

Mining for Ancient Copper. Essays in Memory of Beno Rothenberg, edited by Erez Ben-Yosef. 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, 2018. xviii 1 566 pp. Hardcover \$149.95.

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Beno Rothenberg, famed archaeologist who explored and excavated in the ancient copper-mining region of Timna Valley in southern Israel since the 1950s, and one of the founders of archaeometallurgy as a scientific discipline, died on March 13, 2012 at the age of 98. The international conference on “Copper in Antiquity” held at Timna Park in 2013 was organized in his memory and these are the contributions presented there, while others were written especially for this book. Erez Ben-Yosef, professor of archaeology at Tel Aviv University and current director of the Central Timna Valley Project, edited this thick volume with 37 chapters organized in five sections, where 66 interdisciplinary researchers paid tribute to Rothenberg’s life and work. It would be impossible to discuss here all contributions with detail, so I will rather concentrate on the core topics that extend throughout the book.

The first section presents essays on “Timna Valley,” with two introductory studies on the geological stratigraphy of Timna and its comparison with neighboring mining areas in the Sinai and Faynan (Chapter 1 by Michael Beyth, Amit Segev, and Hanan Ginat) and on the history of Rothenberg’s research in Timna and questions of chronology of copper smelting (Chapter 2 by James D. Muhly). Muhly’s assertion regarding Timna Site 30 that “I cannot believe that this advanced smelting technology was developed by pastoral nomads or by Shasu nomads” (p. 22) is contradicted by ethnographic cases

recently discussed by Erez Ben- Yosef (2019). The current Central Timna Valley Project is present with the preliminary results of the excavations at Sites 34 ("Slaves' Hill"), 3, 15, 35 and in the mining fields Merkavot 1, 2, and 3 (Chapter 3 by Ben-Yosef). These excavations confirm Ben-Yosef 's initial revision of the chronology of Timna and the abandonment of the "Egyptian paradigm" (Ben-Yosef et al. 2012) that was postulated by Rothenberg more than 40 years ago (1972). According to new radiocarbon data, an Egyptian phase existed in Timna during the 13th–12th centuries B.C.E., as recorded by the early excavations at Sites 2 and 200 (Rothenberg 1972; 1988), but the peak in copper production occurred only in the 10th century B.C.E. Chapter 4 by Lidar Sapir-Hen, Omri Lernau, and Ben-Yosef analyzes the faunal remains from Timna and the copper-mining region of Faynan in southern Jordan, including re-examination of the remains from Rothenberg's Aravah Expedition—the authors suggest the original identifications of fish bones by Hanan Lernau (Rothenberg 1988: 241–56) need revision. This research reveals that the diet of the metal workers was based on livestock (mainly sheep and goats) and supplemented by Mediterranean fish, suggesting that these workers enjoyed a higher status than others. In Chapter 5 two old associates of Rothenberg, Tim Shaw and Alexandra Drenka, present a detailed report of the excavations at the Chalcolithic Timna Mine T. In Chapter 6, Egyptologist Deborah Sweeney studies the well-known inscription of royal butler Ramessesempere engraved above the Hathor shrine in Timna, detailing this functionary's career and suggesting that the Papyrus Harris toponym Atika is not to be identified with Timna as originally suggested by Rothenberg (1972: 201), but rather is probably located in southern Sinai. Ilana Peters, Lisa Tauxe, and Ben-Yosef present in Chapter 7 their archaeomagnetic study of pottery from the fortress of Yotvata, north of Timna. The results show that Yotvata was occupied during the Late Bronze Age as originally proposed by the excavations of Ze'ev Meshel, although one probably should not put too much weight on the analysis of one sherd. Rothenberg's interpretation of Timna Site 200 as an Egyptian "Mining Temple" devoted to Hathor and later transformed into a "Midianite" sanctuary (1988) is here taken by Nissim Amzallag (Chapter 8) to suggest that the deity worshipped in this second phase was none other than Yahweh. This is an attractive proposal, although it should be taken with caution given the uncertainties of Rothenberg's reconstruction of the stratigraphy of Site 200, as recently re-evaluated

by Uzi Avner (2014). The last of the Timna chapters (Chapter 9) is Laura M. Zucconi's study of the multiple genealogical references to Timna in the Hebrew Bible as a reflection of the changing political and economic position of the Timna mines in ancient times, failing to notice that the attribution of the name Timna to the area formerly known as Wadi Mene'iyyeh is rather modern (early 1950s). A similar interpretation linking biblical Timna and her son Amalek with Mene'iyyeh is done by Amzallag on p. 132.

The second section, "Naḥ al 'Amram," deals with this lessknown but equally important copper mining area situated south of Timna, already visited by Nelson Glueck and surveyed by Rothenberg and now investigated by a new multidisciplinary team. In the first article (Chapter 10), Avner et al. provide an exhaustive report of the surveys and limited excavations carried out recently in N. 'Amram, showing that the main periods of mining were the Late Bronze–Iron Ages, the Nabataean–Byzantine, and the Early Islamic periods. Since no evidence of Egyptian or Israelite presence was found for the Late Bronze Age–Iron Age period, the authors suggest that mining was carried out by Shasu nomadic tribes. In highly technical articles, Reuma Arav, Sagi Fili, and Avner (Chapter 11) estimate the volume and mass of mine dumps at N. 'Amram and slag piles at Be'er Orah using 3D laser scanners, while Hanan Ginat et al. (Chapter 12) study the fluvial sediments in the N. 'Amram mines as evidence of past floods. The faunal remains of caprines, camels, and fish found at the N. 'Amram mines of the Roman–Early Islamic periods are studied by Liora Kolska Horwitz, Avner, and Lernau (Chapter 13), who suggest that the local miners enjoyed a rich and varied diet, a conclusion very much in line with what we know from Late Bronze Age/Iron Age Timna as seen in Chapter 4. In Chapter 14, Boaz Langford et al. present a preliminary mapping and survey results of the major mines at N. 'Amram, while in Chapter 15 Sana Shilstein and Sarel Shalev analyze copper slag from the same mines through x-ray fluorescence and compare it with those from other sites.

