RECONSTRUCTING MANUFACTURING LANDSCAPES AT EARLY BRONZE AGE AL-LAJJŪN, JORDAN: THE FIRST SEASON (2003)

Jennifer E. Jones

Introduction and Research Goals

In 2003 the University of Minnesota Duluth — Early Urbanism Project (UMD-EUP) began a long-term research project to examine the location of craft and agricultural production across the landscape near the Early Bronze Age site of al-Lajjūn in south-central Jordan. The 2003 field crew counted pottery, chipped stone and ground stone artifacts along transects in four areas at the site to test whether the final stages of production were nucleated or dispersed. Determining the location of production for a variety of crafts in one community will foster a more nuanced understanding of the organization of production rather than assuming a single mode of production prevailed for all crafts. The density of chipped stone debitage provided the best intrasite evidence for the location of the final stages of tool production. Present in low numbers in all of the surveyed locations, the quantity of debitage spiked in two transect areas. This pattern suggests that low intensity chipped stone tool production occurred across the site in conjunction with more intense production episodes.

This field season established that a multifaceted research design of excavation and targeted, intensive off-site surveys will be required to illuminate the locations of craft and agricultural production that occurred in and around al-Lajjūn. Off site survey, particularly of basalt flows and clay sources, will clarify where the initial stages of raw material acquisition for these crafts took place. In all cases, though, the acquisition of raw materials and their transformation into tools occurs in a variety of locations across the landscape and requires the productive unit to balance a variety of scheduling demands. The presentation that follows briefly introduces the background and theoretical orientation for this research and then describes the location of al-Lajjūn and the results of past archaeological work at the site. A review of the survey methods used to quantify artifact densities is then followed by the results of the data collection. A discussion of future work planned at the site concludes this article.

Background and Theoretical Orientation

A period of disaggregation and abandonment in the southern Levant (Palumbo 2001) followed a time of population aggregation during the Early Bronze Age (Philip 2001). Excavations (Amiran 1978; de Miroschedji 1999; Rast and Schaub 2003), synthetic analyses (Chesson 1999; Esse 1991; Joffe 1993; Philip 2001), studies of craft production and exchange (Falconer 1987; Jones 1999; Schaub 1987; Watts *et al.* 2004), and survey data (Betts 1998; Broshi and Gophna 1984, 1986; Falconer and Savage 1995; Gophna 1995; Greenberg 2001; Harrison 1997; Ibrahim *et al.* 1976, 1988; Mabry and Palumbo 1988; Mattingly 1996; Miller 1991; Palumbo *et al.* 1990) have incrementally added to our understanding of the Early Bronze Age.

The broad research goal of the University of Minnesota – Duluth Early Urbanism Project (UMD-EUP) is to examine the location of craft production at a variety of geographic scales from the intrasite to the wider landscape. While balancing the demands of making an economic living in fields and homes, population aggregation and the construction of fortification walls likely necessitated changes in the organization of labor and the scheduling of tasks. At the same time, people moved across the landscape to tend annual and orchard crops, herd animals, acquire raw materials for craft production, exchange goods and visit other settlements. This pattern of

intensive human investment in a localized area and land use at varying distances and intensities requires a landscape-based approach that takes into account intra and intersite locations of productions.

During the Early Bronze Age, people made pottery, chipped stone tools, copper tools and grinding stones, herded domesticated animals, and grew annual crops and orchard trees. The material left behind from these tasks varies based on the type of activity, the durability of the waste material and the intensity of the modifications to the landscape (**Table 1**). Depending on the primary or secondary nature of the depositional environment, the distribution of artifacts, manufacturing debris and architecture indicates where stages of craft and agricultural production took place.

