MACROSCOPIC ANALYSIS AND CHARACTERISATION OF CHERT FOR PROVENANCE PURPOSES

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1. INTRODUCTION

In prehistory, trade routes were used for both the transport of goods as well as human travel. The most ideal materials used to determine these trade routes are silicious rocks. At present though, the study of prehistoric cultures relies almost entirely on the study of ceramic artefacts. There is very little data collected on lithic artefacts and the data that is collected tends to be minimal and largely subjective. There is yet no standardised method of describing chert artefacts.

This paper focuses on describing distinguishing macroscopic characteristics of cherts. These provide the basic information needed to identify cherts found in the field, or at archaeological sites, and to assign them to a particular stratigraphic and/or geographic provenance. This knowledge helps to pinpoints the source of chert raw materials collected and used by the early people. Among potential archaeological implications are the tracing of settlement and migration patterns, and the discovery of routes followed in the transportation and trading of raw and worked materials. To summarise, the primary objective of this study is the creation of a system of characterising chert.

1.1. What is chert?

Throughout this paper, the word "*chert*" [*silicolit*] will be used as a general term to refer to all *microcrystalline quartz* [*cuarț microcristaline*] varieties and thus will include materials elsewhere called *silex* [*silex*] *flint* [*silex de creta*], *jasper* [*jasp*], *hornstone*, *agate* [*agat*], and *chalcedony* [*calcedonie*]. Although flint, jasper and chalcedony have slightly distinct natures which differentiate them from the rest of the cherts, unless indicated otherwise in this study, they are considered also to be chert. "*Source*" [*sursa*]," as used here, means the area or location from which the chert was originally obtained as raw material and includes primary sources (bedrock deposits) and secondary sources (glacial, stream, beach, and talus slope deposits). A proper understanding of the characteristics of chert must be based on an understanding of the physical characteristics of chert, including its origin, properties, and modes of occurrence.

2. BACKGROUND (bibliographic research)

"*Provenance*" [*proveniența*] is the study of artefacts to find out their geographical origin. It involves the comparison of characteristics of known samples to unknown samples to find out the source. The physical characteristics of the artefact's material are usually looked at.

There are several reasons why this is done. It is useful to social scientists for studying and understanding past cultures. Artefacts might move a long distance from source (geologic or manufacture) to deposit site (where archaeologists find them). This distance might be a few kilometres or over 1000 km. Between the source and deposit there is may be much usage and trading. Provenance studies are needed to plot and understand procurement methods, territory size, migration patterns, interaction networks, trade routes, and economic systems.

In studying the provenance of chert, there is a large overlap with geology, mineralogy and geochemistry. Most prehistoric archaeologists deal with lithic materials, especially those researchers specialising in the stone age. In fact, palaeolithic specialists deal primarily with lithics. In studies of the stone age, most artefacts and features that get preserved are made from geological materials, most commonly stone and ceramics (for the Palaeolithic, almost exclusively stone) as well as lesser amounts of shells, wood and occasional metal.

Many times at an excavation there are artefacts listed as "other", "unidentified", "unknown" or "exotic". In these cases a lithics expert familiar with the suspected source area must be consulted. Usually visual identification of imports and exotics are made. These identifications (sometimes made by non-experts) are often later used (either by the original researcher or by later researchers who may have never even seen the artefacts) to reconstruct trade and transport patterns or the migration of populations[1]. Much research in prehistoric (especially stone age) archaeology looks at things such as group size, territories, trade and social interactions. These studies rely on correct data pertaining to provenance. This means that appropriate analysis of artefacts must be done. Objective analysis (e.g. chemical or microscopic) may be necessary to verify macroscopic (visual) identification of artefact provenance.

There are several benefits of using material analysis (from macro- and microscopic analysis to mineralogical and geochemical) and provenance of chert artefacts to establish trade routes. A lot of geological materials have very specific and distinguishable geographic sources. It is often possible to identify the exact rock formation where artefact raw material came from (or possible natural routes of movement in the case of alluvial secondary sources). In cases of large rock formations, it may also be possible to identify where within a rock the raw materials came from.

3. Field Work: Acquiring Geological Samples

The characterization of the geological sources normally involves the characterisation of as many samples as possible, these being selected from various parts of the geological formation. Ideally they should include the range of variability within the formation, with respect to the knappable chert. This part of the research is obviously critical, yet very difficult to conduct unless there is good access to the geological exposures and the primary and secondary deposits are well mapped[2]. In some areas of Europe, deposits of chert may frequently lie beneath glacial deposits or they may have been widely distributed by Pleistocene glaciation. The primary sources of some types of chert, are located in remote areas, and their secondary sources have been spread out over a large area due to glaciation; this makes the process of obtaining geological samples as well as statistical characterisation difficult. A large problem at present in Romania is that different chert types have not been mapped yet. In fact, even the locations of most chert bearing formations have not been mapped. This means that the first thing that was needed to be done in this study was to gather together information on chert samples in different collections and to interview geology and mineralogy field researchers. This way it would be possible to determine what sources are already known. Geological maps were also consulted to determine potential locations with chert sources. The next step was to go into the field and walk along small rivers looking for samples of chert. If samples were found, the geological maps were consulted to

[1] Gramly 1988, Clark 1984.
[2] Julig 1994.

determine where the river cut through a potentially chert bearing geological formation. All samples of chert, from current collections and new samples found in the field were described using an objective characterisation system. Some samples were also analysed microscopically and mineralogically (using XRD analysis). The results of those analyses are still being processed, therefore they will not be discussed in this paper.

4. BODY 2: Chert Characterisation System

In modern archaeology it is necessary to give objective descriptions of the artefacts that we discover and wish to analyse. To do this, archaeologists need a standardised method of analysing artefacts and raw materials, as well as a standardised set of terminology for describing those same artefacts and materials. For this study, it was necessary to create an objective system of characterising chert. It was decided to use a system based on common mineralogical characterisation systems. The following is a description of the system created for this study. This method is based upon methods and terminology already established in the earth sciences and adapted to archaeology.

