Stones, Numbers—History? The Utilization of Lithic Raw Materials in the Middle and Late Neolithic of Hungary

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Lithic raw material provenance data from Hungary from the Vth to the IVth millennium BC (Middle Neolithic to Copper Age in the local relative chronology) are summarized using spatial statistical techniques. The principal raw material groups are identified and located relative to their geological sources and to their occurrences in archaeological lithic assemblages. The distribution data are presented in a series of isoscale maps illustrating the changes in raw material supply zones through time. The data are interpreted in terms of the particular cultural units defined by prehistoric archaeological research.

INTRODUCTION

A number of strategies are used by archaeologists to study the human past. Almost anything used by humans is of value in solving the giant puzzle as long as strict rules—objectivity, consistency of ideas, and reasonable sampling—are observed. Built on evidence from more or less causal finds, these rules are not always easy to follow. The present paper concentrates on a small, well-defined segment of the puzzle. While the distribution of lithics in Hungary may seem distant to the problems of individual researchers working in other parts of the world, the concept, it is hoped, has a more universal appeal than the actual scope of this study. Using Central European lithic finds from a more or less well-defined period of prehistory (Vth–IVth millennium BC; Middle Neolithic through the Copper Age in the local relative chronology, Table 1), we can attempt to answer the question: how can a scientific study on archaeological material be used to reconstruct history?

The information conveyed by any worked piece of stone is of two types: information supplied by the artifact itself (type, shape, place in the production sequence, use and discard, stratigraphy, and associated chronological data) and information supplied by the raw material (geological age, formation conditions, source region and human utilization, distance from source, and possible ways of transport) (Biró 1994a). Traditional study of lithic assemblages has concentrated on the formal—typeable—features of implements. The peak of this approach was the so-called “French school of prehistory,” led by F. Bordes and a number of followers who used typological classification as markers of relative chronology and cultural taxonomy (Bordes 1961). The morphological features of stone artifacts, however, can be used for more than mere stylistic comparison of stone industries. The procurement, processing, and use of lithic artifacts can illuminate the site economy, everyday activities, crafts, and relation of the site to the source region.

As opposed to vestiges of pottery and most other archaeological finds, stone tools generally are not found as fragments but as...
used (discarded) tools and the debris created in their fabrication. Thus the process of the production, or “reduction sequence,” can be established for the settlement itself—as well as for the corresponding “customers” or related workshops. The use and the production phases can differ widely through time and space (De Grooth 1988).

The analysis of the raw material of stone tools, at the same time, offers a chance of tracing the movement of goods. It is well known to students of economy, prehistoric or more recent, that raw material sources are unevenly and, from a human point of view, arbitrarily distributed. The question for a prehistoric economic interpretation is how much the provenance of certain objects can be traced back to sources; how unique and identifiable the given product or raw materials found in an archaeological context can be.

In the earliest times of human history, people sought sites where basic conditions of life (natural shelter, food resources, and raw material sources) were present. Consequently, settlements tended to be located where all of these conditions were met, or where the basic raw material sources were not further than a day’s walking distance from the settlement. With more effective means of subsistence—e.g., following herd animals—the habitation area was detached from the environs of the raw material sources, the routes of animal movement being more important than the nearness of raw material sources. Also, mobile communities had more opportunity to obtain raw materials by seasonal expeditions or trade. According to the generally accepted opinion, as well as evidence from sites and raw material studies, this stage is observed in the Carpathian Basin in the Upper Palaeolithic, particularly the people of the Gravettian complex (Kozłowski 1973). The open air site of the lowlands tend to contain regional and “long distance” raw materials, while some of the source regions with particularly favorable natural endowments continue to be used as habitation areas (e.g., the Danube Bend region or the southern parts of the Tokaj Mountains).

