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Long distance trinket trade: Early Bronze Age obsidian from the Negev

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Abstract

The discovery of three small obsidian flakes at the Camel Site in the central Negev, Israel, constitutes the first discovery of obsidian in Early Bronze Age contexts in the Negev and Sinai. Obsidian hydration analysis and X-ray microprobe analysis confirm the association of the artifacts with the site and the period, and indicate origins in Eastern Anatolia, in significant contrast to the exclusively Central Anatolian source of Southern PPNB obsidian. The structure of the obsidian trade system in the Early Bronze Age seems to contrast significantly with its Neolithic predecessor, and may be related to a system of pastoral nomadic exchange.

Keywords: Obsidian; Negev; Early Bronze Age; Anatolia; Pastoral nomadism; Exchange; Hydration; X-ray microprobe

1. Introduction

The reconstruction and interpretation of ancient exchange networks based on analyses of obsidian artifacts is a well-established archaeological tool. Chemical analyses based on various techniques have long provided a ‘fingerprint’ for sourcing raw materials (e.g. [55,65]), and hydration analyses can provide some measure of chronology (e.g. [1]). In the Near East, the Neolithic obsidian exchange network has long been the subject of research on the nature of early long distance trade (e.g. [48,49,13,43]).

The recovery of three small obsidian artifacts (Fig. 1) from the Camel Site (e.g. [53]) in the Central Negev, Israel (Fig. 2), constitutes the first discovery of obsidian in Early Bronze Age contexts (ca. 3000 BC) in the deserts of the Negev and Sinai. However, in the light of the well established presence of obsidian in the Negev during the Pre-Pottery Neolithic B (e.g. [43,12,13]), especially from the site of Nahal Lavan 109 [9,10], the issue of the specific origins of the three pieces needed to be addressed before conclusions concerning the significance of the discovery could be drawn. Hydration analysis of the artifacts supports an Early Bronze Age attribution, and trace element analysis using an electron microprobe indicates a source in Eastern Anatolia, in significant contrast to the exclusively Central Anatolian source of Negev PPNB obsidian.

Thus, the materials from the Camel Site extend the life span of the informal down-the-line exchange system both another period forward in time, one phase beyond the previously documented Chalcolithic [68], and deeper into the desert than in that phase. Interpretation of this trinket trade can shed further light on early desert pastoral societies.

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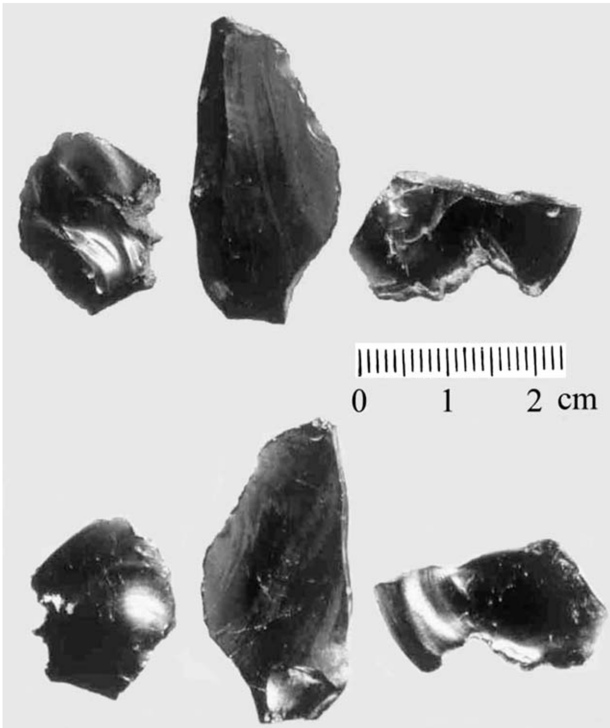

Fig. 1. Three obsidian artifacts recovered from the Camel Site. Left = J30c, Middle = M27d and Right = M28c.

2. The Camel Site

The Camel Site [53] is a small encampment, ca. 400 m^2 in total area, situated some 200 m north of the Ramon Crater (*makhtesh*), the largest of the three erosional cirques in the Central Negev (Fig. 2). Architecturally, the site comprised two irregularly shaped enclosures abutting one another with smaller rooms attached to the periphery (Fig. 3). This general pattern of enclosure and attached rooms, reflecting pastoral pen and hut/tent compounds, is typical of the Early Bronze Age in the southern Levantine deserts (e.g. [52,31, 32,36,5]). Four cairns are located just outside the building remains and a fifth is integrated into the compound structures.

