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NEW INSIGHTS ON THE COPPER MINES OF WADI FAYNAN/JORDAN

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The article reviews archaeological surveys and excavations in the area of the Wadi Faynan, together with various dating proposals. In particular, the results so far published of the San Diego expedition under Thomas Levy and of the possible connection between Iron Age copper mining and the biblical King Solomon are considered, along with the necessity of utilizing evaluation of the material remains by conventional archaeological means (stratigraphy, ceramic typology) alongside laboratory analysis, and not the latter alone.

Keywords: Faynan, 'Arabah, Timna', copper mining, King Solomon

1. INTRODUCTION

Biblical archaeologists note that the modern name 'Faynan' is derived from the biblical name *Pînōn* (Gen 36:41; Num 33:42–43), while Weippert (1971, 456–458) has argued that *Pînōvn* belonged to an Edomite tribe living in the Wadi Faynan during the sixth century BCE. Several other scholars (Knauf and Lenzen 1987, n. 43) have also stated that Wadi Faynan during the eighth and seventh centuries BCE was a part of the Edomite kingdom.

Wadi Faynan stands on the eastern side of the Wadi 'Araba, almost midway between the Dead and the Red Seas (Fig. 1), covering an area of approximately 500 km^2. This area is well known for its richness of minerals, and especially copper, which began to be mined here continuously from around 4500 BCE until *c.* 636 CE (Khalil 1995). Recent surveys of the Wadi have registered 250 mining sites, including Khirbet an-Nahas, Wadi Ghweir, Tell Wadi Faynan, Wadi Faynan, Khirbet Hamra Ifdan, and Wadi Khaled on the eastern side of the Wadi ʿ Arabah, and Khirbet Mneiʿ ah (Timnaʿ) on the western side (Fig. 2). Here we present a brief study of these surveys.

The earliest evidence of settlement patterns in the Wadi Faynan belongs to prehistoric periods, especially the Neolithic (Finlayson and Mithen 2007). Thus, the first settlers of the Wadi chose this area for ecological reasons, and only started mining and smelting copper, probably on a small scale, during the Chalcolithic era (*c.* 4500–3500 BCE). Copper was intensively mined in the Wadi Faynan only from the Early Bronze age. There is little information about the Iron Age I (*c.* 1200–923 BCE), Thomas Levy and his colleagues, based on a cluster of C14 dates obtained from Khirbet an-Nahas, have stated that the mines might date to the reign of King Solomon (Levy 2008; Levy *et al.* 2008).

Ernest Axel Knauf (1992, 781) assumes, on the contrary, that it was the Edomites who mined copper here between *c.* 800 and 400 BCE, arguing from the large number of Edomite Iron Age II sites found in the area, such as Khirbet al-Ghwair, Khirbet el-Jaryyeh, Khirbet en-Nahas and Khirbet Faynan, where Edomite pottery sherds were collected (Hart 1986). This proposed date contradicts the reading of the pottery assemblages by Nelson Glueck in the area, which ranges between the thirteenth and ninth centuries BCE (Glueck 1935).

Surveys have shown that the Nabataeans established many camps and villages in this region, but found no evidence that they exploited the copper mines. They revealed rather

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Fig. 1. Map showing the Wadi Feynan Location (drawn by Fawwaz Ishaqat).

that it was the Romans who exploited copper during their domination of Bilad esh-Sham, using new techniques such as more developed furnaces for copper smelting (Hauptmann *et al.* 1985, 185). Ernest Axel Knauf (1992, 781) argued that the Romans punished Christians by sending them to Wadi Faynan to work in the mines. During the Byzantine period (*c.* 324–636 CE) Wadi Faynan played a major role in the region, as demonstrated by the fact that a bishop was appointed for the area. A cemetery and stone tombs dating to the fifth to the seventh century CE are also still visible in the Wadi. The latest mining operations appear to belong to the thirteenth century CE, the end of the Ayyubid and beginning of the Mamluk period (Jones *et al.* 2012). In fact, more fieldwork needs to be done to determine with certainty the latest copper mining and settlement patterns in the Wadi.

1.1. Archaeological fieldwork at Wadi Faynan

During the end of the nineteenth century and the beginning of the twentieth century several explorers and travellers visited Wadi Faynan, recording all visible archaeological features, including the copper mines. Among these we may mention the Austrian theologian, orientalist and explorer Alois Musil (1907) who presented an extensive description to the region in his book *Arabia Petraea*. Before the beginning of the Second World War, and during the 1930s, Nelson Glueck (1951a, 1951b) conducted an intensive archaeological survey in Jordan and

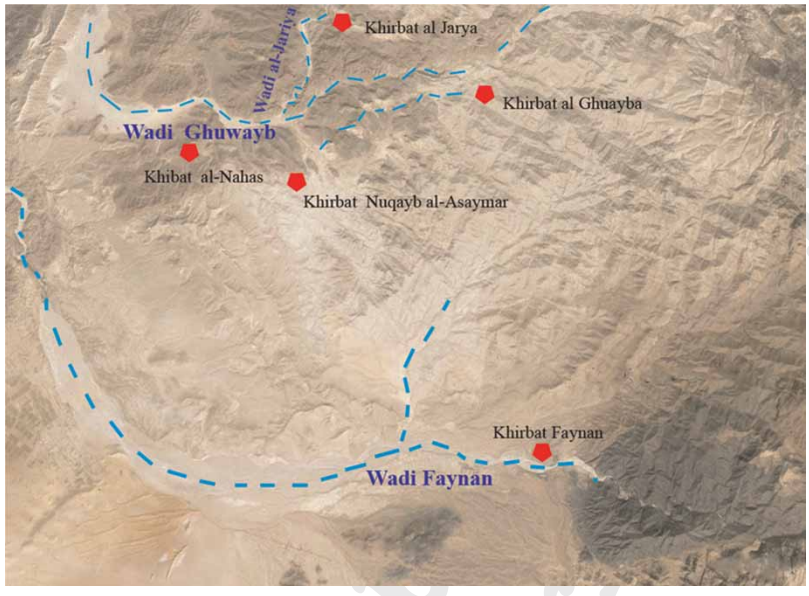

Fig. 2. Map showing the location of the copper mines.

parts of Palestine, during which he visited Wadi Faynan with the aim of finding and inspecting Solomon's tenth-century BCE copper mines. Nelson Glueck declares this ambition clearly in his *The Other Side of the Jordan*, where he states that Solomon's mines are to be found in Wadi Faynan, located approximately 50 km to the south of the Dead Sea (Glueck 1940, 50–88).

