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Bernard MATHIEU, Dimitri MEEKS et Myriam WISSA (eds.), *L'apport de l'Égypte à l'histoire des techniques. Méthodes, chronologie et comparaisons* (Bibliothèque d'Étude 142), Institut Français d'Archéologie Orientale, Le Caire, 2006, VIII + 302 p., 35 €, 2-7247-0417-7.

Heike WILDE, *Technologische Innovationen im zweiten Jahrtausend vor Christus. Zur Verwendung und Verbreitung neuer Werkstoffe im ostmedi-terranen Raum* (Göttinger Orientsforschungen IV. Reihe Ägypten 44), Harrassowitz Verlag, Wiesbaden, 2003, X + 272 p., 5 tableaux, 1 carte, 22 pl., 72 €, ISBN 3-447-04781-X.

Egyptian technology is receiving decidedly more scientific attention of late. The two volumes reviewed here contribute to this growing discussion with two different approaches : The book edited by Bernard Mathieu, Dimitri Meeks and Myriam Wissa assembles 19 scientific papers, first presented at a conference held at the IFAO Cairo in 2003, which deal with technology applied to a very wide range of objects and topics. With four entries, pottery is the largest group. Two articles deal with glass and faience and two each with textiles and ship building. The other categories are represented by individual papers : they reach from meat processing to brick architecture, from studies on basketry to stone quarrying, from metallurgy to encaustic painting, from stone statues to leather and parchment. Almost all authors are directly involved in field work in Egypt and the analytic process. Thus, most issues raised evolved from and are connected to archaeological work. Heike Wilde offers an overview of technological innovations in the 2nd millennium BC in the Eastern Mediterranean. She tackles this by focussing on three issues : glass, metallurgy, in particular tin-bronze, and the uses of horses and chariots. Her work is based on published sources. The goal is to develop a chronological structure for technological change over a long and crucial period of time for the Eastern Mediterranean.

"*The Contribution of Egypt to the History of Techniques*" (my translation) is the title of the book by Bernard Mathieu, Dimitri Meeks and Myriam Wissa. The goal of the colloquium and the assembled essays is outlined in the foreword by B. Mathieu and in particular in an introductory chapter by D. Meeks with the title "*Ancient Egypt and the history of techniques : Egyptians and Egyptologists between tradition and innovation*" (pp. 1-13) : Technological studies tend "*to offer archaeological answers to archaeological questions*" (p. 3, my translation). Philologists and historians have left the debate, which in turn has become a dialogue among specialists. Meeks then poses some questions, regarding such topics as the development of agricultural equipment in Egypt or the use of Near Eastern cereals as opposed to African ones, which are neither dealt with by historians nor archaeologists. A brief overview of the history of the writing "the history of techniques" is offered, with particular focus on the French tradition. Meeks, finally, expresses the hope that a new dialogue between "*the two cultures of Egyptologists and archaeologists*" (p. 13) can be installed. This is followed by 18 articles, of which 12 are in French and 6 in English. The chronological scope is from the Old Kingdom to Modern Egypt. The period most frequently discussed is the Graeco-Roman period (7), followed by the New Kingdom (4). Earlier Pharaonic and later periods are represented by single entries. The discussions are based primarily on archaeological sources, often from

[440] Cf. CHARPIN, *ibid.*

field work, which the author is involved in or directs. Textual sources and depictions are in general added to this discussion. The individual contributions will be very briefly presented in the following :

P. Ballet, F. Béguin, G. Lecuyot and A. Schmitt (pp. 15-30) open their discussion of pottery production of the Graeco-Roman period at Buto (Tell el-Fara^{c}in) as a question : *New ceramic techniques at Buto* ? The article presents the evidence of pottery and pottery ovens from Buto. Located with the help of magnetometry and surface surveying, a series of ovens has been excavated at the northern edge of the tell of Buto. The pottery shapes associated with the workshop are cups, cups with handles, bowls, small jars with two handles, juglets and lamp-dishes. All but the last are fine wares, made of very fine alluvial clay and with a reddish-orange surface, which can have a burnished appearance. Based on parallels, the group can be dated to the 1st and the early 2nd c AD. Typological similarities to Mediterranean *sigillata* are suggested. The connections might extend to the design of the oven, which uses a system of radiating heat similar to what is used in the production of Western *sigillata*.

J. Bourriau (pp. 31-44) advocates "*technology in the pottery of the Middle and New Kingdoms as an underrated tool in the archaeologist's armour*". She initially offers an overview of the history of technology, or the awareness of technology, as reflected in publications on pottery. The importance of and advance in pottery documentation is demonstrated compellingly by opposing two archaeological drawings, about 80 years apart (shown on Fig. 2.a. and 2.b.). The details of analysis and documentation of the more recent drawing enable us to date it quite finely and to locate the region of its production. However, she convincingly advocates the potential of ceramic research beyond such basics of dating. Here her arguments are infused with her many years of experience in the field. A range of practical suggestions regarding the archaeological process and development of research strategies, emphasizing a collaborative effort, are put forward. Finally, six specific research questions from the field of pottery studies are suggested : they concern classification, contextual studies, residuality, inscribed ceramic vessels, ceramic lexicography and the relationship of pottery making to other crafts.

