

# Review of *Usage of Ochre on the Verge of Neolithisation from Levant till Carpathian Basin*, a doctoral dissertation by Julia Kościuk-Załupka

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I was honored to be asked to review the dissertation *Usage of Ochre on the Verge of Neolithisation from Levant till Carpathian Basin* by Julia Kościuk-Załupka. My review below follows a rubric that characterizes the principal goals of a doctoral dissertation.

## 1. Choice of topic: originality, importance, scope

Ochre was used in many places around the world in both mortuary and residential contexts, but it has not been the subject of specific analysis and synthesis. The topic of this dissertation is a macro-regional survey of the documented occurrences of ochre in Stone Age archaeological contexts, the identification of possible geological sources, its physico-chemical characterization, and a synthesis of the findings.

In many prehistoric societies around the world, ochre is found in burials and in domestic sites. Since it is not an artifact, a bone, or a seed, however, archaeologists usually just note its presence and sometimes its relative abundance, without any further consideration of its source or its chemical composition. It is generally not considered in comparative context. To my knowledge, a broad interregional study of ochre itself as a material on a wide spatial and temporal scope has not been previously carried out, thus marking this dissertation as a highly original contribution to knowledge.

The principal goals of the doctoral dissertation are to demonstrate that the candidate is able to undertake a program of investigation that includes the conceptualization of a significant research problem; mastering the relevant literature to understand what is known already and to collect data; organizing and reducing a sufficiently large sample of data; carrying out a purposive and systematic analysis of the data; interpreting the results of the analysis within a logical framework; and presenting the data, results, and interpretation in a professional manner. This review will address each of these aspects in order.

Since I realize that it will be difficult to absorb all my comments in a short time, the items that merit discussion at the defense are indicated below in **bold**.

## 2. Clearly defined objectives

This dissertation spans a period from the final Palaeolithic and Epi-Palaeolithic societies of the Levant and Anatolia and the post-glacial foraging societies of the eastern Balkans and the Carpathian Basin through the early Neolithic farming societies of this area, culminating with Linear Pottery on the northern margin. Its goals are (1) to establish the archaeological framework in which ochre appears throughout this area; (2) to establish a clear definition of ochre as a material; (3) to define the archeological contexts in which ochre appears, making a distinction between sacred (taken to be mortuary and ceremonial use) and profane (other non-ceremonial contexts, generally in habitation sites); (4) characterize the chemical composition of ochre finds and attempt to fingerprint sources; and (5) to draw conclusions about Stone Age ochre use in the study area.

Several areas are absent from this volume, specifically the Aegean, the western Balkans, and the western Carpathian Basin. **While this is not a problem in itself, since boundaries need to be drawn somewhere, I could not find an explicit rationale for making these exclusions.** This delimitation reflects a particular viewpoint of the spread of agriculture into temperate Europe that emphasizes the eastern Balkans rather than the traditional focus on the Aegean – Morava river corridor.

The author identifies several significant challenges in undertaking this research, particularly with chronological resolution. In particular, the reporting of radiocarbon dates is often imprecise or given as uncalibrated legacy dates. Another challenge lies in the definition of ochre itself, as the term is geologically imprecise. Ochre is often conflated with cinnabar, for example at Abu Hureyra. It can be red or yellow, and not all red pigments are ochre. Finally, it is important to consider the range of physico-chemical methods available for analyzing ochre from both archaeological and geological occurrences. Not all are equally sound, available, and reliable, so a critical review of the relevant methods is important. The author makes the cogent point that it is necessary to use two or more methods and that it is important to have a uniform database.

The author skillfully navigates these challenges to prepare for the remainder of the dissertation.

## 3. Command of Relevant Literature

There is an overwhelming amount of literature on the Stone Age societies of the study area as well as on the geology relevant to ochre sources, and its synthesis on such a scale is an immense task. The extensive bibliography contains most of the key publications, primarily since 1990. The literature review itself is impressive, and anything more would be a textbook in itself.

One of the cited works is Lenneis 2007, which provides an important overview of Stone Age ochre use on a more constrained geographical and temporal scale. This publication also shows what lies just outside the study area in terms of ochre burials in the western Balkans and the western Carpathian Basin. It would have been useful to review this publication critically in the introductory section of the dissertation rather than simply cite it as a source of information about ochre finds (e.g. pp. 186-187).

It is an important benchmark for the state of knowledge about ochre use in the core of the area examined by this dissertation, so a fuller critical review would be very helpful in introducing this topic.

The literature on aDNA that is cited is a bit out of date, for example the extensive citation of Budja 2005. Recent work has refined our understanding of human genomes in the area under study. Although it does not detract from the discussion presented in the thesis, it will be necessary to update the aDNA citations in future treatments of the topic.

Aside from the literature review, the catalog of ochre outcrops presented later in the dissertation is particularly useful, especially now that the analysis reported in this dissertation provides a chemical fingerprint for them. Eventually, this catalog and their chemical fingerprints would be a valuable article that could be extracted from this dissertation to appear in an international archival journal.

