman Silicified Limestone, the Al-Hisa Phosphorite, the Muwaqqar Chalk Marl, and the Umm ar-Rijam Chert. These have been exposed by tectonic faulting (associated in part with the formation of the Jordan Rift Valley and the Dead Sea to the west) and erosion. Seasonal streams coursing down the otherwise dry *wadis* (canyons) cut through the different geological deposits. Not all of the chert is of equal quality, however. For example, bedded cherts are often highly flawed and not well suited for making stone tools. As a result, chert quality sometimes influenced the distances prehistoric groups traveled to find suitable chert.

SURVEY AND ANALYSIS

To obtain a comprehensive understanding of chert sources, we walked 39 survey transects: 29 in the Wadi al-Hasa drainage, 3 on the Kerak Plateau just to the north, and 7 in the vicinity of the village of Jurf ad-Darawish to the south. Since we were examining relatively large geological formations, it was not necessary to be as closely spaced as we would have been in a survey for archaeological sites. We walked each transect with team members 50–100 m apart collecting chert samples, marking them with initials, and numbering them sequentially. When we encountered nodular chert or other interesting types of stone *in situ* (their natural location) we recorded it as a *raw material locale*. Using a GPS (global positioning system) unit we obtained its latitude and longitude coordinates, took photographs, and collected samples.

During two field seasons in 2000 and 2004 we recorded 21 raw material locales, several of which probably represent the same source of chert but in different parts of the region. In all, we found five different sources of nodular chert in the Hasa area, each with a combination of characteristics that made them relatively easy to distinguish. Using basic attributes of chert types such as nodule shape and size, cortex, chert texture and quality, and even color—a notoriously problematic attribute which can vary greatly within a single chert source—we compared stone artifacts recovered from archaeological sites with these chert sources. This analysis produced a number of observations with behavioral implications for the prehistoric use and transport of chert.