The southern Levant is an ideal region in which to examine the transformations in craft and agricultural production that accompanied population aggregation. The presence, pace and timing of economic changes in the Early Bronze Age are subjects of debate. Specialists in nucleated workshops are argued to have produced a subset of items, while other crafts continued to be produced in dispersed locations by households. Increasing specialization of ceramic production is alluded to at this time based on the production of multiple ware types (citation). Despite these suggestions for pottery, we do not fully understand the role played by specialists in other crafts or at different stages of production for a given craft type. The inaugural season of the UMD-EUP focused on the intrasite component of production, testing whether people made crafts in dispersed or nucleated contexts at al-Lajjūn. Foundational to this line of inquiry is the premise that the concentration of production will likely differ among various crafts at al-Lajj-

Table 1: Stages of Manufacturing Expected Near al-Lajjūn, Jordan. (1)

Craft Type	Expected Evidence of Production Loci
Pottery	Potential sources of clay in sediments and geological strata. Vessels damaged/bloated during firing. Ashy soil from fuel used to fire pottery. Kilns or burned earth.
Chipped stone (cutting tools – sickles, knives, scrapers)	Potential sources of chert – in nodules lodged in geological beds. Flakes characteristic of the first stages of chert tool reduction. Round hand-sized rocks used for shaping and sharpening (battering damage distinguishes these stones from non-utilized rocks).
Grinding stones (for grinding grain)	Large flakes of stone from the initial shaping of grinding stones. Round hand-sized rocks used for shaping and sharpening (battering distinguishes these stones from non-utilized rocks).
Agriculture	Terraces and check dams (previously identified in Levant) Gravel pavements and rock piles (possible)
Animal Husbandry	Stone pens (lowest course of stone – pens are used to keep sick or expecting animals safely away from the main herd..
Copper tools(2)	Ashy soil from fuel used to fire pottery (possible) Kilns or burned earth (possible) Smelting vessel fragments (possible)

(1) Limited to items that might be preserved on the surface.
(2) The location of copper production is unresolved. Copper ore is not available near al-Lajjūn so manufacturing stages should be limited to repairing broken tools and smelting ingots into finished tools.

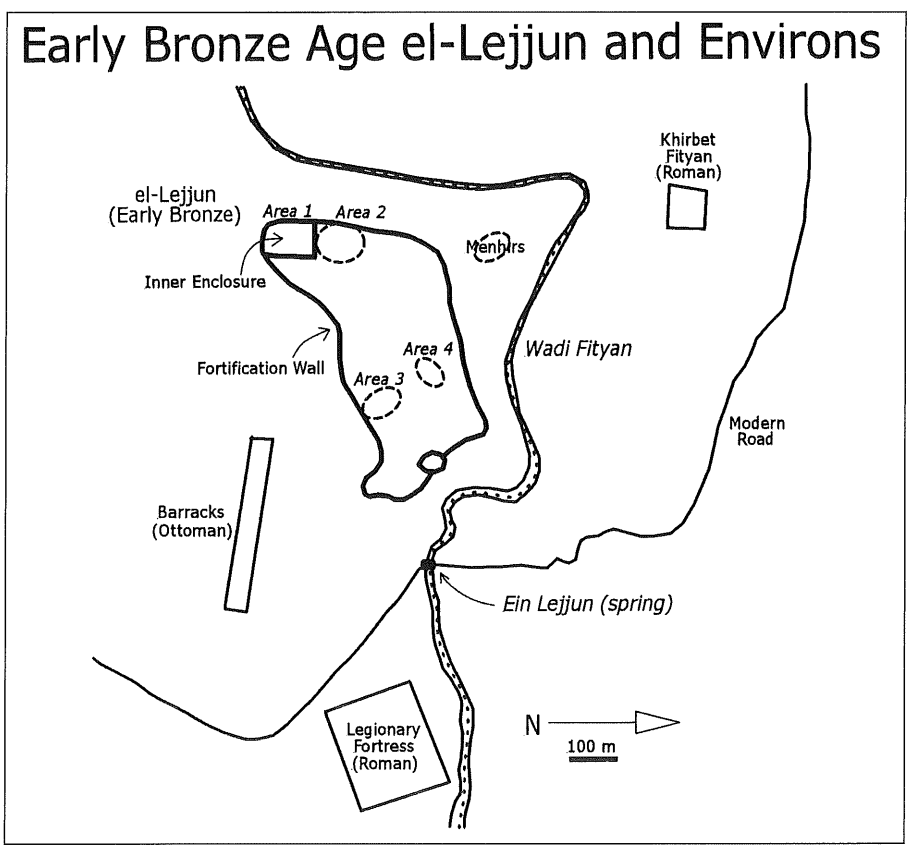
ūn or for individual stages in the production of a particular category of craft item (Costin 1991). Distinguishing between nucleated and dispersed production will allow us to specify with greater accuracy the changes in productive relationships that occurred with the Early Bronze Age population aggregation.