## 4. Hypothesis formulation

The study defines three possible models, which can be considered to be hypotheses:

1. The use of ochre as a cultural practice is completely separate from the process of Neolithization;
2. The use of ochre is different in Mesolithic and Neolithic societies but shows continuity from the Mesolithic;
3. Ochre use differed sharply between the Mesolithic and the Neolithic, but its spread was part of the overall Neolithic dispersals.

Such explicit hypothesis formulation is rare in European archaeology, and the author must be commended for stating them so clearly. These questions guide the remainder of the study. **The next question is, what are the implications of these hypotheses that can be tested through the scientific analysis? In other words, what should we expect the data to show that would either confirm or disconfirm these hypotheses?** These implications are discussed obliquely later in the text, and a conclusion is reached as to which one is the most tenable, but it might have been helpful to have a section in which they are reviewed critically on the basis of the data, in order to set up the conclusion.

## 5. Scientific inquiry

The major contribution to knowledge of this dissertation is the elemental characterization and sourcing analysis that provides primary SEM-EDS data on elemental composition of 785 archaeological and geological samples. The results of these analyses are original data that are now available to the research community for comparative purposes. Moreover, the statistical analysis of the data provides a way to identify patterns in the results that bear on the hypotheses that guide this work.

The sampling strategy consisted of obtaining a range of archaeological and geological samples of ochre from throughout the study area. In some cases, the sample set consisted primarily of archaeological samples, while elsewhere (for example in the eastern Balkans) the sample set was mainly geological. In general, the most illuminating sample sets consisted of both types, such as the Serbian collection that

included both archaeological and geological samples from the Danube Gorges. The availability of samples determined the structure of each set, which is entirely reasonable.

Compiling the sample set involved collaborative interactions with a variety of individuals and institutions, who are listed in the Acknowledgements. Such collaborations are a marker of mature scholarship, for they required the author to identify where samples were held and to reach out to the relevant individuals to obtain access, as well as to consult with regional specialists. Of particular note is the connection with Professor Hani of the Geological Survey of Israel for information about the geological context of Levantine ochres.

After the evaluation of the various analytical techniques available, the decision was made to focus on using SEM-EDS. Some samples were also subjected to the Back-Scattered Electron function within the SEM-EDS system. Key specimens, such as those from Moravany, were also examined with optical microscopy. A trial using Raman spectroscopy yielded sub-optimal results. SEM facilities at the Jagiellonian University were used under technical staff guidance on standard laboratory techniques. Although I do not have personal experience with using these techniques, I am aware that these are state-of-the-art tools for materials characterization used by my colleagues at Princeton.

The SEM-EDS analysis yielded the elemental composition of the ochre samples. I learned that the composition of ochre varies considerably, and that it is not only iron oxide as I had assumed. Silica and aluminum were often heavily represented, in varying percentages, while a number of trace elements provided another major dimension of variability among samples. I was also struck by the elemental variation within individual samples. **How should this be interpreted?**

The immense corpus of data that resulted from the SEM and EDS analyses is presented in two long appendices and discussed in the text. Clearly, these analyses produced voluminous results, and it will be important for them to be available to future researchers. A recommendation would be to provide the raw data on a CD or online so that the reader can refer to it on screen while working through the text explanation. Annotation of the tables and images also would have helped guide the reader to the key cells and diagnostic features.

Optical microscopy was also useful in providing evidence for the physical abrasion of ochre lumps, such as those found at Moravany. **It might be worth expanding on this line of investigation separately on more ochre lumps to determine what sorts of activities might have caused this abrasion. Any thoughts on this?** This “microwear” would make a nice study in its own right, perhaps with an expanded sample.

The results of the SEM-EDS and allied analyses were then normalized and compared using two statistical methods available in the open-source package PAST, cluster analysis and principal components analysis. PAST is a robust set of analytical and visualization tools and is very appropriate for this application. Both methods are designed for comparing samples of similar but not equivalent composition. Cluster analysis generates dendrograms to show the relationship among samples, while principal components analysis generates scatter plots whose spatial delineation can identify groupings of samples with similar

compositions. Professor Emeritus Wojciech Nemeć of the University of Bergen advised the author on the statistical applications.

I cannot claim to be an expert in statistical analysis, but the dendrograms and scatter plots do appear to indicate the dimensions of variability among ochre samples. Ochre is a very heterogeneous material! At the same time, certain samples show clear similarities. This in turn permits conclusions to be drawn concerning ochre use on a regional level, although these conclusions are often implied rather than being stated. **An important topic to be discussed at the defense would be to expand the discussion of what the dendrograms and clustered scatter plots are showing to make sure the readers and audience are correctly understanding what they are observing.**

Since human interaction was not limited by the boundaries among modern states, perhaps in a future study it would be helpful to group the samples on larger macro-regional scales and see what such analyses would bring. Logical groupings might be the Levant-Anatolia macroregion, the West Balkan macroregion, and the Carpathian Basin macroregion.