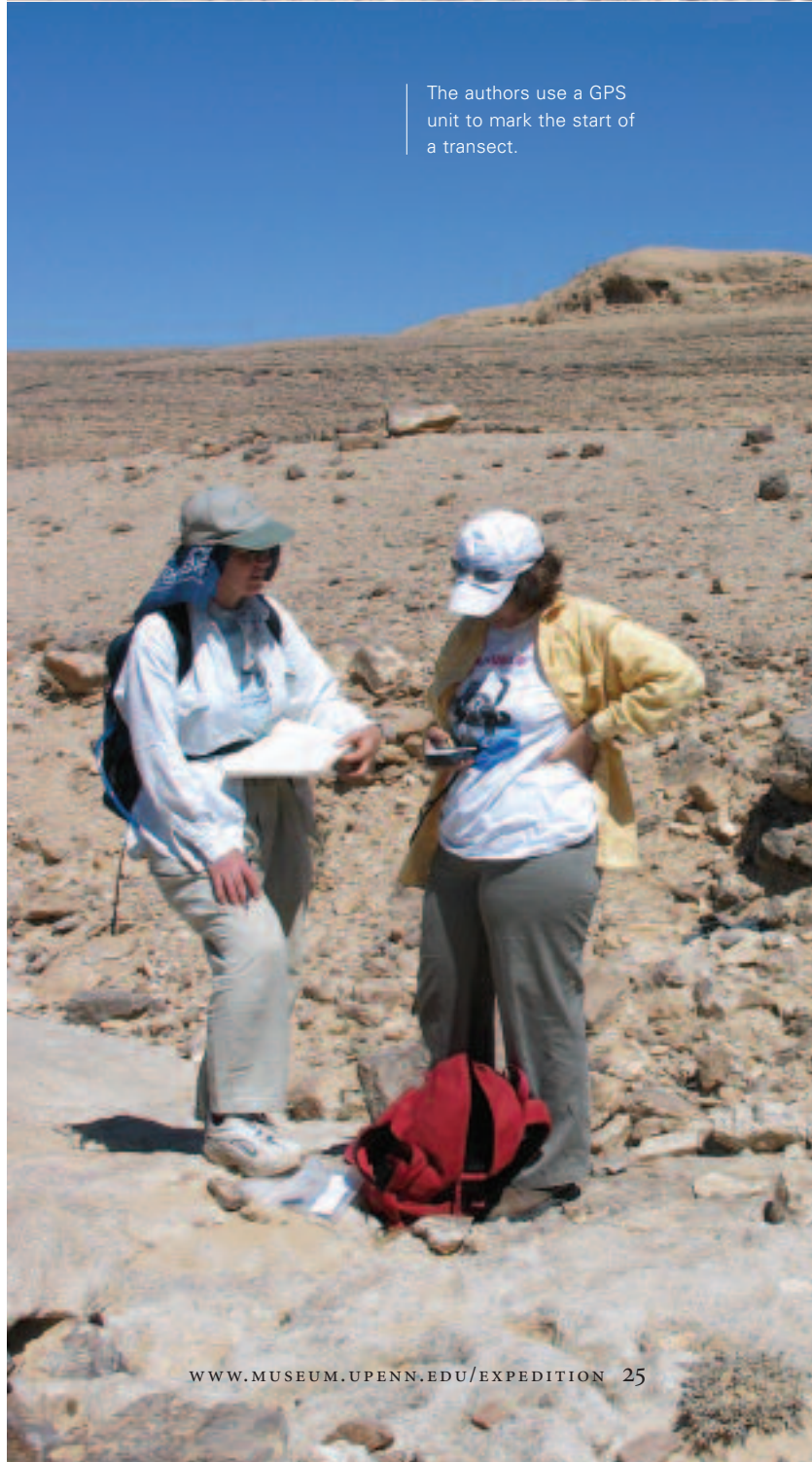
BEHAVIORAL DIFFERENCES OVER TIME

From the Late Upper Paleolithic (23,000–20,000 BP) through the end of the Pre-Pottery Neolithic (10,000–8000 BP), the most common color of chert found at archaeological sites in the Wadi al-Hasa region is grey. This is not surprising given

We also surveyed the rolling hills typical of the area near the former Pleistocene lake.



The authors use a GPS unit to mark the start of a transect.



that all the identified sources in the region yield grey cherts of various shades. When we look at other chert attributes, however, certain trends begin to emerge.

The first involves evidence that later peoples in the region more frequently exploited chert sources near their sites than did earlier peoples. For example, though all the

| Sites/Areas | Period/Industry | Date |
|---|---|------------------|
| Tor at-Tareeq upper deposits | Pre-Pottery Neolithic | 10,000–8,000 BP |
| Yutil al-Hasa Area D Tabaqa | Late Epipaleolithic (Early Natufian) | 12,800–11,000 BP |
| Tor at-Tareeq lower deposits Yutil al-Hasa Areas C/E Tor Sageer | Early Epipaleolithic | 22,300–15,000 BP |
| Yutil al-Hasa Area A | Late Upper Paleolithic | 23,000–20,000 BP |

Late Pleistocene and Early Holocene sites in the Wadi al-Hasa. Dates derive from uncalibrated radiocarbon dating at these sites.

sites under study (except Yutil al-Hasa Area D), showed a preference for cherts with a limestone rind or smooth cortex, sites dating after 15,500 BP show an increased use of lower quality bedded cherts (angular blocks with a stained cortex) or *wadi*-rolled chert cobbles (with distinctive battered outer surfaces). This might indicate that later peoples used cherts immediately to hand, near their sites, rather than traveling to more distant sources for nodular cherts. One possible reason could have been the exploitation of different food resources, ones that required particular scheduling of tasks and limited the amount of time available to seek out distant chert sources.