D. Cardon's article (pp. 45-61) deals with Roman textiles, in particular developments in weaving and dyeing. The basis of the discussion is a selection of textiles from small forts in the Eastern Egyptian desert, namely Krokodilô, Maximianon and Didymoi. Most textiles were coloured and the variety of colours and nuances of colours is remarkable. This was achieved by combining various biological dyes. Two basic types of dyer's madder, distinguished by their proportion of purpure, are separated. 12 percent of the analysed samples show evidence of the use of "real" purple extracted from molluscs. What is particularly intriguing is the fact that this range of colourful and decorative textiles is found at sites where officers and soldiers of medium and lower ranks were based. Whether these textiles reached the site as recycled rags in stuffing and padding or had been worn on site remains open.

C. Defernez and S. Marchand (pp. 63-99) discuss Egyptian imitations of Aegean and Levantine pottery from the 6th c to the 2nd c BC. The discussion is divided into two chronological units : the Late Period is discussed by C. Defernez, the Ptolemaic Period by S. Marchand. The article deals only with large and small jars used as containers and traded for their content. A review of the imported containers forms the basis for the discussion of imitations. The focus is on five regions : Cyprus, Syria-Palestine, Phoenicia, the Aegean and the Attic region. In Egypt the evidence from numerous sites is included. For the Late Period, a particularly significant role is played by Tell el-Herr, due to first hand knowledge of the material by the author. While in the Late Period, for Cypriot and Syro-Palestinian containers, a time gap of 200 years can be observed until local imitations are produced, faithful Aegean imitations seem to appear more rapidly. The Ptolemaic period sees a huge rise in Egyptian imitations of Aegean imports, which eventually develop into shapes distinct from their prototypes.

R.-P. Gayraud (pp. 101-116) discusses the reappearance of glazed pottery in Egypt in the Islamic period. Following the popularity of glazed pottery, produced in the tradition of faience making, in Ptolemaic and early Roman Egypt, this technology subsequently vanished. The author suggests that this disappearance was connected to the rise in popularity for new imported items, such as *sigillata*-ware. Glazed pottery is again produced in Egypt in the 9th century AD, and disappears in the 16th century. At that point it is replaced by high quality products imported from the centers of the Ottoman empire, Europe and China. Based on stratigraphic evidence from the IFAO excavations at Istabl Antar, in Fustat, directed by the author, he argues strongly for dating the first pieces of glazed ware not before the 9th century AD. Whether Egypt or Irak was the first producer of glazed ware can at this point not be answered with certainty, but the oft cited primacy of Irak is based on a confusion of terms. Sassanid glazes, which continued to be produced in Irak, are to be considered distinct from the new "polychrome glazes". The author suggests that this technique appears at the same time in both countries.

G. Hadji-Minaglou's article (pp. 117-131) gives an overview over brick architecture at Tebtynis, a Graeco-Roman site in the Fayum. Not only papyri are well preserved in the Fayum ; this also holds true for architecture. One would thus imagine building archaeologists to flock there, but this does not seem to be the case. Hadji-Minaglou's article is but a brief introduction to a detailed monograph on these topics, under preparation. As would be expected, the main building material is sun dried mud-brick, with stones only being used rarely and for very specific purposes. Remarkably, wood is frequently employed instead of stone, for example, for thresholds, as reinforcement in doorways and as lintels. Wood is also used for windows, for which Tebtynis offers very well preserved examples of frames, grilles and shutters. Finally, she discusses the shapes of vaults. One certainly looks forward to reading more. In the context of the history of technology, it would be interesting, for example, to address the question of regional variations in architecture, both within Egypt and within the wider Graeco-Roman world.

S. Ikram (pp. 125-131) discusses the methods of preserving meat. Depictions, texts and mummified food remains provide us with very rich sources for this topic from Ancient Egypt. Here she presents the results of adding the "non-traditional sources" of ethnography and experimental archaeology to the discussion. Only drying can be positively identified among depictions. Experiments were conducted with drying, salting, salting and drying, salting, spicing and drying, and cooking the meat with salt and fat. The results were observed over time, and tasted. Her study gives valuable input to field archaeologists to consider looking for traces of activities beyond what can be expected based on pictorial evidence.

K. Innemée (pp. 133-141) presents a study on encaustic painting in Egypt, based on recent analysis of paintings in a church in the monastery of Deir al-Surian, in the Wadi Natrun. The painting, showing the Annunciation, has four layers. The second layer, dated to around 700 AD, uses the encaustic technique, while the third layer, done around 900 AD, uses a combination of tempera and encaustic. This evidence contradicts the previously held general opinion that the encaustic technique disappeared in Egypt in the course of the 8th c AD. Innemée argues strongly for an Egyptian origin of the painters and for a continuous Egyptian tradition of encaustic painting since the 3rd c AD, when we have the last certain archaeological evidence. He suggests filling this gap with a number of icons at St. Catherine's monastery which he proposes were produced in Alexandria, and not at Constantinople. Innemée justly laments the dearth of technical research of icons and other encaustic paintings. In his critique of K. Weitzmann's work on the monastery of St. Catherine (Princeton 1976) he voices doubts on the value of stylistic analysis. This, however, seems a bit odd when in the following he bases his line of–intriguing and far reaching–arguments heavily on a stylistic discussion of icons in comparison to the Annunciation painting.