The material culture assemblage recovered from the Camel Site is varied, including a large lithic assemblage of waste and formal tools, ceramics, copper items, haematite, quartz crystals, seashells and seashell beads, ostrich eggshell fragments and beads, and millstones with debris from their manufacture [50,54]. The ceramic assemblage included primarily holemouth cooking and storage ware, and the lithic tool assemblage most notably included microlithic drills, microlithic lunates (= transverse arrowheads), tabular and other scrapers, blade tools including a few rare sickles, and ad hoc elements. With the exception of a few sherds attributable to the Intermediate Bronze Age (= Early Bronze IV = Middle Bronze I, ca. 2000–2200 BC), the entire material culture assemblage accords well with an Early Bronze Age I–II attribution. This, in turn, well matches radiocarbon determinations of 4345 ± 65 BP (RT-3083) calibrated (1σ) to 3080–2880 BC and 4115 ± 50 BP (RT-2043) calibrated (1σ) to 2860–2580 BC. Examination of the actual calibration curve [45] shows a higher probability of an attribution earlier in the range of the second date, thus indeed in close accord with the first date. Both of these dates derive from charcoal from small hearths associated with the occupation surface of the site. Another date, 3235 ± 55 BP (RT-3082), calibrated to 1600–1430 BC, can be rejected as aberrant given the absence of material culture attributable to this period, not only in the site, but in the entire region. The final date, RT-3084, is modern.

As indicated by the material culture and the radiocarbon dates, the site is basically a single period occupation with later ephemeral presence at the end of the third millennium BC. Stratigraphically, it was excavated in three units, the surface layer, an upper yellow loess, and a lower organic horizon consisting of a mixture of the yellow loess and gray ashy matrix. The lower horizon was found only in the enclosures and is suggested to be a degraded dung layer. The large size of the material culture assemblage, over 25,000 lithic artifacts, and the consensus view that the Negev Early Bronze Age is a pastoral nomadic society, suggest seasonally repeated occupations of the site (e.g. [53]).

3. The artifacts

Three small obsidian artifacts were recovered from the Camel Site (Fig. 1). The obsidian itself is black with some gray banding. All three were recovered in the southeast quadrant of the site, in fact, outside of the actual architectural remains (Fig. 3). Dimensions, provenience and technical type are summarized in Table 1. Each piece shows a well-defined bulb of percussion and a narrow striking platform. None show characteristics associated with the more standardized knapping technologies of the 3rd–4th millennia BC, for example the bladelet technologies of the Southern Levantine deserts (e.g. [26,51: pp. 65–67]). Although one piece (M27d) is technically a blade, it is clear that it is technologically an elongated flake. All three pieces show edge damage caused by trampling and sandblasting, and none show convincing evidence for intentional retouch. Two (M28c, J30c) show broken edges. Dorsal scarring, reflecting previous flake removals, is present only on one piece (M27d). One flake (M28c) has a hinge fracture.

The presence of only three obsidian artifacts on the site, and the total excavation of the site with 100% dry sieving through 2–3 mm mesh, indicate that the flakes were imported as flakes and not knapped on-site. Given the small size of the pieces of obsidian, the absence of