The Wadi Faynan copper mines were also surveyed and documented by the German geologist Hans-Dieter Kind (1965). Owing to the archaeological and mineralogical importance of the Wadi 'Arabah region, and Wadi Faynan in particular, during the 1980s, archaeological activities were resumed here. One of the major archaeological projects in this area is that of the Bergbau Museum in Bochum, Germany, set up in 1983 under Hauptmann and Weisgerber (1987). As a result of their survey, the German team estimate that the weight of the copper slags covering the surface ranges between 150,000 and 200,000 kg. They add that the major mining operations in the Wadi took place during the Early Bronze Age (*c.* 3500–2000 BCE) and, additionally, that the copper mining sites of Wadi Khaled, Wadi Dana, Wadi Jaryeh, Wadi Ratyeh, Khirbet Nahas, Khirbit Faynan, and Wadi Fidan span the Chalcolithic (*c.* 4500–3500 BCE) to the Ottoman period (Hauptmann *et al.* 1989; Hauptmann 2000)

Archaeological fieldwork at Wadi Faynan has also been undertaken by other expeditions, such as by Burton MacDonald in 1985 (North American: MacDonald and Koucky 1987), and [1] Steven Hart in 1986 (British: Hart 1986; Hart and Knauf 1986). These were preceded by the British archaeologist Crystal Bennett's work in the 1960s and 1970s at major Edomite sites (Buseira, Umm al-Byara, and Tawilan). From the results of these excavations, and especially the pottery, it has been deduced that Edom, including Faynan, lacks sites datable to the early phases of the Iron Ages (Iron Age I), and that Edom never functioned as a kingdom earlier than the seventh century BCE (cited in Bienkowski 2002).

In 2002 intensive surveys and excavations were undertaken in the area by an American expedition headed by Thomas Levy (Levy *et al.* 2002), who used advanced scientific techniques (Novo *et al.* 2012; Gidding *et al.* 2013) including C14 analysis. Levy has published several articles,

as well as reports in social network media, suggesting that some of the Wadi Faynan copper mines should be dated to the tenth century BCE and belonged to King Solomon of Israel (Levy *et al.* 2004, 2005). Nevertheless, it is well known that copper mining at Wadi Faynan started earlier than the tenth century BCE. Levy himself stated that the "recent excavations at the site Khirbet Hamra Ifdan (KHI) in the copper-ore-rich Faynan district of southern Jordan have revealed the largest Early Bronze Age metal workshop in the Middle East, and have yielded thousands of finds related to ancient copper processing" (Levy *et al.* 2002, 425).

2. KING SOLOMON AND THE COPPER MINES IN WADI FAYNAN

In the last two decades, a number of biblical scholars (often referred to as 'Revisionists' or 'Minimalists') have claimed that the Hebrew Bible was written from the end of the fifth century BCE onwards, and that the information relayed in it is not necessarily reliable (see e.g. Thompson 1999). A major difference of opinion between these and traditional biblical historians is over the existence of a United Monarchy (*c.* 1004–923 BCE) in Palestine during Iron Age II. A number of archaeologists, including Israeli, have also recently concluded that while this kingdom may have existed, its extent and influence have been considerably exaggerated. We shall avoid contributing directly to this debate here, but the issue is obviously relevant to our discussion of the copper mining at Wadi Faynan in the Iron Age.

Basing his interpretation on the biblical narratives, Nelson Glueck (1935, 49–50) had concluded that the Wadi 'Arabah, because of its minerals and its position as a trade route between the Levant and the Arabian Peninsula, was the main cause of warfare between Israel and Edom. He added "it is probable that David carried out on the exploitation of the mines in the 'Arabah after he had subjugated and enslaved the Edomites. The pottery which was used continued to be Edomite, just as Nabataean pottery continued to be used after the Romans had occupied the Nabataean sites in the 'Arabah" (Glueck 1935, 50). He added that "the exploitation of the mines in the 'Arabah was undoubtedly intensified during the reign of Solomon, who maintained firm holds over the 'Arabah". In fact the Old Testament (1 Kgs 11:17–19, 25) states that warfare had been waged against Solomon by the Edomite prince Hadad, who had returned to Edom from Egypt, having fled from David, when the latter conquered Edom. Thus, Nelson Glueck (1940) was the first to assume that the Wadi Faynan copper mines belonged to the era of King Solomon (*c.* 960–923 BCE), towards the end of the kingdom. Glueck based his argument on ceramic finds and biblical considerations (a view rejected by J. D. Muhly [1984]).

In 1959 Beno Rothenberg initiated a well-organized long-range archaeometallurgy multidisciplinary research programme at the site of Timna in the southern Negev, which was generously supported by the Volkswagen Foundation. Beno Rothenberg had worked as Glueck's chief assistant and photographer during his surveys and excavations in Jordan, including the Wadi 'Arabah region. Beno Rothenberg was not completely statisfied with Glueck's claim that the copper mines belonged to Solomon, hence his own project. Rothenberg published the first results of his work in *PEQ*, announcing that Glueck was completely wrong. He added that the site of Tell el-Khaleifeh had nothing to do with copper smelting and that copper smelting being carried on in the region had nothing to do with Solomon (Rothenberg 1962, 46–56), but that the miners were semi-nomads recruited from the Midianites who had settled south of the modern city of Aqaba (idem, 41).