P. Jockey (pp. 143-154) discusses the role Egypt played in the emergence of Greek "kouroi". He approaches this old debate by bringing new natural scientific evidence to the table. His analysis on the colours of Hellenistic sculpture of Delos has brought to light the use of very large amounts of Egyptian blue. The resourceful uses of this synthetic colour as layers and in combinations and mixtures with other colours, give, however, evidence of distinct Greek innovations.

B. Mathieu (pp. 155-167) discusses two, on first view, not necessarily closely related topics : Old Kingdom ships and measuring units for textiles from the New Kingdom. The first topic discusses a scene from the tomb of Kaiemankh at Giza of the 6th Dynasty. It shows, in a cursive style, scenes of wood working and a list providing enormous numbers of ships and elements of ships. Mathieu considers this an example of attempting to transfer technological knowledge into the afterlife and to take ritual advantage of the power associated with ship building activities. The second topic deals with a recently published ostracon from Deir el-Medina from the New Kingdom listing money owed to launderers. Two unusual measuring units are mentioned. The use of a separate system of measuring reflects, according to Mathieu, the marginal and stigmatised social role held by launderers in Ancient Egypt.

M. Mossakowska-Gaubert (pp. 169-184) presents Greek expressions connected with the production of tunics in Egypt. The sources are Egyptian papyri written in Greek from the Roman and Byzantine periods. While tunics of the Ptolemaic period are almost entirely made of linen, those of the Roman and Byzantine periods are made either of linen or wool, some rare examples also of cotton. The textual evidence mentions an enormous range of shades of colours–an interesting additional dimension to the archaeological evidence presented by D. Cardon, above. Geographic terms associated with textiles most likely refer to different sorts of wool and linen, in one case also to a specific shade of colour. Finally, Mossakowska-Gaubert suggests interpretations for some technical terms referring to the production of tunics.

Glass and faience production in Graeco-Roman Egypt is the topic of M.-D. Nenna's paper (pp. 185-205). Her article is separated into three sections : first, Egyptian raw material, second, Egyptian glass production and the possible transfer of knowledge to other regions of the Ancient world and third, faience production. While Egypt was the most important source of the raw material natron, it was not a great exporter of glass in the Roman period. The Egyptian tradition of glass inlays and glass formed of fused "mosaic" segments continues in the Graeco-Roman period. Finds from stratified excavations, such as Ain Manawir in the Kharga oasis, provide the earliest dates (second half of 5th c BC) for objects from this group. At the end of the 3rd c BC, glass wares created from moulded "glass mosaics" are first created. Greek décor and iconography enter the glass and the faience production. The latter is described as an adaption to a changed market, which, however, did not become popular as an export.

P.-T. Nicholson's article (pp. 207-216) on the production of vitreous materials in Egypt is a combination of the history of science and archaeological fieldwork. Nicholson reassesses, based on his own archaeological investigations, the work of W. M. F. Petrie at two sites, Tell el-Amarna and Kom Helul at Memphis. Petrie in the late 19th and early 20th c had worked at both sites and presented evidence for what he considered the production of vitreous materials. At Amarna, Nicholson's work has uncovered kilns for production of pottery, or possibly faience, and structures considered to be glass furnaces. By experimental archaeology, a glass ingot was successfully produced on site. At Kom Helul, faience manufacturing installations, very similar to those described by Petrie, were uncovered. Nicholson demonstrates that Petrie's interpretations contain crucial omissions and some details need to be corrected. Petrie's standing as a pioneer of industrial archaeology is certainly justified. Problems arise when his reports, over 100 years old, are uncritically read and reproduced.

V. Pichot, P. Fluzin, M. Valloggia and M. Wuttmann (pp. 217-237) report on the results of an archaeological and archaeometrical project

analysing Graeco-Roman metallurgy in Egypt. The goal of this undertaking is to trace the operational sequence of copper and iron metallurgy–from reduction of minerals to the production of objects–in the archaeological evidence. Three sites are presented as case studies : the "Cricket Ground site" in Alexandria, Abu Roash and the island of Marea. Experimental archaeology was used to cast Roman Bronze coins, based on moulds found at Hermopolis Magna. A thesaurus of relevant metallurgical terms is attached to the article.