4.1. Introduction

4.1.1. Problems of Current Descriptions

Descriptions of chert in archaeological reports are plagued by three main deficiencies. These are a lack of details, a lack of objectivity and an absence of standardisation. These descriptions generally lack details. A general colour is often all that is mentioned. If a distinctive pattern exists, it might be included, but other more diagnostic details are often either ignored or overlooked. Details given are often subjective. Few or no objective empirical measurements are given which could be easily interpreted by readers who are unfamiliar with the artefacts. A researcher may write that an artefact is brown or yellow but not indicate the hue, value or intensity. Other researchers might be a bit more descriptive and say that a piece is the colour of coffee or honey. This is still a very subjective description with a large amount of variety. Readers may have trouble interpreting such descriptions if they have never eaten breakfast with the writer. What one researcher calls opaque, another might call transparent. What one calls high or low quality, others may call medium quality. Without indicating what is meant by these terms, readers are unable to know what the writer means and how the artefacts appear.

4.1.2. Results of These Problems

These deficiencies produce several undesirable results. Without detailed, subjective standardised descriptions it is difficult for another archaeologist to realise what the chert artefact in question looks like. This in turn makes it difficult to compare finds between sites without actually seeing the artefacts. This leads to the difficulty of reconstructing large inter-site connections and activities.

When lithic artefacts are described, the description often is simply colour and distinct markings. More often though, archaeologists simply mention a chert "*type*" [*tipul*] and it is assumed that the reader will be familiar with what these types look like. Due to a lack of descriptions or descriptive catalogues, readers outside Romania would not likely know of these types. In fact, due to a lack of training in chert types, many archaeologists even *in* Romania do not know what these types look like. Banat or Banat Nord type chert is a good example. Some archaeologists (within Romania) believe that this is a dark brown-black, semi-opaque, high quality chert from the Poiana Ruşca area.

Others believe it is the yellow, opaque jasper from north of the Mureş river, in the Apuseni Mountains. Others still believe that it is a light yellowish brown (without intense colour), translucent, medium course grained chert with whitish speckles from the Apuseni Mountains. Many archaeologists have so little training in rock determination in general that they are unable to distinguish between chert, andesite, and marl-limestone [*marnocalcar*]. Some can not distinguish a transparent chert from obsidian. Clearly a set catalogue of chert types and their descriptions is needed.

In addition to measurable data, archaeologists need a standardised set of terms and measures. Readers and researchers must know what is meant by terms such as opaque and transparent, fine and course grained, dark and light, "with lines", milky, and others. With a standardised set of descriptive points and terminology, readers can much more easily understand what writers are describing and researchers can easily exchange information.

4.2. Proposal For Standardisation

Having discussed some of the shortcomings of current chert analysis and it's developments a system of analysis and description should now be considered. For the study of chert to be of use to archaeologists, researchers must adopt a standardised method of analysing, describing and cataloguing geological chert types and chert artefacts. In France, Canada and the U.S.A. researchers have begun to objectively describe chert using variations of descriptions used in geology, mineralogy and petrology[3]. The advantage of this is that in geological sciences, such descriptions and the necessary terminology have already been developed and standardised. They are currently in use and are understood throughout that domain. Only slight modifications need to be made for them to be applicable to archaeological studies and sciences. It is the primary purpose of this article to propose a standardised system of analysis of chert in archaeology. It is hoped that such a system will be adopted and applied to both artefacts as well as geological samples of known provenience. The characteristics described in this article appear on the example forms provided in Appendices E and F & G.

4.2.1. Macroscopic Analysis

Macroscopic analysis should look at the following categories of characteristics: *Appearance* [*Aspect*], *Colour* [*Culoare*], *Pattern* [*Model*] and *Cortex* [*Cortex*]. Within each of these categories is a set of characteristics, each with specific means of measurement and terminology for recording measurements.

4.2.1.1. Colour [*Culoare*]

Although *colour* [*culoare*] is the most commonly used characteristic at present, it is in fact the least diagnostic means of describing chert, especially for comparison between artefacts or with geological source samples. Although the colour of an artefact or geological samples may be quite distinctive, researchers should be careful of relying too much on it for identifying a chert type. Some materials show a very restricted colour range but most do not. As well, the chroma of even the most distinctive chert types may change due to various factors, such as heat treating. The surface colour of an artefact may also be altered by other factors such as patination, leaching or bleaching due to soil conditions, or exposure to the weather for many years.

[3] Luedtke 1979, *passim*; Rapp 2002, *passim*; Rapp, Gifford 1982, *passim*.

To record colour, the Munsell colour system should be used. It is used as a relatively international standard in geology and soil sciences. Many archaeologists also use this colour system for recording soil stratigraphy. The two most convenient set of charts produced by the Munsell Foundation are the Soil Chart and the Rock Chart. Both are widely available for sale These contain tables with sample colour chips for the colours most commonly encountered in those domains, which facilitates easy identification of exact colours. Colour in the Munsell system consists of three aspects: *hue* [*nuanță*], *value* [*valoare*] and *chroma* [*cromă*]. Hue is the general colour (e.g. red, yellow, green, blue, purple). Chroma is the intensity of the colour. (e.g. from a neutral grey with no evidence of the hue, to a very intense expression of the hue.) Value is the lightness or darkness of the colour (e.g. from white to grey to black)[4]. A graphic explanation is presented in Appendix E.

4.2.1.2. Appearance [*Aspectul*]

Appearance [*aspectul*] is comprised of five characteristics – *fabric* [*structură*], *lustre* [*lustru*], *translucency* [*transluciditate*], *feel* [*cum este simțit la atingere*], and *grain* [*granuația*].