This raises a question, why did earlier peoples travel farther to obtain higher quality cherts? The answer is probably tied to the known use by Upper Paleolithic and Early Epipaleolithic (22,300–15,000 BP) groups of a stone tool technology that emphasized the manufacture of blades and bladelets (long, linear flakes removed from cores of chert). For example, the flat shape of the limestone rind chert nodules from the Umm ar-Rijam Chert source greatly facilitated the making of blades. Having a predetermined narrow edge ensured that most flake removals would be long and linear. In contrast, when round or oval nodules are used much more preparation of the core is required to produce a long, thin blade. Thus, a nodule whose original shape was conducive to the easy

Sources of Nodular Chert

The Wadi es-Sir Limestone is the oldest formation, and the one with the least exposure of available chert. Cherts here are oval-shaped cobbles and boulders, ranging from 10–25 cm in size, and consisting primarily of light grey colors with a smooth cortex.

The Amman Silicified Limestone, found mainly downstream in the narrower, more entrenched parts of the Wadi al-Hasa drainage, provides two nodular chert sources near the top of its sequence of beds. One of these yields moderate-size cobbles similar to those from the Wadi es-Sir Limestone, but here the color is mainly medium grey. This chert sometimes has a very glossy appearance and the cortex of these cobbles is smooth. The second source also has medium-grey chert (sometimes with bluish overtones), but the outer surface of its nodules is characterized by a limestone rind.



This chert source was identified in the Amman Silicified Limestone formation.

The Al-Hisa Phosphorite (which overlies the Amman Silicified Limestone) has a very interesting nodular chert found in its oyster shell bed. Although this bed, known as the Bahiya Coquina, is very widespread in the Hasa region, its nodular chert occurs only sporadically and tends to be found as small roundish nodules of less than 10 cm in size with a limestone rind cortex.

The Umm ar-Rijam Chert (located 16 km southeast of the main Hasa drainage near the village of Jurf ad-Darawish) has chert ranging in color from a medium to dark grey, often with brownish overtones. Its flat-shaped nodules have a limestone rind and can be exceptionally large, over a meter in size.

No chert was found in the Wadi Umm Ghudran or the Muwaqqar Chalk Marl.

Preferred Cherts

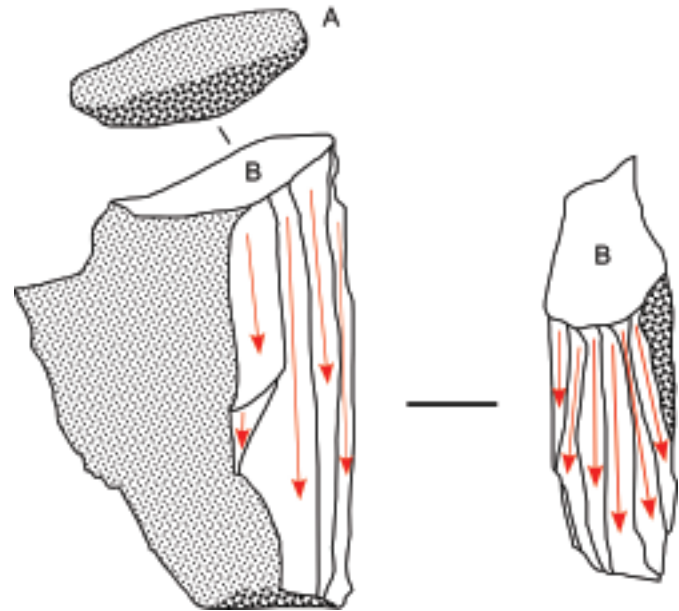
Certain cherts were apparently preferred to make different types of artifacts. For example, relatively large artifacts, such as blades and bladelets, were disproportionately made of brownish-grey chert. Probably obtained from the Umm ar-Rijam Chert source, relatively flat nodules of brownish-grey chert were especially convenient for making long, thin blades.

In contrast, microliths (small bladelet tools 30 mm or less in size), whether geometric or nongeometric, were disproportionately made of glossy grey chert. Geometric microliths (particularly half moon-shaped lunates) were also made of brown, glossy brown, and translucent cherts, while nongeometric microliths were also made of grey chert.