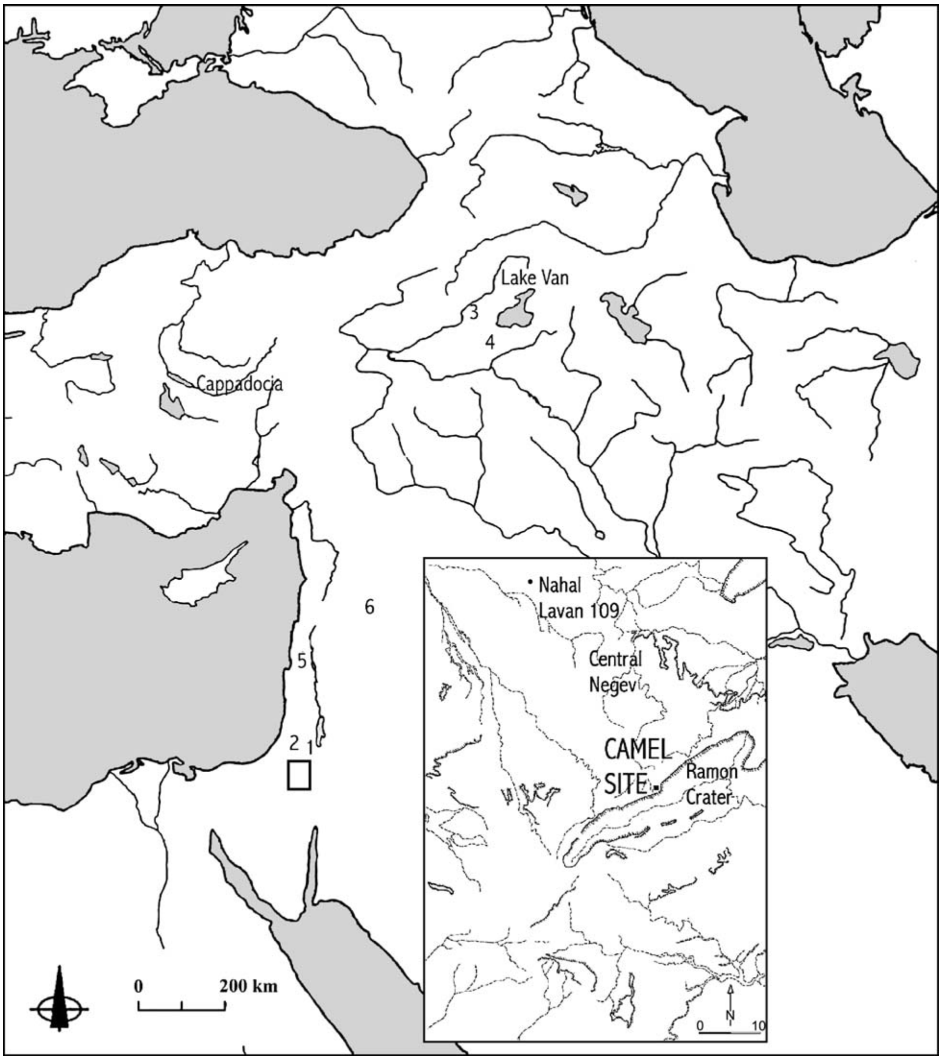

Fig. 2. Map of sites and locations mentioned in text. 1. Arad, 2. Gilat, 3. Bingöl sources, 4. Nemrut sources, 5. Beisamun, Munhata, and Abu Zureiq, 6. Ramad, Ghoraife, and Aswad.

retouch or evidence for intentional modification, and the absence of standardized morphologies (notwithstanding the technical bladelet attribution of one piece), utilitarian functions are difficult to imagine.

4. Obsidian hydration analysis

Obsidian hydration dating (OHD) converts a hydration layer to an absolute date using the equation: $x = kt^2$, where x is the hydration rind width in microns (μm), k is the established hydration rate for inward diffusion of molecular water at a specific temperature/relative humidity, and t is time.

Current thinking on obsidian hydration dating is best summarized by three major assumptions (cf. [56]):

1. Obsidian sources will have a range of hydration rates that is a function of the variation in intrinsic water content [39,56–58].
2. There is no observable relationship between trace element concentrations and the intrinsic water content [23,59].
3. Ambient temperature and relative humidity conditions significantly influence the rate of obsidian hydration [23,37–40,59].

Given these assumptions, a piece specific hydration rate method, applied here, utilizes three analytical procedures: (1) measurement of the hydration rind thickness, (2) measurement or estimation of soil temperature and relative humidity [60], and (3) calculation of rate constants determined from glass composition (the Ambrose/Stevenson relative density/intrinsic water method [e.g. [1,56]]). In practice, the accurate determination of the rind width in microns is the greatest variable in OHD due primarily to variable weathering processes.

