

# Revolution in the Desert: A Reassessment of the Late Bronze/Early Iron Ages in North-western Arabia and the Southern Levant



Juan Manuel Tebes

Catholic University of Argentina / CONICET, Argentina

*Fecha de recepción: 18 de mayo de 2020. Fecha de aceptación: 1 de junio de 2020.*

## Abstract

The societal changes that occurred in north-western Arabia and the arid southern Levant between the mid-second and the beginning of the first millennia BCE were so profound that they can be characterized, borrowing Steven Rosen's terminology, as a "desert revolution." This article will review the archaeological and epigraphic evidence of the Late Bronze and Early Iron Ages in the Hejaz, Negev, north-eastern Sinai and southern Jordan. This period of *ca.* 500 years saw major social, economic and political transformations in the local societies: the development of non-state hierarchical societies; the growth of oasis urbanism in north-western Arabia and industrial-based sites in Edom; the appearance of an advanced metallurgy technology in the Arabah Valley; the construction of the earliest hydraulic works in northern Arabia; the earliest evidence of Bedouin agriculture in the Negev; the domestication of the dromedary and its use as beast of burden; the emergence of long-distance trade networks; the appearance and expansion of autochthonous industrial ceramic traditions; and the materialization of a new religious world with local, tribal deities. The northern Arabian and southern Levantine tribal confederacies and states of the first millennium BCE can no longer be considered emerging from a vacuum, but rather they were the result of long-term transformations that had started centuries earlier.

**Keywords:** Late Bronze Age, Iron Age, Arabia, Levant, Revolution

---

**Revolución en el desierto: Una reevaluación de la Edad del Bronce Tardío y el Hierro Temprano en el noroeste de Arabia y el sur del Levante**

## Resumen

Los cambios sociales que se produjeron en el noroeste de Arabia y en el sur del Levante árido entre mediados del segundo y principios del primer milenio a.n.e. fueron tan profundos que pueden caracterizarse, tomando prestada la terminología de Steven Rosen, como una “revolución en el desierto”. Este artículo explorará las evidencias arqueológicas y epigráficas de la Edad del Bronce Tardío y de la Edad del Hierro Temprano en el Hejaz, el Negev, el noreste del Sinaí y el sur de Jordania. Este período de *ca.* 500 años vio grandes transformaciones sociales, económicas y políticas en las sociedades locales: el desarrollo de sociedades jerárquicas no estatales; la emergencia del urbanismo de oasis en el noroeste de Arabia y de sitios industriales en Edom; la aparición de una tecnología metalúrgica de avanzada en el Valle de Arabá; la construcción de las primeras obras hidráulicas en el norte de Arabia; las evidencias más antiguas de agricultura beduina en el Negev; la domesticación del dromedario y su utilización como animal de carga; la aparición de redes de comercio de larga distancia; la aparición y expansión de tradiciones de cerámica industrial autóctona; y la materialización de un nuevo mundo religioso con deidades tribales locales. Ya no se puede considerar que las confederaciones y estados tribales del norte de Arabia y del sur de Levante del primer milenio a.n.e. emergieron de un vacío, sino que fueron el resultado de transformaciones de largo plazo que habían comenzado siglos antes.

**Palabras clave:** Edad del Bronce Tardío, Edad del Hierro, Arabia, Levante, Revolución

---

## Introduction<sup>1</sup>

Revolutionary changes in ancient times have traditionally been associated with agricultural and urban societies. Most importantly, V. Gordon Childe's notions of “Neolithic revolution” and “Urban revolution” (Childe, 1951) remain very influential in prehistoric archaeology. Societies living in the arid regions of the ancient Near East were often seen, on the contrary, as inherently conservative and not experiencing significant social and cultural changes. Studies on the Near Eastern nomadic groups, some influenced by Marxist theory, viewed the rise of desert pastoral societies as a secondary by-product of the emergence of agriculture (Khazanov, 1994: 69-84).

But this long-established idea is no longer tenable. Recent years have seen an enormous change of paradigm concerning the historical development of the mostly semi-pastoral peoples that moved and settled in the arid southern Levant (modern southern Jordan and Israel) and north-western Arabia (modern Saudi Arabia). New models of the development of these societies have been proposed and their history is now intensely associated with the different subsistence economies they adopted before the formation of local “secondary states” in the mid-first millennium BCE.

During two periods in the history of the arid southern Levant, changes were so dramatic and involved so many aspects of life that they can be considered

---

<sup>1</sup> This article began as a chapter for the *Oxford Handbook of Ancient Arabia* that never materialized. The manuscript was later updated, expanded and formatted to a journal article.

“revolutionary.” The first moment is the adoption of domestic herd animals in the Late Neolithic-Chalcolithic (Early/Middle Timnian) during the sixth-fifth millennia BCE, a long-term socio-economic transformation of enormous consequences that has been recently called a “revolution in the desert” (Rosen, 2017: 131-166). Beginning in this period, small-scale tribalism and open-air cultic practices characterized the desert societies for several millennia (Rosen, 2015). “Another [second] revolution” in the arid southern Levant occurred during the Early-Intermediate Bronze Ages (Late/Terminal Timnian) (fourth-third millennia BCE), a major change that brought the growth of mobile pastoralism (Rosen, 2017: 167-208), the development of the industrial production of copper (Hauptmann, 2007: 150) and the rise of the first desert polity (Finkelstein, 1995: 67-86). The second millennium BCE witnessed the collapse of the Timnian Culture Complex and is normally considered a period of little human presence in the arid southern Levant (Rosen, 2017: 208-218).

However, old and new evidence suggests that during the Late Bronze/Early Iron Ages (*ca.* 1400-900 BCE) north-western Arabia and the arid southern Levant experimented profound changes, crystallized in the emergence of socio-political complexity in the region (Fig. 1). The Late Bronze/Iron Age period is usually viewed as one of contraction in urban settlement in the southern Levant, traditionally attributed to the New Kingdom Egyptian imperialism (Morris, 2005: 27-29), and particularly the years encompassing the mid-thirteenth to the twelfth centuries BCE are considered as one of “crisis” and “collapse” (Knapp and Manning, 2016). The interpretation of contemporary events in northern Arabia has been influenced, implicitly and sometimes explicitly, by this state of affairs in the Levant. But a systematic perusal of the most up-to-date research demonstrates that this period of around 500 years saw major socioeconomic, political and cultural transformations in the area:

- » The development of non-state hierarchical societies (chiefdoms and tribal confederations) in the Negev, Edom and north-western Arabia (Bienkowski and van der Steen, 2001; Bienkowski, 2009; Tebes, 2013a).
- » The growth of “oasis urbanism” (Parr, 1992: 42) in north-western Arabia (Hausleiter and Eichmann, 2018; Luciani, 2019; Luciani and Al Saud, 2018; 2020) and metal industry-based sites in Faynan (Levy, Najjar and Ben-Yosef, 2014).
- » The appearance of an advanced metallurgy technology based on the extraction and processing of copper in the Arabah Valley, called “the first industrial revolution in this part of the Middle East” (Beherec *et al.*, 2016: 70) and a “punctuated technological leap” (Ben-Yosef *et al.*, 2019).
- » The construction of the earliest hydraulic works in north-western Arabia (Wellbrock *et al.*, 2018; Hüneburg *et al.*, 2019).
- » The earliest evidence of Bedouin agriculture in the Negev desert (Bruins and van der Plicht, 2007; 2017).
- » The appearance and expansion of industrial ceramic traditions in Edom and the Hejaz, local wares that exhibited wide cross-influences between them (Tebes, 2013b; Hausleiter, 2014).
- » In the last part of the period, the domestication of the dromedary and its use as beast of burden for long-distance trade and war, called a “crucial juncture in the history of the region” (Sapir-Hen and Ben-Yosef, 2013: 277; see also Magee, 2015).

- » The consequent emergence of the long-distance trade networks of the south Arabian incense, which had vast consequences for the local societies and beyond, “révolutionnant ainsi les routes commerciales du Proche et du Moyen-Orient” (Jasmin, 2005: 50). This was also interpreted as a “revolution... [that] evolved from a unique configuration of the environmental and social forces that shaped Arabian society over millennia” (Magee, 2014: 274).
- » The materialization of a new religious world with local, tribal deities (Yahweh, Qaus) and sacred landscapes with institutionalized visits to open-air shrines (pilgrimage) (Tebes, 2017).

Although much is known of each of these societal transformations in particular, few analyses have tried to interpret them as part of broader, systemic changes. Current scholarship presents several problems. To begin with, few studies have analyzed these processes as part of the larger systemic transformations that the Near Eastern world-system endured during the Late Bronze/Iron Ages. In addition, major studies reveal a text-centric approach that is almost entirely dependent on written sources coming from small literate circles of ancient Egypt, Mesopotamia, the Levant and the eastern Mediterranean that are peripheral to these areas. A related difficulty is that most scholarly attention had focused on the influence of neighboring societies as “triggers” of the local societal changes. Most particularly, the emergence of social complexity in Early Iron Age Arabia and Edom has been attributed to the expansion of the Egyptian and Neo-Assyrian states (Parr, 1982; Bienkowski, 1995), while the decorated motifs in the ceramics of north-western Arabia have been attributed to the presence of Sea Peoples visiting the region (Parr, 1996). Much of these theories involves speculation.

