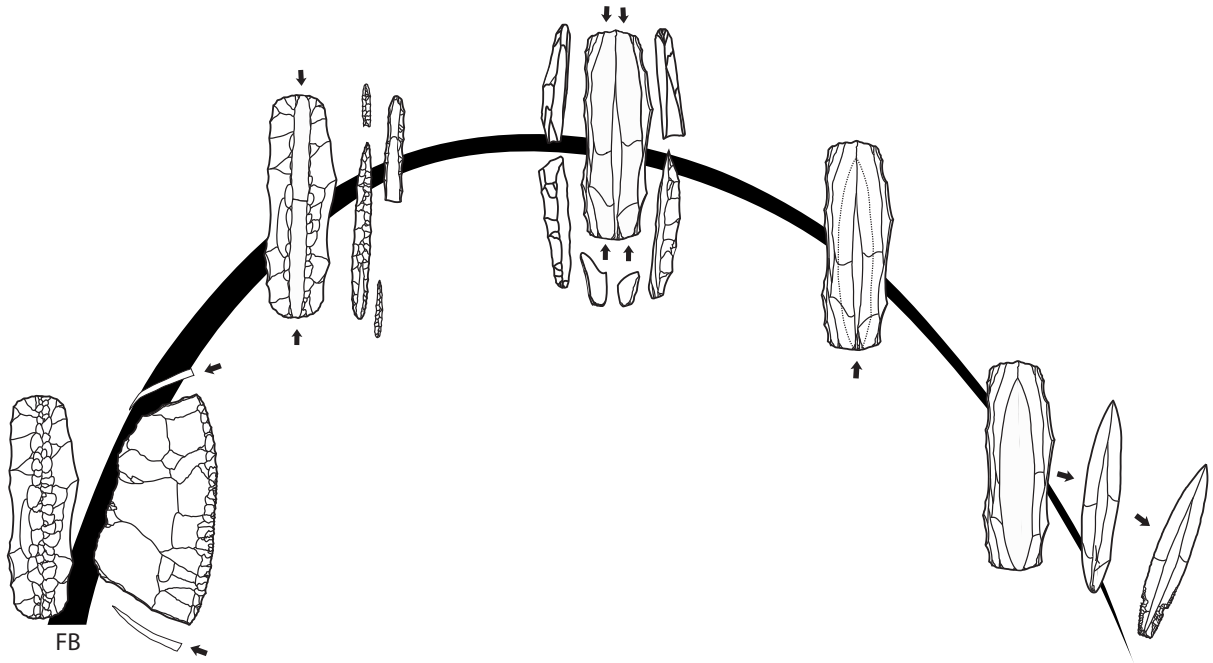
STUDIES IN MEDITERRANEAN ARCHAEOLOGY
VOL. CL

NEAR EASTERN LITHIC TECHNOLOGIES ON THE MOVE. INTERACTIONS AND CONTEXTS IN NEOLITHIC TRADITIONS

8th International Conference on PPN Chipped and Ground Stone Industries of the Near East, Nicosia, November 23rd–27th 2016

edited by

Laurence Astruc, Carole McCartney, François Briois and Vasiliki Kassianidou



ASTROM EDITIONS
NICOSIA 2019

STUDIES IN MEDITERRANEAN ARCHAEOLOGY

Volume CL

Founded by Paul Åström

Cover image: Parekklisha *Shillourokambos,* Cypro-PPNB bipolar blade core technology (drawing by F. Briois)

Published by Astrom Editions
Banérg 25 SE 752 37
Uppsala, Sweden
www.astromeditions.com

ISSN: 0081-8232
ISBN 978-9925-7455-3-1
Print: Bulls Graphics, Halmstad

This volume is dedicated to the late
Nikolaï Ottovitch Bader, Nur Balkan-Atlı, Edgar Peltenburg and Klaus Schmit

The opportunity to hear about ongoing field-work and new discoveries in parts of the Middle East—in spite of the devastation occurring elsewhere. Like our recently departed colleagues, whom we miss, we are united by a passion for prehistory. The PPN8 participants expressed this passion by reaching across ideological boundaries to share data, debate concepts and join in reveries that allow us to preserve the best of what makes the Near East so special to all of us.

Contents

Lithics in social and economic contexts

Technology and specialisation

Innovative stone technologies in the development of agricultural practices

Continuities and discontinuities

Interactions and diffusion beyond the PPN

19
Socio-economic changes in flint production and consumption among the PPNB lithic economies of the Greater Petra Region, Southern Levant

Christoph Purschwitz

Abstract

This contribution is the summary of a PhD dissertation submitted by the author at Free University of Berlin (Purschwitz 2017) and comprises the major results of the chipped lithic analysis from five sites: Ail 4, Ba'ja, Basta, Beidha and Shkârat Msaied. All sites are situated in the relatively confined Greater Petra Region (Southern Levant) and provide occupational layers of early to late PPNB (ca 8800–6900 cal. BC). Almost 16,000 lithic artefacts from various contexts were analysed to study the conditions and organisation of PPNB lithic production and consumption at the household level. A second major focus was the reconstruction of the lithic economy of each site. The lithic economy approach used here includes the complete process of lithic production and consumption including raw material procurement, production of blanks, blank modification and their use as tools, and the circulation of raw materials and products. Each of these aspects is illustrated by selected data sets.

Major changes in the organisation of flint production and blank consumption are indicated with the emergence of the large mega-sites during the late PPNB. A larger number of bidirectional blade consuming households were found in relation to a few producing workshops. These workshops operated beyond household sustenance and may have produced at a regional supply level. Households which may have had restricted access to the late PPNB bidirectional blade network responded with self-supply strategies by using alternative blade technologies. This phenomenon or 'technological dualism' between inter-site production and household consumption rises with increasing specialisation in crafts and comprises all stages of production from raw material procurement to exchange.

It is argued here that the emergence of the dualistic lithic economies in the Greater Petra Region was affected by changes in the household network structure. While middle PPNB sites of the Greater Petra Region are small and only seasonally used, late PPNB mega-sites can be huge and appear to have been permanently occupied by several hundreds to thousands of inhabitants. The personal networks (i.e. family, relatives, friends) of a middle PPNB household are likely to be distributed over several somewhat distant sites, while the personal network of a late PPNB household appears to be restricted to the mega-site itself. Additionally, it is suggested that at mega-sites (such as Basta) an increasing number of inhabitants were not able to share the households' personal networks and that socially distant households may not have maintained social relations with each other.

Introduction

This contribution is the summary of a PhD dissertation submitted by the author to the Free University of Berlin (Purschwitz 2017) and comprises the major results of the chipped lithic analysis from five PPNB sites: 'Ail 4, Ba'ja, Basta, Beidha and Shkârat Msaied. All sites are located in a relatively confined region, referred to as the Greater Petra Region (**Fig. 1**).

The Greater Petra Region is located in the southern Levant some 70km southeast of the Dead Sea basin and comprises an area of about 40km by 45–50km. The region is characterised by numerous, often small-scale landscapes, which are (from west to east): the eastern Negev, the Wadi Araba, the eastern Rift Mountains, the Petra Sandstone Shelf, the Limestone Escarpment with the Shara-Mountains and the Jordanian Plateau. The different topographical, climatic, hydrological and geological conditions allow for an extreme diversity of faunal, floral and mineral resources within the regional site catchment areas (cf. Purschwitz 2017 and this volume, chapter 18).

The continuing investigation of the Greater Petra Region started more than 70 years ago. Several large-scale excavations have been carried out at Pre-Pottery Neolithic B (hereafter PPNB, ca 8800–6900 cal. BC) key sites such as Beidha, Basta, Ba'ja and Shkârat Msaied (Kirkbride 1966; Gebel *et al*. 1997; Nissen *et al*. 2004; Byrd 2005; Jensen *et al*. 2005; Gebel *et al*. 2006b; Kinzel 2013). This outstanding amount of research makes the Greater Petra Region an ideal study ground for the investigation of socio-economic developments which

From *SIMA* 150. L. Astruc, C. McCartney, F. Briois, V. Kassianidou (eds), *Near Eastern Lithic Technologies on the Move. Interactions and Contexts in Neolithic Traditions*
 ISBN 978-9925-7455-3-1

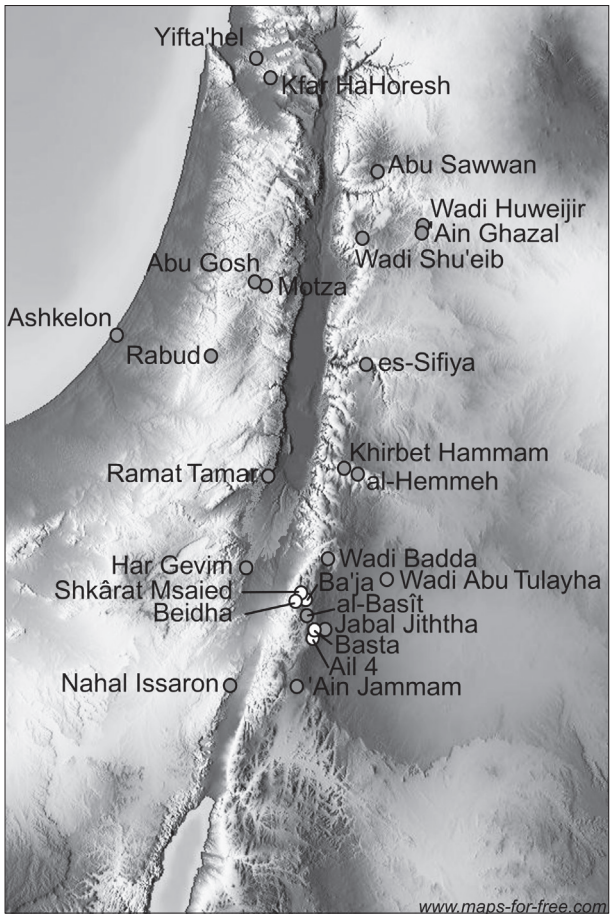


Figure 1. The Southern Levant with the location of the Greater Petra Region and the sites mentioned in the text

took place during the late 9th to early 7th millennium cal. BC.

