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Leave your Stamp: Reconstruction of the Scarab Production Chain

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Author(s): Natasha Solodenko-Vernovsky [1] ✉, Noa Ranzer [2,3], Alex Kuklin [3], Inbar Meyerson [3], Evgeny Gasin [4], Ido Koch [3]

[1] Laboratory for the Study of Human Cultural Evolution, The Institute of Archaeology, The Hebrew University of Jerusalem, Mt. Scopus, Jerusalem 91905, Israel.
[2] Religionswissenschaftliches Seminar, Universität Zürich, Switzerland.
[3] Jacob M. Alkow Department of Archaeology and Ancient Near Eastern Cultures, Tel Aviv University, Israel.
[4] Jerusalem Traditional Archery Club, non-profit organization Idanim, Israel.

Scarabs are beetle-shaped seals originating in Egypt during the third millennium BC. They were first imported into the southern Levant during the early second millennium BC (Middle Bronze Age I), leading to a flourishing of local production in the following centuries. From this point until the late first millennium BC, scarabs were the most common form of stamp-seal in the southern Levant. Past scholarship attempted to create criteria for the identification of Egyptian vs. southern Levantine scarabs, emphasizing mostly their typological and iconographic features, while other aspects of their production have largely been disregarded. In this article, we present the results of an experiment conducted to study a plausible production sequence involved in scarab manufacture. The broad goal of the experiment is to understand the various methods of production and to place the phases of production in a sequential order (their *chaîne opératoire*).

> “The main goal of this experiment was to verify whether our proposed production sequence reconstruction fitted the 24 scarabs analyzed as part of this study and to examine how the work with steatite was executed.

Introduction

Scarabs were the most common type of seal-amulet in Egypt and the southern Levant during the second millennium BC, spanning the Levantine Middle and Late Bronze Ages (Keel, 2004, pp.73–101; Ben-Tor, 2007, p.119). First manufactured in Egypt during the mid-third millennium BC (Dubiel, 2012; Cortebeeck, 2016), they were first exported to other parts of the Eastern Mediterranean in the early second millennium BC, including the northern Levant[1] , Crete (Ben-Tor, 2006), and the southern Levant (Ben-Tor, 2007, p.121). Soon afterward, southern Levantine artisans began producing their own local scarab varieties, which were engraved with both Egyptian iconography (inspired by Egyptian imports) as well as local iconography featuring motifs that had originated from multiple regions, including Anatolia and Syria, among others (Ben-Tor, 2007, p.186). From this point onward, scarabs became the most common form of stamp-seal in the southern Levant, remaining so until the late first millennium BC, with ebbs and flows of local production versus importation.

The majority of studies dealing with scarabs of the second millennium BC have been focused on distinguishing ‘Levantine’ from ‘Egyptian’ scarabs based on typological characteristics of the engraving at the base of the object, including both the engraved iconography and the style in which the Scarabaeidae beetle’s physical features were rendered (see, among others, Petrie, 1930; Stock, 1942, p.11; Williams, 1970, pp.47–53; Hornung and Staehelin, 1976, 65–80; Tufnell, 1984; Keel, 1995; Ben-Tor, 2007). The present article presents an experiment[2] meant to examine and delineate a plausible production sequence involved in the manufacture of steatite scarabs.[3] The experiment tested the first few phases (from the production of rough-outs to the engraving of the features and bases). This specific sequence is deduced from a study on the production of steatite scarabs, currently prepared for publication (Ranzer et al., forthcoming).

The main goal of this experiment was to verify whether our proposed production sequence reconstruction fitted the 24 scarabs analyzed as part of this study (see below) and to examine how the work with steatite was executed. In addition, we explored what tools would have likely been used for working steatite, and what kind of skills would have been necessary to produce steatite scarabs. An additional goal was pedagogic—to teach the basics of experimental archeology and provide MA students at Tel Aviv University with practical experience. In what follows, we present our suggested model, the structure of the experiment, and its results.

Suggested chain of operations

Chaîne opératoire is a methodological tool and theoretical approach that involves analyzing a technological procedure and dividing it into sequential phases, with the intention of acquiring a better understanding of the manufacturing process while highlighting the social contexts in which it took place (Mauss, 1973; Lemonnier, 1992, 1; Dobres, 1999, 124). Technologies are practiced differently in different social contexts because the mastering of a craft has traditionally been based on learning through imitation. To acquire the relevant technique, an apprentice observes the sequence of physical actions, and judging the effectiveness of these actions based on the quality of the final product, adopts and perpetuates them. Thus, a tradition emerges and is maintained over time. Focusing on technologies can reveal the skills, knowledge, traditions and sets of values that, expressed through the agency of the individual artisan, are reflected in the physical appearance of the object (Dobres, 1999, p.128). Employing this methodology to the study of scarabs, formerly associated with different cultures, opens new questions and paths of examination (such as: were both Egyptians and southern Levantine artisans using similar tools for engraving? or did they have different traditions for production?). Since no such experiment has been attempted or published before, a general production sequence was tested, in an attempt to repeat this experiment in the future with further knowledge once the basic tools and techniques were examined.