Fabric and lustre are simple characteristics. *Fabric* (or *structure*) [*structură*] refers to the patterns in the chert, which can be described as either *homogenous* [*omogenă*] or *non-homogenous* [*neomogenă*]. Cherts with non-homogeneous fabic should be described further under "pattern". *Lustre* [*lustru*] can be termed *shiny* [*strălucitor*], *medium* [*mediu*] or *dull* [*mat*]. In addition, the type of shine could be described as *silky* [*mătăsos*], *greasy* [*soios*], *pearly* [*perlos*] or *waxy* [*ceros*].

Translucency [*transluciditatea*] is the degree to which light can penetrate a material, and is measured in the maximum thickness that light can noticeable penetrate. Translucency can be described in two ways. Preferably both methods should be used - a *general description* [*descriere generală*] or a *quantitative description* [*descriere cantitativă*]. A general description can be done in the field without any equipment by holding it up to the sun or a bright light source. If the chert is transparent or near transparent then it should be recorded as *highly translucent* [*foarte translucid*]. If in thin sample, silhouettes can be seen through the sample, and/or light passes through thick parts, then it should be recorded as *translucent* [*translucidă*]. If light only passes through thin parts, it is *sub-translucent* [*sub-translucidă*]. If no, or almost no, light passes through, it is *opaque* [*opacă*]. A quantitative measure should also be recorded if possible. To do this, the artefact or sample should be help approximately 30cm from a 100 Watt light. The greatest thickness where light noticeably penetrates, the thickest part through which light can still be discerned, should be measured in millimetres using a callipers.

Feel [*atingere*] can be described as either *rough* [*dur*] or *smooth* [*neted*]. A fingernail should be dragged across the sample's surface. If nothing can be felt (as would be experience with a window or a glass bottle) then the sample is *smooth* [*netedă*]. If there is a slight rough feel (similar to the surface of a black board), then the sample is *semi-smooth* [*semi-netedă*]. If the sample is distinctly rough, then it should be recorded as very *rough* [*dură*]. Feel is related to grain.

[4] Munsell Foundation 2001, *passim*.

Grain [g*ranulația*] can be described as *fine* [g*ranulația fină*], *medium* [g*ranulația medie*], or *course* [g*ranulația mare*]. Course grained materials have large and noticeable grains, and individual particles can easily be discerned. *Medium-coarse grained* [g*ranulația medie-mare*] materials have a smaller but still slightly noticeable grain. Individual particles may not likely be discerned. Medium grained materials are smoother and the grain may not be noticeable, but a fingernail will grate detectably when drawn across it. A fine grained material will have no noticeable grain, and when running a fingernail across it, no resistance will be noticed. For more detailed descriptions of grain, a microscope should be used.

Materials may also be observed with a magnifying glass and additional observations made. If so, then the magnification power of the lens should be noted. Most fossil and non-fossil inclusions are visible with an unaided eye. A magnifying glass or x10 magnification microscope may be used for a closer examination of potential inclusions and to search for the presence of some of the smaller varieties. These can be noted along with the macroscopic grain description but should also be described in detail with a microscopic *grain composition* [*compoziției granulele*] description.

4.2.1.3. Pattern [*Modelul*]

Pattern [*modelul*] refers to the distribution (whether even [*uniformă*] or uneven [*ne-uniformă*]) of colour, grain, lustre and translucency. Pattern may result from depositional processes (linked to original sedimentary context of deposition) or from diagenesis (appearing during the process of chert formation). A material's pattern or patterns can often be it's most distinctive characteristics or set of characteristics. Pattern can be divided into categories of characteristics, *spots* [*cu pete*] and *lines* [*cu linii*]. The characteristic (e.g. the colour, grain, lustre, translucency or other) of the lines or spots which differs from the rest of the material should be noted as well as how it differs.

Spots can be described based on size and regularity. *Spotted* [*Petele circulare*] (circles) and *splotched* [*petele neregulate*] (irregular shapes) patterns are both less than 30% of the surface area. *Broad mottling* [*Marmorat neregulat*] consists of large irregular blotching, covering more than 30% of the surface. They are often connected together. *Marbled mottling* [*Marmorat regulat*] consists of large relatively round shapes. They also cover more than 30% of the surface and may be connected together. *Speckling* [*Punctiform uniform*] and *flecks* [*punctiform grupat*] are small dots. Speckles are well distributed over the surface whereas flecks are often grouped together. In all cases of spots, researchers should also describe whether the spots are *regularly* [*regulate răspândit pe suprafață*] (evenly) or *irregularly* [*neregulate răspândit pe suprafață*] (grouped) *spread over the surface*. Note should be made of the *size* [*marime*] of the spots in millimetres (as either an average or a range). Researchers should also note what *percentage of the surface* [*procentul din suprafață*] the spots occupy (see Appendix A).

Lines [liniile] may be described as *streaked* [*fâşii*], *banded* [*benzi*] or *laminated* [*lamelat*]. Bands (or banding) are regular lines greater than 1cm thick. Streaking is a less regular, wider form of banding. Laminated lines are less than 1cm. *Finely laminated* [*lamelate fin*] is used to refer to a series of lines less than 1mm. Lines may occur *horizontally* [*orizontale*] or *concentric* [*concentrice*] from a central point. Individual lines less than 2mm in thickness should be referred to as *lamellae* (or *lamellas*) [*lamellae*]. Lines may be *straight* [*drepte*] or *irregular* [*neregulate*], *parallel*

[*paralele*] (if more than one), *overlapping* [*suprapuse*] or *branching* [*ramificate*]. In addition to lines being *solid* [*solide*] with distinction between them, they may also be *blended* [*gradiente*] from one to the next, or *speckled* [*punctiform uniform*] or *flecked* [*punctiform grupat*]. Speckled or flecked refers to a band of small dots. In speckled bands, the dots cover more than 30% of the area of the band, whereas with flecked bands, less than 30% of the band is represented by dots, the rest being either the colour of the adjacent band or a different colour altogether. Speckling and flecks are common with streaking (e.g. speckled streaking).