Not much is known about the early PPNB (hereafter EPPNB, ca 8800–8300 cal. BC) of the region. However, recent research demonstrates the existence of an EPPNB phase in the Southern Levant, although the PPNA/PPNB transition as well as the mechanism of EPPNB distribution is still being debated (see Fujii *et al*., Rokitta-Krumnow and Smith *et al*. this volume). In the Greater Petra Region, there are a few sites with possible EPPNB occupation such as Ail 4 and Sabra 1, which remain unexcavated except for a small sounding at Sabra (Gebel 1988).

The middle PPNB (hereafter MPPNB, ca 8300–7500 cal. BC) is well represented by the sites of Beidha and Shkârat Msaied. Both sites are small and measure between 1000 and 2000m^2, and the majority of both sites have been excavated (Byrd 2005; Jensen *et al*. 2005; Kinzel 2013). These small villages are characterised by circular buildings, which cluster around courtyards and open spaces. Several findings, such as blocked entrances, comprehensive tool inventories as well as shortages in water sources at Shkârat Msaied, indicate a seasonal occupation, most likely during spring and early summer (Jensen *et al.* 2005: 131–132; Bangsgaard 2008).

The transition between the MPPNB and the late PPNB of the Greater Petra Region is marked by significant social changes due to increasing sedentariness and crowding. The late PPNB sites (hereafter LPPNB, ca 7500–6900 cal. BC) such as Basta, al-Basit and 'Ain Jammam are seen as permanently occupied mega-sites (Nissen *et al*. 2004; Gebel *et al*. 2006b). These mega-sites often are founded on slopes. They provide evidence of an extremely compact, often multi-storied architecture without open spaces or alleys between individual buildings (Gebel 2006; Kinzel 2013). Mega-sites such as Basta or 'Ain Ghazal occupy more than 5ha and are assumed to have had from hundreds to several thousands of inhabitants (e.g. Kuijt 2000; Nissen *et al*. 2004: 16; Bienert *et al*. 2004; Gebel *et al*. 2006b: 215).

Almost 16,000 chipped lithic artefacts from 12 samples of five PPNB sites (Ail 4, Basta, Ba'ja, Beidha, and Shkârat Msaied) were analysed to study the conditions of PPNB lithic production and consumption (Purschwitz 2017). The sites are situated in different geological settings: Beidha, Ba'ja and Shkârat Msaied are located in the Petra Sandstone Shelf, while Basta and Ail 4 are situated on the Jordanian (limestone) Plateau. Additionally, samples of different production modes were chosen for the analysis (**Table 1**). These include contexts of domestic flint production as well as dumps of specialised blade workshops or blade caches. The diversity of contexts provided the basis for the reconstruction of the lithic site economies. The lithic economy includes the complete process of lithic production and consumption, starting with the raw material procurement, the production of blanks, blank modification and their use as tools, and the circulation of raw materials or products (**Fig. 2**). This contribution is aimed at presenting a summary of the development of the lithic economies of the Greater Petra Region from selected data sets (for the full data sets see Purschwitz 2017) and discussing factors that may have been involved in these socio-economic changes that are indicated by the late PPNB.

On the organisation of lithic production, PPNB technological dualism, Neolithic trade and social networks

It is commonly acknowledged that the analysis of the conditions and organisation of production, craftsmanship and specialisation is an important key to understanding the economic settings and structure of human societies (e.g. Brumfiel & Earle 1987; Costin 1991; Clark 1995). Many concepts used to characterise past economies have been proposed, of which Costin's (1991) approach is considered here as the most applicable. Costin categorises the organisation of prehistoric production according to four key variables: context, concentration, scale and intensity of

Site		Period	Count	Socio-economic context
Ail 4	Surface	EPPNB	953	Surface sample (unsystematic)
Shkârat Msaied	Unit U	MPPNB	1.921	Domestic building, dump of lithic household production
	Unit K	MPPNB	779	Domestic building, dump of lithic household production
	Loc. 90307	MPPNB	3.739	Pit, complete reduction sequence of 9–11 bidirectional blade cores
Beidha	Phase A	MPPNB	791	Assemblage
	Phase B	MPPNB	1.082	Assemblage, but predominantly dumps of lithic household production
	Phase C	LPPNB	569	Assemblage
Basta	Sondage 1	LPPNB	2.527	Exterior garbage zone, dump of bidirectional blade production
	Loc. A5:5	LPPNB	160	Random sample of 160 blades, dump of bidirectional blade workshop
Ba'ja	Building BI	LPPNB	2.278	Domestic building, dump of adjacent buildings (household production)
	Building BIII	LPPNB	1.157	Domestic building, dump of adjacent buildings (household production)
	Loc. B74:2	LPPNB	34	Blade cache (imported)
			15.990	

Table 1. Sites and samples of the lithic analysis

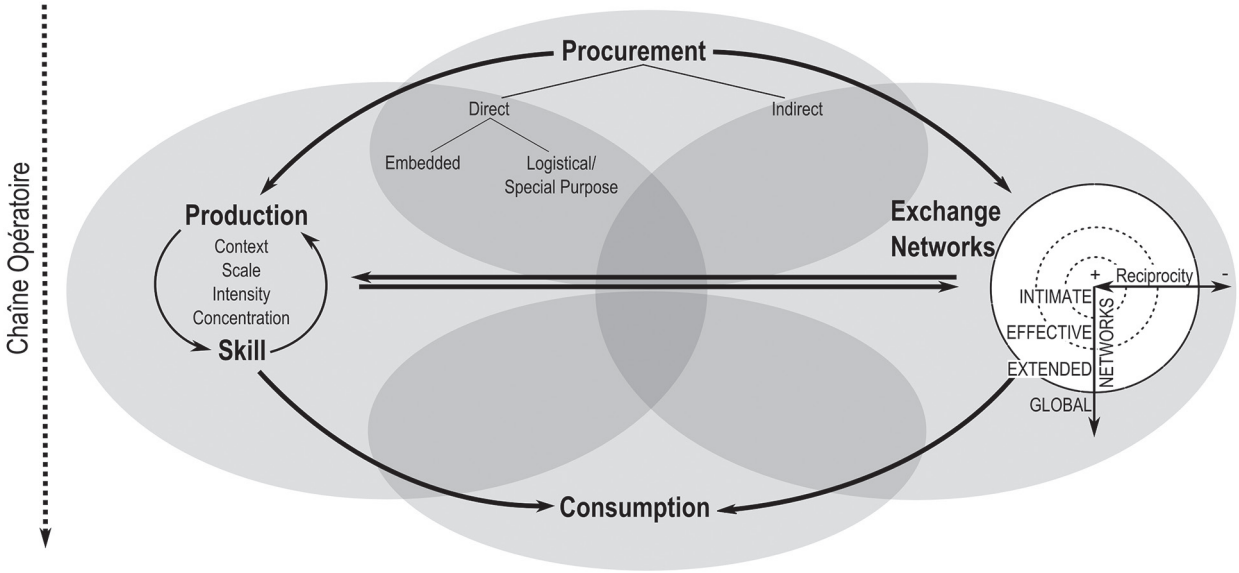


Figure 2. Socioeconomic organisation of lithic economy

production. These variables can be analysed by direct and indirect evidence to infer specific production modes and degrees of specialisation (cf. Costin 1991). Costin's approach has been supplemented over the years by other important findings, such as concepts of skill (e.g. Andrews 2006; Bamforth & Finlay 2008; Bernbeck 2010), knowledge and know-how (e.g. Pelegrin 1990; Ingold 2000) or communities of practice (Lave & Wenger 1991; Wenger 1998). These concepts of social and technological reproduction and the importance of technologies within everyday life and daily praxis are key variables for the reconstruction of the settings of prehistoric production.

The term 'PPNB technological dualism' was introduced by Quintero (2010: 149–151; see also Gebel 2013: 201–203) to describe the dichotomy between specialised production and generalised household production at PPNB 'Ain Ghazal. This dichotomy in lithic production, which is also reported from other regions of the Southern Levant (e.g. Gebel 2004b), is marked by the (part-time) craft specialisation (of a few workshops) for the production of very standardised (bidirectional) blade blanks that is in contrast to generalised household production. The generalised household production instead focuses on the (*ad hoc*) production of tools and the reduction of non-formalised (i.e. non-bidirectional) blade cores and flake cores. The technological dualism in lithic production is not a unique phenomenon of the PPNB—it is well attested in the Levant among post-PPNB farming communities of the 7th millennium cal. BC (Barzilai & Garfinkel 2006; Rokitta-Krumnow 2011, 2013; Barzilai

2013; Borrell & Khalaily 2016; Borrell *et al*. this volume, chapter 33) and among the early urban centres of the Chalcolithic/Early Bronze Age (e.g. Rosen 1997). This dichotomy between specialised production (shown by the number of workshops and production intensity) and *ad hoc* household production rises with increasing social complexity (Purschwitz 2017).