The *chaîne opératoire* of scarabs was reconstructed based on four datasets:

1. Examination of 24 scarabs from the second millennium BC (Southern Levantine Middle and Late Bronze Age) unearthed at four sites located in the modern-day Tel Aviv Metropolitan Area.[4] These scarabs were examined at three different resolutions, following Roux (2016, p.7), who argued for the importance of combining different scales of observation: by the naked eye, through a Zeiss Discovery V8 stereo microscope with a zoom ratio of 8:1, objective magnification 10x (see Figure 1),[5] and three-dimensional scanning with a Polymetric PT-M 3D Scanner.[6] The latter two facilitates certain actions that are harder to accomplish with the naked eye: the microscope helps in focusing on

the engraving lines, for example, or to measure the perforation hole[7] ; the 3D scans visualize the entire object (in contrast to photos) and produce a section drawing of the scanned item (see Grosman et al., 2014, Fig. 7). This is one example for the use of the scanner, which holds much potential for studying the production of such small items.

2. Integration of information derived from previous studies of production contexts in Egypt where unfinished scarabs and working tools were found.[8] Unfinished scarabs (or "scaraboids", see Ranzer et al., forthcoming) are characterized by the absence of base engravings and beetle-shaped features, while their perforation holes were already drilled.
3. Visual representations of the production of beads and other associated artefacts found in Egypt. Most of these are decorating the walls of a tomb dated to the New Kingdom period (see, for example, Davis, 1922, Pl. XXVIII; 1925, Pl. XI; 1943, Pl. LIV), however there are also some depictions of seal makers from earlier periods (Keel, 1995, 133, Figures 255–256).
4. Archaeological experiments: Although no experiments involving the production of steatite scarabs have previously been published, some scholars have engaged in the production of similar artefacts. Among these scholars are Stocks (2003), who examined drilling techniques and other aspects of ancient stone object production methods and Green (2016), who reconstructed the engraving sequence employed in the creation of steatite seals in the Harappan-period (2600–1900 BC) Indus Valley.

Based on our analysis of the four datasets, we reconstructed the following chain of operations (see justifications for each phase further herein). We refer to each phase separately, acknowledging the possibility that different artisans were involved in each phase and that parts of the production might have occurred in different places (See Costin, 2020, p.186).

Collecting the material: All the scarabs discussed here—like most second-millennium BC scarabs (Keel, 1995, p.147)—are made of steatite, a soft stone (number one on the Mohs hardness scale) found in Egypt's Eastern Desert (Harrell 2017, 10), in the northern Levant and Mesopotamia (Moorey, 1999, p.100), as well as on the islands of Crete and Cyprus (Skowronek et al., 2020, p.4). Steatite can be worked with simple tools made of flint, wood, or bone and even with a fingernail (Connor et al., 2015; Connor, 2018, p.14).

Forming the basic shape: Since we have no direct evidence regarding the specific tools used in this process, we based our suggestions on available data about the production of beads (Gwinnett and Gorelick, 1981, pp.10–11). Steatite could easily have been processed with sharp flint tools and/or by rubbing the steatite against flat surfaces of harder materials (such as harder stone, wood, and the like).

Drilling: Drilling the hole through the center of the scarab was done relatively early in the procedure since it involved a risk of breaking the item and thereby wasting any intricate work that had already been done on it (Tosi and Piperno, 1973, p.20). Known unfinished scarabs from the southern Levant are already perforated, despite remaining uncompleted (Keel, 1995, pp.33–34). Depictions from the New Kingdom period indicate that a bow drill was used for perforating beads. Therefore, the same would have likely been used for drilling scarabs. Drilling was done from both ends, meeting in the middle to form a single hole passing through (Keel, 1995, pp.34–35). Stocks (1989, pp.526–528) performed an experiment in which he drilled several beads simultaneously, imitating the drilling procedure depicted in New Kingdom representations. He also claimed that before the actual drilling, each side of the bead would have been slightly perforated with a flint borer to keep the drilling tool from slipping.

Further shaping, polishing, and smoothing: The scarabs were worked into their final shape only after the hole was drilled. Similarly, to the second phase of production, this was accomplished using sharp tools and flat abrasive surfaces. It is possible that additional types of material were used to polish the unfinished scarabs, such as hide or shells, known as polishing materials in other crafts, such as burnishing pottery (Amiran, 1971, p.22).

Marking the features: The fifth phase involved carving in the characteristic features of the beetle, namely, the head, legs, back and wings. The tools used for engraving these features were most likely made of flint, copper, or bronze (Keel, 1995, p.133), and were possibly the same tools used for engraving the base (see the next phase).