This approach to the estimation of hydration rates differs from earlier methods that used a straight line

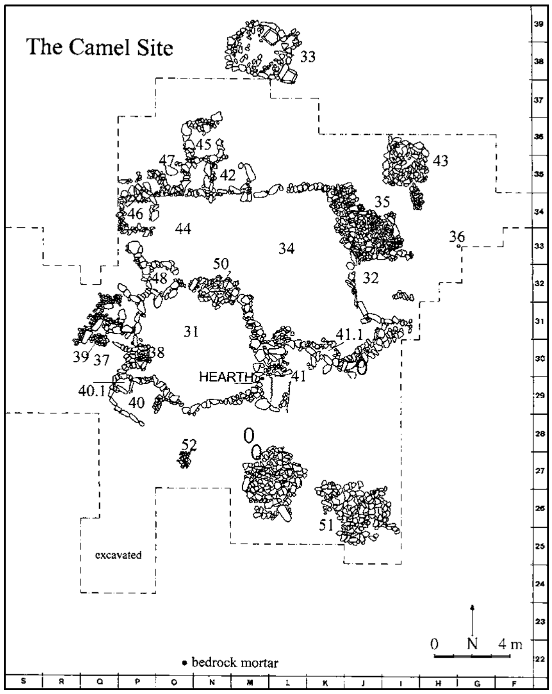

Fig. 3. Plan of Camel Site with location of obsidian artifacts, indicated by ○. Other numbers refer to loci. Artifacts in Fig. 1 can be located by reference to grid squares.

function or were empirically derived, wherein hydration rim depths were 'matched' to associated non-obsidian dating information to create a site specific hydration rate. The method used here results in a hydration rate for each artifact. Given the need to test the archaeological associations, hydration rates could not be 'matched' to the actual Camel Site date, ca. 3000 BC, for obvious reasons of logic. However, in order to better control the relative dating of the artifacts, samples were also run from the known age site of Nahal Lavan 109, an early Pre-Pottery Neolithic B site, dating to the first half of the ninth millennium BC (calibrated) about whose associations there was no question.

For this analysis, two or three slides were made for each sample. This was done due to the difficulty in finding a reading from an accurate rind. The rind thickness was measured by taking five independent measurements from thin sections under a Jenaval model polarizing light microscope with a Leitz filar micrometer attachment at

Table 1
Summary of basic features of obsidian artifacts

Provenience	Length	Width	Thick	Mass	Description
M27d upper layer	34 mm	17 mm	4.8 mm	2.34 gm	small blade
M28c upper layer	25	14	2.5	0.80	small broken flake
J30c surface layer	17	19	4.0	0.65	small broken flake

625× power. Only clearly visible intact hydration rinds with well-defined diffusion fronts are measured. All reported measurements are accurate to within ±0.2 μm. Although this measurement error in theory could be used to calculate a confidence range for the date, other factors, such as environmental change over time, may cause variation in hydration rate, and deviation between Hydration Years and Calendar Years. Calculation of dates based on the piece specific rate method uses only the smallest verified rind from each sample, based on the assumption that the smallest measurement is more likely to date the last knapping episode.

There is a quantifiable proxy relationship between relative density and intrinsic water [57]. The density measurement utilizes the weight in air vs. weight in liquid of each sample of obsidian taking advantage of the Archimedean principle. This gravimetric method was utilized here. Weights were taken on a scale valid to four decimal places (using a Mettler AG104 balance) using a heavy liquid to increase surface adhesion and reduce bubbles thereby reducing errors. The algorithms that determine how to go from density to water content to effect on hydration rate is available in software from Dr. Stevenson. These algorithms include correction factors for calculating density for the special liquid's temperature and for laboratory to laboratory calibration using a master quartz wedge.

For the environmental factors, relative humidity (RH) was estimated to be 97% (from salt cell data as measured from similar sites in the California Great Basin). For effective hydration temperature (EHT), the more sensitive and more important factor, weather station data from Mitzpe Ramon was used for the Camel Site and data from Sderot used for Nahal Lavan 109. This factor was also compared with similar data from the California Great Basin Death Valley and Mojave weather stations and with salt cell data from Inyo-182 (another site in the western Great Basin area).

The results of the obsidian hydration dating for these two sites (Table 2) are somewhat better than simple relative dating. As an absolute dating technique, however, these results are promising but suffer from two major problems: sample size and rind measurement.

