

Copper Trading Networks across the Arabah during the later Early Bronze Age

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Introduction

Excavations in the Faynan region of southern Jordan during 1989–1993 provided the first opportunity to define a ceramic typology and chronology for the Early Bronze Age of southern Jordan south of the Wadi Hasa. Prior to this time, the lack of well-stratified excavation data in this southernmost part of Jordan meant that there was little upon which to build a definitive ceramic profile for the region. In contrast to this situation in southern Jordan, the Early Bronze Age of western Palestine had been extensively explored and a large amount of data, both historic and new (Glueck 1961, 1968; Rothenberg 1970; Beit-Arieh 1977, 1981; Cohen and Dever 1978, 1979, 1981; Cohen 1986, 1999), had provided a significant increase in evidence for this period allowing a fuller understanding of the rich prehistoric and Bronze Age landscapes on the western side of the Wadi Arabah.

In the Faynan region excavations at the site of Khirbat Hamra Ifdan during 1990–1992 allowed for the development of a ceramic typology for the Early Bronze Age III–IV (Adams 1999, 2000), which, combined with the excavations in 1990 and 1993 at the type sites in the same region for the Early Bronze Age I at Wadi Fidan 4 (Adams and Genz 1995; Adams 1999), and for the Early Bronze Age II at Barqa al-Hetiye (Fritz 1994a, 1994b, nd; Adams 1999, 2003), provided a nearly complete ceramic typology of the Early Bronze Age of the region. These ceramic typologies were particularly important due to the series of radiometric dates which allowed for the dating of the principal strata at each of these sites (Hauptmann 2000: 65–66, table 7) and which taken together with the ceramic typologies provided a firm basis for comparison of these Early Bronze Age sites at Faynan with other regions. Although there was a small gap in the Early Bronze Age during the late phase of the Early Bronze Age I, the general picture which emerges is one of steady human occupation in the region throughout the Early Bronze Age.

The sites in the Faynan region during the Early Bronze Age are key to understanding the expansion of copper metallurgy in the Levant during this formative period of technological development. The evidence for this development has been discussed elsewhere (Haupt-

mann 2000; Adams 1999, 2002), but it is important to note here that, as a result of the central role of copper production and trade in the development of complex society and inter-regional trade in the southern Levant during the Early Bronze Age, the Faynan region sites, despite their location away from what has been considered the ‘mainstream’ of cultural developments, played a significant role in technological and social developments in the broader region during this period. It is not unreasonable therefore to assume that this impact can be traced in terms of local cultural developments in Faynan in general as well as through evidence of relationship between Faynan and other regions. This is particularly true in terms of the east–west relationship between the Faynan region and the heartland of developing ‘urban’ centres during this period in the Jordan Valley and in western Palestine. Despite the potential difficulties of transportation posed by the physical geography and environment of the Wadi Arabah, these regions have a long history of interaction, and it appears now that, rather than a barrier, the Arabah has been a major route (both east–west and north–south) for trade and cultural interaction during the Early Bronze Age.

Early contacts between Faynan and western Palestine

The initial phase of the Early Bronze Age witnessed the first local development of copper production in the Faynan region, building upon a long period throughout the Chalcolithic when copper ores were mined and exported to other regions for production of metal. During the Chalcolithic period there is significant evidence elsewhere that copper ores had been transported from the Faynan region, to the northern Negev (Levy 1995) and as far as Egypt (Hauptmann and Pernicka 1989). In particular the Beersheba Valley cultures during this period may have held a near monopoly on copper smelting since there is as yet no evidence of any local copper production near the mining zones of Faynan or Timna. Despite the apparent transport of ores from Faynan to western Palestine, an activity which no doubt required significant organisation of resources and labour, these activities left virtually no evidence of cultural impact upon the local populations at Faynan. Emerging

evidence for Late Neolithic and Chalcolithic occupation in the Faynan Basin is one of a consistent local development sequence from the Pottery Neolithic through the Early Bronze Age I, albeit with some gaps during the later phases of the Chalcolithic period. At the beginning of the Early Bronze Age, the village level societies of the Faynan Basin such as the one at Wadi Fidan 4 (Adams and Genz 1995; Adams *et al.*, in prep.) were small-scale domestic settlements practising a combination of animal husbandry and dry farming supplemented by limited mining of copper ores and small-scale metal production. Although there is evidence of trade with other regions, and as far south as the Gulf of Aqaba, the cultural indicators and in particular the local ceramic styles had changed little from the regional Pottery Neolithic ceramics known from earlier sites such as Tall Wadi Faynan (Najjar *et al.* 1990). The first production of copper metal recorded in the Faynan region occurred during the Early Bronze Age Ia at Wadi Fidan 4 (Adams 1999; Hauptmann 2000) in the form of small-scale crucible smelting, suggesting that the region was significantly behind developments in the Beersheba Valley and elsewhere (Golden 1998, in prep; Golden *et al.* 2001).