Another key element within the lithic economy is exchange and exchange networks. Exchange may include raw materials as well as blanks or finished products, or even technological knowledge. The existence of trade among early Neolithic societies is highly debated and rejected by most researchers (e.g. Torrence 1986; Bar-Yosef & Belfer-Cohen 1989; Zimmermann 1995; *contra* Gebel 2010, 2013). However, there is consensus that prehistoric exchange was based on social actions and actors, who may have had different motivations for exchanging things and ideas. As the motivation for the distribution or non-distribution of artefacts, technologies or ideas is hard to determine, it appears more useful to focus on the social agents on which the distribution is based. An interesting approach to the study of social interaction networks is provided by Gamble (1998; cf. Watkins 2008), who considers the social and spatial distances of the people and networks involved in the exchange. Based on the social network theory of Turner and Maryanski (1991), Gamble assumes that social networks were formed and maintained by emotional, material and symbolic ties between the actors. According to family relations and social distance, Gamble distinguishes four network types: the intimate, the effective, the extended and the global network. The intimate network is very small and includes only very close relatives. This relationship network is characterised by everyday interaction and often comprises less than ten people. The effective network includes friends and close acquaintances in daily life, and the average size is around 20 persons. The extended network includes acquaintances and persons with occasional contact, such as friends of friends. The average size is between 100 and 400 persons. In addition to these three networks, there is a global network which includes social interaction with unknown actors. Furthermore, Gamble assumes that there are archaeological correlations for the emotional, material and symbolic relationships, and that the exchange mechanisms between the actors differ according to social distance. He assumes that the reciprocity tends to shift from a general one (mutual giving and receiving without goods and services having to be balanced) in favour of a balanced or even a negative reciprocity (unbalanced exchange, the attempt to get something for nothing) the larger the social distance between the actors becomes (cf. already Sahlins 1972; see also Benz 2010).

Raw material procurement

Lithic raw material procurement strategies differ according to the degree of sedentariness or mobility and according to raw material availability in the site catchment area (**Table 2**, **Fig. 3**). There are clear differences in flint raw material procurement strategies between the MPPNB sites of the Petra Sandstone Shelf (i.e. Beidha Phases A and B; Shkârat Msaied) and PPNB sites of the limestone plateau (i.e. Ail 4 and Basta).

As a general feature of the lithic economy, the importance of local resources rises with increasing sedentariness during the LPPNB. On the limestone plateau the use of locally available Flint Raw Material Groups (hereafter FRMG) increases from 69% in EPPNB Ail 4 to almost 82% in LPPNB Basta. On

	'Ail 4	Shkârat Msaied[a]	Beidha A	Beidha B	Beidha C	Basta S1	Ba'ja
flint sources (all primary products)							
Local supply (0–4h)	**69.2 %**	**26.3 %**	**42.0 %**	**35.5 %**	**26.1 %**	**81.7 %**	**72.3 %**
Non-local supply (4–10h)	**0 %**	**16.6 %**	**10.2 %**	**4.1 %**	**11.6 %**	**0 %**	**19.6 %**
Non-local supply (<10h)	**30.8 %**	**57.1 %**	**47.8 %**	**60.4 %**	**62.3 %**	**18.3 %**	**8.1 %**
ground stone tools							
Local supply (0–4h)	**n.d.**	**82.1[e] %**	**88.8 %[b]**	**88.8 %[b]**	**88.8 %[b]**	**97.8 %[c]**	**>98[d] %**
Non-local supply (>10h)	**n.d.**	**17.9[e] %**	**11.2 %[b]**	**11.2 %[b]**	**11.2 %[b]**	**2.2 %[c]**	**< 2[d] %**

[a] Data includes samples of Unit U and Unit K
[b] Data not distinguished according to Phases (Wright 1992: tables 5–12)
[c] Data from Area A (Muheisen *et al*. 2004)
[d] after Wright in Gebel, Bienert *et al*. 1997
[e] after Harpelund 2010

Table 2. Raw material use according to distance of closest source area

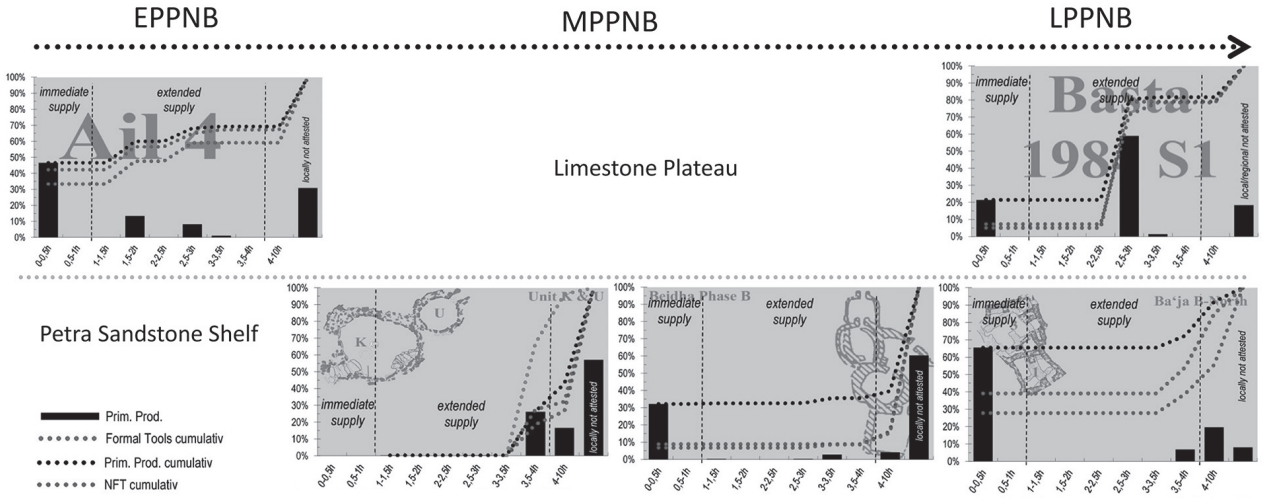


Figure 3. Raw material procurement patterns according to distance of closest source area

the sandstone shelf, the proportion of local FRMG increases from 26 to 42% during the MPPNB, to more than 72% in the LPPNB. Conversely, there is a marked decline in non-local FRMG. On the limestone plateau, the proportion of raw materials outside the 10ha site catchment area declines from 30% in Ail 4 to 18% in Basta. In the area of the sandstone shelf such non-local flints decrease from about 60% in Shkârat Msaied and Beidha Phase B to only about 8% in Ba'ja. A very similar development is shown for the raw materials of ground stone tools. There is a clear rise in local raw materials, while the importance of non-local raw materials decreases from 18% in MPPNB Shkârat Msaied to around 2% in LPPNB Basta and Ba'ja (**Table 2**).

The analysis of natural surfaces shows different modes of flint source exploitation (**Table 3**, **Fig. 4**). Secondary sources, such as wadi deposits, were often used in domestic production contexts for non-bidirectional blank production. Surfaces of bidirectional blade products instead are predominantly characterised by primary cortex and indicate the exploitation of primary flint deposits. Whether or not mining was carried out in the region is not fully clear, since systematic surveys of potential primary resource areas are generally missing (cf. Purschwitz this volume, chapter 18). However, the Southern Levantine flint mines and procurement sites of Har Gevim (Gopher & Barkai 2011), Mztpe Ramon (Oron *et al*. this volume), Ramat Tamar (Schyle 2007), Jabal Jiththa (Muheisen *et al.* 2004) or Wadi Huweijir (Quintero 2010), discovered in recent years, clearly suggest that additional efforts in raw material procurement were a common PPNB strategy to obtain specific (i.e. high-quality) flint raw materials.

Organisation of blank production and tool production

Major changes in the organisation of flint production and blank consumption are in evidence through the emergence of the large mega-sites during the LPPNB. An increasing number of bidirectional blade consuming households were found in relation to a