For the Camel Site, only three artifacts were recovered and available for measurement. The water content percentages were very consistent and it is felt that the environmental factors are reasonable, although salt cell data would be preferable. The rind size, however, measures 6.1 μm on OHL 16200 and this is the 'cleanest' reading. For 16198 the rind read 5.0 μm and for 16199 the rind was 5.2 μm but both are on pieces that showed sandblasting. There is no known method of determining how much of the outer edge has been worn away. We have arbitrarily added 10% to the rind readings of three samples (two from the Camel Site and one from Nahal Lavan 109) in order to provide

Table 2
Obsidian hydration data summary

OHL	Prov.	USF	Rind (μm)	Weight (g)	EHT	RH%	RH by wt.	Hydr. rate	Age (BP years)	BCE
Camel										
16198	M27d	499	5.0	2.34	22.37	0.97	0.1105	6.6	3801	1851
	Upper	499	5.5						4597	2647[a]
16199	M28c	500	5.2	0.80	22.37	0.97	0.0989	5.5	4943	2993
	Upper		5.7						5981	4031[a]
16200	J30c	501	6.1	0.65	22.37	0.97	0.0958	5.2	7128	5178
	Surface									
Nahal Lavan 109										
16222			10.5	1.41	26.40	0.97	0.1279	13.0	8536	6586
			11.6						10328	8378[a]
16223			3.2	2.89	26.40	0.97	−0.0036	13.0	aberrant	
16224			NHV	1.89	26.40	0.97	0.2304	28.7	aberrant	
16225			4.4	0.54	26.40	0.97	0.3881	52.9	aberrant	
16226			11.4	2.39	26.40	0.97	6.7352	757.9	aberrant	
			11.4	2.39	26.40	0.97	0.1279	13.0	9937	7987[b]

EHT for the Camel Site is taken from Mitzpe Ramon, EHT for Nahal Lavan 109 is taken from Sderot identical to Death Valley and the Mojave Desert stations. NHV = no hydration value.
[a] Added 10% to rind to adjust for sandblasted surface.
[b] Water content estimated using sample 16222 measurement.

a perspective on the possible variability in the dates. The resultant range of 'roughly usable' dates for the Camel Site is 1850–5200 BC.

For Nahal Lavan 109, five debitage samples were utilized. Only OHL 16222 had both a rhyolitic level water percentage (0.13% by weight) and a readable rind of 10.5 μm (dating provided at 10.5 and at 11.6 μm or plus 10% to possibly account for weathering). Samples OHL 16223, 16224, and 16225 had both very erratic water contents and no reasonable sized rind. Sample OHL 16226 did exhibit a good readable rind at 11.4 μm but the water content (at 4.52%) is off scale. So, to provide at least one other date, the relative density and thus water content of 16222 was used. The result suggests a rough range for Nahal Lavan 109 of 6600–8400 BC, according reasonably well with the Pre-Pottery Neolithic B cultural attribution.

For our purposes, the key result of the hydration analysis is the clear distinction that can be drawn between the Pre-Pottery Neolithic B materials and those deriving from the Early Bronze Age. In other words, the Camel Site obsidian reflects a contemporary connection with Anatolia, and not the mere looting or collection of materials from local Neolithic sites like Nahal Lavan 109. This distinction is also supported by the differing water contents of the artifacts, suggesting the likelihood of different sources. The chemical composition analyses presented below support the likelihood of different sources, indirectly supporting the idea of chronological distinction.

5. Chemical analysis

Obsidian from geological sources in Turkey is well-known at Mesolithic and Neolithic sites in southern Anatolia and the Levant [11,48,49,67,43,14,12,30], and has even been identified as far west as Sitagroi in northeastern Greece [3]; at the same time, obsidian from sources in eastern Turkey and Armenia was distributed to Mesopotamia and also the Levant [8,30]. While the central and eastern Anatolian sources were considered to be the most likely sources for the Camel Site samples, Aegean, Caucasian, and Red Sea sources were not excluded as possibilities (cf. [65,69]).

Neutron activation analysis has been the most widely used method for the characterization of archaeological materials, but it does not provide bulk compositional data, it is not inexpensive, and commonly is destructive to artifacts. Furthermore, it has been demonstrated that nearly all of the Mediterranean, European, and Near Eastern obsidian sources may be distinguished based on their major element chemistry [18,33,61–64]. Given the glossy, homogeneous nature of obsidian, X-ray analysis using the electron microprobe is a good alternative analytical technique for sourcing since only a tiny 1-mm sample is required for quantitative analysis, the instrumental cost is on the order of only five U.S. dollars per sample, and a batch of 18 samples can be prepared and analyzed in several hours. This technique has been used for obsidian sourcing in Europe [7], the Mediterranean [61,62], Anatolia [33], and East Africa [41,42].