It was not until the early third millennium BC at the beginning of the Early Bronze Age II that the first impact of external cultural developments can be traced in the Faynan region through the adoption of ceramic styles known from western Palestine and the developing urban heartland of the Early Bronze Age, as seen in the excavations of the site of Barqa al-Hetiye (Fritz 1994a, 1994b, nd; Adams 1999, 2003). This transition of ceramic styles and the relationship of this relatively sudden change to the equally rapid development in mining and smelting practices in the Faynan region suggest that the processes of technological development in metallurgy were at the least not entirely indigenous, and more likely relate to the increasingly complex societies of western Palestine and Egypt and their growing need for resources, including copper metal (Adams 1999, 2002). It has long been suggested that one of the principal reasons for the development of early city states in the southern part of the Levant during the Early Bronze Age II has been due in part to the trade in copper from the principal copper resource zones of the Arabah and southern Sinai. This emphasis upon the importance of the copper trade has varied over the years however, from Amiran's discussion of the centrality of the city of Arad in this trade (Amiran *et al.* 1973; Amiran 1978; Amiran and Gophna 1989), to others who see the development of social complexity more broadly tied to the expanding specialisations in technology, of which copper is only one, albeit a prime example (Joffe 1993). Although in general there is a noticeable rise in the volume of copper found at habitation sites throughout the Levant during the Early Bronze Age II, there is little clear evidence for extensive trading networks from the

archaeological evidence of western Palestine. Despite the suggested centrality of copper production and trade as a key factor in the development of complexity during this period, the evidence for the copper trade in the southern Levant is comparatively sparse. Perhaps the best evidence that this trade must have existed at a significant level is the evidence for the rapid development of specialised mining and copper smelting technology at Faynan during this period and for the increased scale and intensity of production which accompanies these changes (Adams 1999, 2002, 2003). Since there is no possibility that this was to meet a local demand, it must be assumed that the copper was produced for export to other regions. In this regard the evidence at one of the principal outlets of the proposed copper trading networks is worthy of mention. The extensive assortment of copper objects used in elite burials during the Old Kingdom is equally convincing as to the importance of copper as an item of conspicuous consumption by Egyptian elites. Recently Gophna and Milevski (2003) have suggested that there is reason to suspect that there was a maritime trade of ores from the Arabah in general and Faynan in particular during the EBA I–II and that sites along the southern coastal plain such as those at Ashkelon, Afridar and Tall as-Sakan provided a maritime base for the movement of copper up the Levantine coast towards the Lebanon and also to Egypt. It is still assumed that overland trade to the Levantine coast across the northern Negev was facilitated through sites such as Arad, En Besor, Tel Halif and Tel Erani, from where the copper would have been shipped by sea. At the same time the overland routes through the North Sinai and presumably other routes to the northern Levant such as the Jordan Valley are assumed not to have been active in certain periods. Although this is an interesting idea, there is at present a complete lack of evidence in support of this maritime route and it is largely speculation that it existed at all. It is much more likely, given the current evidence, that overland trade of copper was the most significant avenue for movement of copper *throughout* the Levant and to Egypt up to the end of the Early Bronze Age, despite evidence suggesting sea-borne trade between Egypt and Byblos from the Early Bronze Age III onwards. One of the reasons why such a maritime trade could be proposed is that interpretations of the overland route through the arid zones of western Palestine have suggested gaps during the Early Bronze Age, and particularly in the EBA I and III. Recent research reviewing this evidence, however, suggests that these so-called gaps can be reconciled with the available evidence.