However, claims that the Wadi Faynan mines belonged to King Solomon, have resurfaced. Thomas Levy's San Diego expedition team, working in the area from 2002, has stated that the Wadi Faynan copper mines were exploited during the tenth century BCE by King Solomon's people (Levy *et al.* 2008). Hence, despite recent doubts, a 'United Monarchy' is still being invoked in this connection. We have no objection to this if such a kingdom, and

such a link can be scientifically proven. Indeed, Thomas Levy based his claim on a comprehensive set of AMS radioncarbon dates indicating that the main copper production at Wadi Faynan dated to a period between twelfth and ninth centuries BCE (Levy *et al.* 2008). But Erez Ben-Yosef recently noted that the activity was initiated by local semi-nomadic tribes, probably belonging to Edom (Ben-Yosef *et al.* 2012, 31). Hence we can accept the assigned dates, but not the connection with Solomon, whose control of the Wadi 'Arabah is now widely questioned.

After the excavation season of 2006 at Khirbet an-Nahas, Thomas Levy (2007) argued that by the end of the Late Bronze Age (*c.* 1300 BCE) Cyprus had ceased to be the main supplier for copper in the region. In addition, the demise of the great empires of the Hittites in Anatolia, the New Kingdom in Eygypt, the Mycenaeans in Greece and the Kassites in Mesopotamia gave smaller societies in the southern Levant new economic and social opportunities. As a result, the copper production industry flourished again in the Wadi Faynan region. He added that "complex societies, oscillating between the chiefdom and kingdom level of social integration, were organizing the mass production of copper metal much earlier than was previously assumed by scholars" (Levy 2007, 91).

This assertion also requires discussion. The archaeological excavations of the 1960s at the Timna Egyptian Temple on the western side of Wadi 'Arabah implied earlier dates for the main copper production sites in the Wadi than those mentioned above. Beno Rothenberg (1999) proposed a date for the temple ranging between the fourteenth and twelfth centuries BCE. Yohanan Aharoni (1962), the expedition's advisor on pottery typology, was confident that none of it should be dated later than the eleventh century BCE, Nelson Glueck and initially William Albright, rejected this conclusion (Glueck 1967, 1969). However, the excavations of the Egyptian *Hathor* Temple in Timna yielded artifacts including cartouches from the nineteenth and twentieth Dynasties in Egypt, reinforcing Aharoni's dating, a dating, also accepted by J. D. Muhly (1984). Beno Rothenburg (1990) also concluded that site 39 in Timna should be dated to the Chalcolithic period.

In the second edition of his *The Other Side of the Jordan*, Nelson Glueck (1970) acknowledged finding material dated to the nineteenth and twentieth Egyptian Dynasties, but did not agree with Aharoni that the pottery from Timna should be assigned to a period no later than the eleventh century BCE. Nevertheless, William Albright (1971) and other scholars reconsidered the association of the copper mine with Solomon and adopted the description 'Egyptian'. This is in our view more acceptable because it dates the Wadi 'Arabah copper mines to the end of the Late Bronze Age when this region was under Egyptian domination. It should, however, be mentioned that the British archaeological investigations on the Jordanian side of the Wadi (Bienkowski 1992) have offered later dates for the main copper smelting sites in Faynan, namely the seventh to sixth centuries BCE, stressing Assyrian influence.

As a result of the tenth-century date proposed by Thomas Levy and his team for the copper mines in Wadi Faynan, an Israeli expedition decided to start new excavations at Site 30 in Timna (Ben-Yosef *et al.* 2012, 37–63). The excavation yielded more Midianite pottery sherds and a cluster of C14 dates (Ben-Yosef *et al.* 2012, figs. 11–12; 55). The pottery sherds resemble those encountered at the site of Qurayyeh in the north-west of the Arabian Peninsula and belong to the type known as QPW (Qurayyah Painted Ware), dated to the Late Bronze Age II (Fig. 3). The published C14 dates range from the eleventh to the end of the tenth centuries BCE, and this type of pottery has already been excavated at several sites in northwest Saudi Arabia, such as at Tayma (Eichmann *et al.* 2006; Hausleiter 2011, 2013). The dating of the QPW is admittedly notoriously difficult, but it can be argued that that the material culture contradicts the C14 dates.

Badwen (1983) discussed the painted Midianite pottery from Tayma as belonging to 2
northwest Arabia. He dated this type of pottery to the Late Bronze Age, based on the

Fig. 3. Qurayyah Painted Ware (probably 13th to 12th century BC) from Tayma, Area H (photograph: DAI Orient-Abteilung, J. Kramer).

results of the excavations conducted at Tayma, where Midianite pottery utensils were encountered in a well-stratified context (Badwen 1983, 38, 50). He argued that there are many indications of a continuation of settlement at Tayma even later than the eighth century BCE, as seen in the so-called 'Sana'iye Pottery' (Fig. 4), and this is confirmed by the results of the

Fig. 4. Painted pottery of the Middle Iron Age (so-called 'Sana'iye pottery', probably 9th–5th centuries BC) from Tayma, Area H (photograph: DAI Orient-Abteilung, J. Kramer).

recent excavations by the German Archaeological Institute (Eichmann *et al.* 2006). In addition, in 1968 an expedition under Peter Parr investigated Qurayyah, approximately 70-km northwest of the city of Tabouk and concluded that the pottery assemblage conforms to the Midianite pottery style (Parr *et al.* 1970).

Nelson Glueck (1935) was the first to assign the Edomite pottery to between thirteenth and eighth centuries BCE, based on a study of the form and the painted decorations, which are the most striking element in the assemblage. Edomite pottery was recovered at three major sites in southern Jordan, Buseirah, Tawilan, and Umm el-Biyara, all excavated by Crystal Bennett. All these Edomite pottery assemblages were dated to the Iron Age II (Bienkowski 1992).

We are not against using absolute dating methods, such as high-precision AMS radiocarbon dating of short-lived organic samples, but under one condition, that it is accompanied by a relative typological study (if available) from the same site and locus. Accurate dating of copper production in Wadi 'Arabah region is fundamental for reconstructing the ancient history, culture, economy and social activity in this area. It is unfortunate that some scholars try to connect the copper production with the origin and development of local sociopolitical entities in the region (Ben-Yosef *et al.* 2012, 32). We further assume, in general, that it is dangerous to assign the material culture to a specific ethnic group in Bilad esh-Sham. This is because the area was never settled by a single ethnic group. Moreover, the same ethnic group may have several religions, rituals and traditions. The best example comes from Bilad esh-Sham where Jews, Christians, and Muslims lived and are still living side-by-side. Nevertheless, as a cautionary reminder, it should be noted that the Bible (1 Kgs 7:46) says "In the valley of Jordan the king cast them, in the clay ground between Succoth and Zarethan". Thus if we accept the historical accuracy of this verse, we should conclude that Wadi 'Arabah copper mines had nothing to do with Solomon.