Engraving the base: The engraving of the base was usually performed using one of three techniques, or a combination of two out of the three: (1) Linear engraving using a graver to remove a relatively small amount of material and trace only the contours of the motif; (2) engraving that resulted in a sunk relief (Keel, 1995, pp.129–132), where the entire motif was hollowed out and a much greater amount of material was extracted. For this goal not only gravers but also flat blades were used. (3) Engraving concentric circles and wavy patterns with a double or triple-pointed edge tool.[9]

The production of steatite scarabs often included two additional phases which marked the end of the procedure: glazing and firing (Keel, 1995, pp.147–148). This transformed the soft steatite (one on Mohs's scale) into a much harder stone (seven on Mohs's scale). However, these phases were not executed in the current experiment and will be the main objective of future experiments.

Materials and Methods

The experimental program was based on the *Chaîne opératoire* presented in the preceding section herein. The selection of the raw material, steatite, was determined according to the material of most scarabs (see previously herein). For the purposes of our experiment, steatite was purchased at a local store. We choose materials that are visually closest to archaeological materials, steatite light gray in color, similar to steatite found in Egypt, although it is important to note that the purchased stone was not imported from Egypt.

The working tools used during the scarab production were all made of materials that were available during the second millennium BC. For forming the basic shape of the scarab, we decided to use flint tools, such as blades. There is no direct evidence of the use of flint tools for scarab production, however these tools are known to have been used during the first millennium BC, although on a much smaller scale (Rosen, 1996; 1997).

Drilling was done by the bow method from both ends following Stocks (1989). The borers were made from a variety of materials: wood, bone, flint, copper and bronze. Further shaping, polishing and smoothing were performed with wood, hide, basalt and flint pebbles. Finally, the engraving was accomplished using flint, copper, and bronze borers, as well as natural materials available in Egypt and the Levant, such as a porcupine quill (See Table 1).

The flint borers and other tools were made of multiple types of good quality locally sourced flint, while the copper and bronze for the borers were purchased locally. Flint blades and flakes were produced from simple cores with one striking platform by direct percussion with a hammerstone and a soft hammer (antler). The flint tools prepared on blades include retouched and denticulated blades, some cortical and natural backed knives (NBK), as well as burin and simple non-retouched blades. The flint borers were made on flakes by pressure flaking with pointed antler.

Phases of production	The working tools
Forming the basic shape	• Flint tools such as blades
Drilling (bow method)	• Wood borers • Bone borers • Flint borers • Copper borers • Bronze borers
Further shaping, polishing, and smoothing	• Wood • Hide • Basalt pebble • Flint pebble
Making the features and engraving	• Flint borers • Copper borers

	• Bronze borers • Porcupine quill

TABLE 1: PHASES OF PRODUCTION AND WORKING TOOLS

The bone borers were made from cow femur and the wooden borers were made from oak tree. Both were made by chipping and turning. The copper and bronze borers were fashioned from ready-made materials purchased in a store. The bronze alloy we purchased is similar in composition to the alloy found in the archaeological record. The tin-bronze dating to the relevant period was typically composed of 85–90% copper; 5–10% tin and 0.5–1% arsenic. The modern tin-bronze used in the experiment was composed of 78–82% copper; 9–11% tin; 8–11% lead, with all other elements present in the alloy constituting less than 1%. The copper and bronze borers were shaped by cold forging. All the borers were connected to wooden spindles.

A protocol characterized by specific parameters based on the aim of the experiment is necessary for any experiment, especially if it involves a group of tools/activities/people, as ours did. Such a protocol must include a general explanation of the experiment covering all required steps, variables and equipment. Documentation during the present experiment included a general protocol with experimental lines, that is the decisions taken regarding different variations of working tools, especially during drilling—a crucial phase in the production sequence. In addition, protocols were maintained for each item/scarab (item protocol). The item protocol included the following data:

1. General information such as date, location of the experiment, person performing the experiment and his or her experience.
2. Details about the scarab—type of activity, raw material, measurements of roughout and of the final item, diameter of the hole, engraving pattern and schematic drawing.
3. Technological information about each working tool—date of production, knapper or maker, raw material, technology, matrices (length, width, thickness, diameter) and morphology of the working edge.
4. Information regarding every step of production—auxiliary tools, and tool number (bow, stand, bearing block, etc.), drilling method and direction, working time, activity, motion, working angle, hafting or prehension, observation regarding efficiency of the working tool, general notes.

The experiment: Results

A total of 21 students and team members took part in the first stage of the experiment which lasted two days and included the following operations: forming the basic shape, drilling, further shaping, polishing, and smoothing, marking the features and engraving the base. Most of the students had no experience in experimental archaeology or in crafts.