Unfortunately, due to the few excavations carried out in northern Saudi Arabia, for long time information came mostly from excavations in southern Israel and Jordan, regions located in the peripheries of the Arabian phenomena. This state of affairs has fortunately changed in the recent years and renewed excavations have been carried out in important oasis-towns in the northern Hejaz, thus providing for the first-time information on the local human settlement harking back to the third millennium BCE.

Thus the time is ripe for a reassessment of this third “desert revolution” (borrowing Rosen, 2017’s terminology) that occurred in north-western Arabia and the arid southern Levant between the mid-second and early first millennia BCE. This article will review the archaeological and epigraphic evidence of the Late Bronze (LBA) and Early Iron Age (IA) in the Hejaz and the arid margins of the southern Levant, including the Negev, north-eastern Sinai and southern Jordan, reassessing old and new data.

A number of factors complicate the research on this period. The most relevant is the lack of local textual sources: the local communities developed their own writing systems only in the first millennium BCE, and petroglyphs that survive from this period are almost totally iconographic and do not present recognizable signs of writing. This picture is somewhat balanced by inscriptions written in Egyptian, produced locally (*e.g.* ostraca or inscribed on rock) or imported (amulets, adornments, pottery, etc.), and a few references in Egyptian official records. In the past the Hebrew Bible has been used as a reliable source for this

period, but the use of a secondary source like the biblical text is very problematic and should be utilized with the most due caution, due to its late dating and obvious theological overtones.

There are enormous differences in the intensity of archaeological work in the southern Levant and Hejaz, and because of obvious political reasons these regions have been traditionally kept as separate fields. The Negev has been the object of intense research since the early twentieth century, epitomized by the excavations led by F. Petrie in the tells of the north-western Negev during the 1920s. Archaeology in southern Jordan developed somewhat later, initiated by the still relevant surveys carried out by N. Glueck in the 1930-1940s. Archaeological research in the Hejaz started with the early scientific surveys carried out in the 1960s by F. V. Winnett-W. L. Reed and P. Parr, but subsequent archaeological research on the LBA/IA was limited and almost totally focused on Tayma.

A major methodological problem lies in the small number and uneven distribution of excavated sites with continuous stratigraphy, most of which are located in the north-western Negev. Archaeologists have struggled also with the almost complete absence of inscriptions that could date local archaeological assemblages, and for this reason analysis of pottery, and most recently radiocarbon dating and optically stimulated luminescence (OSL), have become key for establishing the chronology of the area. At the center of the problem is the region's historical dependency on the chronology of ancient Egypt, whose dates – especially those found in the inscribed material found in the shrine of Hathor at Timna – are used as dating anchors for much of the period (Tebes, 2004; Bimson and Tebes, 2009).

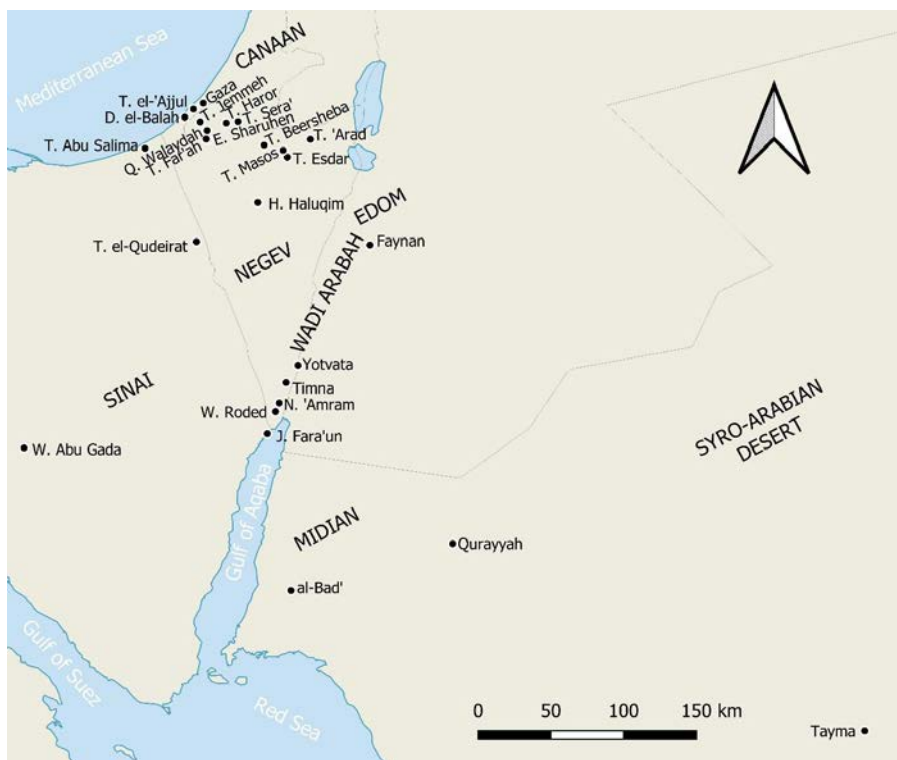


Fig. 1. North-western Arabia and the southern Levant in the Late Bronze and Early Iron Ages.

## Settlement patterns

### Hejaz

Although human settlement in the Hejaz is difficult due to the low precipitation levels, sedentary sites were established in ancient times in agricultural lands irrigated by flood-water or within oases where water can be obtained from underground aquifers, which greatly “facilitated survival through climatic downturns” (Petraglia *et al.*, 2020: 8268). Following early surveys in northern Hejazi sites such as Qurayyah and al-Bad‘, scholarship saw the growth of urbanism as starting in the last phases of the LBA and the Early IA and only as a result of the influence of the Egyptian New Kingdom imperialism (Parr, 1982; 1992). However, archaeological surveys and excavations carried out in the last decade in Tayma and Qurayyah have revealed substantial evidence of sedentary occupation during the whole second millennium BCE, if not before.

The new settlements can be categorized as “oasis urbanism” (Parr, 1992: 42) with the caveat that it was an urbanism of a very different kind than the one found in the Fertile Crescent. The few Arabian oasis-towns excavated so far, such as Tayma, Qurayyah and Dumat al-Jandal in north-central Arabia, were enclosed by systems of walls and crisscrossed by dividing walls that formed enclosures or compounds, although the archaeological evidence of buildings in the enclosed area during the second and even during the first millennium BCE is very limited. The enclosed areas were probably never entirely occupied but employed for other functions, such as agricultural fields, pastoral grounds, workshops and cemeteries (*cf.* Hausleiter and Eichmann, 2018: 16-18). The erecting of such wall systems and the construction of complex hydraulic systems and – later in the period – massive building structures must have necessitated coordinated efforts supervised by some sort of managerial entity. Unfortunately, the lack of references in the contemporary Near Eastern textual sources make it difficult to determine the type of political structure of these oasis-towns, although there is clear evidence of the development of non-state hierarchical societies, which lacking a better term we can define as “chiefdoms” (Tebes, 2013b: 43-45). “Warrior burials” with weapons as mortuary goods found in second millennium BCE Tayma (Hausleiter and Zur, 2016) symbolically connected the local elites with the ruling classes of the contemporary Near East.

In the site of Qurayyah in the eastern edge of the Hisma early surveys found a walled settlement associated with a complex irrigation system and a fortified plateau. The site was difficult to date with precision, but the large numbers of sherds of Qurayyah Painted Ware (QPW) scattered throughout the site pointed initially to a date at the end of the LBA (Parr, Harding and Dayton, 1968-1969: 219-225; Ingraham *et al.*, 1981: 71-74). However, recent surveys and excavations carried out by a Saudi-Austrian expedition have extended the history of sedentary occupation to at least the third millennium BCE (Luciani, 2019; Luciani and Al Saud, 2018; 2020). The earliest structure dated so far is part of a wall that extended in the upper plateau, dated by radiocarbon to the early third millennium BCE (Fig. 2), while an associated workshop for smelting



arsenic copper can be dated to the last part of that millennium. There are still no dated domestic remains for this and the second millennium BCE, but there are several funerary structures and a pottery kiln dated to the mid-to-late second millennium BCE found at the foot of the plateau.



Fig 2. Stone wall in the plateau to the south-west of the residential area of Qurayyah.

Courtesy of Marta Luciani, Universität Wien.

Much more is known about Tayma, an oasis town famous because of its role in the first millennium BCE route of the south Arabian incense, but in which recent Saudi-German excavations have found evidence of sedentary occupation that extended throughout most of the second millennium BCE. The most characteristic remains of ancient Tayma are a series of mud-brick walls surrounding the site and sub-dividing it in several parts. The external western wall has been analyzed by radiocarbon and OSL dating, the results of which indicate it was constructed in the early third or even the late fourth millennium BCE (Hausleiter and Eichmann, 2018: 24-25). A tower-like structure excavated at a north-western branch of the same wall provided two radiocarbon dates in the sixteenth-fourteenth centuries BCE (Hausleiter, 2014: 401-402). Unfortunately, no buildings can be reasonably related to these structures, but circular “warrior burials” with weapons as grave goods were excavated in the nearby area of al-Nasim, provisionally dated to the second millennium BCE (Hausleiter and Zur, 2016).