In summary, the determination of the elemental composition of hundreds of ochre samples represents a significant scholarly undertaking, both in its acquisition of primary data and its statistical analysis, worthy of doctoral level research. In itself, it constitutes an original contribution to knowledge.

## 6. Interpretation of results in larger context

The author seems to be a bit cautious about the interpretation of her results in terms of prehistoric behavior. Let me encourage her to be more assertive about what they show. Can these results be used to argue for ad-hoc acquisition of ochre from the nearest available source, intersettlement movement of ochre through sharing or trade, or expeditions to distant ochre outcrops? All of these would have important implications for prehistoric human behavior. **In other words, what choices did people make about using ochre?**

## 7. Quality of writing and images

The English prose in this dissertation is clear and readable, and the author is to be congratulated for this huge effort. That being said, the prose bears a number of characteristics of having been translated fairly literally from Polish. Specific Polish scholarly expressions, word order, and punctuation conventions that would not be used in English are present (e.g. “worth underlining” as a literal translation of “warto podkreślić”.) When this volume is eventually reduced and prepared for publication, it is recommended that it be closely copy-edited for clarity to streamline the text and to remove the wordiness that comes from translating Polish prose directly into English. Signposting of the text through the greater use of headings and subheadings would be welcome. The length of chapters should be balanced, suggesting that some of the text in the longer ones could be condensed.

The maps support the text well and are a clever use of Google Earth. A few more pictures of archaeological contexts and ochre sources and nodules would have enlivened the text and provided

some visual interest. The SEM images and EDS tables are clear documentation of the analytical technique, although some brief comment in the captions about what diagnostic features can be observed in each of the images and tables would be helpful. These are discussed in the text, but making the correlation between the text and the tables is a challenge for the reader.

## 8. Weaknesses

The main shortcoming of this dissertation is the relative lack of archaeological comparisons outside the study area, despite the citation of ethnographic analogs in other parts of the world. The most significant absence is a discussion of the Archaic Moorehead Phase in northeastern North America, formerly called the “Red Paint People,” in which ochre is a consistent element in their burial rite and a defining characteristic of this phase. Another extensive use of ochre is in the Mesolithic cemeteries of northern Europe, such as Bøgebakken, Gønghusvej, Dragsholm, etc., in Denmark. At Skateholm in Sweden, over half the graves contained ochre, while at Olenij ostrov in Karelia 92% of the graves contained ochre. See the chapter by Grünberg in the 2015 *Muge 150<sup>th</sup>* volume (which is largely silent on ochre use in the Levant-Balkan area studied in this dissertation, interestingly.)

Taken together with the burials from Vlasac and from the Levant, these comparative examples all point to a florescence of ochre use in complex foraging societies, compared with earlier and later occurrences. **A question for further investigation is what might trigger such a florescence of ochre use among complex foragers.** The Moorehead-Phase fisher-foragers did not adopt agriculture, while the Ertebølle eventually took it up but after a long delay, so the change in subsistence (what might be called “Neolithization”) does not seem to have been a factor.

Such comparative examples would provide additional support for the author’s conclusion that ochre use should not be considered part of the “Neolithic package” but instead spans forager and farmer societies without being specific to either one.

## 9. Contribution to knowledge and publication suggestions

This dissertation is a meticulous work of scholarly synthesis and presentation of original data. It shows a mastery of the relevant literature, presents a catalog of geological and archaeological ochre finds, demonstrates the utility of SEM-EDS for the elemental analysis of ochre, draws some tentative conclusions, and points out areas for future investigation. Despite the few shortcomings listed above, it is an important original contribution to knowledge about an often-overlooked archaeological material.

I recommend that elements of this dissertation be published in archival journals, and I suggest the following sequential approach. First, identify significant sub-topics in the analysis, some of which I have identified above, and turn them into publishable articles. The basic SEM-EDS data can be presented under Supplemental Information rather than included in the articles themselves. Then, guided by the peer review of these papers by specialists, which will be stringent, and the response of the academic community, a monograph can be prepared that synthesizes the archaeological, geological, and analytical components of this topic in a compact and readable way, keeping in mind the goal of

presenting an original contribution to knowledge and understanding that the readership will want a broad comparative approach rather than a strictly regional treatment. When translated into English, have it professionally copy-edited by a skilled editor.

## 10. Overall assessment and recommendation for defense

I unequivocally recommend that this dissertation be accepted in fulfillment of the requirements for the doctoral degree on the basis of its contribution to archaeological knowledge and its demonstration of scholarly ability. I believe that it is ready to be defended.

From my experience, deciding on distinction and esteem can only be done within a comparative context of similar works within a community of scholars, in this case members of departments of archaeology in Polish institutions of higher education. Since I do not come from this community, I cannot make such a direct determination myself. Given the scope and scholarship of this dissertation, I do believe that it should be considered for such recognition by members of the Wydział Historyczny and program faculty, but it would not be appropriate for me to reach a definitive recommendation on this matter.

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