P. Pomey (pp. 239-251) presents textual evidence for the role of drawing in ship building. The main source is a letter written in Akkadian from the Late Bronze Age Egyptian-Hittite correspondence. This letter refers to a ship being sent by Ramesses II to the Hittite king in order for it to be drawn, so that a new ship can be constructed based on the drawing. The second, very brief, Akkadian text dates to the 6th c BC and also refers to creating the drawing of a ship. The first letter, from the archives of Boghazköy, is not only a remarkable example of international cooperation, but also demonstrates how technology could be transferred.

The building of roads in Pharaonic Egypt and Nubia in connection with stone-quarrying is the topic of I. Shaw's article (pp. 253-266). Three main roads are discussed : the Hatnub road, the Northern Faiyum roads and the Tushka gneiss-quarriers' road. The last, with a length of 80 km, is the longest surviving Egyptian quarry road. Some roads, such as the Northern Faiyum road leading from the basalt quarries to Qasr el-Sagha, were paved with stone slabs. The Hatnub road was constructed in a way as to avoid sharp ascents and descents. Connected with the construction of roads are various other installations : wells, camps and cairns.

W. Wendrich (pp. 267-275) analyses the transfer of technology as exemplified by basketry. She used an ethnoarchaeological approach and placed herself in the role of apprentice of an Egyptian basket maker. This made her realize that reconstructing the "*chaîne opératoire*", based on Leroi-Gourhan, does not reflect the often irregular and chaotic reality of the production process. Her definition of the archaeological equivalent of skill centres on the recognition of rhythm. This is demonstrated by a table minutely recording the basket makers' actions, based on a video recording. This is intriguing and one would like to be informed of the next steps, such as specific indications for different rhythms and levels of skills and how this is reflected in archaeological material.

M. Wissa (pp. 277-301) discusses the development of techniques for treating leather and parchment, from their origins to the Islamic period. Her description of the steps of the two techniques is based on visits to the tanneries at Cairo. Wissa cites numerous indications that alum may have been used in the tanning process distinctly earlier than the 1st millennium BC. While ancient Egyptian sources for leatherworking are ample, those for producing parchment, or "*parchmented* skin", as she refers to its less adequately prepared form, are scarce.

The illustrations in all articles are exemplary as is the quality of the photographs, both in black and white and in colour. The latter are particularly relevant when accompanying articles in which the colours, as is the case with textiles and glazed wares, are discussed in detail. These images are not only a visual delight, but are highly useful for comparative purposes. An editorial inconsistency can be noted : While six articles have a bibliography at the end, the rest does not. Bibliographies, in particular on highly specialised topics, would be very useful for the non-specialist to get an overview over the relevant and up-to-date literature. The specialised technical terminology necessary in order to discuss technology makes reading some articles, for non-French speakers, quite demanding. English abstracts would be highly helpful–and encourage the dialogue, which the initiators of this book hope to achieve.

Egyptian archaeology continues to provide us with vast amounts of remains of material culture, often in quantities overwhelming those in charge of studying them. The dry conditions at many archaeological sites in Egypt have supplied us with a range of excellently preserved specimens of organic finds, such as textiles and leather. Egyptology often does not take full advantage of their scientific and historical potential. This book

shows how detailed studies of many categories of objects, whose study has hitherto often been neglected, can add crucially to our understanding of history. Not only the history of technology, one should emphasize, but history in a broader sense. However, such individual studies need to be incorporated into broader views–and this is rarely done.

Such an attempt is the book by Heike Wilde. It is a slightly revised version of her MA thesis, accepted in the winter of 1999/2000, and published in German in 2003. The book is titled "*Technological Innovations in the 2nd Millennium BC. The Use and Distribution of New Materials in the Eastern Mediterranean*" (my translation). Her discussion focuses on three topics, of which only two can be classified as materials : glass and tin-bronze. The third theme is horses and chariots. The Eastern Mediterranean is organized into three main regions, Egypt, the Near East and the Aegean, which are discussed separately and in that order for each topic. Her starting point is Egypt, due to "*the richness of sources, archaeological, pictorial and textual, while for the Near East written sources dominate*" (p. 3, my translation). In particular Egypt and Near East are compared, as "*due to the wealth of available sources exact observations and relatively secure dates can be achieved*" (p. 3, my translation). Finally, the Aegean is presented. It is discussed primarily based on archaeological finds.

The three main chapters on glass, tin-bronze, and horses and chariots are brought together and parallelized in section III. Section IV offers a brief summary and an outlook on future topics emerging from this study. This is followed by a bibliography, a catalogue, tables offering chronological overviews, a map and 22 plates. No index is provided.

The goal of this study, outlined in the introduction (p. 4), is to establish a relative chronology of phases for these innovations, which deal with their first appearance, the evolution of the techniques for working the materials and ultimately the acceptance of these materials in the various regions. The analysis uses a model of four consecutive phases based on the work of Gordon Childe[441] and Christian Strahm[442]. Here the phases are called primary phase, secondary or experimental phase, phase of expansion and phase of acceptance. She describes these phases as follows : The primary phase (pp. 7-8) is characterized by the first contact with the new material. This contact can be based either on the introduction of this material from the outside, be it as raw material or in the shape of finished products, or on an autochthonous production. Products made of new materials are imitated in other materials, while imported raw materials are worked in methods established for other materials. The secondary phase (pp. 8-9) is an experimental phase. The new material is worked according to the qualities and advantages inherent in the material. The technological process is advanced and can be reproduced, but the products are restricted to specific social groups. The phase of expansion (pp. 9-10) is characterized by a standardised, often centralised production. Mass production leads to simplification of design. The production of very large quantities leads to the establishment of an export market. A phase of acceptance (pp. 10-11) can follow, if the new material or the new product has been widely successful. Precondition is the availability of resources in the required amount.