During this experiment 40 blocks were prepared with a size of about 30 by 30 by 20 mm. The cutting of the blocks involved 16 flint tools, including blades, retouched blades, denticulated, naturally backed knives, and retouched naturally backed knives (see Figures 2–3).

The average length of the tools was 93 mm, with the shortest being 49 mm in length and the longest one 141 mm. The average width was 35 mm, while the average thickness was 12 mm. Most of them were used on more than one item, and all were found to be very efficient for this activity. In other words, they were easy to cut with and comfortable to hold.

Further processing was done on 35 out of 40 blocks. Drilling was done using four flint borers, three wood borers, two bone borers, five copper borers, and three bronze borers (see Figures 4–5). All borers, except those made of flint, were one or two mm in diameter, with an average length of 25 mm. In addition, they were all attached to wooden spindles to allow for bow drilling. The flint borers had a conic drill, were held freehand, and used in manual drilling. The flint borers were found to be very efficient, yet it was not possible to finish drilling with them because they are short and expendable, so the work was finalized with bronze or copper borers. Each of the three wooden borers broke during work on a single scarab. After which, the work was finished with copper or bronze borers. Bone borers were found not to be efficient either, yet they lasted longer than their wooden counterparts (two to three scarabs each). The copper and bronze borers were initially used on 18 scarabs (nine for each type), and to complete the work when other borers failed. During the drilling, nine scarabs were broken. Another two items were broken during later phases of polishing and smoothing.

The final shaping was performed on 24 items (five items were not finished) with eight flint tools (denticulated blades, retouched backed knife, retouched blades, burin, cortical blade), see Figures 6–7. Different materials were used for polishing and smoothing, including flint, basalt and kurkar pebbles, hide, wood, and shells.

Marking the features and engraving of the base were done with copper and bronze borers and four flint items (blades and cortical blades), see Figures 8–10.

In total, 19 scarabs were prepared during the experiment, for example, see Figures 11–12.

Discussion and conclusion

The main goal of this experiment was to verify whether the reconstructed production sequence fits the series of actions needed to produce ancient scarabs. The results generally confirm the proposed *chaîne opératoire*. However, there are a few points which should be refined, following the experiment.

First is the difficulty posed by the perforation of the objects. As was expected, this phase is the most crucial in the production of steatite scarabs due to the fragility of the steatite, as the perforation process often led to the breakage of the unfinished item. In current experiment, 30% of the blocks broke during the drilling process.

Second, in order to ease drilling, a small amount of material was extracted from both ends of the unfinished scarab with the help of a flint borer. This served as a preparation for the drilling conducted with the bow, which greatly facilitated the process.

The third issue pertains to the size of items produced during the experiment. The average size of ancient scarabs is usually less than 20 mm long, 15 mm wide, and ten mm thick; however, the products of our experiment were larger, measuring circa 25 by 18 by 13 mm respectively. Following this result, an additional experiment has been planned, but has not yet been executed. Accurately recreating the small scale of the original steatite scarabs was probably the biggest challenge that presented itself during the experiment.

A general result that arose this experiment was the revelation that a detailed account is still needed for the actual production of steatite scarabs, as many unexpected decisions had to be made during the production process, such as whether the back (the features of the scarab) or the base engravings were produced first, and whether there was a specific sequential order for each typological group of scarabs. The answers to some of these questions are currently being reconsidered and will be published soon (Ranzer et al., forthcoming). Apart from that, an additional experiment is currently planned, which is aimed at answering questions regarding the continuation of the sequence, including the glazing and firing of steatite scarabs.

Lastly, studies of the production of scarabs and other ancient stamp seals encounter difficulties in reconstructing the techniques employed by the artisans who originally created them, since the archaeological evidence is, by its nature, partial. Experimental archaeology holds significant potential for shedding light on these processes, especially when focusing on the production of such small-scaled items.

1 Exemplified by the contents of the Byblos Montet Jar, see Ben-Tor, 1998.

2 The production sequence tested in this experiment was originally suggested in Ranzer's MA thesis, 'Object's Biography: Production and Function of Middle and Late Bronze Age Scarabs in the Ayalon and Yarkon Basin', written at TAU under the supervision of Yuval Gadot and Koch.

3 Keel (1995, 1pp.29–132) briefly discussed stamp-seal manufacturing techniques, focusing on engraving methods.

4 These sites are Tel Gerisa (Herzog 1993), Tel Aphek (Gadot and Yadin, 2009), Tel Bene Beraq (Be'eri et al., 2020) and a burial unearthed at Horkanos street in Tel Aviv (Further information about Tel Gerisa was provided by Z. Herzog. Further information regarding the burials from Tel Bene Beraq was provided by R. Beeri and D. Ben-Tor).