Artefacts seldom fit any of these categories exclusively, and notes should be made describing individual patterns. Often, more than one colour pattern may be evident on samples. Other terms may be used to further describe the pattern, such as *cross-bedding* [*gradient încrucişate*], *convoluted lines* [*linii încurcate*], etc.

4.2.1.4. Cortex [*Cortexul*]

If cortex [*cortex*] is present, researchers should note its *nature* [*natura*], *aspect* [*aspectul*], *colour* [*culoarea*], *thickness* [*grosimea*] and *transition* [*gradul de tranziție*] (*sharp* [*abrupt*] or *gradual* [*gradual*]). Knowing something about the parent rock may help identify artefact sources.

4.2.2. Chert Artefact Attributes to Describe

In addition to a description of the material that an artefact is made of it is important for researchers to record some other data pertaining to the artefact itself and the context in which it was found.

After consulting a database of chert types, particularly those of the immediate vicinity, or from comparison with geological samples which the researcher has seen, the *most likely type of chert* [*tipul de siicolit cel mai probabil*] should be suggested. The "chert ID" [*ID-ul silicolitului*] and "chert name" [*numele silicolitului*] should be used. Both of these are described below in the section on geological source descriptions. As well, if the researcher is unsure of the type of chert, he or she should indicate other *possible types of chert* [*tipurile posibile de silicolit*]. This should also be noted if there exists other chert types that match (or closely match) the description of the artefact, no matter how remote the possibility.

Some background information about each artefact should be recorded. The *site where the artefact was found* [*situl unde artefactul a fost descoperit*] should be noted. One should record both the geographic location and the name of the site or excavation where found. Other information, such as culture and time period of the culture, trench/section number and depth, year of discovery, and site director may also be recorded. This information may be used later for two functions. Firstly, it will help to understand the connection with other similar artefacts and possible sources. Secondly, it will be useful in cases in which someone later wishes to find the artefact or excavation notes in storage or the archives. The *context in which the artefact was found* [*contextul în care artefactul a fost descoperit*] should be noted. This encompasses the environmental conditions of the site where the artefact was found. This is also of use in drawing connections with artefacts found at other sites and with geological sources. The *size of the artefact* [*mărimea artefactului*] is important to know for other researchers who may not have seen the artefact. Small artefacts may not exhibit all of the characteristics typical of their source materials. For this reason, one should note the length, width and thickness of the artefact.

4.2.3. Geological Source Descriptions

4.2.3.1. Formation Identification

The main thing that should be established for each geological chert sample is the formation identification. This is comprised of several forms of identification – *chert name* [*numele silicolitului*], *chert ID* [*ID-ul silicolitului*], *other known names* [*alte nume cunoscute*], *geological material* [*materialul geologic*] and *possible connections* [*posibilele conexiuni*].

Each chert type should have a common *name* [*nume*]. If one does not exist, for example if a new type of chert is being catalogued, then a name should be given to it. The name of the chert should be the most commonly used and accurately descriptive name used in the literature. If more than one name exists, the oldest should be used. In addition to a common name, each type should have a *chert ID* [*ID-ul silicolitului*]. This is made up of 1 or 2 letters based on the geological period of the strata in which it was located, plus a 2 digit number used to distinguish it from other cherts of the same geological period, and 2 letters to identify which country the formation is located in.

Other known names of the chert [*alte nume de silicolite cunoscute*] or names used in the literature to refer to this chert should be listed. This is important for future researchers who may be presented with several names in the literature used for the same chert type.

The *geological material* [*materialul geologic*] should be recorded. This is the information written on geological maps to refer to this chert or it's parent formation. Typical pieces of information include geological period of the formation (e.g. Late Cretaceous – Early to Middle Oxfordian), material type of the chert (e.g. flint, jasper, chalcedony, opal, etc.) and the material type of the parent rock (e.g. limestone, basalt, etc.).

Possible connections [*posibilele conexiuni*] to other cherts from similar formations with similar attributes which might be of a similar origin to this chert should be noted. This is particularly useful in cases where several chert types may either be semi-distinct parts of a larger formation or in fact identical parts of a single formation.

4.2.3.2. Mode of Occurrence [*Modul de Apariție*]

The mode of occurrence [*modul de apariție*] should be noted in type descriptors. This describes how and where the chert occurs. This includes the outcrops when in primary context, morphology, site of cherts, etc. The following information should be recorded for geological sources: *locality* [*localitate*], *site names* [*numele de situri*], *geographical descriptions* [*descrieri geografice*], *geographical co-ordinates* [*coordonatele geografice*], *precision of coordinates* [*precizie coordonatelor*], *geology* [*geologia*], *type of source* [*tipul de sursă*], and *other types of chert in the area* [*alte tipuri de silicolit care se găsesc în zonă*].

Under *locality* [*localitate*] one should record the country, county and the nearest city, town or village. In addition names given to this site (*site names* [*numele de situri*]) should be noted. This includes official names, such as on maps, or locally given names. When researchers are in the field at source locations, they should make a *geographical description* [*descriere geografică*] of the area. One should give a physical description of where the sample was collected so that other researchers can more easily find the location later if they are searching. For example, "at the bottom of a steep slope, at a bend of the Ampoi river just before it goes under a road bridge, approximately 2km

west of the village of Micești, which is located just to the north-west of the city of Alba Iulia".

As accurately as possible, *geographical coordinates* [*coordonatele geografice*] of outcrops should be indicated. If possible, latitude and longitude readings from a GPS should be used. The *precision of the coordinates* [*precizie coordonatelor*] should be indicated so that later researchers know how far from the coordinates the location may be. One should note how accurate the coordinates listed are. For example, "within 5km", "within 20m", etc. It is also useful to know how the coordinates were derived (e.g. "from a handheld GPS unit", "from visual analysis of a map", "by triangulating position relative to other landmarks", etc.). For ease of later researchers, it is useful to note which *topographic map* (or *maps*) [*hartă (sau hărți) topografică*] this location can be found upon.