Samples 1 mm in size were removed from the Camel Site artifacts, mounted in a 1-inch diameter epoxy disk, and polished flat using successively finer grinding compounds. Nine elements were then quantitatively determined using an electron microprobe equipped with wavelength dispersive spectrometers. Standard mineral and rock reference materials were analyzed to insure the accuracy of the analyses and their comparability with other laboratories and other techniques; concentrations as low as 100 ppm of some elements are detected, and precision is better than ±5% for most elements – almost always better than the range in variation within a single obsidian source and, more importantly, far better than expected or known differences between sources. Two spots 40 μm in diameter were analyzed on each sample to insure against heterogeneity; the beam was positioned with an optical microscope to avoid analyzing microlite inclusions. The resulting data were then normalized to 99% to eliminate the effects of variable water content, and to enable comparison with existing obsidian source data produced using similar techniques (e.g. [18,20–22,7,33,61]). Further details on the methodology, instrumentation, and standard reference materials used have been published previously [61,64]. Most importantly, while analysis of both artifacts and geological samples using the same instrument and techniques would resolve any questions about comparing results from different laboratories, such comparisons have been successfully applied within the Mediterranean for these same techniques and laboratories [19,62,64].

All three Camel Site obsidian artifacts have alkaline affinities (Table 3, high alkalies and iron, and low aluminum concentrations), contrasting with most Mediterranean and Near Eastern obsidian flows, and essentially eliminating them as potential sources for the Camel artifacts. For the remaining peralkaline sources (Pantelleria, Bingöl, Nemrut Dağ, and the Red Sea region), some analytical data have been published by [33,28,29,44], and [21,22], but other than for Pantelleria relatively few samples from these sources have been analyzed for both major and trace elements. This is significant in that the statistical heterogeneity or range of values for most of these sources is not that well characterized.

Unfortunately, despite a large chronological gap in their age of formation, some of the Nemrut Dağ outcrops (of Quaternary age) are very similar in chemical composition to Bingöl (late Miocene) making it difficult to confidently assign artifacts to one source rather than the other. Nevertheless, the values obtained by microprobe in this study are similar to those obtained by XRF analysis [21,33,44], and clearly different from the other Mediterranean and Near Eastern sources (note the similarity in results by the two techniques for Sardinia A obsidian in Fig. 4).

While two of the Camel Site artifacts tested (M28c, J30c) have virtually identical major element compositions to each other, the third artifact tested (M27d) has noticeably higher silicon and aluminum, and lower calcium, potassium, and iron concentrations, suggesting that they may have come from different geological sources. The Fig. 4 plot using Fe_2O_3, CaO, Na_2O, and Al_2O_3 ratios shows that the first two artifacts appear to match best with Bingöl, while the third seems to better fit with the Nemrut Dağ 2 (south) locality. While such specific attributions could be confirmed through analysis of both artifacts and geological samples using the same instrument (and by doing trace element analyses as well), such a specific attribution is not critical for our interpretation of obsidian finds at the Early Bronze Age Camel Site.

Our attribution of the Camel Site obsidian to Bingöl and/or Nemrut Dağ south in Eastern Anatolia, while surprising for the time period involved, is at least

Table 3
Electron microprobe analyses of obsidian artifacts from the Camel Site

Artifact #	USF #	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	MgO	CaO	Na_2O	K_2O	MnO	Total
Raw data											
M27d	499a	74.40	11.09	0.10	2.85	0.00	0.08	5.64	4.14	0.04	98.35
M27d	499b	74.61	11.08	0.10	2.82	0.00	0.09	5.74	4.07	0.03	98.60
M28c	500a	74.88	10.61	0.13	3.36	0.00	0.13	5.56	4.45	0.04	99.16
M28c	500b	74.45	10.57	0.12	3.34	0.00	0.14	5.42	4.49	0.04	98.59
J30c	501a	73.89	10.58	0.12	3.26	0.00	0.16	5.50	4.33	0.05	97.91
J30c	501b	73.94	10.42	0.13	3.25	0.00	0.14	5.58	4.38	0.05	97.90
Standardized											
M27d	499	74.90	11.14	0.10	2.85	0.00	0.08	5.72	4.13	0.04	99.00
M28c	500	74.76	10.60	0.12	3.35	0.00	0.14	5.50	4.48	0.04	99.00
J30c	501	74.74	10.62	0.12	3.29	0.00	0.15	5.60	4.40	0.05	99.00
Geological											
Bingöl	$n = 9$	73.49	11.34	0.19	3.68	0.03	0.20	5.91	4.07	0.09	99.00
Nemrut Dağ 1	$n = 33$	71.86	9.40	0.35	6.02	0.04	0.31	6.55	4.27	0.20	99.00
Nemrut Dağ 2	$n = 12$	72.76	12.16	0.20	3.16	0.03	0.33	5.76	4.52	0.09	99.00
Nemrut Dağ 3	$n = 3$	72.55	10.88	0.27	4.61	0.03	0.29	5.90	4.33	0.14	99.00

Geological XRF data from [21] standardized for direct comparison.