Finally, very small flakes (20 mm or less in size) tended to be translucent and glossy grey cherts. These flakes probably resulted from the resharpening or reshaping of tools and suggest that these materials came to Hasa sites as partially finished or finished tools.

removal of blades would have saved blade-making flintknappers time and effort. This was probably one of the reasons why it is likely that earlier Upper Paleolithic and Early Epipaleolithic peoples brought Umm ar-Rijam Chert into the Wadi al-Hasa region.

Another interesting pattern we noted was the highly selective use of cherts later during the Late Epipaleolithic (12,800–11,000 BP). The sites of Tabaqa and Yutil al-Hasa Area D have artifact assemblages almost completely composed of either translucent chert and glossy grey chert (Tabaqa) or translucent chert and grey chert (Yutil al-Hasa D). While the glossy grey and grey cherts are undoubtedly from local Hasa sources, no local source for the translucent chert was found in the Hasa region. We suspect that it may come from some distance—the closest source we are aware of is 80 km to the southeast. Traveling this distance for a very specific chert, when other suitable cherts are much closer to hand, suggests a new cultural practice during the Late Epipaleolithic. This pattern has also been observed at this time in other parts of the Levant such as the Negev and Sinai regions to the southwest, and it may represent a cultural preference for this type of chert.



Blades are removed from a narrow chert nodule by striking off an initial flake (A) to create a striking platform (B) from which blades can be removed. Stippling indicates cortex.

Other evidence indicates that some chert sources were only exploited when they were nearby. One example is grey chert with pink or purple banding which is found in the Amman Silicified Limestone. Although it forms only a minor portion of each site's assemblage, the sites with the highest amounts are likely to be those closest to the source (e.g. 1.8% at Tor Sageer and 1.2% at Yutil al-Hasa Areas C/E, but only 0.2% at Tabaqa and 0.2–0.4% at Tor at-Tareeq). This might indicate that banded chert was targeted only when it was relatively close to a camp site.

Another example is the Al-Hisa Phosphorite rubble found just above the site of Tor at-Tareeq. This contains a knappable material called siliceous coquina—a highly compressed marine shell deposit with the same characteristics as a microcrystalline chert. During the Early Epipaleolithic and the Pre-Pottery Neolithic, Tor at-Tareeq was the only site where we found this material being used. It was also the only site where we found phosphatic chert (mostly likely also originating from the Al-Hisa Phosphorite). Although these two stone types occurred in very small quantities as artifacts, their presence at this site indicates a level of opportunistic stone use not found at other Hasa sites.

Overall, our research shows that the Hasa region contains extremely abundant chert in both bedded and nodular forms. Although prehistoric groups could have picked up chert near any of their sites, incurring little in the way of travel or transport costs, they often chose specific cherts that required additional effort to obtain. This suggests that they did not always make decisions based on what was most expedient or least

costly in terms of transport. Instead decisions were affected by the nature of their preferred technology (e.g. blade manufacture) and perhaps tradition or cultural preferences (e.g. the use of translucent chert).

Although our detailed studies are still under way, we anticipate that the use of nodular cherts, such as those from the Wadi es-Sir Limestone, Amman Silicified Limestone, and Bahiya Coquina, was guided in part by their relative visibility, quality, and convenience. Our future work will concentrate on teasing out differences in the recognition of cherts and the patterns that will allow us to reconstruct the territorial ranges and behaviors of the prehistoric groups who inhabited the Wadi al-Hasa region during the waning days of the Pleistocene and the onset of the Holocene. 🏠



Maysoon al-Nahar (left) and Deborah I. Olszewski (right) at the site of Yutil al-Hasa in the Wadi al-Hasa.

the Wadi al-Hasa sites—ranging in time from the Paleolithic to the Islamic period. Recently her research has

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