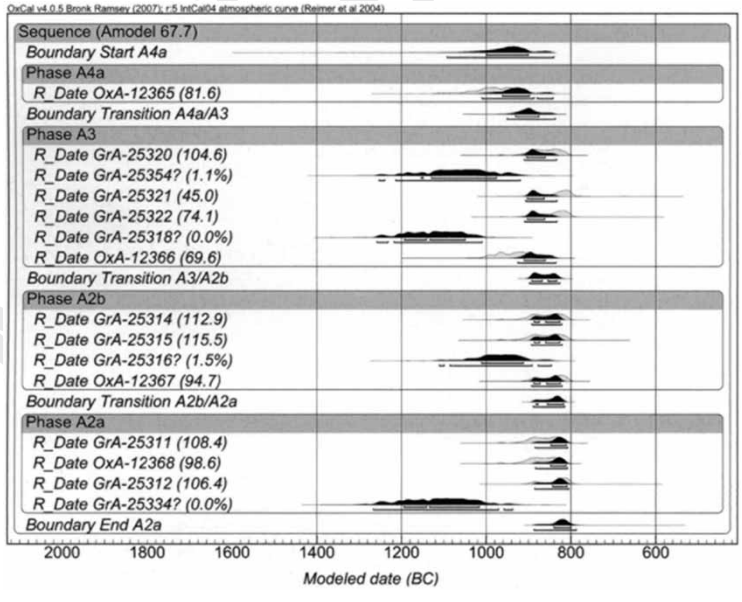

Fig. 5. C14 Dates from Khirbet en-Nahas (after Smith and Levy 2008).

3. KHIRBAT EN-NAHAS, THE C14 DATES VERSUS THE ARCHAEOLOGICAL MATERIAL

It is for archaeologists to decide the dating and significance of archaeological sites, but always based on the excavated remains of the material culture. Given dates might be either relative or absolute, but to be determined they require several lines of evidence, including stratigraphy, pottery, architecture, and laboratory analysis of organic or non-organic samples. At Khirbet

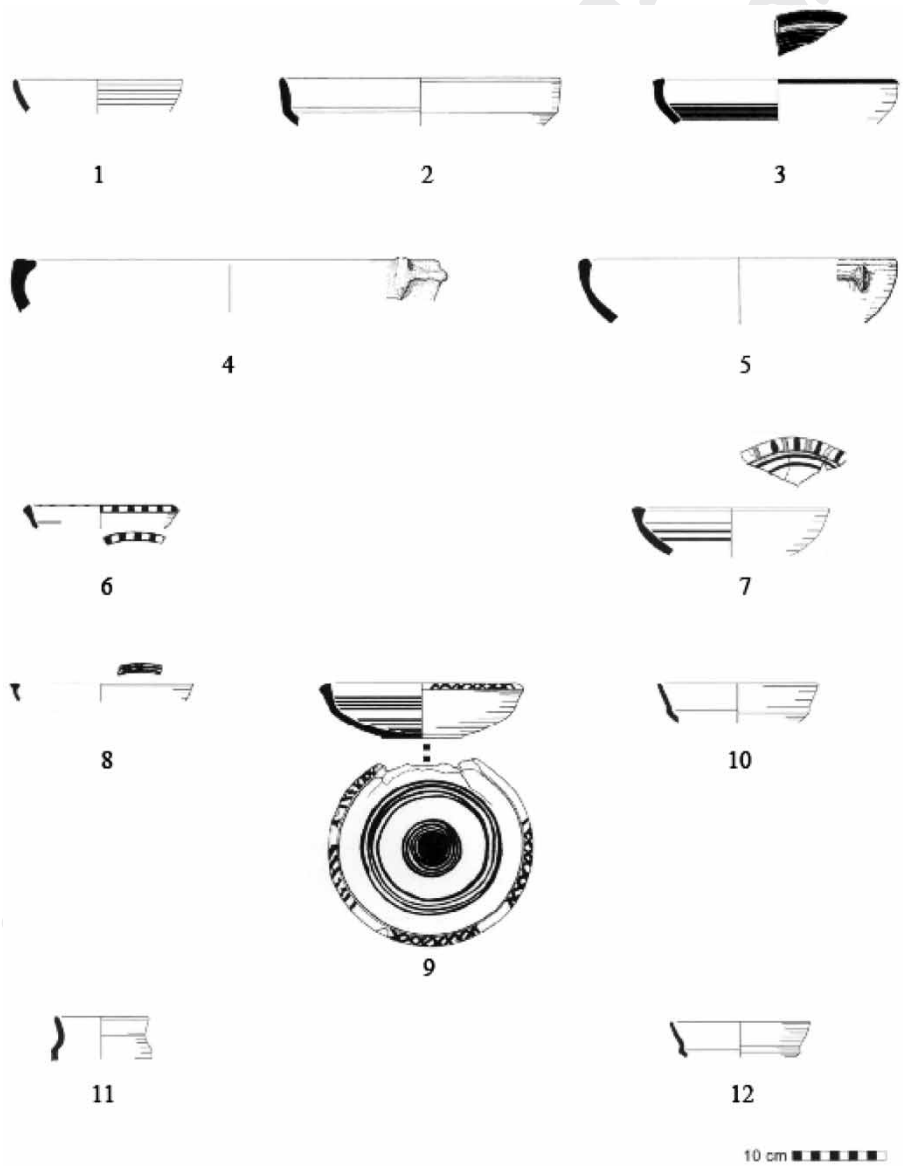

Fig. 6. Selected Published Pottery drawings (after Smith and Levy 2008).

