Chapter 4

SOURCING RAW MATERIALS FOR CHIPPED STONE ARTIFACTS: THE STATE-OF-THE-ART IN HUNGARY AND THE CARPATHIAN BASIN

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ABSTRACT

The provenancing of chipped stone tool raw materials is an integral part of prehistoric research. Such studies include the necessary steps of field survey, fingerprinting, and characterization of geological outcrops, together with investigations of the archeological evidence. The state of such research, however, varies by country and region. It is argued here that joint projects involving international cooperation can advance the field, and promising examples will be presented from Central Europe with special focus on problems to be solved. An Internet based network of information systems is advocated to facilitate the wide dissemination of the results of lithic raw material studies.

INTRODUCTION

Lithic provenance analysis has a long tradition in Central Europe. The Carpathian Basin is a unique area within this region, surrounded by high mountains of the Alpean system (Alps, Carpathes, Dinarids) and currently comprising about eight independent political units (Figure 4.1). Due to the regional/national organization of research centers and projects, knowledge of lithic resources and their distribution is highly variable, even within the territory of a single country. Thematic conferences and joint projects have furthered the subject significantly, but we still lack the degree of practical geological knowledge our prehistoric ancestors possessed. Indeed, some source regions are still unknown to us or are imprecisely located, while others may not exist any longer due to prehistoric exploitation and/or modern destruction of the sources.
The practical application of source identification (i.e., fingerprinting raw materials by quantitative methods) and collection of distribution data from archeological sites also varies by country, region, and to some extent, chronological periods. Though lithic provenance studies as a rule are diachronic in the sense that the same raw material sources could be, and were, utilized over longer periods of time, there is substantial variation in accessibility, as well as recognizability of important raw materials.

This chapter will focus on lithic raw materials utilized during the Hungarian Paleolithic. It must be stressed, however, that much of this knowledge originates from the study of much younger prehistoric periods and wider geographical areas inside and outside the Carpathian Basin.

**IDENTIFICATION OF LITHIC RAW MATERIALS**

A necessary first phase in lithic raw material research is the identification of the raw material type. Simple as it may seem, even this phase is burdened with all the
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The results were presented in 1986 at a regional international conference in Sümeg, Hungary (Biró 1986; 1987) and the collected samples have been incorporated into the “Lithotheca” raw material collection housed in the Hungarian National Museum in Budapest. The Lithotheca contains geological specimens and provenance information, two catalogue volumes (Biró-Dobosi 1990; Biró-Dobosi-Schléder 2000) and a web-page with true color images of the most important raw material varieties have been published (www.ace.hu/litot). The collection continues to grow and has proved to be an excellent tool for provenance studies.

In addition to the expansion and continued documentation of the Lithotheca collection, the performance of analytical studies on the sample set continues in order to facilitate comparisons with archeological material, preferably by non-destructive methods. Recently, such analyses have focused on raw materials used for polished stone tools as part of the UNESCO-IGCP 442 project (Biró-Szakmány 2000), obsidian (Elekes et al. 2000; Kasztovszky-Biró 2004), grey flint (Kasztovszky-Biró 2002), radiolarite (Biró et al. 2002), and Szeletian felsitic porphyry (Markó et al. 2003). Current efforts also involve the analysis of other raw materials utilized in prehistory as part of the “Atlas of Prehistoric Raw Materials” project (www.ace.hu/atlas).

LITHIC RAW MATERIAL UTILIZATION IN THE PALEOLITHIC PERIOD

Provenancing Paleolithic material is a difficult task as artifacts are often heavily patinated, making macroscopic identification difficult, if not impossible. The availability of specific raw material sources also changes with time and the probability of the same resources being accessible throughout the Paleolithic period is less than in relatively modern times. Typically, effective provenance studies were primarily initiated on younger prehistoric assemblages with tightly controlled temporal affiliations. In such cases, settlement density, resource exploitation, supply patterns, and production on an industrial scale help facilitate archeological interpretations. In contrast, Paleolithic sites as events are dispersed over a vast period of time. It is difficult to identify the “trade partners” when the documented evidence is separated by at least several generations. It is also difficult to establish to what extent the distribution of goods (basically lithics, but also jewellery in the form of fossil shells and amber)

Figure 4.2 Nomenclature draft for chipped stone raw materials in the Carpathian Basin.

Table: Nomenclature draft for chipped stone raw materials

<table>
<thead>
<tr>
<th>Minerals SiO₂ minerals</th>
<th>Rocks Siliceous rocks (~ silex)</th>
<th>Sedimentary</th>
<th>Postvolcanic</th>
<th>Postvolcanic-sedimentary</th>
<th>Volcanites</th>
<th>Sedimentary rocks</th>
<th>Metamorphic rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock crystal</td>
<td>Lydite</td>
<td>Hydroquartzite</td>
<td>Obsidian</td>
<td>Nummulitic silex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jasper</td>
<td>Hornstone</td>
<td>Hydroopalite</td>
<td>Felsitic quartz porphyry</td>
<td>Quartzite</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chalcedony</td>
<td>Chert</td>
<td>Limnoquartzite</td>
<td>(Andesite)</td>
<td></td>
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<tr>
<td>Opal</td>
<td>Radiolarite</td>
<td>Limnoopalite</td>
<td>Silified limestone</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Nummulitic silex</td>
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</table>

Figure 4.2 Nomenclature draft for chipped stone raw materials in the Carpathian Basin.
reflects the actual movement of a particular community or its direct/indirect contact with other groups. A postulated sign of trade in the Upper Paleolithic is the establishment of workshop settlements around particular sources, as recently argued by Dobosi (1997). Recently, raw materials of apparent importance among the Paleolithic populations of the region were summarized at the Krosno conference on the Paleolithic of the Carpathian region (Biró 2002).