5 Microscope examination was conducted at the Use-Wear Laboratory at Tel Aviv University, headed by Solodenko.

6 The scarabs were scanned at the Computational Archaeological Laboratory at the Hebrew University, headed by Prof. Leore Grosman, using the tArtefact 3D program (Grosman et al., 2014).

7 A feature that is often disregarded in previous publications: the photos are usually of the base, back and sides, while photos of the perforation hole are missing (see, for example, Ben-Tor, 2018).

8 At Kerma, modern-day Sudan, from the early second millennium, Egyptian Middle Kingdom (Reisner, 1923, p.89) and at Memphis, from the mid-to-late second millennium, Egyptian New Kingdom (Petrie, 1909, p.11).

9 This engraving technique was not executed during this experiment.

Keywords stone working

Country Egypt
Israel

Bibliography

Amiran, R., 1971. *Ancient Pottery of the Holy Land: From Its Beginnings in the Neolithic Period to the End of the Iron Age*. Jerusalem: ha-Ḥevrah la-Haḳirat Erets Yiśra’el ṿe-‘Atiḳoteha.

Be’eri, R., Golan, D., Dayan, A., Harpak, T., Haklay, G., Rudin, T., Karkovsky, M.., 2020. Tel Bene Beraq (South), Burials and Cemetery, *Hadashot Arkheologiyot: Excavations and Surveys in Israel*, 132. [online] available at <http://www.hadashot-esi.org.il/report_detail_eng.aspx?id=25844&mag_id=128> [Accessed 13 November 2022]

Ben-Tor, D., 1998. The Absolute Date of the Montet Jar Scarabs. In L.H. Lesko, ed. *Ancient Egyptian and Mediterranean Studies. In Memory of William A. Ward*. Providence, Rhode Island: Department of Egyptology and Ancient Western Asian Studies, Brown University., pp. 1–17.

Ben-Tor, D., 2006. Chronological and Historical Implications of the Early Egyptian Scarabs on Crete. In E. Czerny, ed. *Timelines Studies in Honour of Manfred Bietak*. Leuven, Paris and Dudley, MA: Peeters Publishers (Orientalia Lovaniensia Analecta, 149), pp. 77–86.

Ben-Tor, D., 2007. *Scarabs, Chronology, and Interconnections: Egypt and Palestine in the Second Intermediate Period*. Fribourg and Göttingen: Vandenhoeck and Ruprecht (Orbis Biblicus et Orientalis Series Archaeologica, 27).

Ben-Tor, D., 2017. Ramesside Scarabs Simulating Middle Bronze Age Canaanite Prototypes: Canaanite or Egyptian?, *Ägypten und Levante/Egypt and the Levant*, 27, pp. 195–217.

Connor, S., 2018. Sculpture Workshops: Who, Where and for Whom?. In G. Miniaci, J.C. Moreno García, S. Quirke, A. Stauder. eds. *The Arts of Making in Ancient Egypt: Voices, images, and objects of material producers 2000–1550 BC*. Leiden: Sidestone Press, pp. 11–30.

Connor, S., Tavier, H. and De Putter, T., 2015, “Put the Statues in the Oven”: Preliminary Results of Research on Steatite Sculpture from the Late Middle Kingdom, *Journal of Egyptian Archaeology*, 101, pp. 297–311.

Costin, C. L., 2020. What is a Workshop?. In A.K. Hodgkinsonand C. Lelek Tvetmarken, eds. *Approaches to the Analysis of Production Activity at Archaeological Sites*. Oxford: Archaeopress Archaeology, pp. 117–197.

Cortebeeck, K., 2016. Stamp Seals in Ancient Egyptian Tombs–A Revision of the Usages in Quest of the Sex of Their Owners, *Studien zur Altägyptischen Kultur* 45, pp. 105–123.

Davis, N. de G., 1922. *The Tomb of Pyuemrê at Thebes, Volume I: The Hall of Memories*. New York: The Metropolitan Museum of Art.

Dobrés, M.-A., 1999. Technology’s Links and Chaînes: The Processual Unfolding of Technique and Technician. In M.-A. Dobrésand C. R. Hoffman, eds. *The Social Dynamics of Technology: Practice, Politics and World Views*. Washington, D.C: Smithsonian Institution Press, pp. 124–146.

Dubiel, U., 2012. Protection, Control and Prestige - Seals Among the Rural Population of Qau-Matmar.. In I. Regulski, K. Duistermaat, and P. Verkinderen, eds. *Seals and Sealing Practices in The Near East*. Leuven, Paris, and Walpole, MA: Peteers Publishers (Orientalia Lovaniensia Analecta, 219), pp. 51–80.

Gadot, Y. and Yadin, E., 2009. *Aphek-Antipatris II: The Remains on the Acropolis. The Moshe Kochavi and Pirhiya Beck Excavation*. Tel Aviv: Emery and Claire Yass Publications in Archaeology.