The third section, "Faynan, the Negev and Beyond", moves away from Timna and N. 'Amram. Archaeometallurgical research in the Faynan district of southern Jordan, the largest source of copper in the southern Levant, would have been impossible without

Rothenberg's first foothold in Timna. Thomas E. Levy, Ben-Yosef, and Mohammad Najjar review in Chapter 16 the history of research in that region, contesting again Israel Finkelstein's (most recently, 2014) downdating of the fortress of Khirbet en-Nahas. More technical chapters include Ingolf Löffler's examination of the technological innovations and organizational structures in Chalcolithic–Early Bronze Faynan (Chapter 17); Aaron N. Shugar's study of the extractive metallurgy at the Ghassulian site of Abu Matar in Beersheba (Chapter 19); and Hendrik J. Bruins, Irina Segal, and Johannes van der Plicht's examination of a bronze chisel from the Late Bronze Age/Iron Age site of Horvat Haluqim in the central Negev Highlands. On a more general level, Moti Haiman analyzes in Chapter 18 the Negev desert copper trade in the Early Bronze Age IV. He suggests that the orchestrators of this trade system should be located in the oases of northwestern Arabia, citing the findings of flat stone figurines or stelae similar to those found in Arabia. Recent excavations in northern Arabian sites such as Tayma and Qurayyah confirm Haiman's "theoretical assumption" (p. 273), revealing the existence of oasis urbanism already in the 3rd millennium B.C.E. (Hausleiter and Zur 2016). In an important study, Naama Yahalom-Mack and Segal (Chapter 22) investigate the origin of the copper used in Canaan during the Late Bronze Age/Iron Age through lead isotope analysis of 47 bronze artifacts. They point to Timna and Faynan as the most significant source of copper, particularly after the Egyptian withdrawal in the 12th century B.C.E., thus coinciding with the results of Ben-Yosef's recent excavations at Timna as outlined in Chapter 3. Two other chapters include Meshel's short essay on the discovery of the archaeological site of Kuntilet 'Ajrud in northeastern Sinai (Chapter 21) and Ian W. N. Jones, Najjar, and Levy's short survey of the Arabah copper industry in Islamic times (Chapter 23).

As per its name, "Beyond the Southern Levant: Cyprus, Oman, Greece and Britain," the fourth section is the most variegated, with articles by Vasiliki Kassianidou (Chapter 24) on the archaeology of the Late Bronze mining settlement of Apliki Karamallos on Cyprus, Shimon Dar (Chapter 25) on the written sources pointing to Herod the Great's exploitation of the Cyprus copper mines, Julie Goy et al. (Chapter 26) on the preliminary results of their surveys and excavations in the copper area of the northern Al-Hajjar mountains in the Oman Peninsula, Markos Vaxevanopoulos et al. (Chapter

27) on the ancient mining and metallurgy in Mount Pangaeon in northeast Greece, Robert Alan Williams (Chapter 28) on the Bronze Age Great Orme copper mine in northern Wales, and Simon Timberlake and Peter Marshall (Chapter 29) on the copper mining and smelting in the British Bronze Age.

The last section collects essays on “Metalworking.” In an interesting paper, Yulia Gottlieb (Chapter 30) examines the evidence of copper and iron metallurgy in the Iron Age Levant, concluding that while iron-working was adopted immediately in the Shephelah and Beersheba Valley, in the north copper-working remained the principal metal industry for most of the period, probably because of northern cultural conservatism and access to the Cypriot and Faynan copper. Relatedly, she argues against the model of the western “Tel Masos chiefdom” controlling the desert copper trade as developed by Finkelstein (2014) and Juan Manuel Tebes (2003) in favor of the Edomite-related control of the Faynan copper mines. Other metalworking-linked papers include studies by Rachel Ben-Dov on the craft workshops at Iron Age Tel Dan; tracking the local copper to the southern Arabah mines (Chapter 31); Matthew Ponting and Dan Levene on the management of scrap metal in Jewish sources and archaeological finds of Late Antiquity (Chapter 32); Christopher John Davey on Egyptian Old Kingdom crucibles and their alleged origins in remote arid smelting sites (Chapter 33); Frederik W. Rademakers, Thilo Rehren, and Edgar B. Pusch on Ramesside bronze production in Qantir-Pi-Ramesse (Chapter 34); Marcin Czarnowicz on copper harpoons of Pre-Dynastic Egypt (Chapter 35); Michele Degli Esposti et al. on bronze working at Sumhuram on the coast of Dhofar in Oman (Chapter 36); and finally Jamie M. Szudy on ancient Near Eastern socketed copper alloy arrowheads (Chapter 37).

To sum up, the scope and interdisciplinarity of *Mining for Ancient Copper* is superb. The book will become a mandatory reference for anyone interested in the archaeometallurgy of the ancient world, and a fitting tribute to Beno Rothenberg, one of its earliest supporters. One personal note: as a young graduate student I remember being welcomed by Beno in his humble home in Ramat Gan, who shared with enthusiasm his last manuscripts on Timna and showed me boxes full of beautifully decorated sherds of Midianite/Qurayyah pottery. These essays in his memory are a perfect homage to a great scholar and noble human being.

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