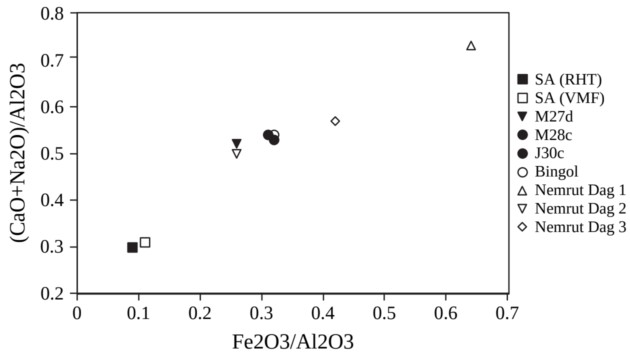

Fig. 4. Electron microprobe results for the Camel Site artifacts (filled symbols), and XRF data [21] averages for geological sources Bingöl ($n = 9$) and Nemrut Dağ 1 ($n = 33$), 2 ($n = 12$), and 3 ($n = 3$).

consistent with the earlier distribution of obsidian from this source region to sites in the Levant including Ramad, Ghoraife, Aswad, Beisamoun, Munhata, and Abu Zureiq, although neither Bingöl nor Nemrut Dağ obsidian had been identified south of the Syrian desert or Upper Mesopotamia [15: Fig. 16b].

6. Discussion and conclusions

The discovery and analysis of three obsidian artifacts from the Early Bronze Age Camel Site offers several conclusions beyond the simple identification of their geological source in Anatolia. This is accomplished through a comparison of the basic structure of the Negev–Anatolia Early Bronze Age exchange link in all its particulars – source, route, and function – with that of the Pre-Pottery Neolithic period, the only other period for which obsidian has been recovered in the Central Negev.

6.1. Source

Pre-Pottery Neolithic B obsidian from the Negev, as defined by Nahal Lavan 109 [43], derives exclusively from the Cappadocia area of Central Anatolia. In general, Southern Levantine Pre-Pottery Neolithic obsidian originates primarily from this region, although in later periods, the later Neolithic and the Chalcolithic, Eastern Anatolian sources are also evident (e.g. [13], (Fig. 4), [27]). However, even when eastern obsidian is present, as at Chalcolithic Gilat [68], the Central Anatolian sources dominate. The contrast with the Camel materials, deriving from the Lake Van area, in Eastern Anatolia, is obvious.

6.2. Route

Although the difference in sources between the periods suggests the possibility of different transport routes, the key issue is really the fact that in the Pre-Pottery Neolithic B one can trace a continuum of obsidian from central Anatolia through the western Levant and down to the deserts of the southern Levant, in a fall-off curve interpreted by Renfrew [46,47] as down-the-line trade. That is, there are numerous PPNB sites in Israel and Palestine with obsidian, and there is no major geographic gap in the distribution from north to south. Data from other periods remain too scanty for reasonable reconstruction. Garfinkel [24] notes the general decline of the obsidian trade with the end of the Pre-Pottery Neolithic.

In significant contrast, Early Bronze Age sites in the southern Levant are lacking obsidian. Even given the very small number of artifacts recovered from the Camel Site, the absence of obsidian from geographically intervening sites, especially the absence from the known desert gateway city at Arad (e.g. [2,34,17: 67–86]), strongly suggests that there was no down-the-line obsidian exchange through the Mediterranean zone of the southern Levant. The only other alternative is a route through the Syrian and Jordanian deserts.

6.3. Function

The differences between obsidian and flint in terms of raw material properties are reasonably straightforward. Obsidian is structurally amorphous. It is thus more easily knapped and capable of achieving a sharper edge than flint. It also tends to have a glossier and smoother surface than flint. Access to obsidian in the Near East was also more restricted than to flint. On the other hand, flint is a less brittle material, and is somewhat harder. The large number and range of flint sources results in greater variability in its basic attributes. These differences are reflected in the archaeological record in what appears to be a greater preference for obsidian in areas where it is readily available, and an added value where it is present, but scarce.