The Early IA is better represented in the archaeology of Tayma, probably reflecting a surge in construction related to the impact Ramesside Egypt had in the area. This is best seen in the impressive remains of a rectangular building found in Area O, enclosed by at least one row of pilasters and containing a paved forecourt area. The structure should probably be identified as a temple, owing to the rich finds of cultic-related items, several

of which reflect strong Egyptian influence, such as Egyptian idols, vessel fragments and a human-headed faience scarab (Hausleiter, 2013: 314-317). In 2010 a rock inscription in Egyptian hieroglyphic mentioning Ramses III was discovered near Tayma, similar to two other inscriptions of the same king found in Wadi Abu Gada (Sinai) and Wadi Roded (southern Negev) (Somaglino and Tallet, 2013). The inscription certainly demonstrates the Egyptian interest in the area, although its extent is difficult to assess based on this sole finding.

### North-western Negev

The north-western Negev has been historically the region most suited to human settlement in the Levantine southern arid margins. The history of this area during the LBA was shaped by the policy of New Kingdom Egypt (18th-20th Dynasties) in the land of Canaan. During the LB IA (1550-1479 BCE) several of the large Middle Bronze Age (MBA) sites in the north-western Negev were destroyed or deserted, very likely caused by the military campaigns of the 18th Dynasty pharaohs against Hyksos strongholds (Morris, 2005: 27-29). Although most of these sites continued being occupied during the LB IB and LB IIA (1479-1300 BCE), they were considerably smaller in size than their MBA predecessors and some lacked fortification systems or made use of those from the preceding period. Only in the LB IIB and LB III (1300-1140 BCE) there was some architectural expansion, when the 19th and 20th Dynasties apparently invested more resources and dispatched more people to keep a firm grip in Canaan. The result was a construction programme of new settlements and buildings during the thirteenth-twelfth centuries BCE housing more Egyptian personnel, evidenced by the more plentiful Egyptian-type pottery, hieratic votive inscriptions on ostraca, and “patrician” administrative buildings influenced by Egyptian architecture.

In the north-western Negev urban sites clustered around the coastal plain, where was located the main road linking Egypt to Palestine and Syria, and along the several wadis that connected the Mediterranean with the inland desert environment. The most important LBA centre in the coastal plain was Gaza, seat of the Egyptian governor of Canaan. This settlement probably lies buried under the modern city (Tell Harube), an area which has never been properly excavated (Maeir, 2013). To the south lies Tell el-‘Ajjul, where the MBA fortified town was destroyed in the LB I, the site subsequently being almost completely abandoned for the rest of the period except for a fort guarding the area (Fischer and Sadeq, 2002) and a satellite site at nearby el-Moghraqa (Steel *et al.*, 2002).

During the LBA the Egyptians established the “Way of Horus,” a military road with fortified points and supply spots along the northern Sinai coast, connecting Egypt with southern Palestine. At the eastern end of this road three sites were excavated, the now-obliterated Tell Abu Salima (Oren, 1993a), Tel Ridan, featuring cist graves (Vitto and Edelstein, 1993) and Deir el-Balah. The finds at Deir el-Balah, built in the thirteenth century BCE, provide exceptional evidence of the presence of Egyptian personnel living and working in the site, including a residential complex, a potters’ workshop and cemetery (Dothan and Brandl, 2010).



Inland sites located along the transversal wadis served as gateways between the coastal centres and the highlands and valleys of the central Negev. Along the Nahal Gerar two large MBA towns, Tel Haror (Oren, 1993b) and Tel Sera' (Oren, 1993c), were followed by considerably smaller sites in the LBA. In the LB III both sites knew some architectural enlargement, most evident from the construction of an Egyptian-type administrative structure at Tel Sera'. At the western end of the Nahal Besor lies Tel Jemmeh, a prominent city in the LBA featuring a massive Egyptian-influenced courtyard building and probably fortifications (Ben-Shlomo and Van Beek, 2014). Upstream were located the small site of Qubur al-Walaydah, with a similar Egyptianizing building complex (Lehmann *et al.*, 2010), and the large fortified town of Tell el-Far'ah South, with evidence of continued occupation throughout the whole LBA, most of which is dated to the thirteenth-twelfth centuries BCE, particularly a large Egyptian-type elite residency and burial chambers with rich finds (Lehmann *et al.*, 2018).

### Central Negev and north-eastern Sinai

During most of the LBA the northern loessical valleys and the central highlands of the Negev were void of sedentary settlement, and only at the end of the period some evidence of runoff farming and permanent architecture does begin to appear, initiating the wave of settlement that was going to characterize the entire IA. The forerunner of this process in the northern Negev was the site of Tel Masos, where the IA strata were probably preceded by some occupation at the end of the LBA, as attested by the presence of Egyptian pottery typical of the 20th Dynasty, sherds of QPW and an Egyptian-type residence (Fritz and Kempinski, 1983). During the Early IA Tel Masos exhibits archaeological evidence of the emergence of social complexity – a “chieftdom” polity, featuring specialized buildings and probably controlling small neighboring villages such as Tell Beersheba, Tel 'Arad and Tel Esdar. Behind the site's supremacy was probably its strategic location in the trade routes of the Arabah copper and the local smelting of that metal (Tebes, 2008: 55-76)

There is also evidence of human activity during the LBA in the valley of 'Ain el-Qudeirat in the north-eastern Sinai, some pointing to runoff farming (see below) and other to sedentary occupation. Singer-Avitz (2008) has suggested the presence of a twelfth-century BCE occupation layer below the IA fortress of Tell el-Qudeirat, evidenced by the presence of QPW, New Kingdom-type seals, and by at least one radiocarbon date (Bruins and van der Plicht, 2007: 488; although this 14C date has been contested by Gilboa *et al.*, 2009: 91).

### Southern Arabah Valley

Although conditions in the Wadi Arabah, the long, dry valley that extends between the Dead Sea and the Gulf of Aqaba, are very harsh for human settlement, the area attracted the interest of humans since the Chalcolithic period because of its rich mineral resources, particularly copper. After a hiatus of several centuries, two mining areas located in the southern Arabah, Wadi Timna and Nahal 'Amram, began to be exploited by the Egyptians, who probably knew this area as the “land of Atika” (Papyrus Harris I).

The multidisciplinary project led by B. Rothenberg in the southern Arabah (1959-1990) broke new ground in the use of archaeological and scientific data to comprehend the world of ancient metallurgy. The most significant evidence was found in Wadi Timna, where several LBA mines and smelting camps were extensively recorded (Rothenberg, 1972: 63-111; 1999: 150-155). Several cultic sites were found in the valley, including a small shrine dedicated to the Egyptian goddess Hathor (Rothenberg, 1988). The chronology of Timna, which Rothenberg established based on the Egyptian finds and cartouches found in that shrine (Seti I to Ramses V), and the extent of the Egyptian involvement have been recently the object of re-evaluation. While new excavations have produced radiocarbon dates that may support a later period of occupation, between the late twelfth and the tenth centuries BCE (Ben-Yosef *et al.*, 2012; Ben-Yosef, 2018), others have provided 14C dates falling in the thirteenth-twelfth centuries BCE with associated sherds of QPW, finds consistent with Rothenberg's "Egyptian paradigm" (Erickson-Gini, 2014). In view of these finds, it is likely that the metallurgical operations in the valley extended throughout a long period of time, with both Egyptians and local peoples taking part in them.

The casemate fortress excavated at Yotvata north of Timna, dated to the LBA-Early IA, probably guarded the access to this network of metallurgical sites (Meshel, 1993).

### **Southern Jordan**

The lowland region of Wadi Faynan in the north-eastern part of the Arabah Valley is the largest source of copper in the Levant. It began to be exploited during the Chalcolithic period and the Early Bronze Age, followed by a hiatus with little archaeological evidence throughout most of the second millennium BCE (Hauptmann, 2007). It was only at the end of the last century when a comprehensive understanding of ancient Faynan began to emerge, as a result of archaeo-metallurgical research initiated in the 1980s by the German Mining Museum and followed in the 1990s-2010s by British, American and Canadian expeditions.

Evidence for the second millennium BCE at Faynan is restricted to a few sites, which very likely represent pastoral camps (Barker *et al.*, 2007: 270). Extraction of copper ore began in Faynan as early as the mid-second millennium BCE, if not before (see below), although the evidence from this period is not clear enough, probably because the copper mining and smelting was occasional and made by nomadic people. At around the eleventh century BCE we witness the beginning of a wave of copper production that was going to extend until the ninth century BCE, when large fortified sites such as Khirbet en-Nahas and Khirbat al-Jariya were built to oversee and control the working population, although its dating has been the object of fierce debate (Fig. 6). The excavators argue, based on their own radiocarbon datings, that these structures and adjacent buildings belong to the tenth-ninth centuries BCE (Levy, Najjar and Ben-Yosef, 2014). Other interpretations, however, downdate their construction to the eighth-seventh centuries BCE, defending that the pottery found there is late and that the radiocarbon dates pre-date the erection of the buildings (Finkelstein and Singer-Avitz, 2008).