The chapter on glass (pp. 13-64) begins with a discussion of the classification of glass and related substances, such as frit and faience. The production of glass is then described based on the scheme of phases. The primary phase for Egypt took place in the advanced Middle Kingdom, the Second Intermediate Period and the early 18th Dynasty. The objects produced in this phase range from small glassy inlays to an assortment of monochrome glass vessels. Within this phase glass vessels are hollowed out by means of a stone drill, but also the first true hollow vessels are found. The vulture pectoral with glass inlays (p. 23, Kat. I-28) cited as Second Intermediate

[441] CHILDE G., *Stufen der Kultur*, Stuttgart, 1952 (German translation of *What happened in history,* first published in 1942).

[442] STRAHM C., "Die Anfänge der Metallurgie in Mitteleuropa", *HelvA* 25 (97), 1994, pp. 2-39.

Period has been convincingly dated to the New Kingdom[443]. A pin with glass inlays (p. 23, Kat. I-9) forms part of the Salhiya-treasure, where it was purportedly found. While often linked to Tell el-Dab^{c}a, it has not certain provenance. The earliest glass finds in the Near East date from the 3rd millennium BC and are discussed under the heading of "primary phase". However, on p. 155 the author writes, "an actual primary phase of glass production is missing" (my translation). In the Aegean, the earliest locally produced glass objects are stamp seals. The secondary, or experimental, phase is dated in Egypt from Hatshepsut/Thutmose III to Amenhotep II. As numerous artifacts dated to Thutmose III are also cited for the primary phase, there is obviously an overlap. Typical for this phase are core-formed polychrome glass vessels. The shapes and decoration of many glass vessels found in the tombs of Thutmose III and Amenhotep II are non-Egyptian. Wilde argues, however, that these jars were most likely produced in Egypt (p. 37). As reason she names the lack of parallels for the shapes in the Near East. This is a crucial issue requiring detailed study. The bottles from the tomb of Amenhotep II were found in fragments and reconstructions of the shapes need to be critically reviewed. For example, some show evidence of handles, which are not mentioned. One such piece is I-39 (p. 37, Taf. 5, Abb. 8), a piriform bottle with vertical ribbing. A similar shape, albeit it also without handles, can be cited from Byblos, in the shape of a small golden jar[444]. The piece I-90 (p. 36, Taf. 6, no. 1) from the tomb of the three foreign wives of Thutmose III does not just display close similarities to a fragment from Nuzi, but Nuzi has been convincingly scientifically established as source by Lilyquist and Brill[445]. A summary of the polychrome vessels of the secondary phase is tucked away, incongruously, on p. 41 at the end of chapter 1.3.2.3., which deals with small glass figurines. The Egyptian phase of expansion is subdivided into phase I, from Thutmose IV to Amenhotep IV, and phase II, from Tut-Ankh-Amun to the Third Intermediate Period. The glasses of phase I are mostly blue with a décor of bows, garlands or feathers. In phase II, post-Amarna, the shapes of the vessels become simpler, they have thicker walls and generally they are monochrome. The popularity of foreign shapes : pilgrim flasks, amphorae, spindle bottles, base-ring ware and pomegranate-shaped vessels is noteworthy. This phase is characterized by decentralisation and streamlining of production. But what remains unclear whether this is also reflected in the archaeological evidence. In the Near East the production of mosaic-glass is noteworthy for this period. However, the chronological frame for this phase can not be established, due to the lack of finely dated settlement layers from Mesopotamia (p. 58). While the Aegean production continues to be dominated by beads and elements for jewellery, a small scale local production of glass vessels is considered likely. Lacking in this context is a discussion of the trade of the raw material glass, as exemplified by the glass ingots found on the Ulu Burun shipwreck. An acceptance phase cannot be established for Egypt and the Aegean, in contrast to Mesopotamia. While glass vessels are no longer produced in Egypt, Egyptian glass production did not, however, entirely cease in the Late Period[446]. For Mesopotamia continuity until Hellenistic times is suggested. Some important studies on Egyptian glass are not mentioned[447]. Since completion of

[443] LILYQUIST C., "The Boston/Lafayette jewel and other glass-inlaid ornaments", *VA* 9, Numbers 1-2, April/August 1993, pp. 33-44.

[444] DUNAND M., *Fouilles de Byblos. 1933-1938*, Tome II, Atlas, Paris, 1950, pl. CXXXVI, no. 16695 (Temple aux obélisques).