In the Neolithic the situation is more clear. Relatively dense settlement networks can be discerned, and the environs of lithic raw material sources tend to be uninhabited. Of course there are exceptions in certain periods, but these exceptions are associated with individual cultures, when particular communities appear to have exercised tight control over specific lithic resources.

To date, the most comprehensive sourcing studies of Paleolithic lithic inventories have been conducted on the earliest (Lower or Middle Paleolithic) assemblages. Pioneering petroarcheological studies were restricted to the determination of mineral composition (quartz, chalcedony) and atypical fossils, often present in shapeless aggregates in the siliceous matrix (e.g., Vendl 1930). More accurate sourcing was accomplished in situations where the analyst had good regional knowledge on the site environs, primarily for Lower Paleolithic, Middle Paleolithic, and Early Upper Paleolithic sites. This was partly explained by proximity to raw material sources, usually woodlands and foot-hill regions, as an important factor in the selection of a settlement location. Examples of such situations include the sites of Tata (Végh-Viczíán 1964), Érd (Dienes 1968), and Vértesszőlős (Varga-Máthé 1990) (Figure 4.3).

As Upper Paleolithic hunters moved from the environs of lithic sources to the open steppe regions they became detached from the raw material sources. Such groups appear to have been highly mobile, following herds of animals (typically reindeer) and covering

**Figure 4.3** Raw material acquisition area for Lower and Middle Paleolithic sites in Transdanubia (Vértesszőlős, Tata, Érd).
considerable distances. The lithic raw materials used reflect such movements and, to a much lesser extent, the contacts of the community. The pattern of lithic raw material exploitation consisting of a centrally located archaeological site tied to possible resources in a “star-pattern” has been referred to as the action radius model. This model postulates that raw material sources were directly visited by the inhabitants of a settlement (Biró et al. 2001a,b). Figure 4.4 illustrates the action radius model based on data from the Upper Paleolithic Gravettian site of Bodrogkeresztúr in northeast Hungary. The same array of contacts is often proposed when assessing more recent (Neolithic or younger) sites, as demonstrated by Raczky et al. (2002: 850) for the Late Neolithic site of Polgár. In this case, however, we must be aware that we are dealing with the product of several factors and not necessarily the actual movement of people between a settlement and a raw material source. Mapping the occurrences of source-specific or unique materials allows the reconstruction of broad temporal patterns of specific commodity utilization, and has been especially successful in Hungarian Paleolithic studies. Raw material sourcing projects supported by analytical methods have been successfully performed on several specific materials, including obsidian (Biró et al. 1986, 1988; Elekes et al. 2000; Kasztovszky-Biró 2004), Szeletian felsitic porphyry (Vértes-Tóth 1963; Simán 1986; Markó et al. 2003), rock crystal (Dobosi-Gatter 1996), and recently, nummulitic silex (Markó-Kázmér 2004). Source identification of these materials has been investigated by the application of different chemical and physical fingerprinting techniques. Obsidian has been of particular interest due to its easy recognition and limited source area compared to its wide archeological distribution (Vértes 1953; Gábori 1950; Biró 1984).

Figure 4.4 Action radius plot for the Upper Paleolithic settlement Bodrogkeresztúr.
The investigation of common raw materials that occur at several localities, such as radiolarite, limnic silicates, or hornstone, are more problematic. A particular problem is the frequent use of secondary sources of these materials, such as river gravels, during the Paleolithic. Such deposits exploited in the past do not necessarily correspond to the modern distribution of these same materials. Intensive patination can also be a problem. Chemical fingerprinting for these raw materials is still in an embryonic state (Elekes et al. 2000; Biró et al. 2002).

The diffusion radius of certain materials appears to be dependant on quality. Certain unique raw materials, such as obsidian or rock crystal, were moved over hundreds of kilometers, though the quantity of such materials decreases with distance. The regular supply zone seems to be confined to much smaller areas, where distance from the nearest source was an important limiting factor. As a result of both systematic surveys and diachronic petroarchaeological investigation of archaeological lithic assemblages, it appears that all the important raw material sources currently identified were utilized during the Paleolithic period. It also appears that the use of regional and secondary resources (e.g., pebble deposits) was more important than among subsequent Holocene groups still reliant on lithic raw materials.

**TASKS FOR THE FUTURE**

Elucidating the basic raw material stock of the Carpathian Basin was a major step in the analysis of Paleolithic raw material distribution and exchange networks in Hungary. Much work is needed, however, to refine our understanding of the lithic exploitation systems at this time. Important tasks include refining the precision of provenancing basic raw materials such as radiolarite, flint, or limnic quartzite. Also, the revision of lithic assemblage descriptions in relation to raw material utilization is important in light of our existing, as well as developing, knowledge. Provenancing techniques, mainly non-destructive geochemical methods, should be used more extensively both on archeological and comparative geological material and followed by comprehensive studies of the technological reduction chain of individual raw materials. By these steps, we can refine our insights into the movement, trade, and circulation of various lithic raw materials during the Paleolithic period.

**REFERENCES**


Sourcing raw materials for chipped stone artifacts


INTERNET RESOURCES

www.ace.hu/atlas
www.flintsource.net
www.ace.hu/litot