The large industry-based sites in the Faynan region were very different from what we know in the rest of the Near East. Whatever the dating of these structures, it is clear that the magnitude of the copper exploitation was such that it necessitated coordinated managerial efforts well beyond the capabilities of the local tribal structures. Regardless of whether such supervision was carried out by either a “chiefdom” (Tebes, 2013a: 40-42) or a “tribal kingdom” (Ben-Yosef, 2019), such polity was clearly characterized by the dominance of nomadic pastoral groups. Even in a period as late as the tenth century BCE nomads seem to have been the major component of the local society, as attested by the large necropolis excavated at Wadi Fidan 40, featuring a total of 245 cist graves of the local pastoral population (Beherec, Najjar and Levy, 2014).

## Economy

### Agriculture and Pastoralism

With some exceptions, annual precipitations in the Hejaz and the southern arid margins of the Levant are less than 250 mm, so most of the area is too dry for rainfed farming. Agricultural production in the loessical plains of the north-western Negev, straddling in the aridity limit for dry farming of most cereals, seem to have been significant enough in the LBA to attract the interest of the Egyptian taxation system, as is attested by hieratic receipts of tax deliveries of grain written on votive bowls found in Tel Sera', Tell el-Far'ah South, Deir el-Balah (Morris, 2005: 747-748, 753-754) and now Qubur al-Walaydah (Wimmer and Lehmann, 2014).

To judge from the apparent lack of permanent LBA settlements in the central Negev highlands, nomadic pastoralism was likely the preponderant economic activity in this region. However, the presence of runoff agriculture in the central and western Negev during the second millennium BCE is attested by radiocarbon dates retrieved from presumably ancient farming fields at Horvat Haluqim and the 'Ain el-Qudeirat Valley (Bruins and van der Plicht, 2007; 2017). Although the accuracy of some of these data has been questioned by some scholars (Gilboa *et al.*, 2009: 91-92; Shahack-Gross and Finkelstein, 2017), the central Negev Highlands constituted a propitious ecological niche for opportunistic agriculture practiced by local Bedouins, with comparatively higher elevations, good soils in wadis and the presence of some springs.

Aside from a few pastoral sites with MBA and LBA pottery in the Faynan area (Barker *et al.*, 2007: 270), zooarchaeological data is our main source of information on the pastoral economy of the Wadi Arabah. The animal osteological record of Timna (Grigson, 2012: 84; Sapir-Hen and Ben-Yosef, 2014: 781) and Late LBA-Early IA Khirbet en-Nahas (Muniz and Levy, 2014: 636-637) is dominated by caprines (sheep and goats), and these were almost certainly the main source of food feeding the local labor force. However, there was also a complex runoff farming system, as evidenced by dense concentrations of Iron Age pottery within walls and enclosures of field systems in the Wadi Faynan (Mattingly *et al.*, 2007: 282-285).

New hydrogeological studies have found the earliest evidence of the construction of complex irrigation systems in north-western Arabia during the second millennium BCE. Evidence of the construction of complex irrigation systems in the LBA Hejaz is only present at Qurayyah and Tayma, but the hyper arid climate means that contemporary Hejazi sites must have possessed similar systems of collection and channel of water. The method most widely known was the erecting of retaining walls to divert runoff or underground water to nearby farming fields. At Qurayyah, early surveys found several external walls extending perpendicularly from the southern plateau and surrounding the open field areas to the north. They were interpreted as part of a complex irrigation system in which the retaining walls diverted the flood-water from the surrounding wadis and the water from a now-dry spring to the farming fields in the north, where remains of stone agricultural channels were found (Parr, Harding and Dayton, 1968-1969: 219-225; Ingraham *et al.*, 1981: 71-74). The results of the recent hydrogeological analyses in the site have concluded that irrigation by surface rain water was likely, although some of the presumed evidence of this hydraulic system is lacking, like a “ditch” that could transfer water and a spring (Wellbrock *et al.*, 2018: 179-190).

Although the beginnings of agriculture at Tayma can be dated to about 3000 BCE (Dinies *et al.*, 2016), their channels were built in the third/second millennia BCE (Hüneburg *et al.*, 2019). Tayma’s access to water was characterized by the tapping of underground water through two wells, one spring, irrigation channels and retaining walls to prevent erosion (Wellbrock *et al.*, 2018: 154-159), but it is hard to tell which of these features dated to this or later periods.

### Metallurgy

The rise of industrial metallurgy in the Wadi Arabah, apparently after a long gap in activity during the second millennium BCE, is one of the most important social events that saw the region. In the last phases of the LBA the New Kingdom Egyptians carried out annual expeditions to the copper mines of Timna Valley. The reasons behind this sudden surge in interest in the Arabah copper mining is not explicit in the Egyptian sources, although scholars attribute it to the end of the contacts with Cyprus, Egypt’s main supplier of copper (Liverani, 1987: 71). At Timna, eight chiselled-carved mines – with three types: vertical shafts, horizontal galleries, and flat depressions – and eleven smelting camps were recorded and dated by Rothenberg (1972; 1999) between the fourteenth and mid-twelfth centuries BCE. Two of the metallurgical sites dating to this period were excavated (Sites 2 and 30), unearthing building ruins, perimeter walls (in Site 30), smelting furnaces, workshops and slag heaps, attesting the processing of the copper coming from the nearby mines (Fig. 3). The finds of large numbers of QPW and “Negevite” pottery sherds in the smelting camps is indicative of the presence of local laborers working in the mines for the Egyptians (Rothenberg, 1972: 63-111; 1999: 150-162).

During the last decade the metallurgical sites at Timna have been re-excavated, leading to a reassessment of their chronology and to a revision of Egypt’s previous paramount role. The evidence of copper extraction and industrialization at Timna is now more evenly distributed through time, with the local desert

peoples having a more important role than previously thought. According to the new excavations and to novel radiocarbon data, an Egyptian phase did exist in Timna during the thirteenth-twelfth centuries BCE, as recorded by the remains of copper industrialization at smelting Sites 2, 3 and 35. However, the peak in copper production occurred only in the eleventh-tenth centuries BCE, after the Egyptians left the area in the late twelfth century BCE, a reality very apparent in Sites 15, 30 and 34 (Erickson-Gini, 2014; Ben-Yosef *et al.*, 2012; Ben-Yosef, 2018). A similar picture emerges from the recent and limited surveys carried out in the copper mines at Nahal 'Amram, to the south of Timna, where there is evidence of copper mining between the fifteenth and the tenth centuries BCE (Avner *et al.*, 2018).



Fig 3. Aerial view of Timna Site 2 facing south-west. At the forefront, the remains of a copper smelting workshop. At the back in the left, the remains of an open courtyard shrine. Courtesy of Tali Erickson-Gini and the Israel Antiquities Authority.

Mineral resources were far larger in the Wadi Faynan, a region with a long history of copper metallurgy. The predominantly pastoral economy seems to have been accompanied by sporadic mining and smelting, as attested by radiocarbon dates from slag heaps from Khirbet Faynan (nineteenth-sixteenth centuries BCE) and from the Wadi Khalid mines (sixteenth-fifteenth centuries BCE) (Fig. 4). The copper exploitation developed much further since thirteenth and especially the twelfth centuries BCE, a process attested by radiocarbon dates taken from the Wadi Dana mines and from slag heaps and occupation levels at Khirbet Faynan, Khirbet al-Jariya, Khirbet en-Nahas, Khirbet al-Ghuwayba, and Khirbet Hamra Ifdan (Hauptmann, 2007: Table 5.1; Levy *et al.*, 2014: Table 2.9; Ben-Yosef, Najjar and Levy, 2014: Table 12.3, pp. 848, 850). The metallurgical technology found at Faynan (remains of tuyères, furnace walls, slag, furnace installations) is similar to that found in LBA-IA Timna, likely indication that some exchange of labor, technology and information existed between the two mining regions (Hauptmann,



2007: 103, 122). The peak of copper production occurred in the late-tenth and ninth centuries BCE, the smelting taking place in the dry wadis close to the mines in locations where the industrial debris accumulated in huge slag piles, such as those recently excavated at Khirbet en-Nahas and Khirbet al-Jariya (Figs. 5, 6) (Levy, Najjar and Ben-Yosef, 2014).



Fig 4. Wadi Khalid vertical mines, Faynan. Photo by J. M. Tebes.



Fig. 5. Slag pile, Khirbet en-Nahas, Faynan. Photo by J. M. Tebes.



Fig. 6. Fortress gate and perimeter wall, Khirbet en-Nahas. Photo by J. M. Tebes.

Papyrus Harris I states that the copper extracted at the “land of Atika” was carried to Egypt, both by ships and overland by donkeys. However, much of the copper also found their way to metal workshops in the Negev, Sinai and Canaan, probably distributed by nomadic middlemen, as it is attested by metal artefacts found in Cisjordanian and Jordanian sites showing compositions consistent with the copper from the Arabah deposits, and evidence of copper work in Late LBA-Early IA sites at Jezirat Fara’un (Gulf of Aqaba), Tell Abu Salima (Sinai), Yotvata, Tel Masos, and ‘En Sharuhen (Negev) (Tebes, 2013a: 53-69).

