
Technology and Tradition in the Eastern Arctic, 2500 BC–AD 1200: A Dynamic Technological Investigation of Lithic Assemblages from the Palaeo-Eskimo Traditions of Greenland

by Mikkel Sørensen. Museum Tusulanum Press, University of Copenhagen, Copenhagen, DK. 418 pp. ISBN 978-87-635-3167-2 (hardcover) US\$89.00. 2012.

FOR DECADES, THE SOPHISTICATED stone tools found among Palaeo-Eskimo sites spanning the North American Arctic and Greenland have inspired the imaginations of archaeologists. Through detailed typological analyses, these tools have been used to establish regional culture-histories to understand how and when these original peoples lived in the far North. These pioneering studies laid the foundation upon which more recent analyses, like this one, are based. Mikkel Sørensen cites two sources of inspiration for this work, which presents the findings of his 2006 Ph.D. dissertation, completed at the University of Copenhagen's Department of Prehistoric Archaeology. The first is Sørensen's own fascination with the tiny lithic artifacts found among Palaeo-Eskimo sites in Greenland. The second is an emergent "reordering" (p. 18) of Palaeo-Eskimo culture-history based upon new investigations of previously studied sites and extant artifact collections. The book is published by the University of Copenhagen's Museum Tusulanum Press, which prints dozens of works each year that are written by university affiliates, like Sørensen. The book is lengthy at 418 pages, and includes seven chapters and one appendix.

Chapter 1 presents the multi-layered goals of the study. First, Sørensen aims to focus on the actions of individuals to facilitate the description of a new and "dynamic" view of Arctic prehistory. He proposes a "French formulated methodology," known as *chaîne opératoire* (CO) as the most effective way of achieving this. Second, Sørensen endeavors to construct precise definitions for the functional tool types that comprise Palaeo-Eskimo toolkits. This, he argues, will permit Arctic archaeologists to interpret what kinds of lithic production and use activities occurred within settlement sites. The final goal is to achieve a new interpretation among the five identified Palaeo-Eskimo cultures in Greenland, and their North American and Siberian relatives.

Chapter 1 continues with a brief overview of previous work in Greenland. Sørensen states that more recent studies, like his, are challenging existing interpretations, which are described as being shaped more by the historical development of research than actual events in prehistory. Previous work in the Canadian Arctic, especially that of Moreau Maxwell, is more harshly criticized as widely inaccurate since, according to Sørensen, it was based on mixed assem-

blages from multi-component sites that yielded questionable radiocarbon dates.

After outlining his two research problems (one methodological; one culture-historical), Sørensen describes briefly, and selectively, previous Arctic lithic studies he considers technological. While Sørensen does not define what constitutes a technological analysis, it becomes apparent that he is largely referring to those that use, or at least mention however cursorily, the French methodology or CO. This position artificially sets up the study as being among the first to view Palaeo-Eskimo lithic technology from a dynamic technological perspective. What Sørensen fails to acknowledge is that there is indeed a body of research that has examined Palaeo-Eskimo lithic technology using such a perspective. Sørensen's oversight to mention these studies is arguably tied to a larger debate in the field of lithic analysis that focuses on the epistemological differences between CO and what are known as reduction sequence models (RSM). At the heart of the debate is whether CO is fundamentally different analytically than RSM.

Chapter 2 presents a thinly researched overview of this debate that negatively generalizes North American lithic studies, which commonly use RSM, in such a way that he can discount them, unjustly, as inferior and methodologically antiquated. CO and RSM are essentially reduction sequence models, which is, ironically, well illustrated by Sørensen's Figure 2.1 on p. 31. However, one of the main points of divergence between CO and RSM is the belief that those who use a CO approach can access prehistoric cognition, which is one of Sørensen's goals in this book.