The Early Bronze Age population of the arid zones of the southern Levant

Recently Avner, Carmi and Segal (1994) and Avner and Carmi (2001) have suggested that these so-called gaps

in the evidence for populations in the southernmost portion of the Levant in the Negev and Sinai are in fact illusory. Using the survey data from southern Israel, they have shown that despite the significant gaps *perceived* on the basis of artefactual dating (principally ceramics and lithics) during the Chalcolithic and Early Bronze Age I and again in the Early Bronze Age III (Avner and Carmi 2001: 1204, fig. 1), that in fact the radiocarbon evidence from all periods of the Early Bronze Age indicates not only a continuity of occupation but also a *steady growth* in populations throughout the period from EBA I through EBA III, followed by a significant decline in the terminal phase of the EBA IV (Avner and Carmi 2001: 1205, table 1, fig. 2). It is clear from this evidence that the problem of 'gaps' in the population of the region is more perceived than real and that when reliance upon artefactual dating is supplemented by radiometric dates these gaps simply disappear. Distinguishing between the sub-phases of the Early Bronze Age has always been problematic, due largely to the complexity of the ceramic and lithic data. Despite these complexities these data have been skewed to support specific theories regarding human occupation in and interactions with these arid zones during the Early Bronze Age. The overemphasis upon the EBA II due to theories regarding the role of the town of Arad, as well as upon the EBA IV to support theories regarding the decline in urbanism and a reversion to pastoralist mode of population during the terminal phase of the Early Bronze Age, are key examples of how the data was manipulated in support of theories which now seem to be quite untenable. Avner (Chapter 4, this volume) has clearly demonstrated that in fact these arid regions have a continuity of population which is comparable to other portions of the Levant and that these so-called marginal zones have been consistently exploited throughout prehistory, and even up to modern times. Significantly, the problem lies with the interpretation of the data and not the quality or quantity of the evidence of human occupation in these arid zones. Given the early state of research in the arid zones of southern Jordan, it can be suggested that the gaps which are apparent in this area may also be closed with the aid of further extensive survey and excavation, as well as the judicious use of radiometric dating.

The arid zones and the copper trade during the Early Bronze Age

There can be little doubt that the exponential increases in copper mining, smelting and production in the Faynan region from at least the Early Bronze Age II onward led to contact between the populations of the Faynan region and western Palestine. As stated above the evidence of a break or shift in patterns of ceramics from local to more broadly regional forms are an

indication of this external contact. So too is the evidence at Faynan that these ceramics are for the first time not all locally produced. Although there is no substantial evidence during this period which links the Faynan region on a large scale with settlements in the arid zones of western Palestine, some Early Bronze Age II pottery found at Barqa al-Hetiye was composed of fabrics identified as coming from the Ora Shales formation of the southern Negev and central Sinai (for a description of this fabric group see Goren 1999: 48, fig. 7). Additionally, petrographic analysis of pottery from Barqa al-Hetiye and Khirbat Hamra Ifdan indicates that Amiran's (Amiran *et al.* 1973) 'arkosic cooking pots' from Arad were much more likely to have originated in the Faynan region of southern Jordan than Sinai (Adams 2003). This evidence, taken together with both the increased scale of copper production and increasing complexities of the mining and smelting operations, indicates that a model of inter-regional exchange of copper best supports the changes in Faynan during the EBA II. The cumulative evidence, although circumstantial, supports increasing links with western Palestine in general and the arid zones in particular, perhaps as routes along which copper from Faynan was transported to Egypt during this phase of the Old Kingdom (Haiman 1992, 1996).

By the EBA III the evidence for contact between the Faynan region and western Palestine increases substantially, and contact with the southern arid zones becomes indisputable. Avner's review of the radiocarbon evidence (Chapter 4, this volume) suggests revisions in the way we view human occupation during later phases of the Early Bronze Age in the arid zones of western Palestine and can be supported by the archaeological evidence from both Faynan and the Central Negev Highlands. Key evidence in support of these contacts comes from the excavations of the copper manufactory at Khirbat Hamra Ifdan (hereafter KHI) in the Faynan region (Adams 1999, 2000; Levy and Adams *et al.* 2002). From the earliest excavations at KHI (Adams 1999) it was clear that this site held the clue to understanding the origin of the enigmatic 'copper ingots' found at so many sites in the Central Negev Highlands, including hoards from Har Yeruham (the Kochavi excavations), En Ziq and other places in southern Palestine such as Hebron (Maddin and Stech-Wheeler 1976) and Lachish (Tufnell 1958). The ingot moulds found at KHI were clearly for production of an ingot identical in type to those which had been found at a number of these sites but which had been dated to the EBA IV. In contrast to the assumed dates for these ingots from western Palestine the radiometric dates for the copper production centre at KHI suggested that these moulds (and hence the ingots) should be dated primarily to the EBA III, albeit towards the middle and end of that period (Adams 1999; Hauptmann 2000). The question arose as to how to understand the differences in interpretation of this data, and to

reconcile the dating of archaeological evidence from these two regions.