Location of al-Lajjūn and Archaeological Work

The environment and post-occupational history of al-Lajjūn present an opportunity to identify production loci across the landscape, as no subsequent occupation buried the site and the area today is sparsely populated and not vegetated. The town (JADIS #2307-001) is located on the Karak Plateau in south-central Jordan between modern day Karak and Qaṭrāna (UTM East: 772300, UTM North: 3459600) **(Fig. 1)**. The settlement sits atop a ridge along a precipitous drop to Wādī Fityān and near a perennial spring and small creek to the northeast **(Fig. 1)**. Current estimates of the size of al-Lajjūn vary from 14 hectares in JADIS based on previous survey estimates, to 10-11 hectares estimated by Chesson *et al.* (2005: 24) from a GPS generated map. The area has attracted settlement intermittently over the millennia as Paleolithic flints, a Roman/Byzantine legionary fortress, Ottoman period barracks and modern era burials occur in the near vicinity.

The architecture at Early Bronze Age al-Lajjūn includes a fortification system, an inner enclosure wall in the southwestern corner of the site, discontinuous wall segments and a line of 17 menhirs on the slope northwest of the site. The fortification wall is a substantial feature, preserved several courses high in sections along Wādī Fityān **(Fig. 1)**. It includes an approximately 3.00m thick stone encircling wall with a series of projecting rectangular towers. Spaced at irregular distances along the wall, the towers varied in width with two adjacent ones along the southern side of the wall measuring 7.70m and 10.40m wide. No gates were visible although erosion gullies and soil deposition obscure the wall's course along the spring side of the site.

Visible on an aerial photo (Parker 1987: fig 20, p. 189) and noted by successive archaeological teams (Albright 1934; Glueck 1934; Miller 1991; Musil 1907), the 1.00-2.50m wide inner enclosure segregates a 0.5 hectare area within



1. Map showing the area around Early Bronze Age al-Lajjūn and the location of transect survey Areas 1-4 inside the fortification wall.

the southwestern corner of the fortification wall **(Fig. 1)**. Although this feature has been referred to as the boundary of an "acropolis" (Albright 1934: 14; Glueck 1934: 44; Miller 1991: 102), determining the function of this area will require excavation to gain additional information on associated artifacts.

A number of discontinuous wall segments and rock alignments lie along the ridgeline north of the inner enclosure wall. Construction details, namely the smaller stones used and the single stone width differentiate these segments from the fortification system and inner enclosure and suggest that they may mark domestic structures.

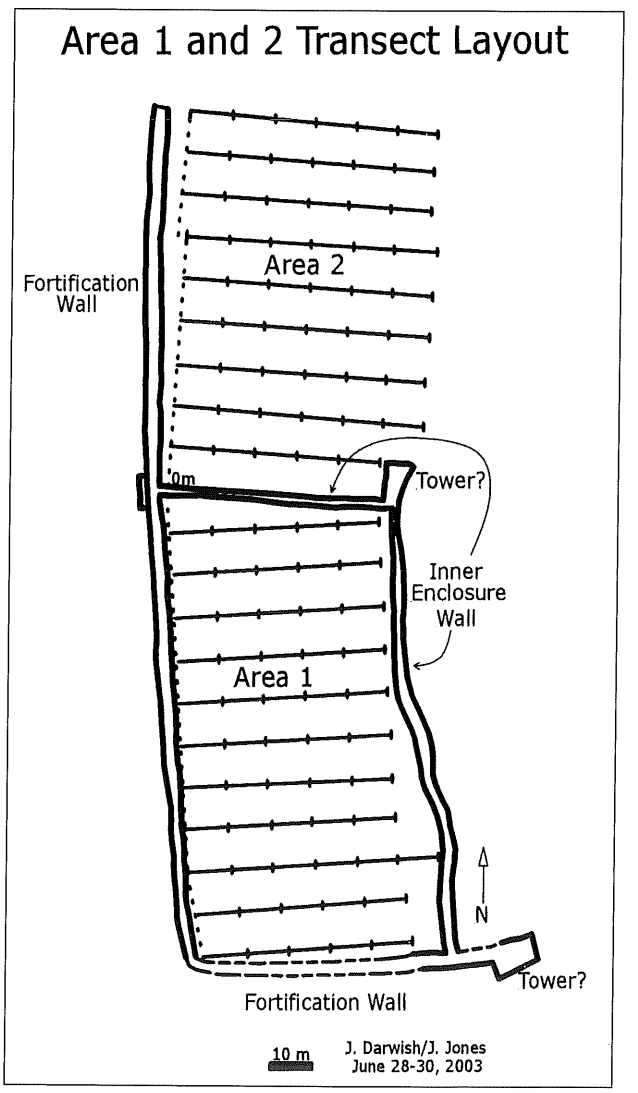
The menhir line at al-Lajjūn contains seventeen stones, 11 of which stand upright, arranged in a north-south line outside the fortification wall. Photographs of the menhirs taken during Glueck's survey show the same stones as were intact in 2003, indicating that the line has not been altered for al least eighty years (Glueck 1934: fig. 19, p. 45).