Green, A. S., 2016. Finding Harappan Seal Carvers: An Operational Sequence Approach to Identifying People in the Past, *Journal of Archaeological Science*, 72, pp. 128–141.

Grosman, L., Karasik, A., Harush, O., Smilanksy, U. 2014. Archaeology in Three Dimensions: Computer-Based Methods in Archaeological Research, *Journal of Eastern Mediterranean Archaeology and Heritage Studies*, 2(1), pp. 48–64.

Gwinnett, A. J., 1981. Beadmaking in Iran in the Early Bronze Age. Derived by Scanning Electron Microscopy, *Expedition*, 24(1), pp. 10–23.

Harrell, J.A., 2017. A Preliminary Overview of Ancient Egyptian Stone Beads, *Palarch’s Journal of Archaeology of Egypt/Egyptology*, 14(2), pp. 1–16.

Herzog, Z., 1993. Gerisa, Tel, *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Edited by E. Stern. Jerusalem.

Hornung, E. and Staehelin, E., 1976. *Skarabäen und andere Siegelamulette aus Basler Sammlungen*. Mainz: Zabern (Ägyptische Denkmäler in der Schweiz, 1).

Keel, O., 1995. *Corpus der Stempelsiegel-Amulette aus Palästina/Israel: Von den Anfängen bis zur Perserzeit: Einleitung*. Fribourg and Göttingen: Vandenhoeck and Ruprecht (Orbis Biblicus et Orientalis Series Archaeologica, 10).

Keel, O., 2004. Some of the Earliest Groups of Locally Produced Scarabs from Palestine. In M. Bietakand E. Czerny, eds. *Scarabs of the Second Millennium BC from Egypt, Nubia, Crete and the Levant: Chronological and Historical Implications (Papers of a Symposium, Vienna, 10th-13th of January 2002)*. Vienna: Verlag der Österreichischen Akademie der Wissenschaften, pp. 73–101.

Lemonnier, P., 1992. *Elements for an Anthropology of Technology*. Michigan: University of Michigan, Museum of Anthropology (Anthropological papers, 88).

Mauss, M., 1973. Techniques of the Body, *Economy and Society*, 2(1), pp. 70–88.

Moorey, P. R. S., 1999. *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence*. University Park, PA: Eisenbrauns.

Petrie, F. W. M., 1909. *Memphis I*. London: Cambridge University Press.

Petrie, F. W. M., 1930. *Beth Pelet I (Tell Fara)*. London: British School of Archaeology in Egypt.

Ranzer, N., Gadot, Y. and Koch, I., (forthcoming). The Production of Middle Bronze Age Steatite Scarabs from the Southern Levant: A Chaîne Opératoire Approach. (Manuscript submitted for publication January 2022.

Reisner, G. A., 1923. *Excavations at Kerma. Parts IV–V*. Cambridge, MA: Harvard University Press.

Rosen, S. A., 1996. The decline and fall of flint. In G. H. Odell, ed. *Stone Tools: Theoretical Insights into Human Prehistory*. New York: Plenum Press, pp. 129–158.

Rosen, S. A., 1997. *Lithics after the Stone Age: a handbook of stone tools from the Levant*. Walnut Creek, CA: AltaMira Press.

Roux, V., 2006. Ceramic Manufacture: The Chaîne Opératoire Approach. In A. M. W. Hunt, (ed. *The Oxford Handout of Archaeological Ceramic Analysis*. Oxford: Oxford University Press, pp. 1–17.

Skowronek, T., Hauptmann, A. and von Rüden, C., 2020. Using spinel chemistry to characterize archaeological steatite found in the wall paintings of Tell el-Daba, Egypt, *Journal of*

Archaeological Science, 117(105137), pp. 1–9. doi.org/10.1016/j.jas.2020.105137

Stocks, D. A., 1989. Ancient Factory Mass Production Techniques: Indications of Large-Scale Stone Bead Manufacture during the Egyptian New Kingdom Period, *Antiquity*, 63(240), pp. 526–531.

Stocks, D. A., 2003. *Experiments in Egyptian Archaeology: Stoneworking Technology in Ancient Egypt*. London: Routledge.

Stock, H., 1942. *Studien zur Geschichte und Archäologie der 13. bis 17. Dynastie Ägyptens, unter besonderer Berücksichtigung der Skarabäen dieser Zwischenzeit*. Hamburg, New York, Augustin: Glückstadt.

Tufnell, O., 1984. *Studies on Scarab Seals Volume II: Scarab Seals and their Contribution to History in the Early Second Millennium B.C.* Warminster: Aris and Phillips LTD.

Williams, B., 1970. *Representations on Scarabs from the Second Intermediate Period*. Unpublished Thesis. University of Chicago, Oriental Institute.