The evidence for links between KHI (and Faynan in general) and the Central Negev Highlands takes a number of forms. In addition to the similarity of the moulds to the ingots, there is also the lead isotopic evidence for the ingots and their relationship to Faynan copper ores; the physical similarity as well as the composition of the fabrics of ceramics from both KHI and the Central Negev Highlands; and last of all the close similarities in building styles between KHI and several sites in the Central Negev Highlands. Each of these groups of evidence will be reviewed briefly to illustrate the nature of the relationships between these two zones.

The copper ingots from the Central Negev Highlands: the lead isotopic evidence

For a number of years the evidence from Faynan has been increasing to show that despite earlier theories regarding the importance of copper sources in Sinai and Timna, the copper sources of Faynan during the Early Bronze Age were by far the most important. In addition to the physical evidence at Faynan of mining and smelting, a range of analytical studies has been able to show the widespread distribution of copper from Faynan throughout the Levant and to Egypt from at least the Chalcolithic period onward (Golden 1999; Golden *et al.* 2001; Hauptmann and Pernicka 1989). One of the key aspects in this programme of analysis has been the work done by Hauptmann in characterising the copper ores, slags and metals at Faynan (Hauptmann *et al.* 1992), as well as his comparison of these data sets to discrete groups of copper objects indicating the possible role of Faynan copper production in the larger Levantine and Near Eastern contexts (Tadmor *et al.* 1995; Hauptmann *et al.* 1999). With regard to the copper ingots from the Central Negev Highlands, Hauptmann and his colleagues at the Max Plank Institute for Chemistry at Mainz and the Geochronological Laboratory at Münster undertook an analysis of some 70 of these ingots to determine their chemical composition and lead isotope abundance ratios (Levy and Adams *et al.* 2002). These results were additionally confirmed by independent work by Segal and Roman (1999) and Segal *et al.* (1999) through the analysis of a group of ingots from 'En Ziq and Beer Resisim. Both of these studies confirmed that, on the basis of the lead isotope abundance ratios, ingots from the Central Negev Highlands and elsewhere in western Palestine were consistent with the copper ores from Faynan (Hauptmann *et al.* 1992). This evidence, when put together with the evidence of the moulds for ingot production at KHI, suggests a firm link between the Faynan region and those sites of the Central Negev Highlands where the majority of ingots were found.

Ceramic styles at KHI and from sites in the Central Negev Highlands

Detailed analysis of the similarities between the ceramics from KHI and sites of the Central Negev Highlands has been discussed elsewhere (Adams 2000), but the key points will be summarised here. In analysis of the ceramics from the excavated phases at KHI (1990–1992), the principal occupational phase at the site was determined to be Phase 5, which comprised the building (5a) and the abandonment phase (5b) of the main building complex. This was followed by Phase 6, which post-dated the use of the principal building complex. An initial appraisal of the ceramics from these phases clearly indicates that the pottery of Phase 5 is dominated by the so-called 'Family TR' or red-slipped wares (Dever 1973, 1980). This group of pottery is now well known from southern Jordan, and although this pottery has been attributed to the EBA IV in western Palestine, in southern Jordan it clearly has its roots in the EBA II and at KHI dates principally to the EBA III period. At KHI, Phase 5 has been radiocarbon dated to the period between 2600–2300 BC (Adams 1999; Hauptmann 2000), and only the overlying and later Phase 6 contains the first evidence of Dever's 'Family S' or 'Southern Family' pottery (Dever 1973, 1980). There is no evidence of 'Family S' pottery in Phase 5, but Phase 6 contains both 'Family TR' and 'Family S' ceramics, suggesting a clear overlap of these two 'families' of pottery during the EBA III/IV transition post-2300 BC.

The Phase 5 pottery is dominated by several primary ceramic forms, the vast majority of which are red-slipped wares, and include inverted-rim bowls, spouted holemouth jars, flat-bottomed juglets and bowls, as well as the first appearance of 'spouted' lamp-bowls (Adams 2000: figs 21.3–21.10). The non-slipped wares include a variety of storage jars and pithoi, many with specific applied and impressed decorations at the neck/body join (Adams 2000: fig. 21.4), and a number of large open storage vats with impressed band decoration (Adams 2000: fig. 21.10: 5, 6). This assemblage is large and very distinctive and the recurrence of the forms and decoration styles throughout suggests mass-production and a large degree of standardisation in this pottery group.