Published records of Early Bronze Age al-Lajjūn date back at least to 1896 and 1897 when Simeone Vailhe and Germer-Durand noted the menhir line and the similarity of the stones to nearby geological strata (cited in Brunnow and Domaszewski 1905: 38). Musil (1907: 36) visited the menhirs in August 1896 and professional interest continued through the years with visits from Glueck (1934), Albright (1934), Parker (sherd collecting in 1987), Miller (1991), and Chesson *et al.* (2005). The first excavation at al-Lajjūn occurred in 2000 and in three test units revealed archaeological deposits approximately 0.40-0.60m deep (Chesson *et al.* 2005). Two radiocarbon samples taken from a floor in one of the test units yielded calibrated dates in the EB II period, 3088-2919 and 2923-2884 respectively (Chesson *et al.* 2005: 30).

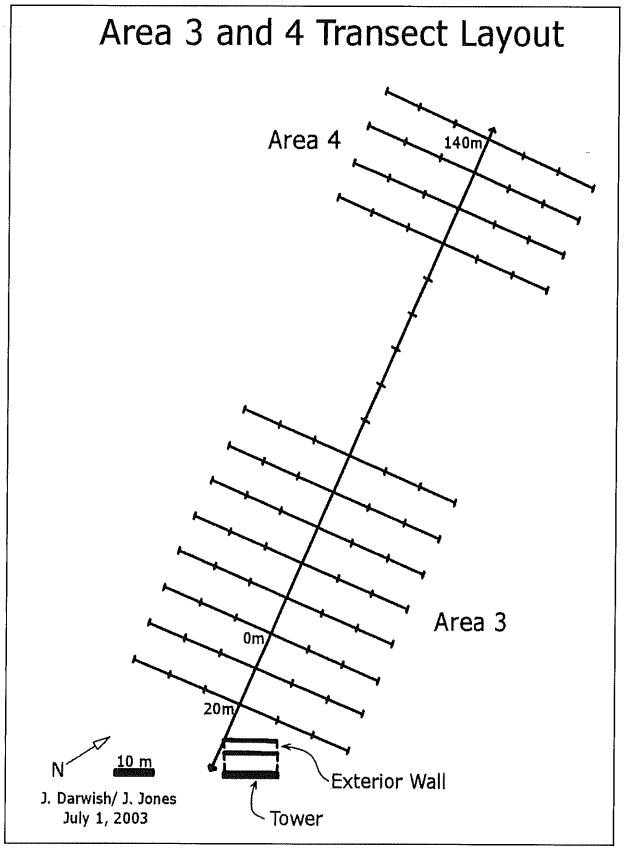
Survey Methods

The 2003 field season began with a non-random inspection of al-Lajjūn to ascertain the visibility of architecture and of ceramic, chipped stone and ground stone artifacts. Ascertaining whether production was nucleated or dispersed at the site required us to calculate artifact densities to accurately compare quantities of items across the site. To calculate these densities, we counted artifacts in four areas, numbered 1-4 **(Fig. 1)**. Areas 1 and 2, in the south western corner of the site contained a number of discontinuous and narrow stone walls, presumably from domestic structures, and contrasted with Areas 3 and 4 which had very few stone walls of any size. The size of each transect area was determined by the time allotted to the survey work.