By the Early Neolithic and the general spread of an economy based on domesticated plants and animals, the habitation area and everyday activity zone became detached from the environs of the raw material source. The mountainous regions are void

<table>
<thead>
<tr>
<th>Dates (B.C, approx.)</th>
<th>Period</th>
<th>Sequence in Vinca stratigraphy</th>
<th>Alföld region</th>
<th>Transdanubia + left side of the Danube</th>
<th>Northern Mid-Mountain Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000</td>
<td>Late Neolithic</td>
<td>D2</td>
<td>Proto-Tiszapolgár period</td>
<td>Lengyel III</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D1</td>
<td>Tisza III culture</td>
<td>Proto-Tiszapolgár period</td>
<td>Lengyel II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>Tisza II culture</td>
<td>Herpály culture</td>
<td>Lengyel I culture</td>
</tr>
<tr>
<td>4000</td>
<td>Middle Neolithic</td>
<td>B2</td>
<td>Tisza I/II culture</td>
<td>Tisza I culture</td>
<td>Sopot-Bicske culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1</td>
<td>Szakálbát culture</td>
<td>Esztár group</td>
<td>Zoelc culture</td>
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<tr>
<td>5000</td>
<td>A</td>
<td>Alföld LBC culture</td>
<td>Alföld LBC culture</td>
<td>Transdanubian LBC</td>
<td></td>
</tr>
<tr>
<td>6000</td>
<td>Early Neolithic</td>
<td>A</td>
<td>Korós culture</td>
<td>Alföld LBC culture</td>
<td>Earliest LBC culture</td>
</tr>
</tbody>
</table>
of traces of settlements. Activity areas around the source probably existed, but there is no evidence of habitation in those areas until the Middle Neolithic. From this time on, the intensity and stability of mountainous occupations were directly related to the industrial needs of the lowlands.

This study is primarily concerned with the lithic raw material distribution patterns of the period following the establishment of farming communities in the Carpathian Basin and the acme of the Neolithic economies, corresponding more or less to the Late Neolithic Age in the local chronology (Table 1).

RAISING THE PROBLEM

The investigations summarized here are focused on the lithic raw material circulation and economy of the Hungarian Alföld, the Great Hungarian Plain, a large terrestrial basin of fluvial–aéolian sediments of some 40,000 km² in the heart of Central Europe, a region that was densely occupied during the Neolithic period and that is practically void of local raw material sources. The Alföld region, however, cannot be investigated in isolation: regular contact and supply of raw materials for this special niche of human occupation incorporated the total interior parts of the Carpathian Basin and even extended from time to time to territories beyond the Carpathians. Therefore the lithic assemblages analyzed in this study are plotted in the geographical frames of the Carpathian Basin (Fig. 1).

A number of model-driven interpretations were constructed, prior to the systematic sourcing and petroarchaeological analysis of the lithic evidence (e.g., Chapman 1981; Sherratt 1986), that relied mainly on geographical argumentation and the extrapolation of results from occasional obsidian fingerprinting studies (e.g., Renfrew, Cann, and Dixon 1965; Williams-Thorpe, Warren, and Nandris 1984). The basic argument was that since the fertile plains had no mineral (lithic) resources, the supplies must have been obtained from the neighboring mountainous regions. One of the apparent source areas was well known as a classical source of obsidian; in fact, it was the only source of mainland obsidian in Europe during the earliest lithic industries.

For an historical interpretation, however, a simple assumption of “the raw material of the mountainous areas supplying the lowlands” is not enough. What is really necessary is a thorough knowledge of existing, potential, and exploited sources of raw material as well as abundant and representative lithic material to test the actual (economic and social) situation influencing the distribution of these raw materials in time and space.

MATERIALS AND METHODS

This more complex statement of the problem ensures that the research is far beyond the scope of a personal project. Large parts of the puzzle were put in place by various, often contradicting, bits of regional geology, analytical petrography, and traditional archaeological research done by other investigators. The author’s part began with collating the evidence. I selected rock types that might reasonably have represented valuable raw materials for this special niche of human occupation incorporated the total interior parts of the Carpathian Basin and even extended from time to time to territories beyond the Carpathians. Therefore the lithic assemblages analyzed in this study are plotted in the geographical frames of the Carpathian Basin (Fig. 1).