The *geology* [*geologia*] of the location should be noted. This is the formation according to the geological maps to which the substrate belongs. This information is written on the legend of the map. To better understand how the samples may have travelled or how widely material might naturally occur, it is useful to indicate the *type of source* [*tipul sursului*] for samples found. For example, *primary* [*primar*], *secondary* [*secundar*], *fluvial* [*fluvial*], *alluvial* [*aluvial*], *glacial deposit* [*depozit glacial*], *erratics* [*neregulați*], etc. Finally, *other types of chert in the area* [*alte tipuri de silicolit din zonă*] should be noted. One should list and briefly describe, what other chert types are located nearby, how far away they are, and whether there is a possible connection to these other cherts.

4.2.4. Recording Descriptions

The benefit of having a standardised system of analysis and description is that it can easily be entered into a database. The information that researchers collect should be recorded on a paper form or in an electronic database. Examples of forms for artefact and geological samples appear in Appendices B and C and D respectively. Descriptions initially recorded on paper should at some point be transferred to an online database. In an electronic format, it is much easier for researchers to combine data from other researchers with their own. It also makes it possible to consult, compare with and add to larger centralised databases. A standardisation of information entered into databases would make it easier for the data to be converted into other languages without having to translate the entire database..

8. CONCLUSIONS

Without a more standardised system of describing chert artefacts, a large aspect of the study of prehistoric cultures, their lifestyles, their resource procurement methods and their inter-settlement interactions will be greatly limited.

Characterisation studies allow researchers to take a look at large scale activities such as trade and procurement studies. By comparing artefacts to geological samples of known provenance, archaeologists can better determine the provenance of those artefacts. With a large database of geological samples, it is much more likely for archaeologists to determine the source or possible source of chert used to make tools found at a site. Researchers can investigate questions regarding how far people travelled to obtain raw materials, which types of chert they were receiving through trade and who were likely trading partners and possibly even whether the chert was being re-traded several times before arriving at a certain destination. Characterisation and provenance

studies also open the possibility of attempting to reconstruct trade routes based on distribution of artefacts of different types of chert.

Standardised characterisation of chert would improve inter-site comparisons. Researchers could more easily and more accurately describe the artefacts that they find. This in tern will allow them to easily exchange more accurate data with colleagues and to make comparisons with other sites. By being able to compare sites, researchers can look for more analogies and patterns among sites and so gain a better insight into prehistoric ways of life.

When it is possible to describe artefacts and assemblages in detail with a standardised method then it will be much easier for international studies. When descriptions can be entered into a database then it is much easier to convert that data from one language to another. Researchers from one country will more easily be able to compare their finds to finds found in other (often neighbouring) countries, even if there exist minor language barriers. Since the areas occupied by many past culture groups extends beyond modern borders it is advantageous to be able to consider research and discoveries made in various countries. It would be possible for researchers with little or no language skills to gather information from a country where they do not know the local language. Foreigners could also read descriptions made locally and understand them, even if they do not have a lot of experience with local chert types.

By adopting a standardised methodology and terminology for the macroscopic and microscopic analysis of chert, archaeologists can improve the efficiency, the ease and the dissemination of their research. When a standardised system, such as the one proposed here is adopted and data openly shared among researchers, the level of our knowledge regarding prehistoric cultures will increase significantly.

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APPENDIX A: Charts for Estimating Proportions of Spots and Grains

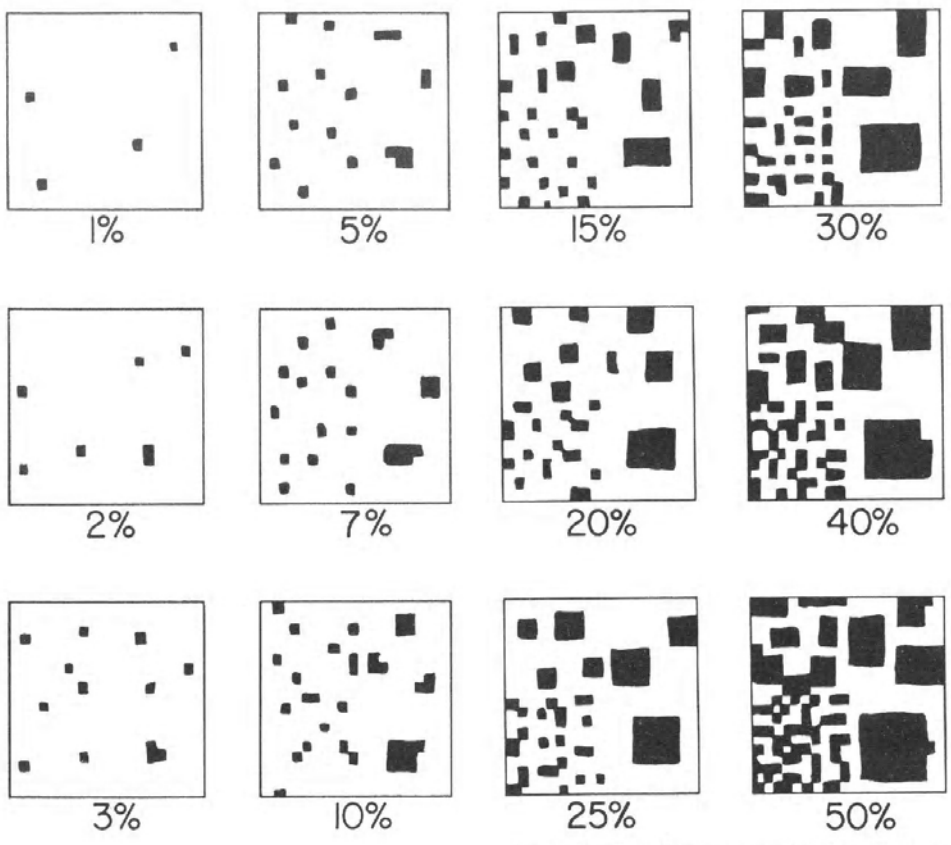


Figure 1 - Charts for Estimating Proportions of Spots and Grains
(de Munsell Foundation 2000:10)