Key to Fig. 6

Number	Smith and Levy (2008)	Smith and Levy Date	Comments
1.	fig. 11; Str.S1	Uncertain	Bienkowski (2002), fig. 9.25: 7. (Buseira).
2.	fig. 17.4; Str. S1	Uncertain	Bienkowski (2002), fig. 9.25, 15. (Buseira).
3.	fig. 16.2; Str. S2a	9th century BCE	Bowls with overall red or black burnishing 'irregularly burnished slip' dated to the Iron Age dominated during the 10th cent. BCE and continued through the 9th and 8th centuries BCE. Bienkowski (2002) (Buseira)
4.	fig. 17.11; Str. S1	9th century BCE	Iron Age bowls with bar-handles dominated during the 9th century BCE and continued through the end of the Iron Age periods
5.	fig. 16.7; Str. S2a	9th century BCE	Iron Age bowls with bar-handles dominated during the 9th century BCE and continued through the end of the Iron Age periods
6.	fig. 13.3; Str. A2a	9th century BCE	Bienkowski (2002) (Buseira). Hart (1995), figs. 6.4.3–8; 6.5.1, 10 (Tawilan 7–6th centuries BCE)
7.	fig. 15.5; Str. S2b	9th century BCE	Hart (1995), figs. 6.4, 3–8; 6.5: 1, 10 (Tawilan 7–6th centuries BCE)
8.	fig. 12.2; Str. A2b	9th century BCE	Hart (1995), figs. 6.4, 3–8; 6.5: 1, 10 (Tawilan 7–6th centuries BCE)
9.	fig. 17.1; Str. S1	Uncertain	Bienkowski (2002) (Buseria). Hart (1995), figs. 6.4,6 (Tawilan 7–6th centuries BCE)
10.	fig. 13.9; Str. A2a	9th century BCE	Hart (1995), figs. 6.8: 20 (Tawilan 7–6th centuries BCE)
11.	fig. 15.1; Str. S4	? earlier than the 10th century	Bienkowski (2002), 286 (Buseira) Bienkowski (1995), fig. 9.11 (Tawilan)
12.	fig. 13:11; Str. A2a	9th century BCE	Bienkowski (1995), fig. 9.20 (Tawilan)

en-Nahas a large amount of material has been excavated and a cluster of C14 dates published. A brief discussion is presented below.

3.1 The C14 dates from Khirbet an-Nahas

A sequence of four main strata (A4–A1) associated with copper production has been obtained (Fig. 5). In addition, excavation and radiocarbon dates from Area (S) indicate that the site was occupied between the twelfth and ninth centuries BCE (Levy *et al.* 2004). This proposed dates has been rejected by several scholars such as Israel Finkelstein (2005), who pointed to the small number of samples taken from the occupational layers and the 'old Wood' phenomenon. He added that the earliest C14 dates from the fort area were sampled from industrial waste and fills under the fort. Therefore the fort was, in his opinion, built during the late 8th century BCE (Finkelstein and Piasetzky 2008). Van der Steen and Bienkowski (2006) further criticized the use of Bayesian calibrated radiocarbon dates by the Khirbet en-Nahas team because, in their view it delivered earlier dates than it should and 'the results of the BCal calibration

are completely dependent on the nature of the other chronological data, and the way they have been fed into the programme' (Van der Steen and Bienkowski 2006). They claim that Levy's team is attempting to push the dates to about a hundred years or so earlier than the calibrated radiocarbon data allow.

In response, Levy *et al.* (2006) disagreed that the fortress had been built over earlier archaeo-metallurgical deposits, adding that none of the C14 samples from the site show human activity during the eighth to seventh centuries BCE (Levy and Najjar 2006; Levy *et al.* 2006).

We do not feel in a position to judge who is correct here, but we should stress that the excavated material culture along with the written historical sources must have priority over any other dating methods, because the process of sampling is subject to factors that may distort the results. In addition, the procedure for analyzing samples differs from one laboratory to another. Moreover, while scholars can check the conclusions of any scientific analysis, the testing often requires destroying the sample, so that no one can replicate the result. This does not mean that the scientific analysis should be aside, but a combination of the excavated material culture and the use of high scientific techniques is absolutely necessary in dating archaeological sites. The uncertainty of dating techniques is illustrated by the observation that in the 1990s the earliest date of the Faynan copper mines seemed to be the seventh century BCE (Bienkowski 1992; Hauptmann 1986), whereas shortly before J. D. Muhly (1984, 280) had argued that the Timna' copper mining and copper smelting must be dated to the thirteenth to twelfth centuries BCE.

3.2 Archaeological material

3.2.1 Pottery (Figs. 6 and 7). In 2008 Smith and Levy (2008) published a preliminary report on the excavated pottery assemblage from Khirbat en-Nahas. The published pottery consisted of wheel- and handmade, well-stratified pottery sherds that were either locally made (Edomite) or imported (Cypriot Black-on-Red Ware), and associated with a highly specialized industrial site. Rims, bases, handles, and decorated sherds were encountered (Smith and Levy 2008, 51). Parallel pottery assemblages are to be found at other well stratified sites such as Buseirah, Tawilan, Um al-Biyara, Tell el-Khaleifeh in Jordan, and various Negev sites. Moreover, several parallels are visible in the published pottery assemblages from the Wadi Hesa Survey (MacDonald 1992, fig. 12.12, 11; Hart 1995), and the Petra Region Survey — e.g. at the site Um el-Ala (Zeitler 1992, fig. 14.5, 1–6). Those were mostly dated to the Iron Age II, and a few to the Iron Age I. Smith and Levy (2008, 84) commented that "the ceramic assemblages published on the eastern side of the Wadi 'Arabah have been collected mostly from surveys or poorly recorded excavations from sites such as Tell el-Kheleifeh". In our view this is not entirely true, since while we allow that the excavation and recording methods of the Khirbet en-Nahas excavations are much more advanced than those of the 1930s and 1960s, the excavators of those sites were, and still are, competent practitioners of field archaeology who applied scientific excavating and recording methods in their excavations. Moreover, Ahmad Al-Shorman (2009, 203–212) conducted a petrographic investigation for the Iron Age domestic pottery sherds excavated at several sites in Wadi 'Araba including the site Khirbet an-Nahas and concluded that he recognized two groups of pottery, the first containing slag temper originated from the site Khirbet an-Nahas, and the second without any slag temper found at Faynan IV.