The generally low density of artifacts on the surface, compared to other Levantine sites of this size, and the single period of occupation allowed us to count artifacts larger than 1cm in size within our survey areas. The two person planning team of myself and Department of Antiquities Representative Jihad Darwish counted on each side of transect lines spaced 10m apart, restarting our tallies at 10m intervals along each line **(Figs. 2 and 3)**. Approximately 2.5m of



2. Location and layout of survey Areas 1 and 2.



3. Location and layout of survey Areas 3 and 4.

ground was visible on either side of a given transect, yielding 50m^2 of coverage per each 10m segment. The square meters covered and an assessment of the visibility of the ground surface within each transect area are listed in **Table 2**. A total of 9,100m^2 or 6.5% - 9.1% of the surface area of this 10-14 hectare site was surveyed using these methods **(Table 2)**.

Results

We were unable to locate the surface remnants of production areas outside the town walls because later disturbances from the Roman through modern eras have altered the ground surface. The intramural deposition of artifacts likely resulted from a combination of use, disposal and production contexts. Disentangling these contexts is challenging based on surface collected material but the artifact counts indicate that certain parameters can be narrowed. For example, the lack of ceramic production debris and ground stone shaping flakes within the transect areas suggests that these items were not produced on-site and that the distribution of the artifacts present reflects a combination of use and/or disposal activities rather than production.

Pottery

Heavily eroded diagnostic and non-diagnostic sherds from utilitarian and burnished ceramics lay within the transect areas. The predominance of body sherds suggests that collecting by previous survey teams has reduced the number

Table 2: Transect Areas, Square Meters Covered, and Transect Visibility.

Area	Square meters covered	Visibility
Area 1	2800m^2 (10 transects of 50m and 1 transect of 60m * 5m of visible area)	Moderate. Ground heavily covered with stones 0.10-0.20m in size. Possible domestic architecture present.
Area 2	2700m^2 (9 transects of 60m each * 5m of visible area)	Good. Some coverage of stones 0.10m in size but less densely than Area 1. Possible domestic architecture present.
Area 3	2400m^2 (8 transects of 60m each * 5m of visible area)	Good. Some coverage of stones 0.10m in size, especially in southern half of transects. Little domestic architecture.
Area 4	1200m^2 (4 transects of 60m each * 5m of visible area)	Very good. Light coverage of naturally occurring chert gravel but few larger stones. Little domestic architecture.

of diagnostic pieces in the surface assemblage. Nearly all of the ceramics date to the Early Bronze Age, although Miller (1991) noted the presence of Early Bronze IV sherds and Chesson *et al.* (2005) identified two Iron Age II and two Byzantine sherds, one of which was Late Byzantine.

Chesson has suggested that the paste and temper of ceramics from al-Lajjūn is different from other Early Bronze Age sites she surveyed on the Karak Plateau (2005: 24). Specifically, her impression is that the fabric of pottery from al-Lajjūn is finer grained and the temper is smaller in size. If compositional testing can verify these differences, they may assist in identifying ceramic exchange on the Plateau.

No ceramic production waste was identified in the surveyed areas at al-Lajjūn. Similar densities of sherds prevailed across all of the areas. For example, the densities varied from a low of 0.22 sherds per m^2 in Area 2 to a high of 0.30 per m^2 in Area 3 **(Table 3)**.

Ground Stone

The ground stone tools within the survey transects were produced from black vesicular and non-vesicular basalt rather than the locally available fossiliferous and chert-rich limestones. Known local sources of these types of basalt include an area near Jad'a on the King's Highway, approximately 19 kilometers northwest of al-Lajjūn (Koucky 1987: 38), and flows that lie 3.5-12 kilometers west of al-Lajjūn (Shawabkeh 1991: see map insert). Ongoing compositional analysis of artifacts and samples from similar flows on the Karak Plateau will play an important role in determining the source or sources of the querns fragments at al-Lajjūn (Watts *et al.* 2004).