In the Neolithic Levant, both materials were exploited in the production of chipped stone tools, in spite of the scarcity of obsidian. Thus, PPNB obsidian assemblages, especially as exemplified by the materials from Nahal Lavan 109 [9,10], include a large range of tool types, typologically identical to those made from flint, and the complement of debitage reflecting local production. Obsidian, while probably perceived as something special and perhaps more valuable than local flint, was nevertheless traded and treated as a raw material for the production of tools.

In post-Neolithic times, the range of functions utilizing obsidian broadens, including jewelry, magic, medicine, vessel manufacture, mirrors, and sculpture [16]. The three pieces recovered from the Camel Site reflect a fundamentally different phenomenon from the Neolithic. They are not formal tools in a lithic technological sense, nor can they in any way be interpreted as raw material for tool manufacture. Furthermore, the absence of any production waste, in a 100% sieved site (2–3 mm mesh), indicates clearly that they were chipped elsewhere and imported to the site as small flakes. Thus, their only value can lie in their trinket status as rare objects, and cannot derive from any utilitarian function. In this they are akin to the other trinket type artifacts recovered from the excavations, including imported pink quartz crystals (from south Sinai), Mediterranean and Red Sea shells and shell beads, fresh water mother-of-pearl (Nilotic?), and perhaps small local fossils. Notably, the Camel Site shows evidence for ostrich eggshell bead production [50].

These basic contrasts in the structure of the obsidian trade in turn suggest conclusions concerning both the nature of the obsidian exchange in the different periods, and its role in the respective societies. Returning to the general characteristics of ancient Near Eastern obsidian exchange as down-the-line trade [46,47], a key element in this trade is the mobility of the agents of exchange. Bar-Yosef and Belfer-Cohen [4] have suggested that hunting parties operated as prime agents in the movement of goods and the exchange of ideas in the Pre-Pottery Neolithic B, in fact serving as the glue cementing the Levantine interaction sphere into a comprehensive regional unit. For our purposes here, the key point is that PPNB mobility – i.e., hunting – extended throughout the Levant, even in the Mediterranean farming zone, and it constituted a primary activity among large segments of the population. That is, the proportion of the population engaged in hunting, i.e., mobility, must have been quite high. Thus the movement of goods like obsidian was relatively straightforward.

In contrast to this system of relatively high mobility hunting, albeit tethered to sedentary villages, Levantine Early Bronze Age society was primarily urban and sedentary, with an economy based on cereal agriculture, arboriculture, and domestic herd animals. Although one could attempt to make the case that the pastoral component of this society played a role similar to that of the hunters of the PPNB, the parallel is not justified, if for no other reason than the unlikelihood that more than a fraction of the urban Early Bronze Age population engaged in herdsmen husbandry (cf. [35: 22]).

Thus, the absence of obsidian in the Mediterranean zone is perhaps comprehensible, a function of increasing sedentism. This would also explain the decline in obsidian exchange in the latest stages of the Neolithic and the Chalcolithic. On the other hand, the development of peripheral pastoral nomadic societies on the desert fringes, both in the east and the south (e.g. [6,25,52]) provides a rationale for the alternative route suggested earlier, and an agency of exchange for that route. As with the PPNB hunters, the high mobility of the pastoralists offers the means for the movement of obsidian from the Anatolian source area. Unfortunately, we are still lacking the intensive exploration of these regions necessary to confirm this hypothesis.

The significance of the trinket trade for Early Bronze Age desert nomads should not be underestimated. Wiessner [66] has noted the role of reciprocal exchange among the Kalahari San, providing one of the basic glues of the social system. The scarcity of such artifacts as Anatolian obsidian may suggest that they were valuable. The presence of other beads and trinkets, deriving from a variety of sources, indicates the range and variety of trade connections. The combination of value and variation reflects the importance of the trinket trade to Early Bronze Age desert pastoral society. The apparent structural transformation of the obsidian trade from its relatively utilitarian Neolithic antecedents to the Bronze Age trinket trade can be tied to the fundamental evolution of Near Eastern societies from Neolithic farmer–hunters to the complex and variegated societies of early historic times.

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