Sørensen goes on to describe the historical context for the CO approach and

acknowledges some of the ambiguities associated with its use. He clarifies his use of the CO term in that it "describes the physical reduction sequences that all together consist of many artifacts" (p. 31). He continues stressing that these reduction sequences are carried out on the basis of what he calls the production concept. It is the production concept, or mental template, that is handed down generationally through one's culture. Based on this information, Sørensen argues that a "technological tradition" as it is identified archaeologically equates to a people or culture (p. 35–37). The toolkits used by a culture are described as being standardized and specialized, which necessitate a particular production process to create and maintain. The repeated creation and maintenance of this standardized toolkit requires knowledge, know-how, and apprenticing. What Sørensen is trying to establish is that people learn how to make stone tools through apprenticeship with those in one's social unit who have the knowledge of the craft. Because novices learn from experts who possess the mental templates for how to make tools a certain way, CO analysis can determine to what degree artifact assemblages are related or not given observed similarities and differences in the attributes they display. The tightness of the similarities, in theory, should be indicative of shared mental templates or production concepts and hence cultural affinity such that discrete social groups or cultures can be identified and their degree of relatedness or interaction assessed.

Sørensen goes on to explain that when a contemporary knapper, like himself, learns how to make the stone tool types used by a people in the past, they can gain a hermeneutic understanding of that culture through the establish-

ment of “overlapping horizons” (p. 39). As such, studying the results of replication experiments affords the same technical insights as studying the remains of archaeologically derived materials. The contemporary knapper can, arguably, get inside the head of the prehistoric knapper by repeating the same reduction sequences, thus gaining insight into prehistoric cognition.

Sørensen’s methodology comprises four approaches. The first is lithic refitting of formal tools. The second is a technological dynamic classification, which involves classifying lithic material as deriving from the production of blades, bifaces, cores, etc. However, one must conceive of the reduction from start to finish so that if a core is being made, it begins with the original raw material and then the steps of the sequence are envisioned until one reaches the final finished product. The third approach is contemporary lithic replication (which provides the knowledge to apply the second approach). Last, mental refitting is carried out in conjunction with replication experiments in the sense that one studies the negative flake scars on tools to determine the how flakes were detached and in what order.

Chapter 2 concludes with a description of Sørensen’s analytical procedure, which includes the analysis and comparison of two sites for each of the identified Palaeo-Eskimo cultures that inhabited Greenland.

Chapter 3 describes the formation of lithic raw materials found throughout Greenland and their respective macroscopic properties. The photographs for each raw material are excellent and provide a strong visual sense of the diversity of available toolstones.

Chapter 4 is a daunting presentation spanning 226 pages of incredibly dense

descriptions of sites and site histories, lithic raw materials, artifact assemblages, and CO sequences for specific tool types. Sørensen’s artifact drawings are prolific and well laid out in terms of the different phases of tool production he has identified. However, representative photographs of the artifact assemblages and individual artifacts are not included meaning the reader cannot evaluate for themselves the actual artifacts in question; instead one must rely on Sørensen’s perception of their idealized forms. The data presentation is wanting in several areas. For example, axes for frequency distributions are not always labeled and none of them include absolute numbers for the variable data summarized. This is especially frustrating when examining the distributions for lithic debitage (see for example Figure 4.1.12). The tables are also lacking artifact totals for each artifact type.

While formal artifact types are discussed in detail, the lithic debitage analyses, when included, are cursory and clearly of secondary importance. Precise definitions for flake attributes examined are not provided so it is challenging to understand the meaning of what appear in some instances to be idiosyncratic terms (e.g., the “butt” of a flake; p. 122). Moreover, on page 328 Sørensen essentially discounts the analytical value of lithic debitage since his version of a technological analysis, which privileges formal tool types, is “qualitative” and as such, examining things like the relative proportions of debitage to tools, which is quantitative, is insignificant.

Chapter 5 begins with a discussion of raw material procurement patterns that Sørensen has identified among the sites included in the study for each Palaeo-Eskimo culture. The reduction method for each Palaeo-Eskimo culture

is then presented. Sørensen advocates the importance of burins as sensitive chronological markers in Palaeo-Eskimo culture-history, which sharply contrasts with other studies that identify these tools as multi-functional, unstandardized, and thus unsuitable for typological classification (e.g. Barton et al., *J Field Arch* 23(1)). The chapter concludes with an evaluation of the methodology used, which Sørensen claims is dynamic and non-typological. He believes ardently that all artifact types created by Palaeo-Eskimo peoples were precisely worked, making them amenable to morphological and technological classification, no matter the stage at which they are found in the archaeological record.