The site Timna' (excavated by Beno Rothenberg in 1959–1969 and 1974–1976) is the earliest and most important copper mine site to be excavated in the region. According to Rothenberg (1980, 210), Stratum III should be dated to the time of Sethos I (*c.* 1303–1290 BCE) of the Egyptian New Kingdom. Here appeared high red-burnished Egyptian pots made of Nile clay

alongside the Midianite and the so-called 'Negev-Ware'. Rothenberg reported that the same groups of pottery assemblage continued in Stratum II, which represents (Site 30) the main occupation phase and belongs to the time of Ramses II (*c.* 1290–1217 BCE), who enforced and developed the installations and constructed the Hathor Temple and ten huts. Beno Rothenberg (1980, 211) argued that the inhabitants of the site were the 'Amalekites' mentioned in the Bible (Gen 14:7) who fought against the Israelite tribes during the Exodus and then remained in the Negev and Wadi 'Arabah regions until the eighth century BCE. Stratum I was assigned to the time of the XXII Dynasty in Egypt, especially during the reign of the Pharaoh Sheshenq I (*c.* 946–925 BCE).

Now, it can be argued that Strata I, II, and III of the Site 30 at Timna' yielded several parallels to the pottery from at Khirbet en-Nahas (Rothenberg 1980, pls. 209–213). But the Midianite pottery vessels were encountered only in Strata II and III, while the so-called 'Negev-Ware' was uncovered only in Stratum I. In our view such a continuation and mixture of pottery types show that it is hard to claim Amalekite, Midianites, or even Negebite origin. It is highly likely that the vessels were locally made, despite the fact that some were

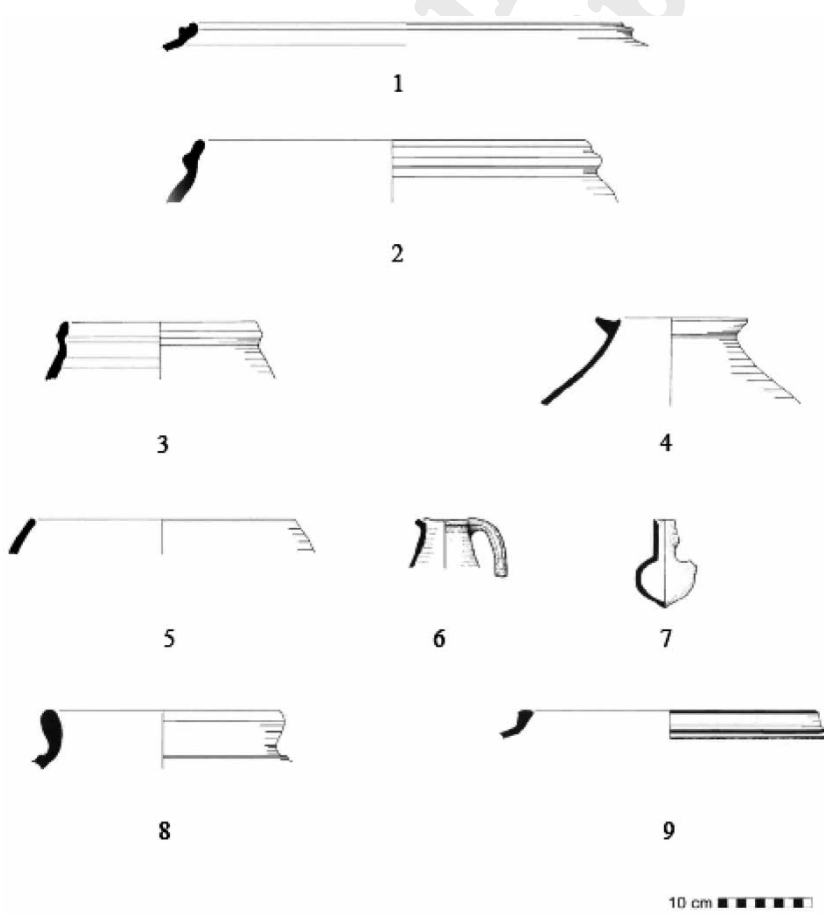

Fig. 7. Selected Published Pottery drawings (after Smith and Levy 2008).

Key to Fig. 7

Number	Smith and Levy (2008)	Date Given by Smith and Levy	Comments
1.	fig. 18.6; Area S	9th century BCE	Bienkowski (2002), figs. 9.38, 9.39. Amiran (1969), pl. 75 (Iron II A-B, C)
2.	fig. 18.1; Area S	9th century BCE	Bienkowski (2002), figs. 9.38, 9.39. Amiran (1969), pl. 75 (Iron II A-B, C)
3.	fig. 18. 4; Area S	9th century BCE	Bienkowski (2002), figs. 9.38, 9.39 Amiran (1969), pl. 75 (Iron II A-B, C)
4.	fig. 15.4; Str. S3	9th century BCE	Rothenberg (1980), 201; Abb. 213, 7 (Str. I= 946–800 BCE)
5.	fig. 18.9; Area S	9th century BCE	Bienkowski (1995), fig. 16.16) Rothenberg (1980), Abb. 213.1–2 (Str. II)
6.	fig. 11.17; Str. A3	9th century BCE	Bienkowski (2002), fig. 9.59, 2 Hart (1995), figs. 6.31,7?(Tawilan 7–6th centuries BCE) Iron IIC ? (Phoenecian?)
7.	fig. 15.21; Str. S2b	9th century BCE	Amiran (1969), pl. 86.12 (Iron II A-B) Amiran (1969), pl. 88. 19 (Iron II C)
8.	fig. 11.7; A3	9th century BCE	Bienkowski (2002), fig. 9.46, 15–16 Hart (1995), figs. 6.30 (Tawilan 7–6th centuries BCE)
9.	fig. 15.13; Str. S2b	9th century BCE	Bienkowski (2002) (Buseira) Hart (1995), figs. 6.12,1 (Tawilan 7–6th centuries BCE)

constructed of Nile Ware as proved by Beno Rothenberg. Below we present two selected line-drawings of pottery sherds published by Smith and Levy (2008) from Khirbet an-Nahas in order to stress the relationship with other assemblages excavated either at Edomite sites in the southern Levant, or even at Tayma in the northern part of the Arabian Peninsula.

