External Examiner's Report on the Dissertation of Martin Odler
"The social context of copper in Ancient Egypt down to the end of Middle Kingdom"

Submitted in 2020 at the Department of Egyptology, Charles University

I. Brief summary of the dissertation

Martin Odler presents a detailed, comprehensive review of information about the ancient Egyptians' procurement, processing, production and use of copper in the Predynastic and Early Dynastic periods and in the Old and Middle Kingdoms. After he defines key terms, limits of his study and issues inherent to interpreting the evidence, Odler then organizes his review into chapters about prior research and publications on the topic; evidence from ancient Egyptian art and texts; evidence from archaeology; and evidence from metallurgy. Odler seeks to organize each chapter according to the *chaîné opératoire* (that is to say, the "chain of operations") that Egyptians used to procure, process, produce and use copper. Odler summarizes this information ("synthesis") and then compares the ancient Egyptians development of a copper industry to models of metallurgical development in other Old World cultures. In his conclusion he reviews the structure of the dissertation.

II. Brief overall evaluation of the dissertation

With this dissertation Martin Odler, building on his significant prior publications on the topic, has carried out a yeoman's work that contributes to studies of ancient Egypt, archaeology and the history of technology. He has done a service for Egyptology by combining natural science and physical analysis with ancient Egyptian language and iconography, and the archaeology of Egyptian sites that yielded information about copper. What he writes at the conclusion of this massive study is true: "Significant energy must be invested into gathering these sources and incorporating them into a comparable structure, all this even before their evaluation and proper study", and, "balance between these different perspectives is challenging" (p. 312). While Odler is not alone in the study and analysis of copper and other metals in ancient Egypt, he establishes himself as a preeminent authority on this subject. With his attempt to set the Egyptian copper industry and use in a social context, Oder presents a dissertation that, perhaps with some adaptation for publication, is just what is needed to round off his prior analytical articles and catalogue of Old Kingdom copper objects. In its eventual published form, this dissertation stands to become a seminal and basic reference in Egyptology.

The remarks and critique that follow are intended for the author's consideration for adapting this work for publication.

III. Detailed evaluation of the dissertation and its individual aspects

1. Structure of the argument

I do not find in this dissertation a particular thesis or argument as such, as opposed to a thorough presentation and descriptive review of the topic.

As the author writes (p. 22): "The thesis aims predominantly at a *complex description* of the use of copper by ancient Egyptians and Nubians with an objective to better understand the emic perspective of the past society and people" (emphasis mine).

If Odler has intended to embed a particular argument in this vast compendium, he needs to bring it more into relief at the end, in his synthesis and conclusion.

Models

At the beginning of the dissertation, Odler writes (p. 23): "….as I perceive this thesis as a preparatory stage for a fully evolutionary study of particular artefact categories and classes, I will refrain from lengthier discussions of the issues connected with the evolution of material culture."

I take it that Odler sees the dissertation as preparation for a stronger interpretative stance and statement that will come later.

A model is a kind of argument or interpretation. Odler refers to a "classical model," or "standard model", or "Levantine paradigm" for the development of copper-use in other Old World Societies, basically: a progression from using natural copper to processing ores, to producing arsenical copper, and finally tin bronze. I do not see where Odler explicates an Egyptian model. As I read the rest of the chapter, I have to assume he believes the Egyptian "model" corresponds to the "classical" model. I don't see this stated clearly. Regarding the paragraphs that follow about the term *bj3* for copper, about copper in Badarian times, about artisan tool blades in elite tombs, and etc., – is this all to argue that Egypt conforms to the "classic model," or not?

Emic perspective. At the end of the extraordinarily useful cataloging of sources and the review of information they provide, I am not sure we have a better "emic perspective" on ancient Egyptians' interactions with copper, that is, how they viewed copper in their own terms. In the section on "synthesis," the author primarily goes over highlights of the information in the preceding inventory of sources, sites, and the information they provide, rather than coming to conclusions, deductions and inferences.

Information, however organized and compendious, does not speak for itself. In publication, it would be good to see the author draw out more of what the ancient Egyptians thought and felt about copper. From the viewpoint of anthropological linguistics, I found this statement

noteworthy (p. 30): "An example that is central to the present thesis: there was no single and singular word that denoted copper in the periods under study." But I did not find in the end chapters a discussion of what that might mean.

2. Formal aspects of the dissertation

Odler structures the dissertation by multilevel numeration, with chapters, sections, subsections, sub-subsections, sub-sub-section…– up to five subsections deep. Without focused effort, the reader can be overwhelmed.

For publication of this invaluable compendium, I would suggest that Odler abandon the subordination of sub-settings, that is to say, the embedding of chapters to such a deep level, and go with simple chapter- and paragraph-numbers (4.1, 4.2, 4.3), even if a specific topic seems to be a subset of a preceding topic.