[445] BRILL R. H. and LILYQUIST C., *Studies in Early Glass*, New York, 1993, pp. 9-15 ; LILYQUIST C, *The Tomb of Three Foreign Wives of Thutmosis III*, New Haven/London, 2003, pp. 150-151.

[446] As shown by NENNA M.-D., in : MATHIEU B., MEEKS D. and WISSA M. (eds.), 2006, reviewed above.

[447] LILYQUIST C., "Granulation and Glass : Chronological and Stylistic Investigations at Selected Sites, ca. 2500-1400 B.C.E.", *BASOR* 290, 1993, pp. 29-94 ; NICHOLSON P. T., "The Place of Glass Technology in New Kingdom Egypt", in PHILLIPS J. (ed.), *Ancient Egypt, the Aegean, and the Near East. Studies in honour of Martha Rhoads* Bell 2, San Antonio, 1997, pp. 377-387.

the book further important studies have appeared[448].

Chapter 2 discusses metallurgy of the 2nd millennium BC and the general introduction of tin-bronze (pp. 65-108). For each phase and each region, shaping techniques and the composition of the artifacts, in particular the use of tin-bronze, are discussed separately. The technological innovation of tin-bronze is older than the 2nd millennium and therefore an overview of metallurgy of the 4th and 3rd millennia is given. The primary phase is included in those periods and by the beginning of the 2nd millennium the secondary phase has been reached. In Egypt this covers the Middle Kingdom, in the Near East it reaches from the distinctly earlier Akkadian period until the 18th century BC and in the Aegean it covers the first half of the 2nd millennium BC. The following phase of expansion has been reached by the Second Intermediate Period in Egypt. It continues in the New Kingdom. In the Near East the secondary period begins with the Middle Babylonian period ; its end, however, is not entirely clear. Based on the chart shown on p. 104, 1000 BC can be considered as the end for this phase. In the text, on p. 102, the author writes that for the period of 1650-1350 BC no raw data from Near Eastern objects was available to her ; however, the chart on the opposite page covers the period from 1900-1350 BC. In the Aegean the phase of expansion is placed in the Late Bronze Period until about 1300 BC. The acceptance phase is treated very briefly on half a page and it does not become clear where the author places this phase. Is the wide spread use of tin-bronze by the 16th c. BC (p. 107) an indicator for this phase, which then would run parallel to the phase of expansion ? This chapter includes seven unnumbered charts which show the content of arsenic and tin for various copper (sic) artifacts from the different periods and regions under discussion. The heading "copper artifacts" is somewhat confusing, as the charts contain objects made of materials ranging from virtually pure copper to tin-bronzes with high tin contents. Such illustrations could be highly useful, but no information is provided on the sources used. A table in the back of the book (Tabelle 2, pp. 265-266) lists the raw data of artifacts, which one would have to correlate with the information contained in the catalogue of metal artifacts pp. 228-261. Thus one might be able to reconstruct the sampled objects, what they actually are, where they come from, what their date is and by what method they were analyzed. While the charts are not directly referred to in the text, it is presumably this data which serves as the basis for the individual sections. The size of samples for these charts, however, is generally very small and ranges from eight (p. 103, Near East, 1900-1350 BC ; p. 104, Near East, 1300-1000) to a maximum of 27 (p. 99, Egypt, New Kingdom). While Egyptology certainly has a lot of catching up to do as regards the scientific analysis of artifacts and the publication of such studies, the situation is by no means as dire as these charts might lead one to assume. One could easily compile a much larger sample than 12 Middle Kingdom artifacts, as shown on the chart on p. 85, by including, for example, metal artifacts from the settlement of Kahun[449]. Discussing the "phase of expansion" in Egypt (pp. 97-100) two charts are shown, one concerning the Second Intermediate Period and one the New Kingdom. For the Hyksos-period (advanced Second Intermediate Period) Wilde states that the use of arsenic copper is distinctly reduced. Relatively pure copper continues to be used, but a clear preference for the use of tin-bronze can be recognized, "*wenngleich die Metallanalysen ein inhomogenes Bild zeigen*" (p. 97). The recycling of metals is given as reason for this heterogeneous picture. Only the work of J. Holladay at Tell el-Maskhuta, a

[448] SHORTLAND A., *Vitreous Materials at Amarna : The production of glass and faience in 18th Dynasty Egypt* (*BAR International Series* 827), 2000 ; NICHOLSON P. T. and HENDERSON J., "Glass", in : NICHOLSON P. T. and SHAW I. (eds.), *Ancient Egyptian materials and technology*, Cambridge, 2000, pp. 195-205 ; REHREN T. B. and PUSCH E. B., *Hochtemperatur-Technologie in der Ramses-Stadt. Rubinglas für den Pharao* (*FoRa* 6), 2007.

[449] GILMORE G. R., "The Composition of the Kahun metals", in : DAVID R. (ed.), *Science in Egyptology, Proceedings of the 'Science in Egyptology' Symposia*, Manchester, 1986, pp. 447-462.