By far the best comparative assemblage for the KHI pottery comes from several of the large permanent sites of the Central Negev Highlands. Although the sites have been dated to the EBA IV period, it is clear that the similarities between the two assemblages suggest that in fact the exact dates of these sites in the Central Negev Highlands may be in doubt. A number of the very specific pottery styles which are numerous at KHI have virtually exact parallels in the ceramic assemblages from a number of sites in the Central Negev Highlands. These vessels, many of which

would be hard to distinguish when put side by side, suggest that these pots are not only contemporary but most likely were made in the same pottery workshops. Although some of the best exact parallels to KHI come from 'En Ziq (see Figure 9.1), there are many other sites with similarly comparable ceramics. To select but a few examples from 'En Ziq, the spouted holemouth jars compare very well to those from KHI (Cohen 1999: plate 110:13; Adams 2000: fig. 21.10: 7); as do the inverted-rim (Cohen 1999: plate 99: 1; Adams 2000: fig. 21.8: 1–7, fig. 21.10: 8) and flat-bottomed bowls (Cohen 1999: plate 99: 12; Adams 2000: fig. 21.7: 3); but perhaps the most remarkable of all are the 'pinched' lamp bowls (Cohen 1999: plate 100: 13; Adams 2000: fig 21.6: 4–10).

In the Central Negev Highlands the mixed nature of the 'Family TR' and 'Family S' pottery traditions evident in so many of the large permanent sites may be an indication that these sites date to that same period of 'mixed families' found in Phase 6 at KHI. It also leaves open the possibility that a number of the sites in the Central Negev Highlands have a longer history of occupation than previously suspected and that in fact many of these sites may have been occupied over the entire span of the EBA III–V, albeit on an intermittent basis (see the radiocarbon dates in Avner and Carmi 2001: 1211; Avner, Chapter 4 in this volume). The shallowness of the stratigraphy at many of these sites in the arid zone and the lack of radiocarbon dates for *most* of these sites may also have contributed to the inability to clearly distinguish between these Early Bronze Age phases.

Composition of ceramic fabrics at KHI and from sites in the Central Negev Highlands

Goren's petrographic analysis of the pottery from the Central Negev Highlands sites has also found significant similarities between these assemblages and those from Faynan. In his analysis Goren (1996) concluded that no less than 38% of the pottery from the major Central Negev Highlands sites which he examined had its origin in the southern portion of Jordan, and most likely the Faynan region. One of the principal fabric groups which Goren identifies as coming from this region is his 'Arkosic Group' which has a high percentage of feldspars which originate from the decomposition of the dominant granitic basement rocks of the region. These 'arkosic' fabrics are the dominant fabrics in all phases of the KHI assemblage and in virtually all periods at Faynan. One of the most interesting aspects of Goren's study pertains to his discovery that a large number of the so-called 'Family S' style ceramics found at sites in the Central Negev Highlands sites have their origin not in the region between Hebron and Jerusalem as might be expected, but on the basis of their fabrics most likely