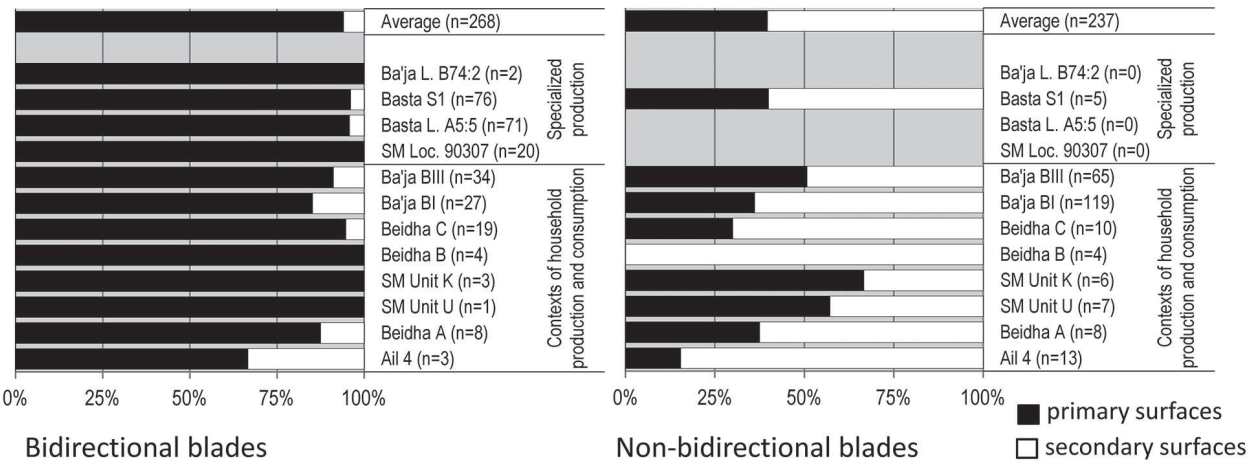


Figure 4. Surface features of blades according to production context

		Ail 4	**Beidha A**	**SM Loc. 90307**	**SM Unit U**	**SM Unit K**	**Beidha B**	**Beidha C**	**Basta A5:5**	**Basta S1**	**Ba'ja B74:2**	**Ba'ja BI**	**Ba'ja BIII**	**Total**
	Production context	Unspecific	Unspecific	Small workshop, household operated, producing for local/ community consumption	Household production, self-sufficient	Household production, self-sufficient	Primarily household production, self-sufficient	Unspecific	Large (nucleated?) workshop, household operated (?) production for regional consumption	Large (nucleated?) workshop, household operated (?) production for regional consumption	Blade cache, imported	Household production, self-sufficient; blanks partly imported	Household production, self-sufficient; blanks partly imported	
Bidir. blades	No. of blades with nat. surf.	3	8	20	1	3	4	19	71	76	2	27	34	**268**
	Primary cortex	2	7	20	1	3	4	18	68	73	2	23	31	**252**
	Secondary surfaces	1	1	0	0	0	0	1	3	3	0	4	3	**16**
	Primary cortex (%)	*66.7%*	*87.5%*	*100%*	*100%*	*100%*	*100%*	*94.7%*	*95.8%*	*96.1%*	*100%*	*85.2%*	*91.2%*	***94.0%***
	Secondary surfaces (%)	*33.3%*	*12.5%*	*0%*	*0%*	*0%*	*0%*	*5.3%*	*4.2%*	*3.9%*	*0%*	*14.8%*	*8.8%*	***6.0%***
Non-bidir. blades	No. of blades with nat. surf.	13	8	8	7	6	4	10		5		119	65	**237**
	Primary cortex	2	3	7	4	4	0	3		2		43	33	**94**
	Secondary surfaces	11	5	1	3	2	4	7		3		76	32	**143**
	Primary cortex (%)	*15.4%*	*37.5%*	*87.5%*	*57.1%*	*66.7%*	*0%*	*30.0%*		*40.0%*		*36.1%*	*50.8%*	***39.7%***
	Secondary surfaces (%)	*84.6%*	*62.5%*	*12.5%*	*42.9%*	*33.3%*	*100%*	*70.0%*		*60.0%*		*63.9%*	*49.2%*	***60.3%***

Table 3. Surface features of blades according to production context

few producing workshops, which operated beyond local demand and produced on a regional supply level. Households which had restricted access to the LPPNB bidirectional blade network responded with self-supply strategies by using alternative blank technologies for blank production (i.e. non-bidirectional blade or flake technology). This phenomenon, or 'technological dualism' between intra-site production and household consumption, rises with increasing craft specialisation, and comprises all levels of production from raw material procurement to exchange.

In the MPPNB sites of Shkârat Msaied and Beidha lithic production is generally part of every household. However, evidence from Shkârat Msaied suggests that bidirectional blade production was not practised by each household to the same extent. The pit Loc. 90307 illustrates how some households produced blade blanks beyond the requirement (cf. Purschwitz this volume, chapter 25). However, the blade surplus of some ten or 11 core reductions is quite low and may not have exceeded community demand. The mode of production is best characterised as individual household specialisation, since there is (through extensive excavation) no evidence of other on-site bidirectional blade workshops at Shkârat Msaied. The processing of raw materials during the E/MPPNB was carried out in a time-consuming way. This is seen by the preferred use of non-local raw materials, thermal raw material treatment to improve the flaking ability and a very meticulous way of platform preparation and trimming (Purschwitz 2017 and this volume, chapter 25). The bidirectional blades are extraordinarily standardised and can therefore be processed into the entire spectrum of blade tools. The bar graphs for widths of bidirectional blades from Shkârat Msaied (Loc. 90307) and Beidha Phase A show a classic unimodal distribution, with blade widths between 9 and 13mm (**Fig. 5**).

The organisational patterns of the LPPNB mega-site lithic economies vary and the lithic dualism increases significantly. Instead of a few dozen reduced bidirectional blade cores, there are hundreds of reduction sequences in evidence at the Basta workshops. The productivity rises from a few hundred, to thousands or tens of thousands of blade blanks per workshop. At Basta, these workshops obviously concentrate in specific quarters and were assumed to have produced for regional consumption (cf. Purschwitz this volume, chapter 18). The core reduction becomes more efficient and core management was optimised. Local raw materials, such as Jiththa-Flint, were preferred. Due to its tabular shape, Jiththa-Flint requires minimal core preparation and allowed for an optimal yield of very standardised blades. The core reduction at Basta appears very uniform and deviations from the standard procedure are rarely found. There is no evidence of time-consuming thermal treatment. Moreover, blades of Jiththa-Flint at Beidha C and Ba'ja illustrate the regional trajectory of the Basta surplus production (Purschwitz 2017: 222–224). However, the idea of

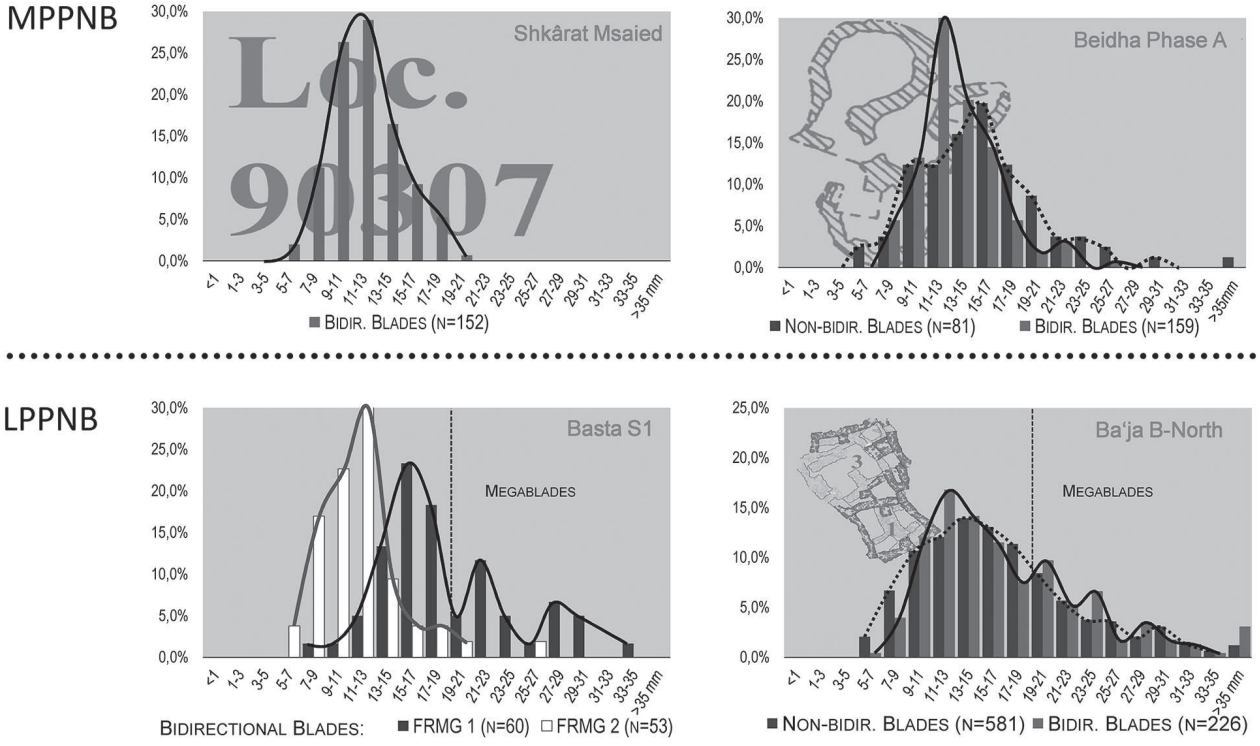


Figure 5. Selected bar charts, widths of bidirectional and non-bidirectional blades from Shkârat Msaied, Beidha, Basta, and Ba'ja

'community specialisation' at Basta as suggested by some researchers (Barzilai 2010: 130; Gebel 2004a: 10), is not fully supported by the evidence. Although Basta obviously functioned as a regional centre of bidirectional blade technology, the majority of the households did not participate in bidirectional blade production and relied on alternative non-bidirectional blade production strategies. Interestingly, the changes in craft organisation were accompanied by changes in products. Instead of one size class of blades (as in evidence in the MPPNB) the LPPNB blade samples of Ba'ja and Basta clearly show at least three (if not four) different size classes. At the Basta workshops, these blade classes correspond well to different raw materials: Jiththa-Flint (tabular FRMG 2, cf. Purschwitz this volume, chapter 18) was used for narrow blades or bladelets, while FRMG 1 prevailed among wider blades and mega-blades (**Fig. 5**).

Blade consumption

The place for blade consumption and tool production appears to be the household. This is well attested through the common association of by-products from tooling or retooling activities (i.e. burin spalls, transversal spalls) with domestic garbage (Purschwitz 2017; see also Quintero & Hintzman 2007; Barket 2013). There was no difference between MPPNB and LPPNB households.

Tool production activities were not restricted to the household level. Evidence of tool production was also found among the dumps of specialised workshops (e.g. Basta S1, Purschwitz 2017: 222; see also Quintero 2010). However, tool production within workshops of specialised production often may not have been only for blade manufacturing itself but may simply represent a self-supply strategy for tools that were needed in other production processes (such as drills in a bead production workshop, e.g. Jensen 2008).