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distinguishable within archaeological lithic assemblages. Six groups of raw materials were differentiated which were essential in the lithic supply of prehistoric Hungary. The individual types were combined into the following units:

I. Obsidian
II. Limnoquartzite
III. Transdanubian radiolarite
IV. Mecsek radiolarite
V. Northern “import” flint
VI. Southern “import” flint

These categories seem to be meaningful in the context of Hungarian petroarchaeology. Altogether, they represent 82% of the material investigated (91% of chipped stone tools). The distribution of the raw material source areas is given according to these main categories in Fig. 2. A more detailed presentation of the main categories is in preparation, along with detailed site information. A complete list of macroscopic-type groups was published in Biró (1993). Table 2 provides an estimate of relevant percentages by pieces within the total lithic material in the sample of ca. 400 sites employed in this study.

The sites were selected arbitrarily from all over Hungary and the Carpathian Basin, mainly from the Middle and Late Neolithic periods. Their spatial distribution is illustrated in Fig. 1, while their chronological dis-
Utilization of Lithic Raw Materials

Table 2
Raw Material Group Percentages for Entire Sample by Age

<table>
<thead>
<tr>
<th>Raw material groupings</th>
<th>Northern “import” flint</th>
<th>Southern “import” flint</th>
<th>Other material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsidian</td>
<td>30.19</td>
<td>19.62</td>
<td>13.50</td>
</tr>
<tr>
<td>Limnoquartzite</td>
<td>19.22</td>
<td>22.35</td>
<td>17.49</td>
</tr>
<tr>
<td>Radiolarite</td>
<td>34.86</td>
<td>5.60</td>
<td>37.2</td>
</tr>
<tr>
<td>Transdanubian Mecsek “import”</td>
<td>0.32</td>
<td>0.29</td>
<td>0.2</td>
</tr>
<tr>
<td>Other material</td>
<td>1.49</td>
<td>17.49</td>
<td>37.2</td>
</tr>
</tbody>
</table>

Table 3
Chronological Distribution of Sample by Number of Sites and Quantity of Lithic Material

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of sites</th>
<th>Total number of Lithics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Neolithic</td>
<td>131</td>
<td>5,937</td>
</tr>
<tr>
<td>Late Neolithic</td>
<td>88</td>
<td>15,086</td>
</tr>
<tr>
<td>Copper Age</td>
<td>49</td>
<td>890</td>
</tr>
</tbody>
</table>

Distribution by site number and quantity of lithic material is given in Table 3. The distribution of the sites in Hungary and the surrounding territories is fairly even. Some regions are poorly represented, partly due to the habitation choice of prehistoric people (e.g., Danube-Tisza interfluvial region), while other parts, like southwest Hungary, are currently the focus of active research. Nevertheless, the available samples are adequate for the study of the Middle and Late Neolithic of the Alfold region. The sample of lithic assemblages is growing due to modern, mainly salvage, excavations. The observed tendencies, however, have proved to be stable since the primary synthesis of the distributions (Biro 1991).

The Map Series

Based on the quantitative data available on raw material distribution, a series of isoscale maps were constructed using standard spatial statistical techniques. The method, software facilities, and their archaeological uses were described by Andreas Zimmermann on the U.I.S.P.P. 4th Commission Interim Meeting in Krakow-Mogilany, 1989.

The data were run on several GIS software packages as well. In this paper, the initial isoscale maps were produced using Surfer (Golden Software, Inc.). These maps have been redrawn for this publication.

Data for the initial maps include x, y coordinates of the sites in a 300:200 raster grid and the percentage representation of each raw material type group (I, II, etc.) by number of pieces in the assemblage. The sample of sites was filtered based on the size of assemblage (n > 10) and chronology (Middle Neolithic, Late Neolithic, Copper Age). The limited contextual data available for the site assemblages did not make a more refined or chronologically more detailed investigation possible. With the accumulation of data, however, additional factors could be also taken into consideration. The current, in many ways rudimentary, chronological divisions have already yielded very interesting results, partly corroborating, partly complementing existing information on the prehistory of Hungary and, in particular, the Alfold region.