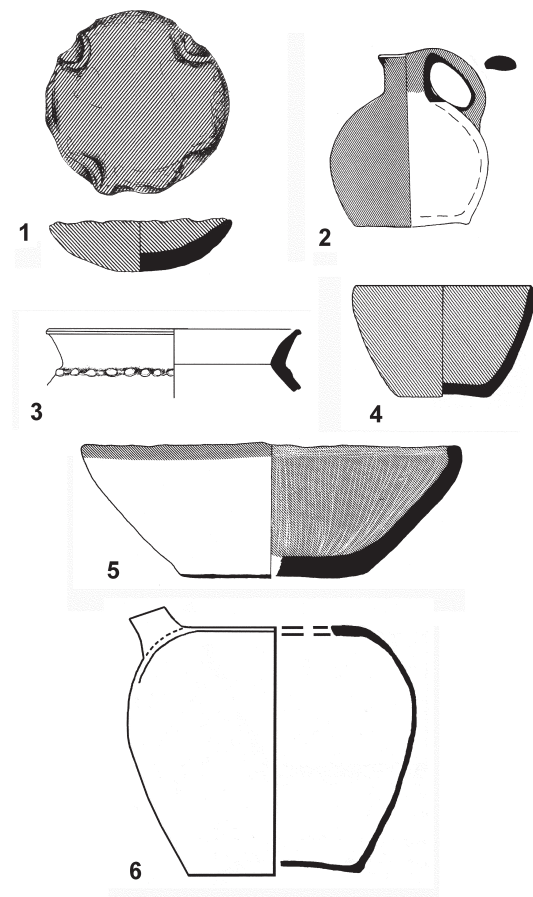


Figure 9.1: Pottery styles from 'Ein Ziq and Har Yeruham in the Central Negev Highlands. Styles from many sites in the Central Negev Highlands closely resemble those at Khirbat Hamra Ifdan. 1: 'Ein Ziq 455 1 (plate 100); 2: 'Ein Ziq 317 1 (plate 100); Har Yeruham 341 9 (plate 69); 4: 'Ein Ziq 31 1 (plate 99); 5: 'Ein Ziq 622 1 (plate 99); 6: 'Ein Ziq 193 1 (plate 110). All illustrations after Cohen 1999. Not to scale.

originated in southern Jordan. Goren concludes that the differences between 'Family TR' and 'Family S' are not entirely regional, but may also be chronological. This is also supported by the ceramic and stratigraphic data from KHI, with a clear chronological distinction between these groups.

Architectural styles in the Central Negev Highlands and at KHI

One final similarity between the two regions lies in the adoption of very similar architectural styles at both KHI and some of the sites of the Central Negev Highlands. Despite the fact that the Negev sites occupy a quite distinctly different geographical zone than at KHI, some similarities can be discerned. One of the key features of the principal architectural phase at KHI is that the buildings are built in a semi-subterranean style, with rooms sunken below the exterior surfaces. At KHI this became evident in the earliest

excavations when comparing the external surfaces surrounding the principal building with the depth of rooms. In the Central Negev Highlands this is also not uncommon and can be seen at a number of sites where the rooms are sunken into the shallow soils covering the bedrock. This style of building is well-suited to an arid environment where there is little vegetation and comparatively little shelter from prevailing winds. In most cases rooms are small and at both sites in the Central Negev Highlands and at KHI evidence of central pillars to support the roof is common.

Another similarity is the use of rooms and courtyards in the Central Negev Highlands, and especially in those sites with rectilinear structures. The use of contiguous rooms surrounding shared central courtyards can be seen at both Har Yeruham (Cohen 1999: plate 68) and KHI (Levy *et al.* 2002: fig. 2). This building style of shared central spaces or courtyards is common to a number of the large Central Negev Highlands sites, although they are more common on sites which utilise a rectilinear rather than curvilinear building style. At KHI these central courtyards were used for copper-production activities (Levy and Adams *et al.* 2002: 431) and it is not unlikely that similar shared activities related to copper production were carried out at the sites in the Central Negev Highlands on the basis of extensive crushing and grinding equipment found at many of these sites (Haiman 1996: 18–20).

'Family TR': Early Bronze Age III or Early Bronze Age IV?

As early as 1973 Dever suggested that 'the Transjordan EB IV is important for filling the gap early in the EB IV–MB I sequence; but even more significantly, it extends this sequence back into EB III...' (Dever 1973: 41). Dever's further discussion (1980) of the dating of his 'ceramic families' confirmed his initial analysis of the various groups and reiterated that 'Family TR' was likely the earliest and the 'Family S' the latest in the EBA IV. In the essential points of his arguments – that there was a chronological distinction to be made on the basis of the appearance of both of these 'families' – Dever was correct. Where his interpretation failed, however, was in determining just how early the 'Family TR' pottery truly was. It now seems clear that the 'Family TR' red-slipped pottery found both in southern Jordan and in western Palestine largely dates to the later phases of EBA III and seems to end in the earliest phase of EBA IV. The evidence from the Faynan region and also from a revised interpretation of the 'EBA IV' sites of the Central Negev Highlands supports this view. The archaeological evidence can now finally be shown to support what the radiocarbon evidence suggested all along, namely that the southern arid portions of the Levant, both in southern Jordan and western Palestine, have a full and complete

history of human occupation throughout the Early Bronze Age, with no gaps. The confirmation of this essential point is a significant factor as we continue to assess the nature and scale of the copper trading networks from Faynan to western Palestine and Egypt.

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