The preferred blanks for blade tool production are bidirectional blades. This conclusion was supported by all samples investigated. This evidence included even contexts such as Ba'ja BI and BIII, where only alternative methods of blank production, such as non-bidirectional blade technology, were practiced (Purschwitz 2013). The increased number of blade classes, from a single size class in the MPPNB to at least three size classes in the LPPNB, is linked to tool requirements. While MPPNB blades can be modified in any blade tool class, the three size classes of the LPPNB are only used for specific tools (**Fig. 6**). Drills, for example, were predominantly made on bladelets or small blades, while blade daggers used long, wide and thick mega-blades. A close correlation between tool class and blank metrics similarly pertained to scrapers, projectiles, sickle implements and cutting tools (Purschwitz 2017: 276–278).

Exchange networks

The exchange of flint blades or tools is difficult to estimate and is in evidence only for a few tool classes. One good example are the very rare bifacial daggers, which first occur in the LPPNB. Also, projectile points appear to have been exchanged. This is indicated by a wide spectrum of non-local raw materials, as well as the presence of non-local retouching techniques and styles, such as the characteristic Abu-Gosh retouch.

Nevertheless, supra-regional exchange networks must have played an important role during the MPPNB. Numerous non-local materials and minerals, such as molluscs, asphalt, turquoise, copper oxides, Dabba marble, soapstone, pumice and others, were found at Beidha and Shkârat Msaied (Wright 1992; Maier 2007; Harpelund 2011). Their geological distribution suggests their circulation on a general north-south axis. However, the extent to which the flint artefacts found or processed at Beidha or Shkârat Msaied may have been involved in these far-reaching networks is difficult to assess. Some projectiles with Abu-Gosh retouch at Beidha Phase B may point to areas west of the Dead Sea (Purschwitz 2017). Nevertheless, flint networks may have been an important contribution to the raw material and blank supply during the MPPNB. Barzilai (2010: 154–156) assumes the existence of several of these networks. The most extensive one is the purple flint network of the E/MPPNB. Blade blanks of purple flint, which were produced in the Jordanian Highlands (e.g. 'Ain Ghazal, Wadi Shu'eib, Abu Sawwan) were distributed to sites northwest of the Dead Sea (e.g. Yifta'hel, Kfar HaHoresh, Beisamoun, Abu Gosh, Motza). To what extent the Greater Petra Region was involved in the purple flint network is unclear. Purple/pinkish flints (FRMG 25, cf. Purschwitz this volume, chapter 18) are a common component among the FRMG used at Beidha and Shkârat Msaied. However, at both sites the majority appear to have obtained the pinkish hues through intentional or accidental heat treatment of FRMG 6 (Purschwitz 2017: 99). Additionally, no purple/pink flints characteristic of the flint quarries of 'Ain Ghazal at Wadi Huweijir (Rollefson *et al.* 2007; Quintero 2010) have been noted among the analysed samples from either site. A second network of regional scale was reconstructed by Barzilai (2010) around Yifta'hel. Blades and tools of HaSollelim-Flint were produced at Yifta'hel and distributed to adjacent sites, and a third network may have existed for the hunters of the Negev, with projectiles and other tools circulated between summer and winter stations.

The large permanent settlements of the LPPNB show various exchange networks (Purschwitz 2017: 278–285). Tools and objects of daily use were primarily produced from locally available raw materials and circulated on a regional level between adjacent settlements. These north-south-oriented networks of

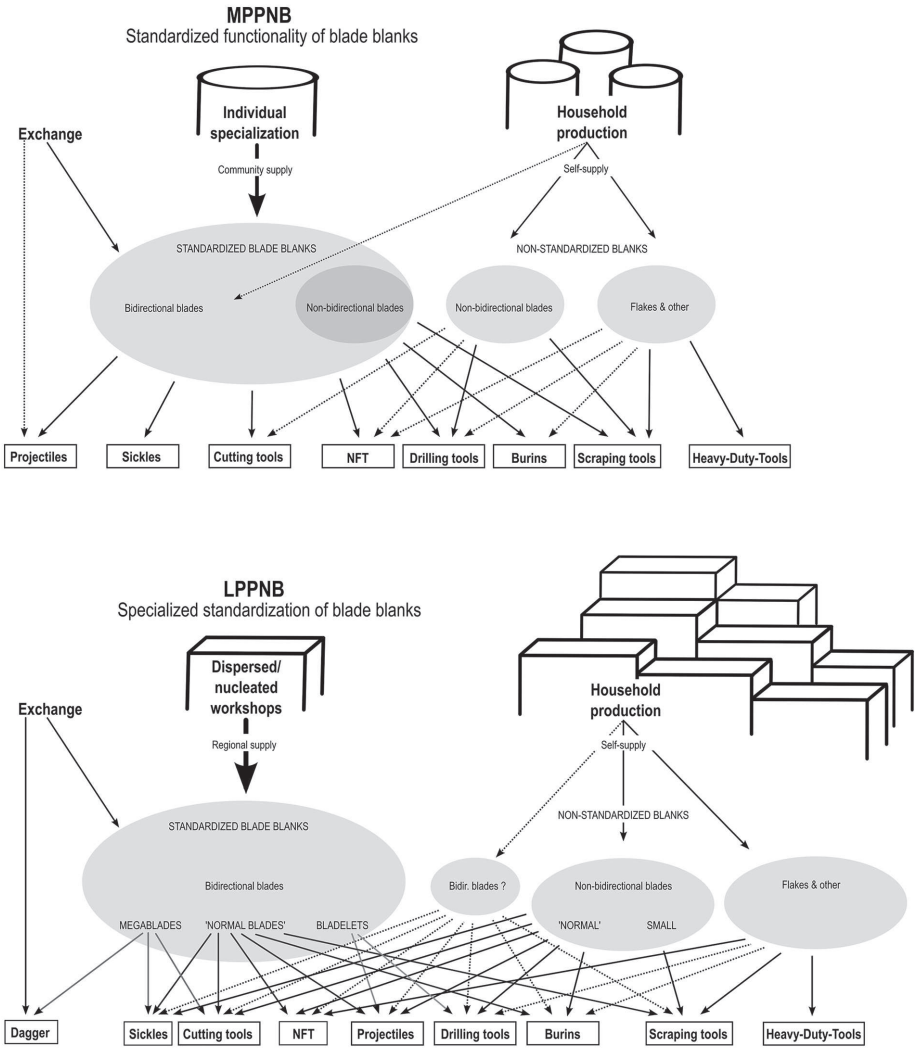


Figure 6. Schemes of generalised blank production and blank consumption patterns of MPPNB and LPPNB sites in the Greater Petra Region (dotted lines refer to production/consumption strategies of minor economic importance)

regional range are well illustrated by the distribution of orthoquartzite blades and sandstone rings (**Fig. 7**). However, their range is low and the number of artefacts declines rapidly the more the distance to the production site increases. Orthoquartzite blades are found in infrequent numbers at numerous LPPNB sites south of the Dead Sea (Wilke *et al.* 2007; Purschwitz 2017: abb. 159). Among the analysed site samples, orthoquartzite artefacts were found mostly at Basta (n=51, ~2%), but rarely at other sites: Ail 4 (n=5, ~0.5%), Beidha B (n=3, ~0.3%), Beidha C (n=1, ~0.2%), and Ba'ja (n=2, <0.1%) (Purschwitz 2017). No evidence of on-site production of orthoquartzite was found in the Greater Petra Region sites, except for 'Ain Jammam (Rollefson 2005; Wilke *et al.* 2007). Interestingly, the distribution pattern of orthoquartzite blades is very similar to the distribution of 'Ain Jammam points, which are frequent at 'Ain Jammam (Rollefson 2005), but also occur in rare numbers in adjacent sites such as Basta (Nissen *et al.* 1991: fig. 4.24–27) or Nahal Issaron (Goring-Morris 1993: fig. 5.10–13). Another good example of a LPPNB regional network is the production and distribution of sandstone rings. The only known production centre of these fragile, tiny rings made of red ferriguos sandstone is Ba'ja, where sandstone ring production was part of most households (Gebel *et al.* 1997; Purschwitz & Kinzel 2007; Purschwitz 2017: 266). Production waste from sandstone ring production is scarce at other sites, but occurs sporadically at Basta and 'Ain Jammam (Starck 1988; Rollefson 2005: 22). At Basta white limestone or oil schist was used and later painted red to imitate ferrous sandstone rings (Affonso & Pernicka 2004; Gebel 2010: 59). Fragments of finished sandstone rings show a much wider range of distribution. Such sandstone rings are common at Basta (Starck 1988), 'Ain Jammam (Rollefson 2005: 22) and al-Basît (Rollefson 2002: table 10). A few pieces are also reported at Wadi Badda (Fujii 2007), Wadi Abu Thulayha (Fujii 2008: fig. 31.24), Khirbet Hammam (Petersen 2004: fig. 10a–b), Ashkelon (Dag & Garfinkel 2008: 189–190, 197), Rabud (Gubenko *et al.* 2009: 77) and es-Sifiya (Mahasneh 1997: 211).