Owing to the paucity of studies in northern Arabia, the picture we have of local metallurgy is largely skewed towards the southern Levant. However, copper metallurgy did exist in the Hejazi oasis-towns, although their magnitude and connections with the Arabah copper works are still in the shadows. We have seen that in Qurayyah one workshop for melting arsenic copper was dated to the twenty-second/twentieth centuries BCE (Luciani, 2019: 141), curiously contemporary to the Early Bronze copper exploitation at Khirbat Hamra Ifdan in the Faynan district (Adams, 2002). However, recent analyses of copper samples retrieved there do not show a provenance from Arabah copper ores, but rather from the Arabian Shield of Western Arabia (Liu *et al.*, 2015). If further analyses confirm these studies, then we will have to conclude that the northern Arabian metallurgy developed autonomously from the southern Levantine metal industry.

## Trade

Sites in the north-western Negev profited from their location close to the “Via Maris,” the main road that linked Egypt with Canaan, and along the wadis that connected with the inland regions. Finds of large numbers of decorated

Mycenaean and Cypriot wares, imported because of their content (oil, wine) or due to their prestige nature, attest to this region's role in the LBA eastern Mediterranean trade networks. The admittedly few QPW sherds bear witness to contacts with the Wadi Arabah and north-western Arabia, reflecting the complex patterns of exchange of this decorated pottery (Tebes, 2013a: 83-86).

The end of the second millennium BCE was traditionally seen as the period of the emergence of the overland trade in south Arabian incense, the development of which was made possible by the presumed domestication of the dromedary at the end of the LBA. This view hinged upon several pieces of evidence, most particularly the discovery of camel bones in several LBA sites of the southern Levant, including Tell Jemmeh (Wapnish, 1981) and Timna Site 30.

Recent reassessments of the osteological, iconographic and textual data indicate, however, that camels were domesticated in south-eastern Arabia in the first centuries of the first millennium BCE (Magee, 2014: 201-212, 259-264; 2015). This data is in agreement with the recent re-dating of Timna Site 30, along with its assemblage of domestic camel remains, to the eleventh-tenth centuries BCE (Grigson, 2012; Sapir-Hen and Ben-Yosef, 2013), while those found at Tell Jemmeh have been found to be few in numbers, the majority of which belonging to the first millennium BCE strata (Magee, 2014: 201). These unexpectedly late datings could be attributed, of course, to the southern Levantine setting of Timna and Tell Jemmeh, but new faunal data from the northern Hejaz seems to confirm them. A recent study has traced the earliest appearance of dromedary remains at Tayma in layers dating back to the Early Iron Age (eleventh-ninth centuries BCE), but with the caveat that even for the Nabataean and Roman periods – considered the “golden age” of camel caravan trade – the amount of camel bones found was very low (Prust and Hausleiter, 2020). In sum, this data combined effectively undermines the notion of a very early development of the south Arabian trade, although new finds could rapidly change this picture.

### **Pottery production**

#### » Pottery in north-western Arabia

The recent excavations at Tayma and Qurayyah have elucidated the characteristics of the local pottery groups, although evidence of their manufacture only exists at the latter. At Qurayyah, a pottery kiln was unearthed at the foot of the plateau (Luciani, 2019: 141) and although its technology was very simple, it certainly went beyond the household level, pointing to an individual workshop industry (Tebes, 2013a: 74).

So far three LBA pottery groups can be distinguished in north-western Arabia. Red Burnished Ware, also called Barbotine Ware, consists of small to medium sized flat and deep bowls and small jars, coarsely made and tempered with minerals. They are treated with a red burnish, while clay dots and applied clay bands can appear on the surface. Grey Burnished Ware is characterized by large, thick-walled and deep, open shapes, tempered with copper alloy prills probably originating in the Arabah. Both wares appear in LBA contexts at Tayma, and could be dated to the fifteenth-fourteenth centuries BCE (Hausleiter, 2014: 403-406).



Qurayyah Painted Ware (QPW), also known as “Midianite” ware, comprises several types of small and medium sized bowls, small juglets and cups, most of which are decorated in tones of black, brown, red, and yellow over a cream slip with characteristic geometric patterns and naturalistic iconography (Fig. 7). Early petrographic studies carried out by Rothenberg and Glass (1983) on QPW samples from Timna indicated its manufacture was not local. Their suggestion that production of QPW was carried out at the Hejaz is now confirmed by the excavations of the pottery kiln at Qurayyah, where production of this pottery is now attested as early as the mid-second millennium BCE (Luciani, 2019; Luciani and Al Saud, 2020). However, southern Levantine production of QPW should not be discarded, as neutron activation analyses (Gunnweg *et al.*, 1991: 249-251) and petrographic studies (Hauptmann, 2007: 128-129, 152) very likely suggest. Although a predominantly Hejazi product, this ceramic had a wide geographical distribution: it was found in large numbers in Timna and Faynan, but in very few quantities in central Jordan, southern Cisjordan, and north-western Sinai (Tebes, 2013b: 319-323). Early interpretations of the QPW as a predominantly LBA phenomenon have now been completely superseded by the mid-second millennium evidence from Qurayyah and Tayma, but finds of QPW in late contexts, especially in Faynan, may indicate this ceramic was still used as late as the tenth century BCE (Adams *et al.*, 2010: 7-8; Smith and Levy, 2014: 412).



Fig 7. Painted QPW bowls from the shrine of Hathor (Timna Site 200), Eretz Israel Museum, Tel Aviv. Photo by J. M. Tebes, with kind permission of the Israel Antiquities Authority.

#### » Pottery in the southern Levant

Most of the pottery found in the north-western Negev comprises wares solidly rooted in the pottery traditions of the LBA Levant. Levantine pottery also appears at Timna, and although petrographic analysis could not

determine the exact place of manufacture, it was very likely not produced locally (Rothenberg, 1972: 107-109, 162-163; 1988: 95; Glass, 1988: 101-108).

Egyptian-style pottery in the LBA southern Levant was overwhelmingly produced locally in workshops such as the one found at Deir el-Balah. The majority of the vessels were daily household wares, while the sporadic imports from Egypt comprised mostly transport containers (Martin, 2011), with the exception of the cultic wares from the shrine of Hathor at Timna (Rothenberg, 1988: 95; Glass, 1988: 96-100). Predictably, the bulk of this pottery was dated to the LB IIB / LB III, the period of highest Egyptian involvement in the southern Levant, and concentrated in sites where Egyptian personnel was stationed, such as Deir el-Balah, Tel Sera', Tell el-Far'ah South (Martin, 2011: 209-215, 221-235) and Timna.

A distinctive type of pottery was the "Negevite" ware. It comprises different types of crude, hand-made wares, manufactured from coarse clay and tempered with straw, dung and sometimes copper slag. The most characteristic type is a cylindrical cooking-pot with flat base and vertical sides, followed by different types of cooking-pots and bowls. During the LBA "Negevite" wares are found in Timna, but their popularity grew exponentially in the subsequent IA. Their name is somewhat a misnomer, because although petrographic studies carried out on samples found at Timna indicate they were manufactured locally, in the IA the area of manufacture included the central Negev Highlands and southern Jordan (Smith and Levy, 2014: 408-410; Smith, Goren and Levy, 2014: 470). They are usually interpreted as the pottery made by the local semi-pastoral groups, who used these inexpensive vessels as their cooking and table wares (Tebes, 2013a: 111-119).

## Religion

The desert communities possessed a religious world rich in cultic imagery and practices that were several millennia old. An important development is that during the LB/Early IA the local desert shrines provide the earliest evidence of the incorporation of outside features as central components of the desert cults, particularly Egyptian and Levantine architectural elements. And for the first time, evidence exist of regular, institutionalized movements of people to sacred places: pilgrimage (Tebes, 2017). The driving force behind the establishment of new sanctuaries, particularly at Timna and Tayma, was the new scenario posed by the Egyptian political and economic enterprises in the region.

Open-air sanctuaries were the most common type of cultic places in the desert regions, and were found particularly in Timna Valley and adjacent areas. They included open courtyard shrines, high-places and rock shelters, with associated elements such as worked stones (standing stones, offering benches, altars, and libation bowls), pottery, remains of metallurgical activities, and rock art (Rothenberg, 1972: 112-124; 1999: 155-158).

Although the local peoples were largely illiterate, much can be learned about their rich religious world from the iconography in the rock art and pottery. Engravings in stones and rock formations, such the one found in Timna Site



25, and painted decorations in the QPW, include schematic human figures in the position of “adoration” so typical in the rock art of Arabia and northern Africa, probably denoting worshippers or sorcerers in ritual scenes rituals such as the sacred hunting of desert animals (Tebes, 2017).

Egyptian temple topographical lists refer to the names of two tribal deities whose greater expansion would occur centuries later: Yahweh, depicted among toponyms of *shasu*-Bedouin living in the arid lands to the east of the Sinai Peninsula (Amenophis III, Ramses II) (Kitchen, 1992: 26), and Qos (Ramses II and III) (Oded, 1971).