Chapter 6 presents Sørensen's interpretations of the CO he's identified among the Greenlandic Palaeo-Eskimo cultures. Surprisingly, Sørensen heavily weights the presence/absence of artifact treatments like edge serration, grinding, and notching as culturally sensitive indicators. These attributes are at the core of the existing typologies that Sørensen heavily criticizes as static and of limited utility throughout the study.

The "reordering" of Palaeo-Eskimo culture-history achieved through this study includes the revelation that Greenland was circum-populated twice by Saqqaq and Independence I (who are viewed as contemporaneous entities), and by Sørensen's newly identified Greenlandic Dorset. The Thule region is described as more culturally complex than previously thought in that it has been occupied, albeit sporadically, by as many as six Palaeo-Eskimo cultures, which now include "Canadian Pre-Dorset" and "Early Canadian Dorset." Lastly, the Saqqaq, Independence I, and Greenlandic Dorset periods are described as remarkably stable and unchanged given the intense

technological conservatism exhibited by their respective lithic toolkits.

Chapter 7 presents Sørensen's evaluation of his methods and his speculation of how CO can be applied in future Arctic studies. It becomes clear to the reader that the net goal of the study was to establish a series of idealized artifact typologies, which include precisely defined phases in the overall reduction sequence for each tool type. Archaeologists are meant to compare finished formal tools, and even tool blanks and preforms, to these typologies so as to identify the Palaeo-Eskimo culture that made them. Production concepts and methods of reduction equate to cultural traditions; therefore, when one finds stone tools, even those that are unfinished, that fit a specific phase of the CO, one can attribute them to that culture and assign them a relative date.

What is so difficult to reconcile after reading this book is that Sørensen tears down existing typologies as inadequate only to advocate replacing them with ones that are more rigid and idiosyncratic. In fact, the CO that Sørensen presents stifle the potential to identify meaningful patterns of lithic artifact variability in Palaeo-Eskimo assemblages because they assert that each person in each culture always followed the same production concept unfailingly, almost robotically. This central tenet of CO (i.e., production concept) has been criticized as "flawed" (Andrefsky, *J Archaeol Res* 17:68) and "unpersuasive" (Shott, *Lithic Technology* 28(2):100) because it leaves no room to identify how people in the past adapted their lithic technologies to deal with situational contingencies in their everyday lives. One would think that living in the Arctic would present a myriad of challenges relating to raw material availability, subsistence

resources, climate, social organization, among others; therefore, it seems highly unlikely that Palaeo-Eskimo peoples did not adapt their lithic technology in order to deal with them. People are people and human behaviour is not that proscriptive.

In a thorough review of CO, Bar-Yosef and Van Peer (*Current Anthropology* 50(1)) demonstrated in a replicative experiment that there is more than one way to produce the same artifact type; in other words, equifinality can yield similar results in the archaeological record no matter how well defined a CO may be. While the replication experiments that Sørensen has carried out are impressive, a major caveat noted with such studies and the CO defined from them is that the idealized production concept created by the contemporary knapper "risks being a construction in [their] mind" and in all likelihood was never applied by toolmakers belonging to the cultural tradition it is meant to exemplify (Bar-Yosef and Van Peer, *Current Anthropology* 50(1):108; see also Andrefsky, *J Archaeol Res* 17:68). The *a priori* statements that Sørensen makes based on his replicative studies as reflecting realities among

Palaeo-Eskimo toolmakers are in danger of being just that, particularly when he rejects the use of quantitative analyses in favour of a subjective and untestable qualitative approach.

This book will no doubt be of value to scholars who are interested in CO. It is attractively illustrated, including the appendix, and presents detailed site maps. The book may be of interest to other specialists in lithic analysis but it will arguably be of limited utility to those studying Palaeo-Eskimo lithics that do not follow the core tenets of CO. While some archaeologists are touting CO as the best methodological choice for future Palaeo-Eskimo lithic analyses, it behooves Arctic researchers to critically assess the purported contributions it can make versus those that it really can. Replacing old artifact typologies with new ones will not do much to move our interpretations of these populations forward.

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