Second Intermediate period site in the Eastern Delta in Egypt, is cited. A critical omission is the work of G. Philip on metalwork in Egypt and Syria-Palestine[450]. In particular Philip's detailed discussion of the metalwork from Tell el-Dab^{c}a (Avaris), the capital of the Hyksos, offers the unique chance to observe changes in the composition of metal artifacts at a stratified site over a longer period of time. While late Middle Kingdom weapons, up until about the middle of the 13th Dynasty, are generally made of tin-bronze, later weapons, including those of the Hyksos period, are made of unalloyed copper[451]. The results are somewhat surprising and require discussion, but this makes them no less interesting or important[452]. Philip suggests that this was based on a deliberate choice and not due to a lack of resources. The fact that the analyzed weapons are almost exclusively from tombs needs to be taken into consideration too. In any case, these findings contradict Wilde's statement (p. 135) that during the Hyksos-period finds made of tin-bronze increase. Such findings indicate that linear models, such as the scheme of phases proposed in Wilde's book, rarely do justice to the complex ways of human society.

The chapter discussing horse and chariot (pp. 109-130) is the briefest one. Despite attempting to link this topic to the previous two chapters via the metallurgical processes associated with metal chariot fittings, this subject seems somewhat out of place in the book. This impression is underscored by the fact that the scheme of phases is abandoned. Following a brief outline of the domestication of the horse in the "Orient", the history of wheeled wagons and chariots in Egypt, Mesopotamia and the Aegean is presented. An important addition to the cited literature is the very detailed study on the bronze equipment for chariots, associated with the excavations at the Ramesside capital Pi-Ramesse/Qantir by A. Herold[453]. Wilde's discussion is primarily technical and functional. Issues of value and symbolic meaning are only touched upon in passing (p. 117) : "*Der Besitz von Streitwagen und Pferd…galt wie im gesamten ostmediterranen Bereich als Statussymbol*". A differentiated approach to this topic was chosen in a recent article by M. H. Feldman and C. Sauvage[454]. While they take the same geographic scope and time frame into consideration, they ask whether the symbolic meaning of chariots, generally classified as an internationally understood object of prestige, is not culture-specific and variable.

Section III (pp. 131-154), titled "*Innovation and Technology-the various phases and the historical frame of the 2nd millennium in the Eastern Mediterranean*" (my translation) summarized the previous study by discussing the various materials and artifacts in chronological sequence. Tin-bronze, as the oldest material in evidence, is discussed first, followed by the development of the earliest wagons. The development of tin-bronze is continued, joined by the discussion of the use of horse and chariot. This is expanded to a discussion of new weaponry, connected to chariots. Finally, glass is discussed and at the very end, the use of the chariot.

The final section IV is a second summary, with a focus on a regional comparison of the scheme of phases. The social dimension of the various artifacts is briefly addressed : While glass and chariots maintain their status as prestige goods, restricted to the elite, tin-bronze, after the middle of the 2nd millennium, becomes a material for the masses. After the 14th c BC, a top-down

[450] PHILIP G., *Metal Weapons of the Early and Middle Bronze Ages in Syria-Palestine* (*BAR International Series* 526), Oxford, 1989.

[451] PHILIP G., "Tell el-Dab^{c}a Metalwork : Patterns and Purpose", in : DAVIES W. V. and SCHOFIELD L. (eds.), *Egypt, the Aegean and the Levant. Interconnections in the Second Millennium BC*, London, 1995, p. 77.

[452] For the latest discussion see the final publication : PHILIP G., *Tell el-Dab^{c}a XV. Metalwork and Metalworking Evidence the late Middle Kingdom and the Second Intermediate Period* (*UÖAI* 26), 2006.

[453] HEROLD A., *Streitwagentechnologie in der Ramses-Stadt : Bronze an Pferd und Wagen* (*FoRa* 2), 1999 ; a second volume, dealing with stone fittings for chariots, has since also appeared : HEROLD A., *Streitwagen-technologie in der Ramses-Stadt : Knäufe, Knöpfe und Scheiben aus Stein* (*FoRa* 3), 2006.

[454] FELDMAN M. H. and SAUVAGE C., "Objects of Prestige ? Chariots in the Late Bronze Age Eastern Mediterranean and Near East", *Egypt and the Levant* 20, 2010, pp. 67-181.

movement can be observed for glass and the use of chariots, within the elite. This "Sinken des Kulturguts" (p. 158) follows a blatantly elitist model developed by H. Naumann in the early 20th c which ascribes creative energy entirely to the upper classes. Such a model is outdated and not useful. Were these artifacts not created by workers who had some creative input in the process of production ? While glass vessels certainly constituted luxury products for the elite, glass beads are widely distributed. It is, therefore, not the material as such, but what is produced out of it, and the quantity, which can be socially relevant. Moreover, the earliest examples of glass were precisely beads, often found in provincial non-elite sites. Was then the milieu from which this technology emerged not a distinctly non-elite one ?