Regional Implications

Although not presented here, the initial step in the analysis was to generate a series of maps of the unfiltered distribution of
lithic groups and a second series filtered on the size of lithic assemblage alone. The unfiltered distributions highlight general distribution patterns, the radius of supply zones, and the natural factors directing and delimiting lithic raw material distribution. On the basis of these factors, lithic raw material provinces could be defined that were regularly supplied by certain raw materials or the combination of the ascertained raw material types and type groups.¹

The area to the east of the Danube typically is supplied from the north—north-east Hungarian (and Slovakian) sources of obsidian and limnic quartzite, while the northern, western, and central parts of Transdanubia are regions supplied by Transdanubian radiolarite, and the south-central portions of the country are supplied from the Mecsek Mountains. The line of the Danube and the plains along the river act almost as a “faultline” between the two large domains (obsidian–limnic quartzite, Transdanubian/Mecsek radiolarite) for most periods. The three “raw material provinces” inferred from these distributions are:

I. Obsidian–limnic quartzite province
II. Transdanubian radiolarite province
III. Mecsek radiolarite province

The categories summarized as “Northern flint” and “Southern flint” are not simple constituents of the Hungarian raw material spectrum; rather, they are occasional elements within the regional supply network. The territories receiving quantities of these materials could during some periods extend into other parts of Hungary; however, the imports do not exhibit the temporal stability of the native raw materials. For example, there are periods when Northern flint enters the picture as an important constituent. We might interpret this phenomenon as the temporary extension of the Northern flint province into Hungary, although the mechanism responsible for such shifts may not be obvious.

Apart from the major categories outlined above, there are a number of local or middle-range materials which could from time to time be important constituents of the raw material spectrum. Within the major provinces, these elements were:

I. The obsidian–limnic quartzite province
   • Szeletian felsitic porphyry
   • Bükk ‘hornstones’ and radiolarite
   • Specific local opal and hydroquartzite varieties
   • Carpathian radiolarite and other raw material varieties deriving from the neighbouring Northern regions.

II. The Transdanubian radiolarite province
   • Tevel flint
   • Buda hornstone, other hornstones
   • Specific varieties of Transdanubian radiolarite (Urkut-Epény, Sümeg varieties)
   • Other raw material varieties deriving from the neighboring Northern regions (Moravian chert, Carpathian radiolarite)

III. The Mecsek radiolarite province
   • Lengyel quartzite

In addition to these, local pebble material was extensively used in all of the regions, particularly in the early periods.

At the boundaries of raw material provinces, special—“cosmopolitan”—regions developed which had unusual raw material spectra most of the time. They could either belong, clearly, to one or the other province or could have a specific hybrid character of their own. These cosmopolitan regions are a function of historical as well as geological and geographical factors. In Hungary, the existence of one such region could be detected in certain periods around the Danube Bend.

The second series of preliminary maps was produced by filtering the size of the assemblage. This technique excluded the solitary prestige finds from the image (typically

¹ In the presentation of the raw material provinces, extracts from a lecture held at Ljubljana (1994) are used (Biró, 1994b).
grave goods which produced unexpected peaks of exotic raw materials. This process mainly affected the distribution of the Northern Flint group, which was a frequent source of exotic grave offerings, particularly during the Copper Age.

The most important historical information is conveyed by the series of maps presented here, which were constructed using data from the Middle Neolithic, Late Neolithic, and Copper Age assemblages, respectively. The number of sites and artifacts were insufficient for a more refined chronological breakdown. In fact, some of the finer details of specific lithic source utilization are actually obscured by the raw material groupings employed in the present analysis. For this presentation, however, concern is with the traces of large-scale historical changes in the Carpathian Basin and especially on the territory of the Great Hungarian Plain. In the following, each of the main raw material groups will be presented; after that, historical implications will be summarized in chronological sequence, to some extent taking into consideration results of more detailed analyses which cannot be directly drawn from these maps.