Odler makes use of his multilevel numeration as an internal reference system in his chapter 7, "synthesis." *The Chicago Manual of Style* (17th ed., 2017, p. 30, para. 1.57) cites multilevel numeration as useable for just such referencing. I found that Odler's multilevel numeration does work, in fact, having used it to refer back to previous sections while reading his synthesis. But to my mind it gets unwieldy and tiresome after the third sub-sub-sub-section. The *Chicago Manual of Style,* itself, has many more sections (paragraphs) that this dissertation, and the topics of many paragraphs can be construed as subsets of other topics of other paragraphs. Yet, the *Manual* uses chapter-plus-section numeration (5.29, 14.228, etc.) which works just fine for internal referencing, such as Odler requires in chap. 7. It keeps to the same number of sections (paragraphs), but is easy on the reader's eyes.

3. Use of sources and/or material

Yes, the author works transparently with secondary sources, makes use of all relevant sources, uses primary sources properly, and employs sources in the methodologically-correct manner of an accomplished professional.

Is the method of data collection and processing in line with the main research question or hypotheses tested? Does the interpretation of the results proposed by the author follow from the results of the empirical research or sources on which the work relies?

My main comment about the dissertation follows under the above questions.

First, to reiterate, the author writes (p. 22): "The thesis aims predominantly at a *complex description* of the use of copper by ancient Egyptians and Nubians with an objective to better understand the emic perspective of the past society and people" (emphasis mine).

While I do not find a particular hypothesis or overarching interpretation in the dissertation, Odler does invoke the concept of *chaîné opératoire* as both a goal and as an organizing principle.

chaîné opératoire

The author states right up front, in his abstract and introduction, that his goal is to establish the *chaîné opératoire* of ancient Egyptian copper artefacts. He introduces the concept in section 2.2, and offers samples of *chaîné opératoire* diagrams as figures 2.1 and 2.2.

In preparation for reading what followed, I refreshed myself on this concept with some additional reading about it after a quick search online. I then read Odler's sections 1 through 3.1.2. Next, I jumped to chapter 7, "synthesis," and went back to the sections in between (with two copies of the dissertation side by side), as Odler referenced those sections in his synthesis and conclusion. I had read some good part of the synthesis when I began to wonder: What happened to *chaîné opératoire?*

I was expecting the dissertation would move toward, and end with, some kind of distillation or abstraction, a model in list or graphic form, of steps in copper production and processing, as the end-result of the compendious review of Egyptian sources. It could have been a comparison with those examples Odler gives as figs. 2.1 and 2.2, perhaps elaborating beyond them, and deriving a *chaîné opératoire* specific to Egypt from the Predynastic through the Middle Kingdom. For example, an article that came up right way online, one that Odler cites, was M.H.G. Kuijpers's ("A sensory update to the *chaîne cpératoire* in order to study skill: perceptive categories for copper-compositions in archaeometallurgy (*Journal of Archaeological Method and Theory* – https://doi.org/10.1007/s10816-017-9356-9). In this article Kuijpers offers tables of "perceptive categories" and diagrams of the *chaîné opératoire* inferred from analyses of specific European Bronze Age axes.

Panning back and looking at Odler's table of contents, I realized that, in his review of information according to various sources, Odler roughly follows a general intuitive sequence of operations of a *chaîné opératoire*. So as to better see the *chaîné opératoire* organizational arc within the dense and massive marshaling of information in Odler's text, I started to highlight in the table of contents what I intuit as key operations, as follows:

As we can see in his table of contents, and as Odler stated at the beginning (section 1.6), he *organizes this dissertation by sources* of *information*: publications (the bibliographic chapter 3), texts, iconography, and paleography (chap. 4), archaeology (chap. 5), and archaeometallurgy (chap. 6). However, it was not until I read Odler's *conclusion* that I found an *explicit* statement that he is organizing each of chapters 4, 5, and 6 according to steps of a *chaîne opératoire,* as in the following excerpts:

p. 310. "Traditional written and iconographic sources (including palaeographic ones) are then divided into several consecutive stages of the *chaîne opératoire*: the procurement, initial processing and transport of the ore through expeditions and exchange; the storage, revenues and transactions with unspecified copper; metalworkers as the social group responsible for copper processing; and, finally, the use, reuse and discarding of copper objects in the periods under study."

p. 311. "Less traditional and seldom studied archaeological sources (artefacts) are discussed in Chapter 5, once again in the order of the *chaîne opératoire*."

p. 311. "Finally, Chapter 6 discusses evidence on the provenance of the ores provided by the natural sciences, the chemical composition of the artefacts and their other properties, again divided according to the stages of the *chaîne opératoire*."

For publication, the reader should not have to learn this at the end. Older should move this statement into his statement of organization at the front, into section 1.6 and into the introduction and abstract.