The Egyptians established several cultic places in the Negev, especially at the end of the LBA, although the majority of the evidence is epigraphic. According to Papyrus Harris I, Canaanites delivered their taxes to the temple of Amun in Gaza (Morris, 2005: 748), and if this practice is behind the inscribed votive bowls found in several sites in the north-western Negev, then one would expect to find more Egyptian temples in the area.

A small shrine dedicated to Hathor was excavated at Timna Site 200, consisting of an open, squarish court built against the face of rock cliffs, with a large niche cut into the cliff (Fig. 8). More than ten thousand votive offerings were found within and close to the shrine, such as amulets, adornments, figurines and pottery. Rothenberg divided the shrine into three phases. The two earliest were described as predominantly Egyptian; the last one was depicted as a “Midianite” shrine, when the structure was reorganized and many of its architectural parts reused for different purposes (Rothenberg, 1988; 1999: 168-172). Although dedicated to an Egyptian goddess, the shrine’s design, small size, and construction materials remind of the open-air sanctuaries popular in the cultic architecture of the desert peoples of the Negev and Sinai (Avner, 2014).



Fig 8. View of the shrine of Hathor at Timna Site 200. Notice the standing stones and stone basins in the two sides. Photo by J. M. Tebes.

As already noted, a probably Egyptianizing cultic structure was recently excavated at Tayma, consisting of a small rectangular structure with several broad rooms and surrounded by a row of pillars, tentatively dated to the twelfth-tenth centuries BCE (Hausleiter, 2013: 314-317).

## Concluding Remarks

While the complete picture is still of incertitude, there is no reason to deny that the societal transformations that experimented the societies of north-western Arabia and the arid southern Levant started far earlier and were more profound than traditionally thought. Details about this “revolution in the desert” can only be known through diverse pieces of evidence that, if interpreted together, can provide us a glimpse of the birth of a completely different type of society. Of course, the question remains as to the relationship and causality of these social processes, that is to say, were they internally produced or rather they were triggered by external factors? And, were all these transformations systemically related or our interpretation of the evidence is just a product of the chances of archaeological discoveries?

Two issues are particularly important. The first one is what role had pharaonic Egypt in the development of urbanism and the exploitation of mineral resources in north-western Arabia. Although the picture is reasonably clear for Egypt’s role in the extraction and transformation of copper in the Arabah Valley during the LBA, there is still not enough evidence for the northern Hejaz. It is undeniable that the processes of oasis urbanization and social hierarchization in the Hejaz pre-dated the LBA, but it is also true that these processes grossly accelerated during the time of Ramesside Egypt’s influence in the region. The second question is about the directionality of change. The new, consistent data demonstrates that some technological innovations, particularly water management in arid environments and copper processing, appeared in the north-western Arabian oasis-towns way earlier than in the Negev and southern Jordan. This contradicts the traditional diffusionist approach that saw the circulation of innovations as moving from the Near Eastern “cores” to the Arabian “peripheries.” Much of these questions involve issues of chronology that, given the paucity of the archaeological evidence and the radiocarbon dates available, are still difficult to understand.

What is clear is that the first millennium BCE northern Arabian and southern Levantine tribal confederacies and states that attracted the interest of the Assyrian, Babylonian and Persian imperialisms can no longer be considered as emerging from a vacuum, but rather they were the result of a long-term “desert revolution” that had started centuries earlier.

## Bibliography

- » Adams, R. B. (2002). From Farms to Factories; The Development of Copper Production at Faynan, Southern Jordan, during the Early Bronze Age, in: Ottaway, B. S. and Wagner, E. C. (eds.), *Metals and Society* (BAR International Series 1061). Oxford: Archaeopress, 21-32.
- » Adams, R. B., Anderson, J. D., Grattan, J. P., Rouse, L., Friedman, H. A., Homan, M. M., Malena, S. and Rouse, T. (2010). Report on the Second Season of the Barqa Landscape Project, South-West Jordan. At <www.barqalandscapeproject.com>
- » Avner, U. (2014). Egyptian Timna – Reconsidered, in: Tebes, J. M. (ed.), *Unearthing the Wilderness: Studies on the History and Archaeology of the Negev and Edom in the Iron Age* (ANES - Supplement Series 45). Leuven: Peeters, 103-162.
- » Avner, U., Ginat, H., Shalev, S., Shilstine, S., Langford, B., Frumkin, A., Shem-Tov, R., Filin, S., Arav, R., Basson, U., Shamir, O. and Scott-Cummings, L. (2018). Ancient Copper Mines at Nahal 'Amram, Southern Arabah, in: Ben-Yosef, E. (ed.), *Mining for Ancient Copper. Essays in Memory of Beno Rothenberg* (Monograph Series of the Sonia and Marco Nadler Institute of Archaeology 37). University Park, PA/Tel Aviv: Eisenbrauns & Emery and Claire Yass Publications in Archaeology of the Institute of Archaeology, Tel Aviv University, 147-177.
- » Barker, G., Adams, R. B., Creighton, O., el-Rishi, H., Gilbertson, D., Grattan, J., Hunt, C., Newson, P., Pyatt, B. and Reynolds, T. (2007). Chalcolithic (c. 5000-3600 cal. BC) and Bronze Age (c. 3600-1200 cal. BC) Settlement in Wadi Faynan: Metallurgy and Social complexity, in: Barker, G., Gilbertson, D., and Mattingly, D. J. (eds.), *Archaeology and Desertification: The Wadi Faynan Landscape Survey, Southern Jordan* (Levant Supplementary Series 6). Oxford: Oxbow & Council for British Research in the Levant, 227-270.
- » Beherec, M. A., Levy, T. E., Tirosh, O., Najjar, M., Knabb, K. A. and Erel, Y. (2016). Iron Age Nomads and their Relation to Copper Smelting in Faynan (Jordan): Trace metal and Pb and Sr Isotopic Measurements from the Wadi Fidan 40 Cemetery, in: *Journal of Archaeological Science* 65: 70-83.
- » Beherec, M. A., Najjar, M. and Levy, T. E. (2014). Wadi Fidan 40 and Mortuary Archaeology in the Edom Lowlands, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (2014), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 2, 665-721.
- » Ben-Shlomo, D., and Van Beek, G. W. (eds.). (2014). *The Smithsonian Institution Excavation at Tell Jemmeh, Israel, 1970-1990* (SCA 50). Washington: Smithsonian Institution Scholarly Press.
- » Ben-Yosef, E. (2018). The Central Timna Valley Project: Research Design and Preliminary Results, in: Ben-Yosef, E. (ed.), *Mining for Ancient Copper. Essays in Memory of Beno Rothenberg* (Monograph Series of the Sonia and Marco Nadler Institute of Archaeology 37). University Park, PA/Tel Aviv: Eisenbrauns & Emery and Claire Yass Publications in Archaeology of the Institute of Archaeology, Tel Aviv University, 3-63.

- » Ben-Yosef, E. (2019). The Architectural Bias in Current Biblical Archaeology, in: *Vetus Testamentum* 69: 361-387.
- » Ben-Yosef, E., Najjar, M. and Levy, T. E. (2014). New Iron Age Excavations at Copper Production Sites, Mines, and Fortresses in Faynan, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (2014), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 2, 766-885.
- » Ben-Yosef, E., Liss, B., Yagel, O. A., Tirosh, O., Najjar, M. and Levy, T. E. (2019). Ancient Technology and Punctuated Change: Detecting the Emergence of the Edomite Kingdom in the Southern Levant, in: *PLoS ONE* 14/9: e0221967.
- » Ben-Yosef, E., Shaar, R., Tauxe, L. and Ron, H. (2012). A New Chronological Framework for Iron Age Copper Production at Timna (Israel), in: *Bulletin of the American Schools of Oriental Research* 367: 31-71.
- » Bienkowski, P. (1995). The Architecture of Edom, in: *Studies in the History and Archaeology of Jordan* 5: 135-143.
- » Bienkowski, P. (2009). "Tribalism" and "Segmentary Society" in Iron Age Transjordan, in: Bienkowski, P. (ed.), *Studies on Iron Age Moab and Neighbouring Areas in Honour of Michèle Daviau*. Leuven: Peeters, 7-26.
- » Bienkowski, P. and van der Steen, E. (2001). Tribes, Trade and Towns: A New Framework for the Late Iron Age in Southern Jordan and the Negev, in: *Bulletin of the American Schools of Oriental Research* 323: 21-47.
- » Bimson, J. J. and Tebes, J. M. (2009). Timna Revisited: Egyptian Chronology and the Copper Mines of the Southern Arabah, in: *Antiquo Oriente* 7: 75-118.
- » Bruins, H. J. and van der Plicht, J. (2007). Radiocarbon Dating and the "Wilderness of Zin", in: *Radiocarbon* 49/2: 481-497.
- » Bruins, H. J. and van der Plicht, J. (2017). Dating of Iron Age Agriculture in the Negev Highlands: A Response to Shahack-Gross and Finkelstein, in: *Radiocarbon* 59/4: 1233-1239.
- » Childe, V. G. (1951). *Man Makes Himself*. New York: New American Library.
- » Dinies, M., Neef, R., Plessen, B. and Kürschner, H. (2016). Holocene Vegetation, Climate, Land Use and Plant Cultivation in the Tayma Region, Northwestern Arabia, in: Luciani, M. (ed.), *The Archaeology of North Arabia, Oases and Landscapes: Proceedings of the International Congress held at the University of Vienna, 5-8 December, 2013* (OEA 4). Vienna: Austrian Academy of Sciences Press, 57-78.
- » Dothan, T. and Brandl, B. (2010). *Deir el-Balah: Excavations in 1977-1982 in the Cemetery and Settlement* (2 vols., QeDEM 49/50). Jerusalem: Institute of Archaeology, Hebrew University of Jerusalem.
- » Erickson-Gini, T. (2014). Timna Site 2 Revisited, in: Tebes, J. M. (ed.), *Unearthing the Wilderness: Studies on the History and Archaeology of the Negev and Edom in the Iron Age* (ANES - Supplement Series 45). Leuven: Peeters, 47-84.
- » Finkelstein, I. (1995). *Living on the Fringe. The Archaeology and History of the Negev, Sinai and Neighbouring Regions in the Bronze and Iron Ages* (MMA 6). Sheffield: Sheffield Academic Press.
- » Finkelstein, I. and Singer-Avitz, L. (2008). The Pottery of Edom: A Correction, in:

*Antiguo Oriente* 6: 13-24.

- » Fischer, P. and Sadeq, M. (2002). Tell el-'Ajjul 2000: Second Season Preliminary Report, in: *Ägypten und Levante* 12: 109-154.
- » Fritz, V. and Kempinski, A. (1983). *Ergebnisse der Ausgrabungen auf der Hirbet el-Mšāš (Tēl Māsōs) 1972-1975*. Wiesbaden: Harrassowitz.
- » Gilboa, A., Jull, T. A. J., Sharon, I. and Boaretto, E. (2009). Notes on Iron IIA 14C Dates from Tell el-Qudeirat (Kadesh Barnea), in: *Tel Aviv* 36: 82-94.
- » Glass, J. (1988). Petrographic Investigations of the Pottery, in: Rothenberg, B. (ed.), *The Egyptian Mining Temple at Timna* (Researches in the Arabah 1959-1984, 1). London: Institute for Archaeo-Metallurgical Studies, Institute of Archaeology, University College London, 96-113.
- » Grigson, C. (2012). Camels, Copper and Donkeys in the Early Iron Age of the Southern Levant: Timna Revisited, in: *Levant* 44/1: 82-100.
- » Gunneweg, J., Beier, T., Diehl, U., Lambrecht, D. and Mommsen, H. (1991). "Edomite," "Negevite" and "Midianite" Pottery from the Negev Desert and Jordan: Instrumental Neutron Activation Analysis Results, in: *Archaeometry* 33: 239-253.
- » Hauptmann, A. (2007). *The Archaeometallurgy of Copper: Evidence from Faynan, Jordan* (Natural Science in Archaeology). Berlin: Springer.
- » Hausleiter, A. (2013). Divine Representations at Taymā', in: Sachet, I. (ed.), *Dieux et déesses d'Arabie images et représentations. Actes de la table ronde tenue au Collège de France (Paris) les 1er et 2 octobre 2007* (Orient & Méditerranée 7). Paris: De Boccard, 299-338.
- » Hausleiter, A. (2014). Pottery Groups of the Late 2nd/Early 1st Millennium BC in Northwest Arabia and New Evidence from the Excavations at Tayma, in: Luciani, M. and Hausleiter, A. (eds.), *Recent Trends in the Study of Late Bronze Age Ceramics in Syro-Mesopotamia and Neighbouring Regions. Proceedings of the International Workshop in Berlin, 2-5 November 2006*. Rahden: Leidorf, 399-434.
- » Hausleiter, A. and Eichmann, R. (2018). The Archaeological Exploration of the Oasis of Taymā', in: Hausleiter, A., Eichmann, R. and al-Najem, M. (eds.), *Taymā' I. Archaeological Exploration, Palaeoenvironment, Cultural Contacts* (Taymā'. Multidisciplinary Series on the Results of the Saudi-German Archaeological Project 1). Oxford: Archaeopress, 3-58.
- » Hausleiter, A. and Zur, A. (2016). Taymā' in the Bronze Age (c. 2,000 BCE): Settlement and Funerary Landscapes, in: Luciani, M. (ed.), *The Archaeology of North Arabia. Oases and Landscapes. Proceedings of the International Congress held at the University of Vienna, 5-8 December, 2013*. Vienna: Austrian Academy of Sciences, 135-171.
- » Hüneburg, L., Hoelzmann, P., Knitter, D., Teichert, B., Richter, C., Lüthgens, C., Alsaud, A. S. and Luciani, M. (2019). Living at the Wadi – Integrating Geomorphology and Archaeology at the oasis of Qurayyah (NW Arabia), in: *Journal of Maps* 15/2: 215-226.
- » Ingraham, M. L., Johnson, T. D., Rihani, B. and Shatla, I. (1981). Saudi Arabian Comprehensive Survey Program: c. Preliminary Report on a Reconnaissance Survey of the Northwestern Province (with a note on a brief Survey of the Northern Province), in: *Atlat* 5: 59-84.
- » Jasmin, M. (2005). Las condiciones d'émurgence de la route de l'encens à la fin



- du IIe millénaire avant notre ère, in: *Syria* 82: 49-62.
- » Khazanov, A. (1994). *Nomads and the Outside World*. 2nd. ed. Madison: University of Wisconsin Press.
  - » Kitchen, K. A. (1992). The Egyptian Evidence on Ancient Jordan, in: Bienkowski, P. (ed.), *Early Edom and Moab: The Beginning of the Iron Age in Southern Jordan* (SAM 7). Sheffield: JSOT Press, 21-34.
  - » Knapp, A. B. and Manning, S. W. (2016). Crisis in Context: The End of the Late Bronze Age in the Eastern Mediterranean, in: *American Journal of Archaeology* 120/1: 99-149.
  - » Lehmann, G., Golding-Meir, R., Neumeier-Potashnik, B.-A. and Niemann, H. M. (2018). Excavations at *Tell el-Fār'a* (South), 1998-2002, in: *Zeitschrift des Deutschen Palästina-Vereins* 134/2: 109-150.
  - » Lehmann, G., Rosen, S. A., Berlejung, A., Neumeier, B.-A. and Niemann, H. M. (2010). Excavations at Qubur al-Walaydah, 2007-2009, in: *Die Welt des Orients* 40: 137-159.
  - » Levy, T. E., Najjar, M. and Ben-Yosef, E. (eds.). (2014). *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press.
  - » Levy, T. E., Najjar, M., Higham, T., Arbel, Y., Muniz, A., Ben-Yosef, E., Smith, N. G., Beherec, M., Giddin, A., Jones, I. W., Frese, D., Smitheram, C. and Robinson, M. (2014). Excavations at Khirbat en-Nahas 2002-2009. An Iron Age Copper Production Center in the Lowlands of Edom, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (eds.), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 1, 89-245.
  - » Liu, S., Rehren, T., Pernicka, E. and Hausleiter, A. (2015). Copper Processing in the Oases of Northwest Arabia: Technology, Alloys and Provenance, in: *Journal of Archaeological Science* 53: 492-503.
  - » Liverani, M. (1987). The Collapse of the Near Eastern Regional System at the End of the Bronze Age: The Case of Syria, in: Rowlands, M., Larsen, M. and Kristiansen, K. (eds.), *Centre and Periphery in the Ancient World*. Cambridge: Cambridge University Press, 66-73.
  - » Luciani, M. (2019). Qurayyah, in: Capodiferro, A. and Colantonio, S. (eds.), *Roads of Arabia*. Milan: Electa, 140-155.
  - » Luciani, M. and Al Saud, A. S. (2018). The New Archaeological Joint Project on the site of Qurayyah, North-West Arabia: Results of the First Two Excavation Seasons, in: *Proceedings of the Seminar of Arabian Studies* 48: 165-184.
  - » Luciani, M. and Al Saud, A. S. (2020). Report on the First Season of the Joint Saudi Arabian-Austrian Archaeological Project, in: *Atlat* 28: 47-77.
  - » Maeir, A. M. (2013). Gaza, in: Master, D. M. (ed.), *The Oxford Encyclopedia of the Bible and Archaeology*. New York: Oxford University Press, 451-453.
  - » Magee, P. (2014). *The Archaeology of Prehistoric Arabia: Adaptation and Social Formation from the Neolithic to the Iron Age* (CWA). New York: Cambridge

University Press.