Map series 1: Obsidian (Fig. 3). Obsidian seemed to be an important component in the Carpathian Basin throughout nearly all periods of our lithic history. It was a basic element of a stable, regular supply in the Middle Neolithic of the Alföld region. From the earliest large lithic assemblages (Méh-telek, Mezőkövesd) which are considered to belong to the earliest Neolithic horizon, the proportional dominance of obsidian in assemblages is observed (obsidian around 80% of total assemblage). The role of obsidian is particularly significant in the territories east of the Danube. Interestingly enough, however, in the earliest Neolithic lithic horizon, of which we have sporadic evidence, areas lying west of the Danube also seem to be rich in obsidian. During the classic Linearbandkeramik Complex, however, obsidian is almost completely missing from Transdanubia, the territories lying west of the Danube. In these early days, there were probably expeditions to the vicinity of the sources, while during the later portions of the Middle Neolithic, a special artisan community famous for its fine pottery and intensive stone tool production activity, known as the Bükk culture, moved into the immediate vicinity of the sources. The symbiotic relation of the lowland (Alföld) farmers and the Bükk artisans is documented in many ways during the Middle Neolithic period.

In the Late Neolithic, dramatical changes are reflected in the obsidian distribution. The heart of the Alföld, formerly well supplied with obsidian, becomes obsidian-scarce. On the sites of the Tisza culture, obsidian is quite rare—under 20% compared to 40% and more during the Middle Neolithic. At the same time, the marginal regions of the Lengyel culture (in northeastern Hungary) are definitely rich in obsidian. We can find several apparent distribution centers—e.g., Aszód, Kolary, Zengővárkony, and Csád, along the route leading to the west and the north, the heart of the Lengyel culture. It is possible that people of the Lengyel culture acted as middlemen for the transport of obsidian to the Gorzsa group, lying to the south of the territory of the Tisza culture. On the territory of the Herpály–Csőszhalom–Oborín complex, the role of obsidian is also important. The distribution data suggest the supply system changed as a direct consequence of social and economic events in the Late Neolithic. It appears that the Lengyel culture achieved control over the obsidian sources, cutting off the Tisza culture from the source areas. Recent investigations on the (Polgár)–Csőszhalom culture also indicate essential Lengyel connections (Raczky 1994). The Csőszhalom culture can be understood as a synthesis of Lengyel, Late Tisza, and Herpály elements, all directed toward the exploitation of the Tokaj raw material sources.

By the Copper Age, the center of obsidian distribution seems to be shifted more to the
FIG. 3. Distribution of raw material type group I (obsidian) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
east. No large distribution centers to the west of the Danube or north of the current borders of Hungary have been documented.

Map series II: Limnoquartzite (Fig. 4). The term “limnoquartzite” includes a wide variety of postvolcanic siliceous rocks occurring mainly in the North Hungarian mid-mountain range, especially in the Tokaj and Mátra Mountains. Limnoquartzite represents the real “local stuff” for large parts of Hungary, particularly for the areas lying east of the Danube and the Alföld region. The sources lie upstream of the river Tisza and its tributaries; that is, in an area of easy transport. The physical characteristics of the rock, however, made it more difficult to work with than the homogeneous obsidian. The largest workshop sites of the Bákk culture (e.g., Boldogkőváralja and Hejce) were located near these limnoquartzite outcrops, mainly in the Tokaj Mountains. The Middle Neolithic distribution map shows a clear dominance of the limnoquartzite group in Eastern Hungary, together with obsidian—in fact, the two groups moved essentially together. During the Middle Neolithic, the Tokaj sources of limnoquartzite seem to be preferred: these occur near to, or together with, obsidian sources. The transport routes could be identical, although the processing stage of the raw material was different. Obsidian typically was traded in the form of cores or nodules, while limnoquartzite, which was much more difficult to work with, was traded in the form of blades. This difference is observable in settlement materials as well as depot finds (Nyírlugos, Kašov, Boldogkőváralja).

The changes in the Late Neolithic circulation of raw material system seem less dramatic at first glance; on a more detailed level of analysis, however, it is apparent that limnoquartzite is filling part of the vacuum left by obsidian in the central parts of the Alföld. On the whole, the limnoquartzite supply area essentially shifted to the west, and the most frequently used sources are the western limnoquartzite outcrops, mainly of the Mátra and Cserhát-Börzsöny region. These formerly minor sources yielded local variants that, in their physical qualities, were similar to the increasingly popular Northern flints. The use of colorful, non-homogeneous Mátra material is especially characteristic of the period in the Tisza culture. From the Tokaj limnoquartzite sources, only the highest quality was selected as accessory material to the obsidian-Northern flint-dominated inventories.