Corresponding Author

Natasha Solodenko-Vernovsky
Laboratory for the Study of Human Cultural Evolution
The Institute of Archaeology
The Hebrew University of Jerusalem
Mt. Scopus
Jerusalem 91905
Israel
E-mail Contact

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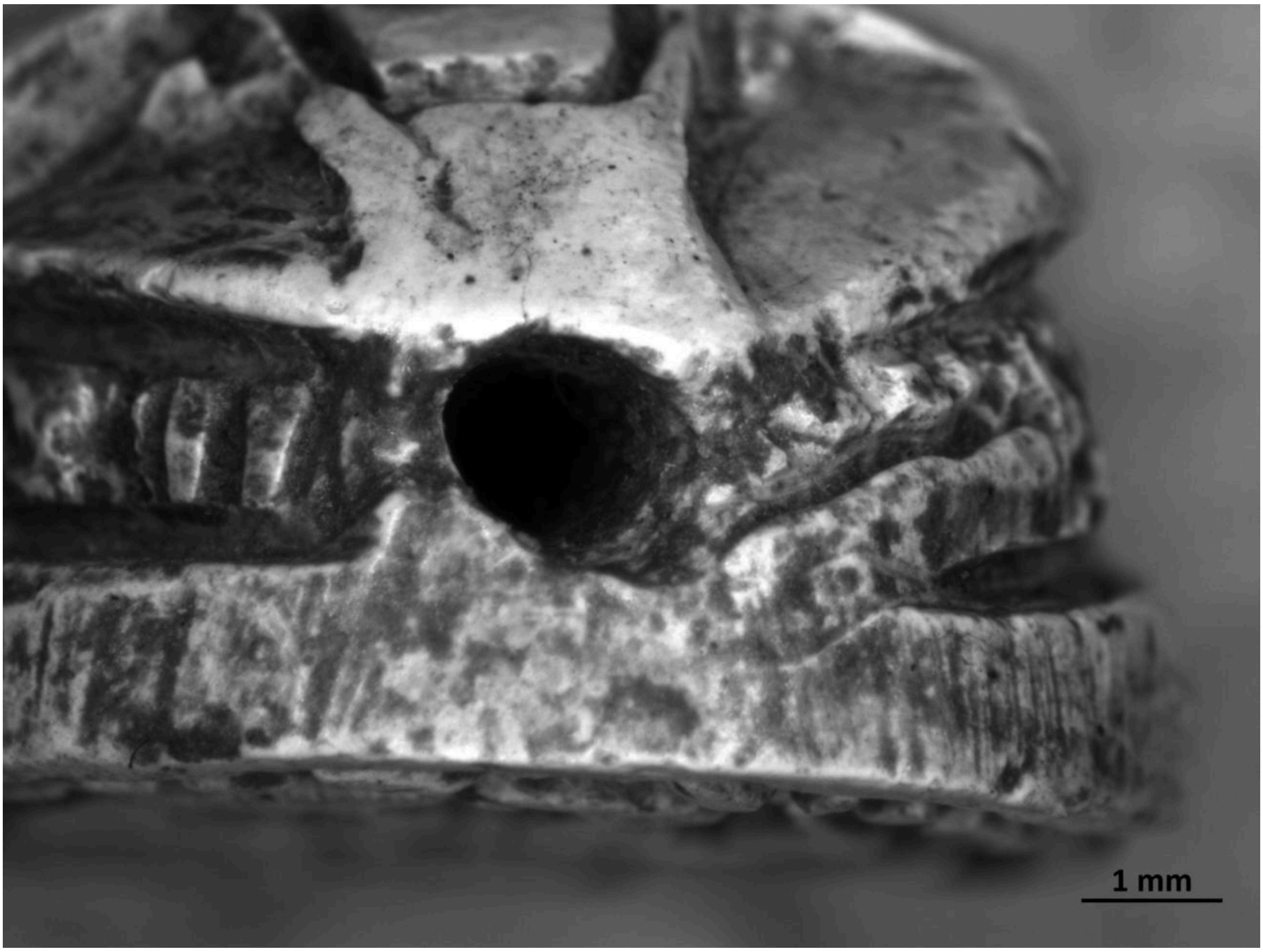