The size of al-Lajjūn and its location near a spring would suggest an agricultural subsistence economy, yet the only complete tools among the 120 ground stone artifacts were a hand stone and one small quern. Other intact specimens may have been scavenged from the site over the centuries, or the number of such tools at al-Lajjūn was lower than we might assume. The ground stone counts from each survey area are shown in **Table 4** with the densities transformed by multiplying by 400 to yield more comprehensible quantities. The transformed densities range from lows of 1 and 1.32 fragments per $400m^2$ in Areas 4 and 3, to highs of 4 and 12 fragments per $400m^2$ in Areas 2 and 1 respectively **(Table 4)**.

Chipped Stone

Chipped stone material including flakes, utilized flakes, flake tools, blades and debitage constituted the most abundant artifact class at al-Lajjūn. We differentiated between utilized flakes and flake tools because a large number of flakes had few or no retouch scars. For this analysis, a flake was considered utilized, rather than as a tool, if it had three or fewer retouch scars. Similar suites of cutting and scraping activities likely required both types of flakes and more retouch scars could be evidence of longer use, the need for a sharper tool or cutting harder substances. Triangular in cross section, blades represented 39% of the utilized flakes, or 150 out of a total of 381. Debitage included a range of pieces from flakes lacking a bulb of percussion to shatter.

Table 3: Count and Density of Ceramics by Area.

Area	Ceramic Count	Ceramic Density	Ceramic Density per $100m^2$
Area 1	770	$0.28/m^2$	28
Area 2	581	$0.22/m^2$	22
Area 3	711	$0.30/m^2$	30
Area 4	326	$0.27/m^2$	27
Total	2388		

Table 4: Count and Density of Ground Stone Artifacts by Area.

Area	Ground Stone Count	Ground Stone Density	Ground Stone Density per $400\ m^2$
Area 1	81	$0.29/m^2$	12
Area 2	28	$0.10/m^2$	4
Area 3	8	$0.033/m^2$	1.32
Area 4	3	$0.025/m^2$	1
Total	120		

The following analysis focuses on the density of debitage as a key indicator of the location of production. Although formation processes are difficult to specify from surface assemblages, the likelihood that debitage distributions are indicative of productive rather than disposal contexts is outlined elsewhere (Jones in press). Debitage accounts for the vast majority of chipped stone artifacts, comprising 76%-85% of the assemblage in Areas 1-4 (**Table 5**). The density of debitage was lowest in Area 1 with a transformed equivalent of 8 pieces per 100m^2 and highest in Areas 3 and 4 with 31 and 21 pieces per 100m^2 respectively (**Table 5**). The density of utilized flakes, blades and tools was low in all transect areas, equivalent to 3-7 pieces per 100m^2 (**Table 5**).

Discussion and Conclusions

Though based on surface data from a portion of al-Lajjūn, the distribution of debitage suggests that the production of chipped stone tools occurred in both dispersed and nucleated contexts. Higher densities of debitage in Areas 3 and 4 suggest that a greater intensity or duration of production in these locations was layered over a broadly based pattern of dispersed production seen across the site. Alternative possibilities include functional differences in the activities carried out within the surveyed portions of the site or chronological differences in the occupation of these areas. Testing these alternatives will require broad-scale excavations. The possibility that chipped stone tool production occurred in both nucleated and dispersed locations at al-Lajjūn caution against assuming a linear association between population aggregation and the presence of specialized craft production. Greater specification of the timing and pace of the adoption of specialized production and the variability in the degree of specialized production across a variety of crafts will require excavation at al-Lajjūn as well as material resource surveys around the site.

The Early Bronze Age site of al-Lajjūn holds considerable promise for understanding the intra-site location of production via architectural and artifact patterning. The shallow deposits identified by Chesson *et al.* (2005) may compromise the preservation of floral and faunal remains, but the lack of post-Early Bronze Age occupation will allow for the excavation of broad exposures. Future investigations into the location of craft production at the site will require different strategies for each artifact class. The initial stages of ground stone shaping likely took place in off-site areas near raw material deposits. The archaeological visibility of these locales will depend a great deal on the intensity with which stone was harvested from an individual location and on subsequent geologic depositional processes. Periodic sharpening of ground stone

Table 5: Count and Density of Chipped Stone Artifacts by Area.