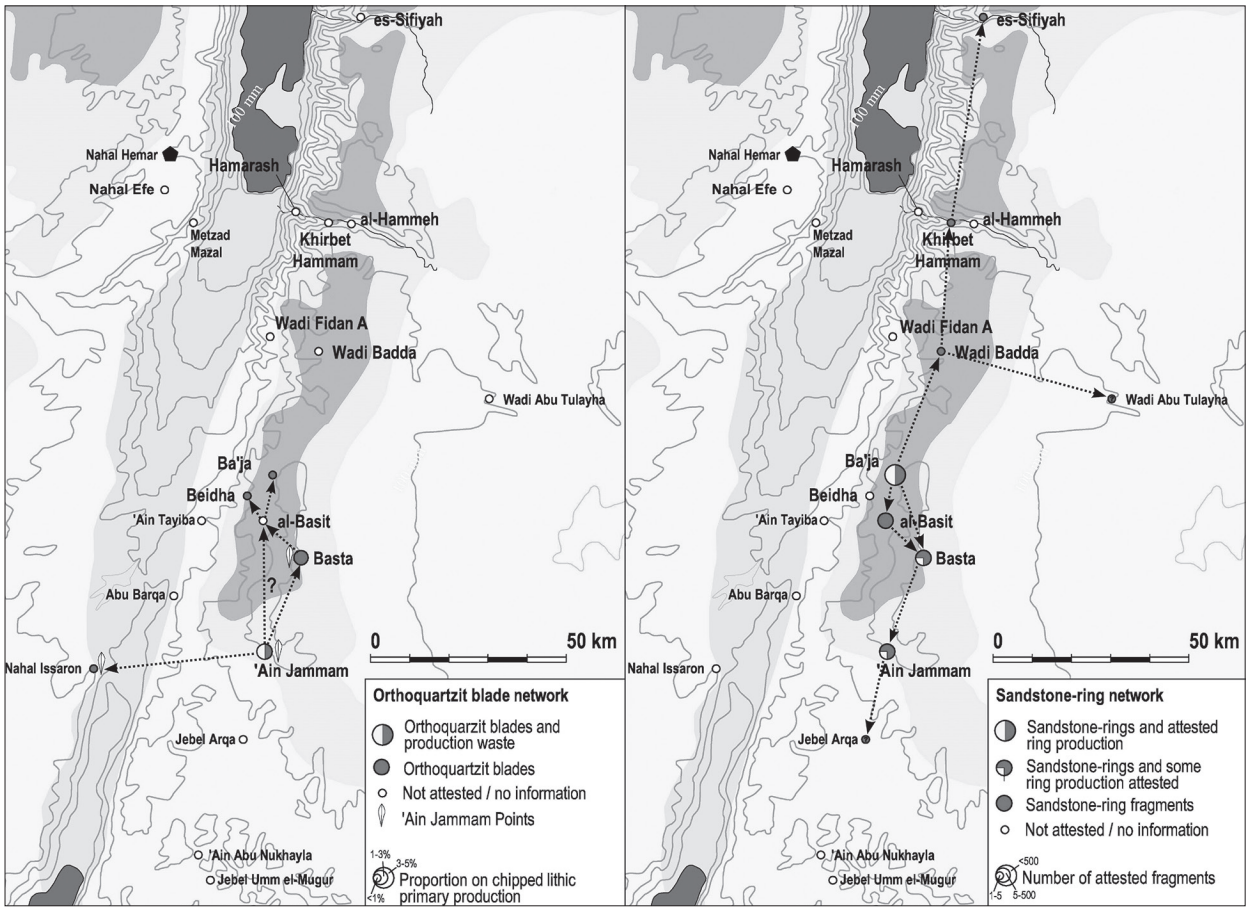


Figure 7. Examples of LPPNB exchange networks of a regional scale: 'Ain Jammam orthoquartzite blade network (left) and Ba'ja sandstone ring network (right)

A second exchange axis (east-west) is indicated for bifacial flaked daggers, which were found in graves at Ba'ja (Gebel & Hermansen 2001; Gebel *et al.* 2006a, 2017) and are reported in a few instances from other LPPNB sites of the Southern Levantine corridor, such as Basta (Gebel, *pers. comm.*), Wadi Badda (Fujii 2007: fig. 6.21), el-Hemmeh (Makarewicz *et al.* 2006), Rabud (Gubenko *et al.* 2009: fig. 6.7) and 'Ain Ghazal (Rollefson *et al.* 1994). To my knowledge, there is scanty evidence for the production of these rare daggers within the mega-sites. However, half-fabricates and production waste are found in the arid desert and steppe areas in the Negev to the west (Goring-Morris *et al.* 1994) as well as in the Badia to the east (Rhotert 1938: 117, 138; Fujii 2006: fig. 13.19; 2008: fig. 28.12–14; 2013: fig. 6.13). I therefore assume that the bifacial flaked daggers primarily were made by mobile hunters or agropastoralists of the desert/steppe areas.

Changing social networks

The factors that promoted changing socio-economic structures during the M/LPPNB of the Greater Petra Region are not totally understood. However, from the perspective of the Greater Petra Region, I argue that changes in social network structures had a considerable impact on the emergence of dualistic lithic economies during the PPNB.

MPPNB sites of the Greater Petra Region were small and were only seasonally used. The number of inhabitants may hardly have exceeded 150 persons per site. Adopting the social network model of Gamble (1998), the personal network of an average MPPNB household was likely to be distributed over several somewhat distant sites. The household personal network comprises the family, relatives and close friends, where generalised or balanced reciprocity is assumed to prevail (**Fig. 8**).

LPPNB mega-sites, in contrast, are huge and were permanently occupied by several hundred to several thousand inhabitants. The personal networks of an average LPPNB household appear to be confined to the mega-site itself (**Fig. 8**). This is also supported by recent epigenic investigation and strontium isotope analyses of human bones found at Basta (Alt *et al.* 2013). The high proportion of inherited teeth anomalies strongly suggests the practice of social endogamy, which matches well with the almost exclusively local strontium isotope signals of bones and teeth. Additionally, it is plausible to assume

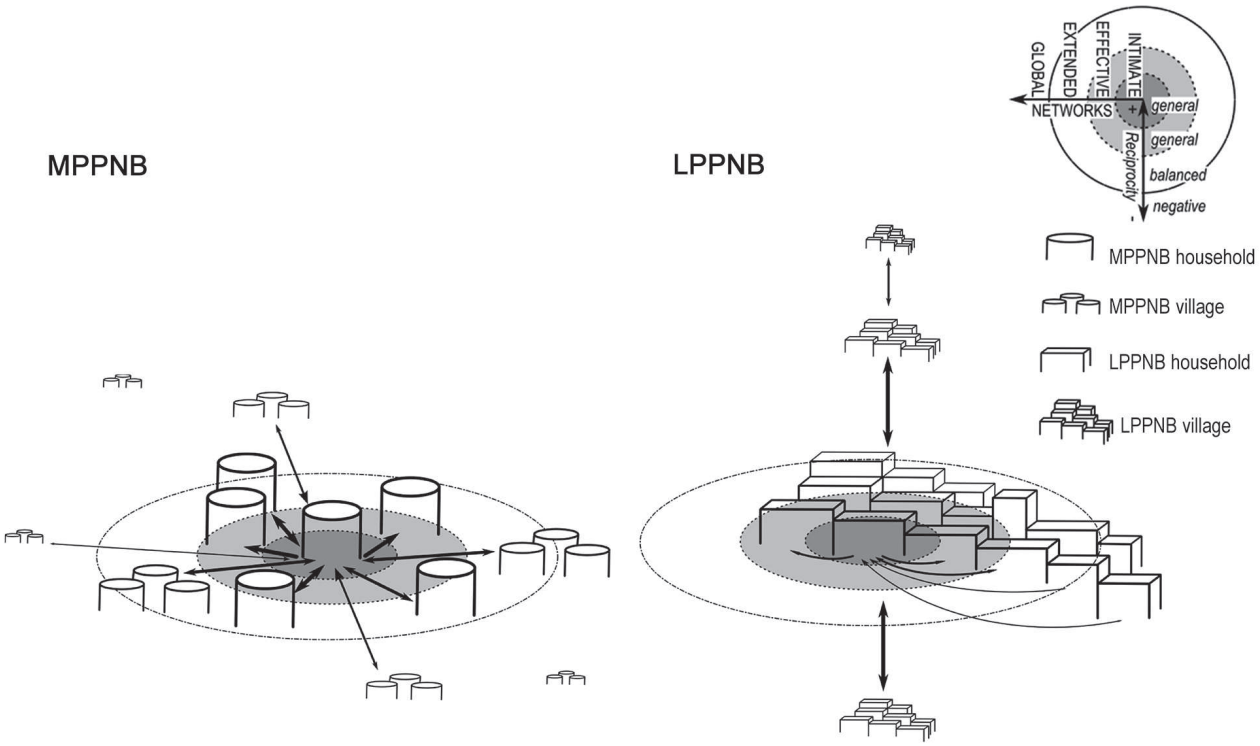


Figure 8. Simplified scheme of assumed social networks and interactions from the household perspective during the MPPNB and LPPNB

that at mega-sites, such as Basta or 'Ain Ghazal, an increasing number of households were not able to maintain social relations with each other. It is therefore likely that anonymous exchange networks may have become intensified during the LPPNB, particularly on an inter-site exchange level. The lack of social control within the LPPNB mega-sites may have promoted profit-oriented thinking, such as negative reciprocity and surplus production, and may have led to an increase in social inequality. This might be indicated by the appearance of rare prestige goods, such as bifacial flaked daggers, as well as an increasing diversity in burial types including elite burials and irregular interments such as trash burials (Rollefson 2000; Gebel *et al.* 2017).