APPENDIX B: General Chert Characteristics Form

FORMULAR CU CARACTERISTICE PENTRU SILICOLIT

Nr. de inventar:	Data:	Depozitar:
Colecție:	Tip artefact:	
Sursa:		

Mărime (mm):	lungime:	latime:	grosime:
Culoare (Munsell):	Transluciditate (mm):	Foto [Da / Nu]	

Incluzii:
- __ nimic
- __ brahiopode
- __ brizoane
- __ columnale de crinoide
- __ fusilinide
- __ corali singuri
- __ spicule de burete
- __ sfredelitori fosilizați
- __ oolite
- __ altele: _____

Textura:
- __ groasa
- __ media groasa
- __ media
- __ media fina
- __ fina

Model: (__ uniformă, __ ne-uniformă)
- __ solida (omogen)
- __ culoare: _____
- __ pete (cm) _____ % _____
  - __ pete distincte
  - __ pete difuze
  - __ stropi
  - __ descriere _____
- __ benzi (cm) _____
  - __ benzi orizontale
  - __ benzi concentrice
  - __ benzi compuse din stropi
  - __ linii (paralele ___ neregulate ___)
- __ altele: _____

Lustre:
- __ mat
- __ satinat
- __ ceroasa

Diagrama:	**Foto digitala:**

Observații: _____

APPENDIX C: Geological Chert Sample Form

Nr. de Artefact / Eşantion: _____ Data: _____ Depozitar: _____
Colecție: _____ Tip artefact: _____
Foto (Da/Nu): _____ Diagrame (Da/Nu): _____

IDENTIFICAREA FORMAȚIUNILOR:

Numele silicolitului: _____ **ID-ul silicolitului:** _____
Alte nume de silicolite cunoscute: _____
Materialul (geologic): _____
Posibilele conexiuni: _____

MODUL DE APARIȚIE:

Localitate: *Țara* _____ *Județul* _____
Cel mai apropiat oraş, localitate, sat _____
Numele de localitate: _____
Descrieri geografice: _____
Coordonatele geografice: _____
Gradul de exactitate al coordonatelor: *Acurății* _____
Surse coord. _____
Hartă topo. _____
Geologia: *Formațiunea* _____
Tipul de sursă: _____
Alte tipuri de silicolit care se găsesc în zonă: _____
Cât de departe? _____
Posibilele conexiuni _____

Contextul în care a fost descoperit: _____
Mărime eşantiona: *Lungime* _____ *Lățime* _____
Grosime _____ *Masa* _____

Diagrama(e):	**Foto Digitala:**

Observații: _____

Formular pentru Eşantioane Geologice (şi Artefacte)
- 2 -

PROPRIETĂŢILE VIZIBILE MACROSCOPIC

Aspect:

Structură: (*omogenă / neomogenă*)
Lustru: (*strălucitor, mediu, mat*) *Descriere:* _____
Transluciditate: *Generală: (foarte translucid, translucidă, sub-translucidă, opacă)*
Cantitativă: _____ mm
Simţit la atingere: (*fina, semi-netedă, dur*)
Granuaţia: (*mică, medie-mică, medie, medie-mare, mare*)
Incluzi: _____

Culoare: *Nuanţă* _____ *Valoare* _____ *Cromă* _____ *Generala* _____

Model: __ uniformă; __ ne-uniformă
__ solid (omogen)
__ caracteristica (culoarea sau altele): _____

__ pete - răspândire pe suprafaţă: regulate / neregulate - mărime: medie: _____ aliniament: _____ - procentul din suprafaţă: _____ __ Petele circulare / petele neregulate __ Marmorat (neregulat / regulat) __ Punctiform (uniform / grupat) __ descriere _____	__ linii - grosime (mm) _____ - fâşii / benzi / lamelat / lamelate fin - orizontale / concentrice - solide / gradiente / punctiform uniform / punctiform grupat - paralele / neparalele - drepte / neregulate __ lamellae: grosime: _____ - paralele / suprapuse / ramificate __ altele: _____

__ altele: _____

Cortex: *Natura lui* _____ *Aspectul* _____ *Culoarea* _____
Grosimea _____ *Gradul de tranziţie* _____
Observaţii: _____

PROPRIETĂŢILE VIZIBILE MICROSCOPIC

Micro-structură: _____
Sortarea: _____ *Orientare:* _____
Textură: (*mudstone / wackestone / packstone / grainstone*)
Matrica: transluciditate: _____ culoarea: _____ modelul: _____
Granule:
Proporţia: _____ *Culoarea:* _____
Forma: Rotunjime: _____ *Forma: (lame / baghete / discuri / sfere)*
Mărimea:(µm) *medie:* _____ *aliniament:* _____ *Sortarea:* _____
Compoziţia granulelor: (grupuri şi descriere de fiecare)
-grup: _____ descriere: _____
-grup: _____ descriere: _____
-grup: _____ descriere: _____
-grup: _____ descriere: _____
Alte Info.: _____
_____

APPENDIX D: Chert Artefact Form

Nr. de Artefact/Eşantion: _____ Data: _____ Depozitar: _____
Colecţie: _____ Tip artefact: _____
Foto (Da/Nu): _____ Diagrama(e) (Da/Nu): _____