The excavators of the Khirbet en-Nahas site have so far dated the Iron Age pottery, based on a cluster of C14 dates, to the 10th and 9th centuries BCE, the early Iron Age II, without excluding that the site continued to be settled during later periods (Smith and Levy 2008, 84). Neil Smith and Thomas Levy admit that these pottery vessels have their strongest parallels with the assemblages from other Edomite sites (Buseirah, Tawilan, Umm al-Biyara, and Gharareh), and add that the Khirbet an-Nahas pottery industry represents a local Iron Age tradition that started in the Edomite lowlands during the 10th century BCE and continued in the eighth and seventh centuries BCE in the highland sites mentioned above. From this assumption, we believe, Smith and Levy aim to persuade us that the excavated pottery assemblage at Khirbet en-Nahas started earlier than at the other major Edomite sites, fitting with the C14 dates they obtained. We regard this claim as unacceptable, because we cannot accept that Edom was geographically divided into two separated industrial sectors, and that it took the people in the highlands of Edom around 200 years to manufacture the same types of pottery utensils as in the lowlands. Moreover, we cannot see that Edomite lowlands were cut off from surrounding regions such as Moab in the North. Piotor Bienkowski states that the collared rim jars from Edomite sites southern Jordan should be dated to the Iron IIC (*c.* 800–586 BCE) (Bienkowski 1992), adding that this type of jar has already been published from several Iron Age sites in Jordan (Herr 2001).

Nelson Glueck (1940; Sauer 1986) had been the first to date the Edomite pottery to a period between the thirteenth to eighth centuries BCE; his studies of the pottery assemblages from major Edomite sites (Buseira, Umm el-Biyara, and Tawilan). Piotor Bienkowski (1990) concluded that none of these materials should be dated earlier than the end of the 8th century BCE. Yet, as above mentioned the recent obtained C14 dates from Khirbet en-Nahas support a date between 1200 and 950 BCE. In his reply to Piotor Bienkowski's studies in Edom, and based on a parallel study of the collared-rim jars from Iron Age sites in Jordan and Palestine, Israel Finkelstein argued that the excavated Edom sites such as Buseirah, Taweilan, and Um-el-Biyara should be dated to a period earlier than the seventh century BCE (Finkelstein 1992).

In their preliminary study of the pottery excavated in 2002 at Khirbet en-Nahas, Smith and Levy (2008) recognized the following vessel types: bowls (37 forms), kraters (19 forms), pithoi (10 forms), jars (16 forms), jugs and juglets (26 forms), and cooking pots. The surface treatment consisted of slip, burnishing, painting and applied decoration. One of the bowl types recognized by them is the triangular rim bowl (Smith and Levy 2008, figs. 12.2; 13, 1–4; 14, 1–2; 15.5; 16. 1–2; 17.1). Most of these were decorated with black concentric lines on the interior and black strokes on the rim. It is obvious from studies from elsewhere that this form has been encountered at major Edomite sites from Iron II (Bienkowski *et al.* 2002, fig. 9.17). We therefore argue that this type of bowl represents a continuation of the Midianite pottery encountered at several sites such as Khirbet en-Nahas and dated to last phase of the Late Bronze Age. In addition, Neil Smith and Thomas Levy (2008, fig. 16.2; Type BL3), featuring a high burnished pink-coloured slip and painted with black and red concentric bands, has parallels in strata belonging to the Iron II period. Moreover, many other published forms and decorations (such as carinated and fine ware bowls) show that they belong to the Edomite pottery production and date back to the Iron Age II.

To sum up, after studying the published pottery assemblage excavated at Khirbet en-Nahas we offer the following observations:

1. The published assemblage included in Smith and Levy (2008) consisted only of rims, and handles attached to rims. No bases are included in this study, except one (fig. 23.19) which belongs to the Qurayyah and Cypriot black-on-red ware juglets.
2. We agree with the Levy team's explanation that the dating of the Midianite and Negebite pottery assemblages is still problematic, and that both forms of vessels were encountered in archaeological contexts ranging from the latest phase of the Late Bronze Age (*c.* 1200 BCE) to the Iron Age II (ninth to seventh centuries BCE).
3. In terms of the strata from which the pottery derives, the published information (Smith and Levy 2008, 43) shows that for each C14 sample, excavated pottery sherds and artefacts were perfectly recorded. The pottery assemblage was encountered in strata belonging to two areas (A 'The Gatehouse' and S 'Metallurgical Processing Building') and each has been divided into sub-strata.
4. Regarding the C14 dates obtained from Khirbet an-Nahas, we agree with Evelin Van der Steen and Piotor Bienkowski that Thomas Levy's team should have published the other chronological data they have used. Furthermore, since the analysed samples comprise only of charcoal (Levy *et al.* 2004, 869), they should be used only as a *terminus post quem.*
5. In his discussion of the claim of the Levy team that the Kingdom of Edom must be started as early as the end of the Iron Age I, Larry Herr (2006) has disagreed with this date and stated that "the local pottery must be published in order to check the typological dating and typological connections with other regions". (This has since been done by Smith and Levy (2008).) 3

6. Despite several excavations at Edomite sites, we believe more studies of the pottery assemblages at those sites are needed. It is very obvious that some of the pottery assemblages, e.g. the so-called Midianite, started as early as the Late Bronze Age and continue through the Iron II. In other words, we still lack a well-stratified settlement in the south of Jordan that commences in the Late Bronze Age and continues through the Iron Age.