By the Copper Age, the role of local limnoquartzite on the Alföld was becoming less significant. The local “flint-like” variants were used in the Danube Bend region, but on the whole, even the former centers of limnoquartzite use on the Alföld are almost devoid of this material. This absence can probably be attributed to the increased availability of Northern flint and, possibly, to the inherent difficulty of working with the extremely hard and rigid material.

Map series III: Transdanubian radiolarite (Fig. 5). Transdanubian radiolarites are the most important raw materials in Transdanubia, the areas lying west of the Danube. Recent research has documented the occurrence of this material in Early Neolithic context quite far to the east (e.g., Méhetelek, Mézökövesd) but during the Middle Neolithic, this material typically is confined to Transdanubia and the plains of the Danube. This distribution pattern is in excellent accordance with the spread of the Transdanubian LBC culture, for which it was a dominant local as well as regional material. The competing Mecsek radiolarite was less popular during this time period. The most obvious change between the Middle Neolithic and the Late Neolithic distribution of the Transdanubian radiolarites is the sharp drop in distribution toward the south, south of Lake Balaton along the line of the Kapos River. The Mecsek radiolarite sources were very intensively exploited during this period. The Transdanubian radiolarites also are strongly represented in the southern and central portions of the Alföld. The mustard-yellow
FIG. 4. Distribution of raw material type group II (limnoquartzite) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
FIG. 5. Distribution of raw material type group III (Transdanubian radiolarite) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
color variant, frequent in the early phases of the Tisza culture, seems to be a horizon marker pointing to contacts with the Sopot culture, occupying a short time between the LBC complexes and the Lengyel culture. Other variants occur in significant numbers in the cosmopolitan region of the Danube during Lengyel phase I and to the north and the east of the river Danube as well.

The Transdanubian radiolarite maintained its dominant role also in the Copper Age lithic assemblages of Transdanubia. In fact its most intensive exploitation period is dated to Lengyel III, the transitional period between the Late Neolithic and the Copper Age. This raw material group maintained its importance throughout all prehistoric time periods.

Map series IV: Mecsek radiolarite (Fig. 6). The radiolarite of the Mecsek Mountains is very similar in appearance to the radiolarites of the Carpathian range. In fact, they share the same palaeogeographical conditions and the formations have the same age. In Hungary, the area supplied by Mecsek Mountain radiolarites can be more or less confidently distinguished from areas supplied by Carpathian radiolarites. The Mecsek Mountain radiolarites have always supplied the south-central parts of the country, though its importance varied relative to other raw materials, mainly Transdanubian radiolarites. The Mecsek radiolarite typically “stayed behind” (to the west of) the Danube, except during the Late Neolithic, when it was intensively used by the Lengyel I. culture. In the Late Neolithic, the Lengyel-related Gorzsza group also used this material, together with higher percentages of obsidian. Both probably were transported by Lengyel culture middlemen that avoided the intervening Tisza culture territory. During the Copper Age, the use of Mecsek Mountain radiolarite was restricted again to the immediate vicinity of the source region.