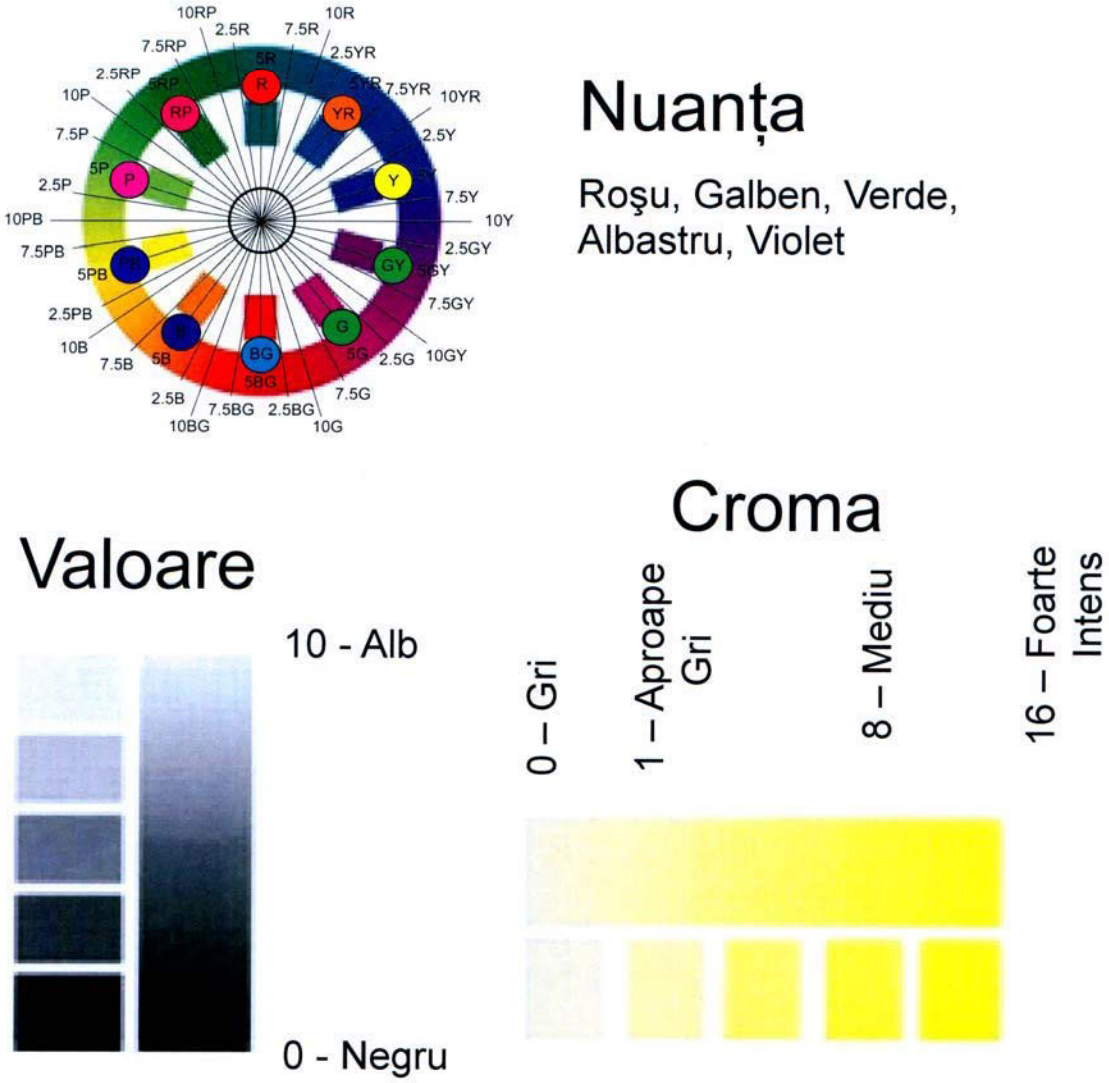
Tipul de silicolit care se potriveşte: _____
Tipurile posibile de silicolit: _____
Situl unde a fost descoperit:
Nume sitului: _____
Locul sitului: _____
Contextul în care artefactul a fost descoperit: _____
_____

Mărimea artefactului: *Lungime* _____ *Lăţime* _____
Grosime _____ *Masa* _____

Diagrama(e):	**Foto digitala:**

Observaţii: _____
_____
_____
_____
_____
_____
_____
_____

APPENDIX E: Schema Culorilor lui Munsell



FIELDWALKING RECORD SHEET

PROJECT: Proiectul Magura Uroiului	Walk date:	Walker(s)	FIELD NO.
	Commune:		
	Site	Location	Nat'nal code
Project Code: PMU	Site code	Loc. code	
Coord.	Accur.	Grid ref.: L-34-83-A-c	

1. Geology	1.
2. Soil type	2.
3. Weather light, precipitation, wind, temperature	3. L: W: P: T:
4. Visibility good, medium, poor and explanation	4.
4a. Visibility estimate percentage visibility of surface	4a.
5. Stage in agricultural cycle	5.
6. Crop type	6.
7. Agricultural history of the field	7.
8. Elevation Min./Max.	8.
9. Archaeological associations	9.
10. Topography and landscape/land use	10.

Details and General Comments

Finds	Presence /Absence	No. of Finds	Dating Asstns.
Lithics			
Pottery			
Metalwork			
Other			
Digital filename			
Walk number			
Orientation *i.e.* direction of walk			
Area (ha)			
Transect width			
No. of transects			
Artefact count (per ha)			
Lithic count (per ha)			
Adjusted count (per ha) assuming 100% coverage			
Prov. condition of arch. site			

Sketch Plan of Field showing direction of walk and slope units

Project:	Proiectul Magura Uroiului	PMU	
Sites:	Magura Uroiului	MU	
	La Vie	LV	
Locations:	Magura - Plateau	MU-Plat	
	Magura - Panta Fortificata	MU-PF	
	Magura - Terasa 1	MU-T1	
	Magura - Terasa 2	MU-T2	
	Magura - Terasa 2	MU-T3	
	La Vie - Primary	LV-Prim	

ARCH. ASSOCIATIONS		**GEOLOGY**	
above ground features		boulder	
crop marks		clay	
geophysics		gravel	
previous excavation		alluvium	
test pits		bedrock	
		andesite	
		limestone	
		sandstone	
STAGE IN AGRICULTURAL CYCLE			
ploughed			
planted			
sprouting crop			
stubble			
recently harvested			
barren			

PROVISIONAL CONDITION

A visual assessment of the sites condition, taking into account the amount of 'completeness' and compared with other similar sites.