- » Magee, P. (2015). When was the Dromedary Domesticated in the Ancient Near East?, in: *Zeitschrift für Orient-Archaeologie* 8: 252-277.
- » Martin, M. (2011). *Egyptian-Type Pottery in the Late Bronze Age Southern Levant* (CEEM 29). Vienna: Österreichische Akademie der Wissenschaften.
- » Mattingly, D., Newson, P., Grattan, J., Tomber, R., Barker, G., Gilbertson, D. and Hunt, C. (2007). The Making of Early States: The Iron Age and Nabataean Periods, in: Barker, C., Gilbertson, D. and Mattingly, D. (eds.), *Archaeology and desertification. The Wadi Faynan Landscape Survey, Southern Jordan* (Wadi Faynan Series 2; Levant Supplementary Series 6). Oxford: Oxbow, 271-304.
- » Meshel, Z. (1993). Yotvata, in: Stern, E. (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem: Israel Exploration Society, vol. 4, 1517-1520.
- » Morris, E. F. (2005). *The Architecture of Imperialism: Military Bases and the Evolution of Foreign Policy in Egypt's New Kingdom* (PdÄ 22). Leiden: Brill.
- » Muniz, A. and Levy, T. E. (2014). Feeding the Iron Age Metalworkers at Khirbat en-Nahas: Zooarchaeological Data, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (eds.), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 2, 627-663.
- » Oded, B. (1971). Egyptian References to the Edomite Deity Qaus, in: *Andrews University Seminary Studies* 9: 47-50.
- » Oren, E. (1993a). Abu Salima, Tell (Sheik Zuweid), in: Stern, E. (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem: Israel Exploration Society, vol. 1, 15.
- » Oren, E. (1993b). Haror, Tel, in: Stern, E. (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem: Israel Exploration Society, vol. 2, 580-584.
- » Oren, E. (1993c). Sera', Tel, in: Stern, E. (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem: Israel Exploration Society, vol. 4, 1329-1335.
- » Parr, P. J. (1982). Contacts between North West Arabia and Jordan in the Late Bronze and Iron Ages, in: *Studies in the History and Archaeology of Jordan* 1: 127-133.
- » Parr, P. J. (1992). Edom and the Hejaz, in: Bienkowski, P. (ed.), *Early Edom and Moab. The Beginning of the Iron Age in Southern Jordan* (SAM 7). Sheffield: JSOT Press, 41-46.
- » Parr, P. J. (1996). Further Reflections on Late Second Millennium Settlement in North West Arabia, in: Seger, J. D. (ed.), *Retrieving The Past. Essays on Archaeological Research and Methodology in Honor of Gus W. Van Beek*. Winona Lake: Eisenbrauns, 213-218.
- » Parr, P. J., Harding, G. L. and Dayton, J. E. (1968-1969). Preliminary Survey in N. W. Arabia, 1968, in: *Bulletin of the Institute of Archaeology, University College London* 8/9: 193-242.
- » Petraglia, D., Groucutt, W. S., Guagnin, M., Breeze, P. S. and Boivin, N. (2020).

- Human Responses to Climate and Ecosystem Change in Ancient Arabia, in: *Proceedings of the National Academy of Sciences* 117/15: 8263-8270.
- » Prust, A. and Hausleiter, A. (2020). Camel Exploitation in the Oasis of Taymā' – Caravan or Consumption?, in: Agut-Labordère, D. and Redon, B. (dir.), *Les vaisseaux du désert et des steppes: Les camélidés dans l'Antiquité (Camelus dromedarius et Camelus bactrianus)*. Lyon: MOM Éditions. At <<http://books.openedition.org/momeditions/8557>>.
  - » Rosen, S. A. (2015). Cult and the Rise of the Desert Pastoralism: A Case Study from the Negev, in: Laneri, N. (ed.), *Defining the Sacred: Approaches to the Archaeology of Religion in the Near East*. Oxford: Oxbow, 38-47.
  - » Rosen, S. A. (2017). *Revolutions in the Desert: The Rise of Mobile Pastoralism in the Negev and the Arid Zones of the Southern Levant*. New York: Routledge.
  - » Rothenberg, B. (1972). *Timna: Valley of the Biblical Copper Mines*. London: Thames and Hudson.
  - » Rothenberg, B. (ed.). (1988). *The Egyptian Mining Temple at Timna* (Researches in the Arabah 1959-1984, 1). London: Institute for Archaeo-Metallurgical Studies, Institute of Archaeology, University College London.
  - » Rothenberg, B. (1999). Archaeo-Metallurgical Researches in the Southern Arabah 1959-1990. Part 2: Egyptian New Kingdom (Ramesside) to Early Islam, in: *Palestine Exploration Quarterly* 131: 149-175.
  - » Rothenberg, B. and Glass, J. (1983). The Midianite Pottery, in: Sawyer, J. F. A. and Clines, D. J. A. (eds.), *Midian, Moab and Edom: The History and Archaeology of Late Bronze and Iron Age Jordan and North-West Arabia* (JSOTSup 24). Sheffield: JSOT Press, 65-124.
  - » Sapir-Hen, L. and Ben-Yosef, E. (2013). The Introduction of Domestic Camels to the Southern Levant: Evidence from the Aravah Valley, in: *Tel Aviv* 40: 277-285.
  - » Sapir-Hen, L. and Ben-Yosef, E. (2014). The Socioeconomic Status of Iron Age Metalworkers: Animal Economy in the "Slaves' Hill," Timna, Israel, in: *Antiquity* 88: 775-790.
  - » Shahack-Gross, R. and Finkelstein, I. (2017). Iron Age Agriculture in the Negev Highlands? Methodological and Factual Comments on Bruins and van der Plicht 2017<sup>a</sup> (*Radiocarbon* Vol. 59, Nr. 1), in: *Radiocarbon* 59/4: 1227-1231.
  - » Singer-Avitz, L. (2008). The Earliest Settlement at Kadash-Barnea, in: *Tel Aviv* 35: 73-81.
  - » Smith, N. G., Goren, Y. and Levy, T. E. (2014). The Petrography of Iron Age Edom: From the Lowlands to the Highlands, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (eds.), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 1, 461-482.
  - » Smith, N. G. and Levy, T. E. (2014). Iron Age Ceramics from Edom: A New Typology, in: Levy, T. E., Najjar, M. and Ben-Yosef, E. (eds.), *New Insights into the Iron Age Archaeology of Edom, Southern Jordan: Surveys, Excavations, and Research from the University of California, San Diego & Department of Antiquities of Jordan, Edom Lowlands Regional Archaeology Project (ELRAP)* (Monumenta Archaeologica 35). Los Angeles: Cotsen Institute of Archaeology Press, Vol. 1, 297-459.

- » Somaglino, C. and Tallet, P. (2013). A Road to the Arabian Peninsula in the Reign of Ramesses III, in: Förster, F. and Riemer, H. (eds.), *Desert Road Archaeology in Ancient Egypt and Beyond*. Köln: Heinrich-Barth-Institut, 511-518.
- » Steel, L., Manley, B., Clarke, J. and Sadeq, M. (2002). Late Bronze Age Gaza: Prestige Production at el-Moghraqa, in: *Antiquity* 76: 939-940.
- » Tebes, J. M. (2004). The Influence of Egyptian Chronology in the Archaeology of the Iron Age Negev: A Reassessment, in: *Göttinger Miszellen* 198: 91-104.
- » Tebes, J. M. (2008). *Centro y periferia en el mundo antiguo. El Negev y sus interacciones con Egipto, Asiria, y el Levante en la Edad del Hierro (1200-586 a.C.)* (ANEM 1). 2nd ed. Atlanta / Buenos Aires: SBL Press / CEHAO.
- » Tebes, J. M. (2013a). *Nómadas en la encrucijada: Sociedad, ideología y poder en los márgenes áridos del Levante meridional del primer milenio a.C.* (BAR International Series 2574). Oxford: Archaeopress.
- » Tebes, J. M. (2013b). Investigating the Painted Pottery Traditions of the First Millennium BC Northwestern Hejaz and Southern Levant: Chronological Data and Arabian Parallels, in: *Proceedings of the Seminar for Arabian Studies* 43: 317-336.
- » Tebes, J. M. (2017). Iconographies of the Sacred and Power of the Desert Nomads: A Reappraisal of the Desert Rock Art of the Late Bronze / Iron Age Southern Levant and Northwestern Arabia, in: *Die Welt des Orients* 47/1: 4-24.
- » Vitto, F. and Edelstein, G. (1993). Ridan, Tel, in: Stern, E. (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem: Israel Exploration Society, vol. 4, 1283.
- » Wapnish, P. (1981). Camel Caravans and Camel Pastoralists at Tell Jemmeh, in: *Journal of the Ancient Near East Society* 13: 101-121.
- » Wellbrock, K., Voß, P., Heemeier, B., Kelholz, P., Patzelt, A. and Grottker, M. (2018). The Water Management of Taymā' and other Ancient Oasis Settlements in the North-Western Arabian Peninsula – A Preliminary Synthesis, in: Hausleiter, A., Eichmann, R. and al-Najem, M. (eds.), *Taymā' I. Archaeological Exploration, Palaeoenvironment, Cultural Contacts* (Taymā'. Multidisciplinary Series on the Results of the Saudi-German Archaeological Project 1). Oxford: Archaeopress, 145-198.
- » Wimmer, S. J. and Lehmann, G. (2014). Two Hieratic Inscriptions from Qubur el-Walaydah, in: *Ägypten und Levante* 24: 343-348.