Area	Count of Utilized Flakes, Blades and Flake Tools(1)	Debitage(2) Count	Total Lithic Count	Density of Utilized Flakes, Blades and Tools per 100m^2	Density of Debitage per 100m^2	Density of Total Lithics per 100m^2
Area 1	73	226	299	3	8	11
Area 2	87	369	456	3	14	17
Area 3	176	749	925	7	31	38
Area 4	45	255	300	4	21	25
Total	381	1599	1980			

(1) Blades, flake tools and utilized flakes were combined into a single category for this analysis since their distribution represents use and disposal contexts rather than production contexts.
(2) Unutilized flakes and all other debitage combined.

tools likely occurred on-site but the presence of hammerstones will not conclusively indicate the sharpening of querns since hammers are used for a variety of battering tasks. Sourcing of clay and temper may narrow down the number of locations where potters gathered these materials. Excavation may reveal evidence of wasters or ceramic production debris, but the forming and firing stages of pottery production are not apparent from the surface material. The locations of the stages of chipped stone production will be best explored by broad excavations in a variety of areas across the site and the careful analysis of debitage. In this regard, wet-screening for micro-debitage would also aid in identifying the final stages of production or tool sharpening.

Acknowledgements

This work was made possible by the gracious assistance of the Director of the Department of Antiquities Dr. Fawwaz al-Khraysheh, by my Department Representative Mr. Jihad Darwish, and by the adroit efforts of the Department of Antiquities staff in Amman. Valuable advice and intellectual contributions were made by Jane Peterson, Meredith Chesson, Michael Neeley and Jihad Kafafi. Special thanks go to Gary Rollefson for translating Musil's folklore account from the German. The field research was funded by a University of Minnesota Summer Faculty Fellowship, a McKnight Foundation Fellowship and a University of Minnesota Duluth College of Liberal Arts Faculty Development Grant. All errors and omissions are the responsibility of the author.

Jennifer E. Jones, Ph.D.
1123 University Drive
Department of Sociology-Anthropology (Cina 228)
University of Minnesota Duluth
Duluth, Minnesota 55812 USA
jejones@d.umn.edu

Bibliography

Albright, W.F.
1934 Soundings at Ader: A Bronze Age City of Moab. *BASOR* 53: 13-18.

Amiran, R. (ed).
1978 *Early Arad: The Chalcolithic Settlement and Early Bronze City, Vol 1. First-Fifth Seasons of Excavations, 1962-1966.* The Israel Exploration Society.

Betts, A.V.G.
1998 *The Harra and the Hamad: Excavations and Explorations in Eastern Jordan, Volume 1.* Sheffield Archaeological Monographs. England: Sheffield Academic Press.

Broshi, M. and Gophna, R.
1984 The Settlements and Population of Palestine During the Early Bronze Age II-III. *BASOR* 253: 41-53.
1986 Middle Bronze Age II Palestine: Its Settlements and Population. *BASOR* 261: 73-90.

Chesson, M.S.
1999 Libraries of the Dead: Early Bronze Age Charnel Houses and Social Identity at Urban Bab edh-Dhra', Jordan. *Journal of Anthropological Archaeology* 18: 137-164.

Chesson, M.S., Makarewicz, C., Kuijt, I. and Whiting, C.
2005 Results of the 1002 Kerak Plateau Survey. *BASOR* 59: 1-62.

Costin, C.L.
1991 Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production. Pp. 1-56 in M. B. Schiffer (ed.), *Archaeological Method and Theory, Vol. 3.* Arizona, Tucson: University of Arizona Press.

de Miroschedji, P.
1999 Yarmouth: The Dawn of City-States in Southern Canaan. *Near Eastern Archaeology* 62(1): 2-19.

Esse, D.L.
1991 *Subsistence, Trade, and Social Change in Early Bronze Age Palestine.* Studies in Ancient Oriental Civilization 50. Chicago, Illinois: The Oriental Institute of the University of Chicago.

Falconer, S.E.
1987 Village pottery production and exchange : a Jordan Valley perspective. Pp. 251-259 in A. Hadidi (ed.), *SHAJ III.*

Falconer, S.E. and Savage, S.H.
1995 Heartlands and Hinterlands: Alternative Trajectories of Early Urbanism in Mesopotamia and the Southern Levant. *American Antiquity* 61(1): 37-58.

Glueck, N.
1934 Explorations in Eastern Palestine, I. *AASOR* XIV: 1-113.