3.2.2 Architecture. The excavations at Khirbet an-Nahas reveal a high density of structures spread over a 10-ha site (Fig. 8). The excavators report having uncovered a large fortress

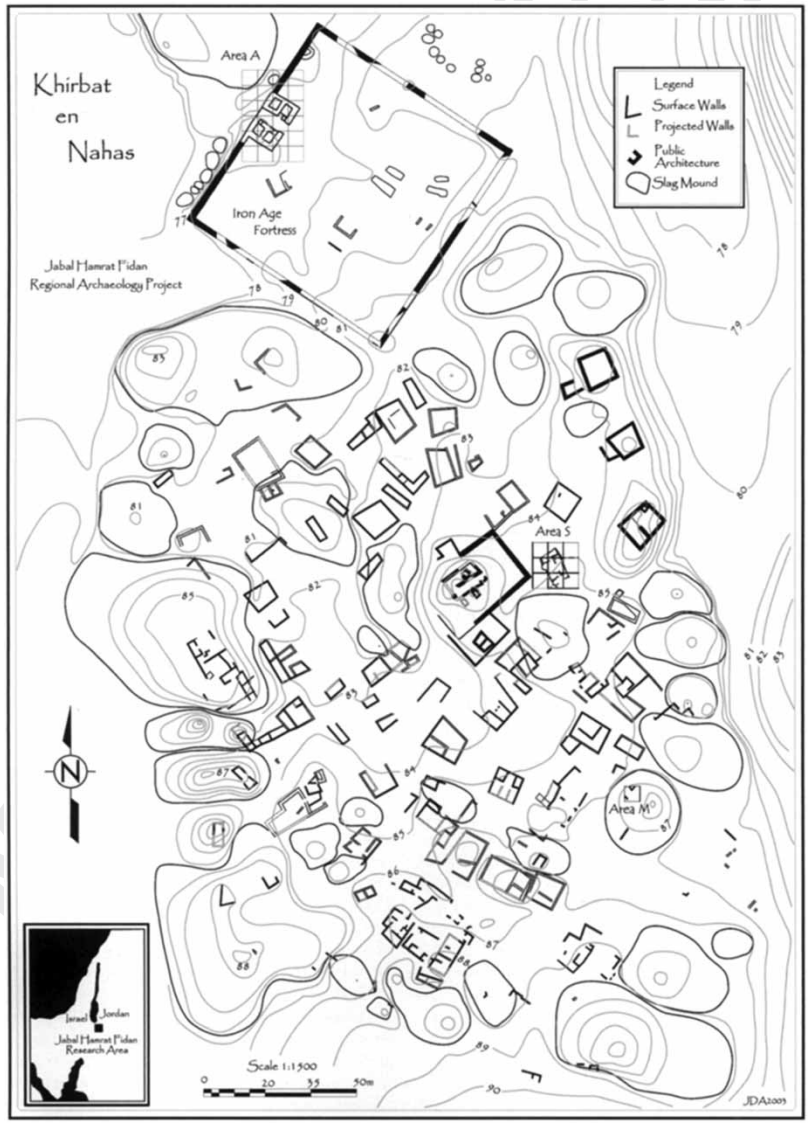

Fig. 8. General top plan of Khirbat an-Nahas (after Smith and Levy 2008).

(*c.* 73 by 73 m) with a four-chamber gate (Area A), a metallurgical processing building (Area S), and thirty industrial slag mounds (Area M; Smith and Levy 2008, 43). In the excavators' point-of-view, the Iron Age II gatehouse uncovered by them is the same structure identified as a fortress by Glueck (1935). Two building phases have been identified, the earlier belonging to the tenth century and the later to the ninth century BCE. According to Levy, based on the C14 dates, this feature should not be dated later than the ninth century BCE. He argues that the fortress had been first constructed during the 10th century BCE. Finkelstein (2005) thinks, however, that it was built during the eighth or seventh century BCE. The metallurgical processing building is square, and has been excavated with the aim of obtaining a well-documented stratigraphic sequence of copper mining at Khirbet en-Nahas. Several strata have been recognized (S1, S2a, S2b, S3, and S4). S4, the earliest (dated to the mid-ninth century BCE), is associated with cooking and other installations and activities. Based on the C14 dates the excavators decided that this building had collapsed during the late ninth century BCE, but was possibly reused during the eighth century BCE. These suggested dates have already been criticized by van der Steen and Bienkowski (2006).

Since the purpose of this essay is to review the published archaeological data from Khirbet an-Nahas, we do not feel obliged to judge the differing opinions and interpretations. We believe that there are no assured facts in archaeological interpretation, since every single archaeological item is subjected to ever more and newer analysis by the scientific methods available. However, we may comment that we oppose assigning archaeological material to ethnic groups. It does not seem to us that at a single site different types of pottery are more likely to have been shared.

4. CONCLUSIONS

1. Thomas Levy based his claim for a Solomonic presence at the site on the biblical narratives; no written objects mentioning this figure were encountered in Wadi Faynan. The C^{14} dates obtained from Khirbet en-Nahas confirm that copper was mined during the Iron Age, but at that time this region was under the Edomite domination. There is no cogent reason why the area should be considered as belonging to Israelites and not Edomites.
2. We agree with Levy *et al.* (2002, 433) that the combination of the ceramic and metallurgical similarities make a compelling case for the re-dating of the copper mining sites. Unfortunately, in this case the C14 dates have taken priority over purely archaeological considerations, allowing the excavators the possibility of assigning it to the period of the United Monarchy.
3. The biblical narratives mention that King David (not Solomon) who attacked and occupied Edom, as a result of which King Hadad of Edom sought refuge in Egypt. But in fact we have no mention of this in any historical source outside the Old Testament.
4. There is no mention outside the Biblical narratives, either, nor in other written documents, either local or foreign (Egyptian), that the area to the south of the Wadi Hesa, including Wadi Faynan, fell under the domination of the David or Solomon.
5. In his discussion of the problem, Muhammad al-Najjar (2008 [Arabic]) has stated that there is no archaeological evidence to prove a relationship between Solomon and the Wadi Faynan copper mines.
6. In considered whether the miners should be regarded as Egyptian or Midianite, Larry Herr commented that "we also need to establish why mining copper at a fortified site implies a 'state' in the region, especially when there is not yet any clear evidence for the settlement of other parts of the region".

We appreciate very much the hard work and scientific expertise of the San Diego University in exploring the archaeology and ancient history of Jordan, but draw attention to statements by scholars such as H. Franken: "let the archaeological remains themselves tell the story of their people, and do not invent your own story out of them".

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