Acknowledgments

This contribution is a summary of my PhD, completed in 2016 at Freie Universität Berlin under the supervision of Professor Dr Reinhard Bernbeck and Professor Dr Susan Pollock (both from the Institute of Near Eastern Archaeology). The PhD was funded by a scholarship of the Elsa-Nauman-Foundation of Berlin. I thank the following people for their guidance, support and assistance during this research: Simona Bracci, Jürgen Baumgarten, Reinhard Bernbeck, Hans Georg K. Gebel, Charlott H. Jensen, Susanne Kerner, Moritz Kinzel, Susan Pollock, Dörte Rokitta-Krumnow, Ingo Saynisch and Hannah Parow-Souchon. I also thank the reviewers for their very helpful comments and suggestions. The English was edited by Brian Agro.

Bibliography

Affonso, M.T.C. & E. Pernicka 2004: Mineralogical analysis of Late PPNB rings, in H.J. Nissen, M. Muheisen & H.G.K. Gebel (eds), *Basta* I. *The Human Ecology* (*Monograph of the Faculty of Archaeology and Anthropology Volume* 4), 155–167, Berlin

Alt, K.W., M. Benz, W. Müller, M.E. Berner, M. Schultz, T.H. Schmidt-Schultz, C. Knipper, H.G. Gebel, H.J. Nissen & W. Vach 2013: Earliest evidence for social endogamy in the 9000-year-old-population of Basta, Jordan, *PLos ONE* 8(6): e65649, doi: 10.1371/journal.pone.0065649

Andrews, B. 2006: Skill and the question of blade crafting intensity at Classic Period Teotihuacan, in J. Apel & K. Knutsson (eds), *Skilled Production and Social Reproduction: Aspects of Traditional Stone-Tool Technologies. Proceedings of a Symposium in Uppsala, August 20–24, 2003*, 263–271, Uppsala

Bamforth, D.B. & N. Finlay 2008: Archaeological approaches to lithic production skill and craft learning, *Journal of Archaeological Method and Theory* 15.1, 1–27

Bangsgaard, P. 2008: An introduction to faunal remains and environmental studies. A mismatch or a match made in heaven? in N. Marchetti & I. Thuesen

(eds), *ARCHAIA. Case Studies on Research Planning, Characterization, Conservation and Management of Archaeological Sites* (*British Archaeological Reports International Series* 1877), 231–237, Oxford

Barket, T. 2013: Household-level flaked-stone tool production at the Neolithic site of 'Ain Ghazal, Jordan, in F. Borrell, J.J. Ibáñez & M. Molist (eds), *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East. Proceedings of the 7th Workshop on PPN Chipped and Ground Stone Industries of the Fertile Crescent*, 133–146, Barcelona

Barzilai, O. 2010: *Social Complexity in the Southern Levantine PPNB as Reflected through Lithic Studies. The Bidirectional Blade Industries* (*British Archaeological Reports International Series* 2180), Oxford

Barzilai, O. 2013: The bidirectional blade industries of the Southern Levant, in F. Borrell, J.J. Ibáñez & M. Molist (eds), *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East. Proceedings of the 7th Workshop on PPN Chipped and Ground Stone Industries of the Fertile Crescent*, 59–72, Barcelona

Barzilai, O. & Y. Garfinkel 2006: Bidirectional blade technology after the PPNB. New evidence from Sha'ar Hagolan, Israel, *Neo-Lithics* 1.06, 27–31

Bar-Yosef, O. & A. Belfer-Cohen 1989: The Levantine 'PPNB' interaction sphere, in I. Hershkovitz (ed), *People and Culture in Change. Proceedings of the 2nd Symposium on Upper Palaeolithic, Mesolithic, and Neolithic Populations of Europe and the Mediterranean Basin* (*British Archaeological Reports International Series* 508), 59–72, Oxford

Benz, M. 2010: The principle of sharing. An introduction, in M. Benz (ed), *The Principle of Sharing. Segregation and Construction of Social Identities at the Transition from Foraging to Farming* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 14), 1–18, Berlin

Bernbeck, R. 2010: The Neolithic pottery, in S. Pollock, R. Bernbeck & K. Abdi (eds), *The 2003 Excavations at Tol-e Baši, Iran. Social Life in a Neolithic Village*, 65–151, Mainz

Bienert, H.D., H.G.K. Gebel & R. Neef (eds) 2004: *Central Settlements in Neolithic Jordan* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 5), Berlin

Borrell, F. & H. Khalaily 2016: Reconstructing the last stages of bidirectional blade technology in the Levant: North and South (dis)connections, *Paléorient* 42.2, 73–95

Brumfiel, E.M. & T.K. Earle (eds) 1987: *Specialisation, Exchange and Complex Societies*, Cambridge

Byrd, B. 2005: *Early Village Life at Beidha, Jordan. Neolithic Spatial Organization and Vernacular Architecture. The Excavations of Mrs. Diana Kirkbride-Helbaek* (*British Academy Monographs in Archaeology* 14), Oxford

Clark, J.E. 1995: Craft specialisation as an archaeological category, *Research in Economic Anthropology* 16, 267–296

Costin, C.L. 1991: Craft Specialisation. Issues in defining, documenting, and explaining the organization of production, *Archaeological Method and Theory* 3, 1–56

Dag, D. & Y. Garfinkel 2008: Ground stone tools, chipped stones, white ware, a clay installation, and various minerals, in Y. Garfinkel & D. Dag (eds), *Neolithic Ashklon*, 183–202, Jerusalem

Fujii, S. 2006: Wadi Abu Tulayha. A preliminary report on the 2005 spring and summer field season of the Jafr Basin prehistoric project, phase 2, *Annual of the Department of Antiquities of Jordan* 50, 9–31

Fujii, S. 2007: Wadi Badda. A PPNB settlement below the Fjaje Escarpment near Shawbak, *Neo-Lithics* 1.07, 19–23

Fujii, S. 2008: Wadi Abu Tulayha: A preliminary report on the 2007 summer field season of the Jafr Basin prehistoric project, phase 2, *Annual of the Department of Antiquities of Jordan* 52, 445–478

Fujii, S. 2013: Chronology of the Jafr prehistory and protohistory. A key to the process of pastoral nomadization in the Southern Levant, *Syria* 90, 49–125

Gamble, C. 1998: Palaeolithic society and the release from proximity. A network approach to intimate relations, *World Archaeology* 29.3, 426–449

Gebel, H.G.K. 1988: Late Epi-Palaeolithic-Aceramic Neolithic sites in the Petra-Area, in A.N. Garrard & H.G. Gebel (eds), *The Prehistory of Jordan. The State of Research in 1986* (*British Archaological Reports International Series* 396), 67–100, Oxford

Gebel, H.G.K. 2004a: Central to what? The centrality issue of the LPPNB mega-site phenomenon in Jordan, in H.D. Bienert, H.G.K. Gebel & R. Neef (eds), *Central Settlements in Neolithic Jordan* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 5), 1–21, Berlin

Gebel, H.G.K. 2004b: Lithic economic systems and early sedentism, in K. van Folsach, H. Thrane & I. Thuesen (eds), *From Handaxe to Khan. Essays Presented to Pedr Mortensen on the Occasion of his 70th Birthday*, 55–65, Åarhus

Gebel, H.G.K. 2006: The domestication of vertical space. The case of steep-slope LPPNB architecture in southern Jordan, in E.B. Banning & M. Chazan (eds), *Domesticating Space. Construction, Community, and Cosmology in the Late Prehistoric Near East* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 12), 65–73, Berlin

Gebel, H.G.K. 2010: Commodification and the formation of Early Neolithic social identity.

The issues as seen from the southern Jordanian Highlands, in M. Benz (ed), *The Principle of Sharing. Segregation and Construction of Social Identities at the Transition from Foraging to Farming* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 14), 35–80, Berlin

Gebel, H.G.K. 2013: The Neolithic commodification of stones, in F. Borrell, J.J. Ibáñez & M. Molist (eds), *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East. Proceedings of the 7th Workshop on PPN Chipped and Ground Stone Industries of the Fertile Crescent*, 191–205, Barcelona

Gebel, H.G.K., M. Benz, C. Purschwitz, B. Kubíková, S. Štefanisko, A. al-Souliman, K. Tucker, J. Gresky & B. Abuhelaleh 2017: Household and death. Preliminary results of the 11th season (2016) at Late PPNB Ba'ja, southern Jordan, *Neo-Lithics* 1.17, 18–36

Gebel, H.G.K. & H.D. Bienert, with contributions by T. Krämer, B. Müller-Neuhof, R. Neef, J. Timm & K.I. Wright 1997: Ba'ja hidden in the Petra Mountains. Preliminary results of the 1997 investigations, in H.G.K. Gebel, Z. Kafafi & G.O. Rollefson (eds), *The Prehistory of Jordan* II. *Perspectives from* 1997 (*Studies in Early Near Eastern Production, Subsistence, and Environment* 4), 221–262, Berlin

Gebel, H.G.K. & B.D. Hermansen 2001: LPPNB Ba'ja 2001. A short note, *Neo-Lithics* 2.01, 15–20

Gebel, H.G.K., B.D. Hermansen & M. Kinzel 2006a: Ba'ja 2005. A two-storied building and collective burials. Results of the 6th season of excavations, *Neo-Lithics* 1.06, 12–19

Gebel, H.G.K., H.J. Nissen & Z. Zaid (eds) 2006b: *Basta* II. *The Architecture and Stratigraphy* (*Monograph of the Faculty of Archaeology and Anthropology* 5), Berlin

Gopher, A. & R. Barkai 2011: A new Neolithic quarry complex at Har Gevim, Israel. An introduction, in M. Capote, S. Consuegra, P. Díaz-del-Río & X. Terradas (eds), *Proceedings of the 2nd International Conference of the UISPP Commission on Flint Mining in Pre- and Protohistoric Times. Madrid,* 14–17 *October 2009* (*British Archaeological Reports International Series* 2260), 275–282, Oxford