Map series V: Northern “import” flint (Fig. 7). The most revealing marker of long distance contacts in Hungary is the group of high quality Polish and Transcarpathian flint varieties termed collectively “Northern flint varieties.” The high quality Northern flint group has often played an important role in the raw material supply of the Carpathian Basin since the Upper Palaeolithic period. Not only the quantities involved in lithic supply but also the occurrence of specific varieties (Jurassic Craców flint, Chocolate flint, Volhynian/Prut flint) have important implications for the intensity and direction of contacts. The sporadic Early Neolithic evidence again speaks for contacts beyond the Carpathians, but its importance was altogether not very significant. In the Middle Neolithic, mainly the north-central areas received some of these materials, although never in large quantities (typically around 5%). The prevailing type among the Northern flint varieties was Jurassic Craców flint. During the Late Neolithic, we can observe a growing importance of Northern flint varieties as a whole. There are, however, important regional differences. In the northeastern parts of the country, the people of the Lengyel culture heavily utilized Jurassic Craców flint and also appear to have sought local substitutes for this material. At the easternmost Lengyel sites and the Csőszhalom-Herpály related assemblages we can find Chocolate flint from southeast Poland, but never in large quantities. In the eastern part of Hungary, there is marked dominance of Volhynian/Prut flint coming from the eastern forelands of the eastern Carpathians, although it is solely associated with the Herpály culture. This lasting dominance of a raw material, the source of which is located at 500–600 km from the sites, is obviously the sign of strong cultural or social contacts with the eastern regions. The connections are corroborated by Precucuteni III type pottery (Kalicz-Raczky 1984) and Precucuteni III/Cucuteni A-type lithic implements. The routes conveying the raw material probably crossed the Carpathians along the Upper Tisza valley, as contemporary assemblages
FIG. 6. Distribution of raw material type group IV (Mecsek radiolarite) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
FIG. 7. Distribution of raw material type group V (Northern flint) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
of Transylvania are less rich in these materials than the more distant Alföld assemblages. The spread of Northern flint, primarily Volhynian/Prut flint, continued during the Copper Age, especially during the Tiszapolgár and Bodrogkeresztúr cultures.

Map series VI: Southern “import” flint (Fig. 8). This category comprises mainly Banat flint varieties as well as the high quality Balkan flint of the Lower Danube region which has found its way at specific periods and in very small quantities to the Carpathian Basin. The southern connection was never strong during the periods under study; it may have been more significant during the Early Neolithic, specifically the Körös culture. The occurrence of this raw material is known mainly from the southeastern parts of Hungary. The highest ratio of occurrence was observed during the Gorzsa culture.

HISTORICAL INTERPRETATION OF DISTRIBUTION DATA IN A CHRONOLOGICAL SEQUENCE

Although there are numerous provenance studies of the lithic industries in Hungary for different stages of the Palaeolithic, Mesolithic, and Early Neolithic periods, the large time span and the low density of sites does not allow a spatial statistical interpretation of the lithic provenance data. Nevertheless, it is clear that the exploitation of lithic raw materials in the Early Neolithic and the Early Middle Neolithic (Earliest Transdanubian and Alföld LBC, Szatmár group) was fairly complex. High quality distant sources were used and inferior quality materials, even in the case of nearby sources, were neglected. The density of sites and the amount of lithic material analyzed allow a statistical interpretation of the material from the Middle Neolithic Period and later, represented in Hungary by the Linearbandkeramik Complex and its descendants. In the classic periods of the LBC (Alföld LBC, Transdanubian LBC) we can already observe clear “raw material provinces” on our distribution maps, corresponding very well to cultural boundaries established by traditional archaeological methods.

In the area of the Alföld LBC, the lithic industries are clearly dominated by an obsidian–limnoquartzite industry, while the Transdanubian parts are definitely dominated by the Transdanubian radiolarite. The evidence from the Mecsek region is very scanty but it seems that Mecsek radiolarite was not important during the Middle Neolithic. The lack of long-distance import and the apparent autonomy of the sites are features of historical significance.

The number of sites and the amount of lithic material do not allow us to follow all subgroups of the archaeological complexes individually, but certain regional differences are apparent, especially by the later groups and descendants (Kalicz and Makkay 1977). The most striking phenomenon is the emergence of the “artisan” Bükk complex, whose specialized workshops are dominated by limnoquartzite. Obsidian here is a subordinate element in the site assemblages but its importance is indicated indirectly (e.g., Kašov, Nyírlugos obsidian core depots).

At the same time as the Bükk culture, the sites of the Zseliz culture of north-central, northwestern Hungary exhibit the introduction of Northern flint, basically Jurassic Craców flint, alongside regional radiolarite–limnic quartzite–obsidian industries. In western Transdanubian sites, Tevel flint completes the radiolarite-based assemblages, while to the south of the Bakony, Transdanubian radiolarite seems to dominate the assemblages absolutely.