This book covers a lot of ground and it does so in relatively compact form. As reader one finds oneself nevertheless somewhat overwhelmed. How overwhelming it must have been for an MA-student to tackle this huge range of issues ! It takes courage to embark on such an enormous supra-regional study and the fields of archaeology and history need scientists willing to adopt such a broad perspective and create overviews, based on all the individual site reports and analytical studies. However, a reduction in scope might have served this book well. While maintaining the geographic and chronological range, a discussion of only one of the three chosen subjects, with an increase in detail and depth, might have established a better, a clearer case. The data needs to be critically evaluated, but more data needs to be included. This will make the story more complicated and lead to new questions and require different explanations.

The scheme of four phases employed is somewhat simplistic, rigid and functionalistic. It implies a linear development, which does not reflect the complex activities in these regions. The questions of the transfer of technology, the role of "imported craftsmen", particular in Egypt, are not addressed. What is noticeable for the "Near East" is a pronounced Mesopotamian bias. The Levant is strongly underrepresented. For instance, glass and glassy finds from such sites as Tell el-Ajjul or Megiddo (Lilyquist 1993) are not or poorly presented. Those sites, and others, could provide a chronological framework for a corpus of glass and glassy beads from the Late Middle Bronze–Late Bronze Levant. Without doubt, this goes beyond the frame work of what can be done within this book, but this precisely highlights the problems of a topic of such vast geographic and chronological scope. On the other hand, the crucial metallurgical centres of the Northern Levant, such as Byblos, are not adequately represented. That being said, the structure of the three regions as such is questionable. Certainly, we are dealing with smaller cultural regions, whose borders are shifting over time.

In a catalogue on pp. 187-261 the crucial information on provenance, date and bibliographical references can be found for glass and metal objects. However, the structure of the catalogue is somewhat confusing and using it can be frustrating. The catalogue is organized first by the material, then by phases. The phases are further subdivided into groups defined by formal features or technological aspects. Within each phase the objects from the various regions are listed separately. The lists then are organized numerically by inventory numbers. When trying to get information on a specific inventory number, mentioned in the text or shown on a plate, one must therefore know in which group an object has been placed. This is all the more difficult as the headings of the groups in the catalogue are not the same as the titles in the text.

The editing of this book is somewhat careless. The captions on the plates display odd inconsistencies regarding the information on provenance and dates. Mostly, no information on provenance is given, such as on Taf. 1, 2, (except for Abb. 9), 3, 6 (except for Abb. 4 : "Ägypten"), 8, 10, 11, 12, 15, 16, 17 (except for Abb. 4 and 5), 19. Provenance is provided on Taf. 3, 4, 7, 9, 13, 14, 18 (except for Abb. 8), 20, 21 and 22. As a rule, when dealing with objects or pictorial evidence from Egypt and the Aegean, no information is provided, while for Near Eastern objects we are provided with this information. If Egyptian provenance is mentioned, it is usually given simply as "Egypt". In the case of Near Eastern sites, this information is by and large

more detailed. However, a range of geographic terms seem to be used synonymously : Zweistromland, Irak and Mesopotamien. Occasionally, catalogue and captions use different designations, as on Taf. 7. In the case of Abb. 4 the caption shows "Zweistromland", while the catalogue entry uses the term "Irak", in the case of Abb. 5, the caption is "Zweistromland", while in the catalogue it is Assur. Captions providing information on provenance–but also a date–for all depicted objects would have been very useful.

The following references to plates are incorrect : On p. 25 the image referred to is found on Taf. 2, Abb. 1 and not Abb. 11 ; on p. 38 the correct reference for the depiction of Kat. I-44 is Taf. 7, Abb. 9 not Abb. 8 ; on p. 39 the correct reference for Kat. I-25 is Taf. 6, Abb. 6 not Abb. 7 ; on p. 57 Kat. I-101 is mentioned as being depicted on Abb. 8, without a plate number. It does not, however, appear to be depicted at all. Kat. I-201 is not shown on Taf. 11, Abb. 7, as mentioned in the catalogue on p. 220, but on Taf. 11, Abb. 6 ; I-229, listed on p. 221, is shown on Taf. 11, Abb. 5 and not Abb. 6. On Taf. 13 the number 3 is given four times. The numbers in the bottom row should be changed to 4, 5 and 6, from left to right.

In the bibliography the journal "*Ägypten und Levante*" is incorrectly cited as "*Levante*" (p. 178). The name of the author I. Hein is misspelled (p. 163, and in footnotes). The title of the article by M. Bimson and I. C. Freestone was mangled with the names of the authors (p. 163). The correct title is : *Some Egyptian Glasses Dated by Royal Inscriptions*. The main author of "*Fouilles à Dahchour*" is J. de Morgan, not M. Berthelot, and it should be listed as such (p. 162).

The images shown on the 22 black and white plates are very small and the quality is in general not good. While the line drawings are clear, most images are reproductions of photos. They are often blurred and details cannot be made out. No scale is given. Most images display coloured glass, which really needs to be shown in colour. If that is not possible, good quality line drawings of the shapes and the décor would be more informative.

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