Goring-Morris, N. 1993: From foraging to herding in the Negev and Sinai. The Early to Late Neolithic transition, *Paléorient* 19.1, 65–89

Goring-Morris, N., A. Gopher & S. Rosen 1994: The Neolithic Tuwailan cortical knife industry of the Negev, in H.G.K. Gebel & S.K. Kozlowski (eds), *Neolithic Chipped Stone Industries of the Fertile Crescent. Proceedings of the 1st Workshop on PPN Chipped Lithic Industries* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 1), 511–524, Berlin

Gubenko, N., O. Barzilai & H. Khalaily 2009: Rabud. A Pre-Pottery Neolithic B Site south of Hebron, *Journal of the Israel Prehistoric Society* 39, 63–80

Harpelund, A.M. 2011: An Analysis of the Ground Stone Assemblage from the Middle Pre-Pottery Neolithic B Site Shkarat Msaied in Southern Jordan. Masters Thesis, Københavns Universitet

Ingold, T. 2000: *The Perception of the Environment. Essay on Livelihood, Dwelling and Skill*, London

Jensen, C.H. 2008: Workshops and activity areas in the PPNB Period. The excavations at Shkarat Msaied, in H. Kühne, R.M. Czichon & F.J. Kreppner (eds), *Proceedings of the 4th International Congress of the Archaeology of the Ancient Near East, 29 March–3 April 2004, Berlin*, 331–344, Wiesbaden

Jensen, C.H., B.D. Hermansen, M. Bille Petersen, M. Kinzel, M.M Hald, P. Bangsgaard, N. Lynnerup & I. Thuesen 2005: Preliminary report on the excavations at Shakarat al-Musay'id, 1999–2004, *Annual of the Department of Antiquities of Jordan* 49, 115–134

Kinzel, M. 2013: *Am Beginn des Hausbaus. Studien zur PPNB-Architektur von Shkarat Msaied und Ba'ja in der Petra-Region, Südjordanien* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 17), Berlin

Kirkbride, D. 1966: Five seasons at the Pre-Pottery Neolithic village of Beidha in Jordan, *Palestine Exploration Quarterly* 98, 5–61

Kuijt, I. 2000: People and space in early agricultural villages. Exploring daily lives, community size, and architecture in the Late Pre-Pottery Neolithic, *Journal of Anthropological Archaeology* 19, 75–102

Lave, J. & E. Wenger 1991: *Situated Learning. Legitimate Peripherical Participation*, Cambridge

Mahasneh, H.M. 1997: The 1995 season at the Neolithic site of Es-Sifiya, Wadi Mujib, Jordan, in H.G.K. Gebel, Z. Kafafi & G.O. Rollefson (eds), *The Prehistory of Jordan* II. *Perspectives from 1997* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 4), 203–214, Berlin

Maier, R. 2007: Grünstein aus der präkeramisch neolithischen Siedlung von Beidha; Jordanien. Masters Thesis, Bergbaumuseum Bochum

Makarewicz, C.A., N.B. Goodale, P. Rassmann, C. White, H. Miller, J. Haroun, E. Carlson, A. Pantos, M. Kroot, S. Kadowaki, A. Casson, J.T. Williams, A.E. Austin & B. Fabre 2006: El-Hemmeh. A multi-period Pre-Pottery Neolithic Site in the Wadi el-Hasa, Jordan, *Eurasian Prehistory* 4.1–2, 183–220

Muheisen, M., N. Qadi & H.G.K. Gebel 2004: Raw materials of the flint and ground stone industries, in H.J. Nissen, M. Muheisen & H.G.K. Gebel (eds), *Basta* I. *The Human Ecology*, 129–154, Berlin

Nissen, H.J., M. Muheisen & H.G.K. Gebel (eds) 2004:

Basta I. *The Human Ecology* (*Monograph of the Faculty of Archaeology and Anthropology* 4), Berlin

Nissen, H.J., M. Muheisen, H.G. Gebel with contributions by C. Becker, B.D. Hermansen, W. Karasneh, N. Qadi, M. Schultz & A. Scherer 1991: Report on the excavations at Basta 1988, *Annual of the Department of Antiquities of Jordan* 31, 13–40

Pelegrin, J. 1990: Prehistoric lithic technology. Some aspects of research, *Archaeological Review from Cambridge* 9.1, 116–125

Petersen, J. 2004: Khirbet Hammam (WHS 149). A Late Pre-Pottery Neolithic B settlement in the Wadi el-Hasa, Jordan, *Bulletin of the American Schools of Oriental Research* 334, 1–17

Purschwitz, C. 2013: Early Neolithic flint raw material selection at LPPNB Ba'ja, Southern Levant, in F. Borrell, J.J. Ibáñez & M. Molist (eds), *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East. Proceedings of the 7th Workshop on PPN Chipped and Ground Stone Industries of the Fertile Crescent*, 147–164, Barcelona

Purschwitz, C. 2017: *Die lithische Ökonomie von Feuerstein im Frühneolithikum der Größeren Petra Region* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 19), Berlin

Purschwitz, C. & M. Kinzel 2007: Ba'ja 2007. Two room and ground floor fills. Reconstructed house-life scenarios, *Neo-Lithics* 2.07, 22–35

Quintero, L.A. 2010: *Evolution of Lithic Economies in the Levantine Neolithic. Development and Demise of Naviform Core Technology as Seen from 'Ain Ghazal*, Berlin

Quintero, L.A. & M.W. Hintzman 2007: Woodworking implements from Neolithic 'Ayn Ghazal. Tools of chance, in F. al-Khraysheh (ed), *Studies in History and Archaeology of Jordan* IX. *Cultural Interaction through Ages*, 193–203, Amman

Rhotert, H. 1938: *Transjordanien. Vorgeschichtliche Forschungen*, Stuttgart

Rokitta-Krumnow, D. 2011: The lithic artifacts from the Late Neolithic settlement of Shir, western Syria, *Zeitschrift für Orient Archäologie* 4, 212–244

Rokitta-Krumnow, D. 2013: The significance of long blade caches and deposits at Late Neolithic Shir, Syria, in F. Borrell, J.J. Ibáñez & M. Molist (eds), *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East. Proceedings of the 7th Conference on PPN Chipped and Ground Stone Industries of the Fertile Crescent*, 59–72, Barcelona

Rollefson, G.O. 2000: Ritual and social structure at Neolithic 'Ain Ghazal, in I. Kuijt (ed), *Life in Neolithic Farming Communities. Social Organization, Identity, and Differentiation*, 163–190, New York

Rollefson, G.O. 2002: Additional information and observations of Neolithic Al-Basit, Wadi Musa, southern Jordan, *Annual of the Department of Antiquities of Jordan* 46, 93–106

Rollefson, G.O. 2005: Stone tools from 'Ayn Jammam, near Ras en-Naqb, southern Jordan, *Neo-Lithics* 1.05, 17–23

Rollefson, G.O., M. Forstadt & R. Beck 1994: A preliminary typological analysis of scrapers, knives, and borers from 'Ain Ghazal, in H.G.K. Gebel & S.K. Kozlowski (eds), *Neolithic Chipped Stone Industries of the Fertile Crescent. Proceedings of the 1st Workshop on PPN Chipped Lithic Industries* (*Studies in Early Near Eastern Production, Subsistence, and Environment* 1), 445–456, Berlin

Rollefson, G.O., L. Quintero & P. Wilke 2007: Purple-pink flint sources in Jordan, in C. Delage (ed), *Chert Availability and Prehistoric Exploitation in the Near East* (*British Archaeological Reports International Series* 1615), 55–67, Oxford

Rosen, S.A. 1997: *Lithics after the Stone Age*, Walnut Creek

Sahlins, M. 1972: *Stone Age Economics*, Chicago

Schyle, D. 2007: *Ramat Tamar and Metzad Mazal. The Early Neolithic Economy of Flint Mining and Production of Bifacials Southwest of the Dead Sea*, Berlin

Starck, M. 1988: Stone rings from Baga and Basta. Geographical and chronological implications, in A.N. Garrard & H.G. Gebel (eds), *The Prehistory of Jordan. The State of Research in 1986* (*British Archaeological Reports International Series* 396), 137–174, Oxford

Torrence, R. 1986: *Production and Exchange of Stone Tools. Prehistoric Obsidian in the Aegean*, Cambridge

Turner, J.H. & A. Maryanski 1991: Network analysis, in J.H. Turner (ed), *The Structure of Sociological Theory*, 540–572, Belmont

Watkins, T. 2008: Supra-regional networks in the Neolithic of southwest Asia, *Journal of World Prehistory* 21, 139–171

Wenger, E. 1998: *Communities of Practice. Learning, Meaning, and Identity*, Cambridge

Wilke, P.J., L.A. Quintero & G.O. Rollefson 2007: Prehistoric exploitation of Eocene flint in the al-Jafr Basin of southeastern Jordan, in C. Delage (ed), *Chert Availability and Prehistoric Exploitation in the Near East* (*British Archaeological Reports International Series* 1615), 228–239, Oxford

Wright, K.I. 1992: Ground stone assemblage variaton and subsistence strategies in the Levant, 22,000 to 5500 BP. PhD Dissertation, Yale University

Zimmermann, A. 1995: *Austauschsysteme von Silexartefakten in der Bandkeramik Mitteleuropas*, (*Universitätsforschungen zur prähistorischen Archäologie* 26), Bonn