Gophna, R.
1995 Early Bronze Age Canaan : some spatial and demographic observations. Pp. 269-280 in T. E. Levy (ed.), *The Archaeology of Society in the Holy Land.* New York: Facts on File.

Greenberg, R.
2001 *Early Urbanizations in the Levant: A Regional Narrative.* London: Leicester University Press.

Harrison, T.P.
1997 Shifting Patterns of Settlement in Central Jordan. *BASOR* 306: 1-37.

Ibrahim, M.A., Sauer, J. A. and Yassine, K.
1976 The East Jordan Valley Survey, 1975. *BASOR* 222: 41-66.
1988 The East Jordan Valley Survey 1976 (Part Two). Pp. 189-207 in K. Yassine (ed.), *Archaeology of Jordan: Essays and Reports*. Jordan: Department of Archaeology, University of Jordan.

Joffe, A.H.
1993 *Settlement and Society in the Early Bronze I & II Southern Levant: Complementarity and Contradiction in a Small-Scale Complex Society*. (1st ed.) Monographs in Mediterranean Archaeology 4. England: Sheffield Academic Press.

Jones, J.E.
1999 *Local Ceramic Exchange in a Collapsed Early Urban Society in the Southern Levant*. Ph.D. Dissertation, Arizona State University.
2007 Craft Production and Landscape at the Early Bronze Age Settlement at el-Lejjun, Jordan. In H. Taher and S. Khouri (eds.), *SHAJ* 9. Jordan: Department of Antiquities.

Koucky, F.L.
1987 The Regional Environment. Pp. 11-40 in S. T. Parker (ed.), *The Roman Frontier in Central Jordan: Interim Report on the Limes Arabicus Project*. Biblical Archaeological Research International Series. vol. No. 340(i).

Mabry, J. and Palumbo, G.
1988 The 1987 Wadi el-Yabis Survey. *ADAJ* 32: 275-305.

Mattingly, G.L.
1996 Al-Karak Resources Project 1995: A Preliminary Report on the Pilot Season. *ADAJ* 40: 349-368.

Miller, J.M. (ed.)
1991 *Archaeological Survey of the Kerak Plateau*. No. 1. Atlanta, Georgia: Scholars Press.

Musil, A.
1907 *Arabia Petraea, Vol 1: Moab*, Germany.

Palumbo, G.
2001 The Early Bronze Age IV. Pp. 233-269 in B. MacDonald, R. Adams and P. Bienkowski (eds.), *The Archaeology of Jordan*. Levantine Archaeology I, R. Adams and Y. Goren, general editor. England, Sheffield: Sheffield Academic Press.

Palumbo, G., Mabry, J. and Kuijt, I.
1990 The Wadi al-Yabis survey report on the 1989 field season. *ADAJ* 34: 95-118.

Parker, S.T. (ed.)
1987 *The Roman Frontier in Central Jordan: Interim Report on the Limes Arabicus Project, 1980-1985*. No. 340(i). London: Biblical Archaeological Research.

Philip, G.
2001 The Early Bronze I-III Ages. Pp. 163-232 in B. MacDonald, R. Adams and P. Bienkowski (eds.), *The Archaeology of Jordan*. Levantine Archaeology I, R. Adams and Y. Goren, general editor. England, Sheffield: Sheffield Academic Press.

Rast, W.E. and Schaub, R.T.
2003 *Bab edh-Dhra: Excavations at the Town Site (1975-1981) Part I: Text*. Eisenbrauns: Winona Lake, Indiana.

Schaub, R.T.
1987 Ceramic Vessels as Evidence for Trade Communications During the Early Bronze Age. Pp. 247-250 in A. Hadidi (ed.), *SHAJ III*. Department of Antiquities: Amman, Jordan.

Shawabkeh, K.
1991 *The Geology of the Adir Area: Map Sheet No. 3152 II*. The Hashemite Kingdom of Jordan, Ministry of Energy and Mineral resources, Natural Resources Authority, Geology Directorate, Geological Mapping Division, Amman, Jordan.

Watts, B.G., Bennett, M.E.I., Kopp, O.C. and Mattingly, G.L.
2004 Geochemistry and Petrography of Basalt Grindstones from the Karak Plateau, Central Jordan. *Geoarchaeology* 19(1): 47-69.