By the end of the Middle Neolithic, two important events occur in the petroarchaeological evidence. One is the appearance and popularity of “Urkút yellow radiolarite” associated with Sopot assemblages within the Transdanubian radiolarites. This takes place

2 For the regional distribution of Neolithic and Copper Age cultures, see recent summaries by Kalicz (1988) and Kalicz and Raczky (1987).
FIG. 8. Distribution of raw material type group VI (Southern flint) (a) in the Middle Neolithic; (b) in the Late Neolithic; (c) in the Copper Age.
together with a notable advance of Transdanubian radiolarite toward the east. At the same time (following the total disappearance of the Bükk culture), the supply of obsidian to the Lowlands seems to have stopped and instead of the “obsidian–limnoquartzite” industries of the Middle Neolithic period, the Tisza culture is better characterized by “limnoquartzite–Transdanubian radiolarite” industries where the bulk of the limnoquartzite now originates from the Mátra sources.

In my opinion, these changes are related directly to the activity of the Lengyel culture, especially its first phase. There is an emerging industrial center around the Mecsek radiolarite sources (radiated to the Alföld in the material of the Gorzsa group), the formation of a “cosmopolitan” region around the passes of the Danube (Aszód, Svodin, Csabdi), and a marked advance toward the Tokaj-Zemplén region (Izkovce). As further evidence for all these developments, we can observe the accumulation of obsidian around the margins of the Lengyel culture, whereas toward the center, there is a balanced local dominance of all major regional raw material sources with moderate exchange between them.

It is not yet possible to determine whether the raw material province differences within the Lengyel culture had a deeper significance than mere regionality. The transitional zones seem very thin and there is an abrupt change, for example, between the Transdanubian and the Mecsek raw material provinces. Typical accessory elements are “lengyel quartzite” on the south-central parts, Tevel flint in the northwest, and possibly Moravian flint to the north. The typological study of the lithic industries suggests the same regional divisions, which can possibly be explained by the different character of the raw material.

In the late phase of the Lengyel culture (Lengyel III) the northeastern assemblages are gradually infiltrated by a significant amount of Northern flint, more specifically chocolate flint and Prut flint. The occurrence of Chocolate flint is essentially restricted to this period in Hungary. In Transdanubia, the Late Lengyel period resulted in a concentration of sites and exploitation activity around the Bakony radiolarite sources (Biró and Regenye 1991).

The Late Neolithic period exhibited dynamic changes in the raw material supply of sites in Hungary. The Herpály culture in the eastern regions seems to belong to the regular supply zone of the Volhynian (Prut) flint, complemented with obsidian and special (South-Tokaj) types of limnoquartzite. Toward the west, the Csoőszhalom group seems to have a transitional material assemblage with more limnoquartzite and less Northern flint. The composition of the Northern flint group is also different, containing more definitely Northern elements (Jurassic Craców flint, Chocolate flint) than found in the Herpály assemblages.

The petroarchaeological information available for more recent periods is very uneven. We have quite large assemblages from modern excavations, most of them still being analyzed. Their topographical relevance also appears to be less universal across Hungary.

Some of the main features of Copper Age raw material provinces are clear. For instance, the Early and Middle Copper Age brought about an extension of the Volhynian flint–obsidian zone to most of eastern Hungary, while Transdanubia was using mainly local (basically Transdanubian) radiolarite. We can suppose a significant amount of Northern (Moravian) material was used in the northwestern portions of the country during this time. It is, however, not yet possible to analyze the Copper Age lithic distributions in fine detail. With the accumulation of additional lithic evidence we can expect more specific results in the future.

**CONCLUSIONS**

Limited in time, space, and scope, this study has tried to construct a piece of prehis-
tory from a scattered series of archaeological observations. The dynamic changes in the patterns of supply on a temporal scale within the same geographical/geological environment were used to elucidate the effects of potential ethnic, political, and social factors in the past. The paper has not gone far in attempting to identify these specific factors or to untangle their superimposed effects; this is asking too much from a single source of archaeological information such as lithics. Similarly, the finer details of the individual studies used in the present analysis are only touched upon. Rather, the intent here was to emphasize the large-scale patterns of stability and change which are visible in the patterns of resource use over time within a given geographical area. Just a cosy little corner of our puzzle.

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