FIG 1. MICROSCOPIC PHOTO OF AN ARCHAEOLOGICALLY DERIVED SCARAB. PHOTO BY NOA RANZER

FIG 2. CUTTING A STEATITE SLAB WITH A FLINT TOOL. PHOTO BY NOAM KODESH

FIG 3. FINAL STEATITE BLOCKS, READY FOR DRILLING. PHOTO BY NOAM KODESH

FIG 4. DRILLING A STEATITE BLOCK WITH A WOODEN BORER. PHOTO BY NOAM KODESH

FIG 5. DRILLING A STEATITE BLOCK WITH A COPPER BORER USING A BOW. PHOTO BY NOAM KODESH

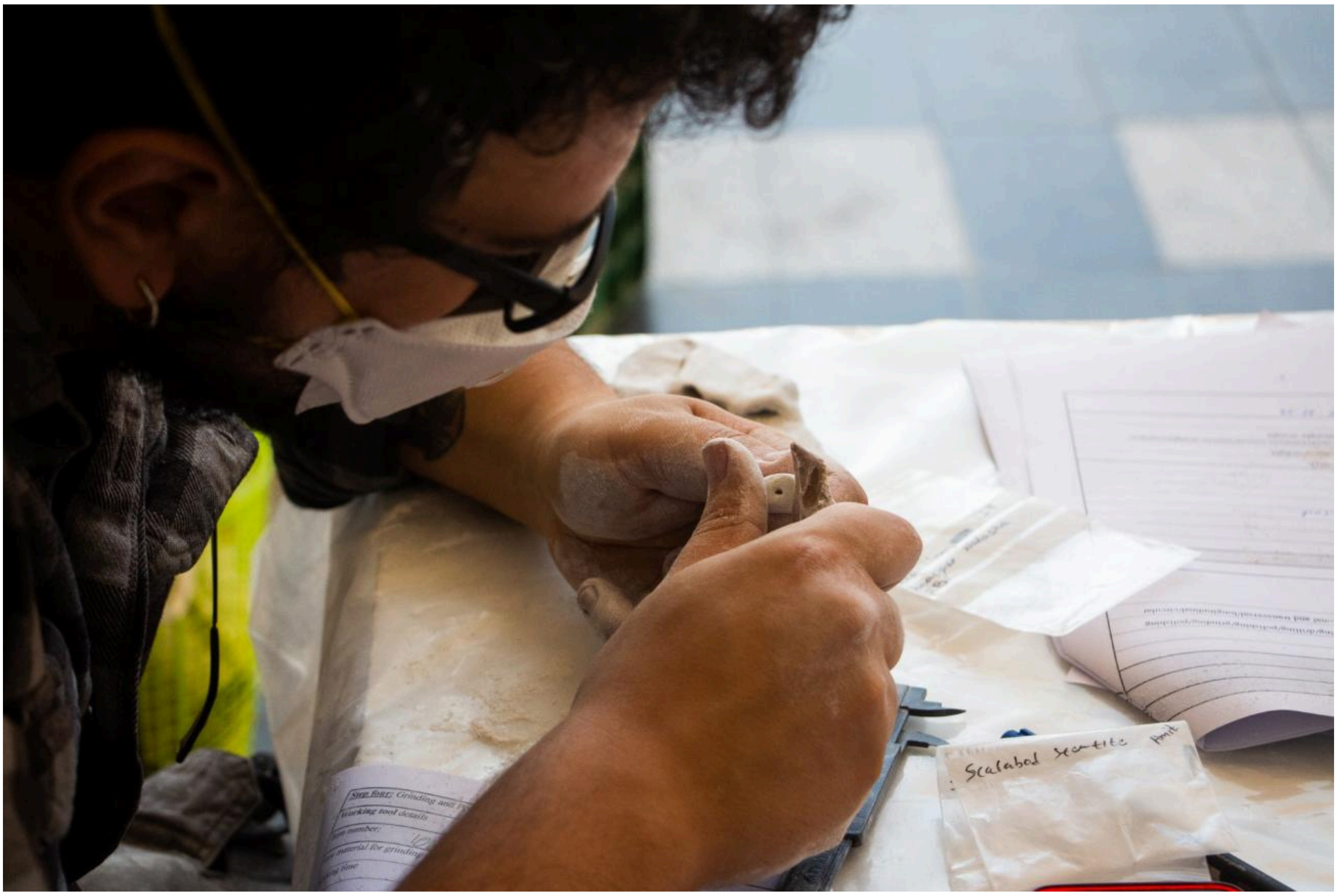

FIG 6. CARVING STEATITE INTO A SCARAB SHAPE WITH A FLINT TOOL. PHOTO BY NOAM KODESH

FIG 7. A STEATITE SCARAB AFTER DRILLING AND SHAPING. PHOTO BY NOAM KODESH

FIG 8. ENGRAVING THE SCARAB FEATURES WITH A BRONZE OR COPPER BORER. PHOTO BY AMMIT ETYA

FIG 9. ENGRAVING THE SCARAB FEATURES WITH A BRONZE OR COPPER BORER. PHOTO BY AMMIT ETYA

FIG 10. ENGRAVING THE SCARAB FEATURES WITH A BRONZE OR COPPER BORER. PHOTO BY AMMIT ETYA

FIG 11. FINISHED SCARAB, BASE. PHOTO BY AMMIT ETYA

FIG 12. FINISHED SCARAB, BACK. PHOTO BY NATASHA SOLODENKO-VERNOVSKY