Also, as I read, it would have helped me if Odler had pointed out in the body of chapters 4, 5, and 6, and in the synthesis, *where and how the information reflects a particular operation in a chain of operations*. In fact, I might suggest, for publication, *reorganizing the compendium* according to the *chaîne opératoire*. Instead of climbing up through the chain, starting again at bottom, for each of chapters 4, 5, and 6 (and even then, the chapters do not reference the operations in the chain very clearly, see below), I would group together all information at hand – bibliographic, art historic, textual, archaeological and metallurgical (chapters 3, 4, 5,and 6) –

according to the major operations of the *chaîne opératoire* (procurement, smelting, transport,…etc.)

As it is, in Odler's synthesis *and* review sections, I felt I had to look for the operations and highlight them for myself in order to delineate which operation was under discussion for any given point of information, along the lines I illustrate in the following quotes:

EARLY DYNASTIC

p. 286. Anatolian copper ore sources were after Maadi used also near Memphis,

p. 284. Transport of the ore over long distances supposed the use of domesticated animals for the moving of heavy loads, especially donkeys, used in Egypt already in fourth millennium BC.

p. 287. Storage: 'Already in the Early Dynastic Period, there is limited evidence of pr-HD – the Treasury. N

p. 287. 'Copper tool blades were apparently weighed and controlled throughout the whole Egyptian Bronze Ae.

p. 287. '…some Early Dynastic institutions possessed also metal workshops and the products were sent to royal tomb(s).

p. 288. Concerning materials used, artefacts made of copper with impurities are spread over Egypt and Nubia, but rather in low numbers.

p. 288 Many tool kits and artefacts were produced out of copper.

OLD KINGDOM

P. 298. Ore procurement was taking place under the auspices of some Old Kingdom deities, especially Horus, Thoth, Min, and Ra

P. 289 Recently found late Dynasty-5 evidence from Edfu connected the specialization of the prospectors unequivocally also to the copper procurement (

P. 290. The metal processing took place probably in the second phase of the settlement, in the Dynasty 5.

p. 291. The "Treasury" remained the main storage centre in the Old Kingdom, written in the dual, pr.wy HD, on the state level.

MIDDLE KINGDOM

p. 299. Prospection for metals was not easy, as the Middle Kingdom Teaching of Vizier Ptahhotep hints at *"Perfect speech is more hidden than malachite, …*

p. 299. metalworkers present at expeditions

p. 299. batteries of copper working furnaces as parts of whole workshops were built here, presumed to be working on the copper from Sinai

p. 300. Copper processing was taking place in late Middle Kingdom Buhen.

p. 300. Copper was presumably also an exchange commodity between Egyptians and Kermans in the Middle Kingdom.

P. 301. Weighing of copper was also depicted in the Middle Kingdom scenes of metalworking

p. 302. Five workshops have been excavated on the site, with 40 copper ore reduction furnaces.

p. …302. where the final form of the object is already present in the mould and casting takes the shape of the final product.

p. 302, patterns of the alloy use

p. 303. …repairing and recasting the metal blades…recycling of some tools is denoted by the phrase jr m – "made in(to)" with another tool cited in the last column of the entry

Odler does not so much draw out and delineate the *chaîne opératoire* and its specific operations, as use them as touchpoints for his review of information that the several sources provide. Chap. 7 is a summary of highlights of that information. Chap. 9, the conclusion, is a summary of the whole dissertation.

If, for publication, Older would organize this rich compendium of information and invaluable review of the topic into *chapters according to major operations* (e.g. "procurement" = expeditions, mining, transport), with the *sources* (bibliographic, textual, art historical archeological, metallurgical) *as the subsections*, it would draw out and delineate the *chaîne opératoire,* Odler's stated objective of his aim to present a complex description.

In any case, even if Older adheres to the present structure of his compendium, it would help if he can be more explicit at the beginning that he is following the sequence of operations in his narrative, and then draw out more clearly how the various pieces of information inform us about a given operation, or operations.

This would contribute to the stated goal – to establish the *chaîné opératoire* of ancient Egyptian copper artefacts – and bring into relief a model ancient Egypt copper procurement, processing, and production.

4. Personal contribution to the subject

I reiterate how much work Odler has put into gathering this information and synthesizing the diverse sources, "even before their evaluation and proper study." I have not commented on the chemical and physical analyses of copper samples and artifacts, where Odler has driven new research that has produced important, original primary data for the archaeometallurgy of

ancient Egypt. I see this dissertation as an important stage, one operation of a *chaîne opératoire* toward a seminal and basic reference in Egyptology that can never be matched.

IV. Questions for the author

The author is free to read, consider, respond to, and accept or reject the comments I have entered above.

V. Conclusion

I recommend the submitted dissertation with the tentative grade of pass.

Mark Lehner
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