Destroyed - Poor - Moderate - Good - Excellent - Unknown - Not Applicable

TOPOGRAPHY

Broad valley floor	the floodplain of a broad valley containing a mature river.	
Dry valley floor	in the bottom of a dry valley with steep slopes on either side.	
River valley floor	in the bottom of a river valley with steep slopes on either side.	
Valley side	on a slope, but significance of location is proximity to a river or stream.	
Cliff base	at the base of a cliff (inland or on the coast).	
Cliff top	at the top of a cliff (inland or on the coast).	
Flat	on level ground	
Marsh or Bog	in a boggy landscape	
Island	on an island surrounded by water.	
Inter-tidal zone	in the area between mean high water and mean low water.	
Shoreline	by the sea, but out of the inter-tidal zone.	
Lakeside	on the edge of a lake.	
River bank	immediately adjacent to a river.	
Mountain	on a mountain	
Knoll	on an area of slightly raised ground in an otherwise flat area.	
Hill top	on the highest point of a given hill.	
Brow of	hill ground not sufficiently level to described it as a ledge.	
Plateau	on a broad flat expanse with downward slopes on at least three sides.	
Promontory/Spur	on land projecting out into an area which is generally lower than it.	
Ridge	on a linear stretch of land with downward slopes on both sides.	
Ledge	on a level area on a hill side with an abrupt change of slope to front and rear.	
Terrace	on a level stretch along the side of a slope.	
Saddle	on the area of flatter ground between two crests on a hill.	
Slight slope	on a slope with a gradient	
Moderate slope	on a slope with a gradient >5m	
Steep slope	on a slope with a gradient >20m in 500m.	

LAND USE

Minimal cultivation		Waste ground	
Cultivation to a depth <0.25m		Recreational usage	
Cultivation to a depth >0.25m		Other landuse	
Cultivated land, undetermined		In use as building	
Marine coastland		Built over	
Inter-tidal		Churchyard	
Coastland above high water		Garden	
Coastal saltmarsh		Land boundary	
Cliff and related features		Mineral extraction	
Other coastal features		Subterranean feature	
Running fresh water		Deciduous native woodland	
Standing fresh water		Deciduous introduced	
Heathland		woodland	
Undisturbed grassland		Mixed woodland	
Disturbed grassland		Coniferous plantation	
Regularly improved grassland		Undetermined woodland	
Grassland, undetermined		Parkland	
Allotment		Scrub	
Orchard		Other woodland	
Thoroughfare		Wetlands	
Verge			

DETAILS AND GENERAL COMMENTS

This may include a brief description of the site, an interpretation of its date and function, and details on its history and condition when last visited. This' field may contain information on the site drawn from a variety of sources, compiled over time. These sources may disagree over the interpretation of the date and function of the site, and may indicate how the site's condition has altered over time. All this information is useful, included with your own record.

FIELDWALKING REGISTER

PROJECT					SHEET NUMBER ______ OF ______			
Field No.	Grid Reference	Commune	Geomorphic Unit e.g. gravel, alluvium	Field Size (ha)	Finds			
					Lithics	Pottery	Other	Total

www.mcdr.ro / www.cimec.ro

FEATURE RECORDING SHEET

SITE CODE	Area Code	Period Type of Feature	FEATURE NO.

1. Dimensions of context
2. Shape in plan
3. Orientation
4. Relationship to other features
5. Proportion Excavated
6. Truncated/Reused

Contexts within feature:

Contexts which cut into feature:

Contexts into which this feature cuts:

Feature Description

Drawing Nos.	Photos Digital Slide Print	Levels Highest Lowest

Interpretation

	Initials
	Date
Checked Interpretation	Checked By
	Date

Sketch Plan on reverse showing relationship to other features

Sketch Plan	FEATURE RECORDING SHEET
Scale Notes	Legend

FEATURE REGISTER

SITE CODE		SHEET NUMBER ______ OF ______

Feature No.	Type of feature	Date of feature	Description

FINDS REGISTER	SITE CODE							SHEET NUMBER ______ OF ______
	Find No.	Context	Material e.g. Chert, ceramic, metal	Prov. Date	Finder (initials)	Co-ords	Level	Description

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Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

Magura Uroiului Project - 2007 Field Season	
Location:	
Find no.:	Context:
Material:	Prov. date:
Co-ords:	Level:
Description:	
Finder (initials):	Date cat.:

ANALIZĂ ŞI CARACTERIZARE MACROSCOPICĂ A SILICOLITELOR CU SCOPUL STABILIRII ORIGINII

Rezumat

În prezent, studiul culturilor preistorice se bazează aproape în exclusivitate pe studiul artefactelor ceramice. Sunt foarte puţine date referitoare la artefactele litice, iar acestea tind să fie minime şi extrem de subiective. Nu există până în prezent nici o metodă standard prin intermediul căreia să fie descrise artefactele.

Metodologia descrisă oferă caracteristicile macroscopice deosebite ale silicolitelor. Aceasta oferă informaţiile de bază, necesare pentru identificarea silicolitelor găsite pe teren sau în siturile arheologice şi pentru asocierea lor cu o anumită proveniență stratigrafică şi/sau geografică. Astfel de informaţii serveşte pentru a indică precis sursa materiilor prime colectate şi folosite de oamenii primitivi. Printre implicaţiile arheologice potenţiale am putea numi trasarea de modele de colonizare şi migrare, precum şi descoperirea de rute ale transportului şi comercializării materiilor prime brute, cât şi a celor finite. Pe scurt, obiectivul major al acestui studiu este crearea unui sistem obiectiv şi standardizat de caracterizare a silicolitelor în Transilvania.