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M.-C. CAUVIN, A. GOURGAUD, B. GRATUZE, N. ARNAUD, G. POUPEAU, J.-L. POIDEVIN et C. CHATAIGNER (éd.). 1998. *L'obsidienne au Proche et Moyen-Orient, Du volcan à l'outil*. BAR International Series 738. Oxford. Par Ernst PERNICKA.

For archaeological provenance studies obsidian is almost an ideal material. Contrary to metals and often also in pottery there is no chemical change involved in the preparation of

an artifact so that geological occurrences can be directly compared with the finished product and contrary to clay there are only a limited number of geological sources and they can

usually be clearly distinguished by their trace element concentrations. Furthermore, as a natural glass it is usually very homogeneous so that sampling does not contribute much to the compositional variation encountered. The physical properties of obsidian, especially its mode of fracture, make it a very desirable material for prehistoric communities. Indeed, together with flint it could be considered as the "steel" of the Neolithic and was therefore actively sought and transported over considerable distances as has long been known.

Geochemical studies of archaeological obsidian samples with the aim to determine their provenance were introduced more than thirty years ago. Accordingly, one would think that most of the geological sources in the Old World have by now been sufficiently well characterized and, indeed, in certain regions like the Aegean this is certainly the case. But the Near and Middle East presents a more formidable challenge in that it comprises many geological sources that are often not easily accessible. Insofar this book provides a welcome and informative summary of the present knowledge.

It is divided into a geological and an archaeological section with an overview of occurrences and geochemical methods of their characterisation in the first one. Although all chapters are justified and well written the ones by B. Gratuze on a comparison of analytical methods used in provenance studies of obsidian and by J.-L. Poidevin with a summary of the present possibilities to distinguish and identify geological obsidian sources in Anatolia and Transcaucasia deserve special attention. As in all cases where samples from one site are analyzed in different laboratories by different methods one encounters the difficulty to compare the results either due to different elements analyzed or due to systematic differences of the analytical methods. The latter should not occur and can be minimized by intercomparison of laboratory standards. Some of the sources, like the central Aegean or central Anatolian ones, are nowadays so well characterized that it is advisable to use those for comparison before one embarks on a major analytical study of obsidian.

Although source identification is possible in most cases with any of the commonly used geochemical methods it is advisable not only to analyze as many elements as possible but also to include Fe, Ti, Y, Nb, Zr, Sr, Ba, and the rare earth elements, because these elements provide the best discrimination between various geological sources. For the analysis of geological sources there is usually abundant sample material available so that the choice of the applied method or a combination of methods is not critical as long as systematic errors can be avoided. Archaeological samples, on the other hand, are usually rather small and then the choice of

available methods is more limited. Gratuze seems to favour ICP-MS with laser ablation and this technique is certainly well suited although it is less precise than other methods according to our own experience. PIXE and NAA are good alternatives but not generally available. A word should be said about the relative costs of analyses. The cheapest method is certainly XRF, if one has free access to an appropriate instrument. It is often claimed that NAA is expensive, but if one considers only the costs of consumable materials then ICP-MS is often more expensive. In detail this depends largely on local conditions; if free access to a neutron source or special equipment is available or not. However, I would agree with Gratuze that the major disadvantage of NAA is its inability to detect several of the above mentioned elements with sufficient sensitivity.

For the analysis of archaeological obsidian artefacts trace elements will certainly remain the most important fingerprint for some time to come. However, for source characterisation one should strive not only to determine the chemical composition but provide a complete set of data ranging from geological field observations and physical appearance to isotope composition and geological age. This will rarely be accomplished by a single laboratory but J.-L. Poidevin has collected, ordered and evaluated the most complete set of data on Anatolian and Caucasian obsidian sources yet presented. His treatment of the data is a model case for future studies. It shows that despite so many studies that have been performed on Anatolian obsidian sources there are still major deficiencies, especially in northeastern Anatolia and the Caucasus. He also draws attention to the possibility of discriminating between geochemically similar sources by geological dating (mainly by fission tracks but maybe also by the Ar/Ar method in the future). This is certainly highly desirable for the geological interpretation of the data but for archaeological applications there is only one convincing case (the peralkaline sources of Bingöl and Nemrut Dagi) where the geological date can provide discrimination between sources that would otherwise be difficult.

A similarly exhaustive overview of the analyzed archaeological obsidian samples and their provenance is provided by C. Chataigner and a summary of their distribution in different periods ranging from the Upper Palaeolithic to Early Uruk by M.-C. Cauvin and C. Chataigner. In the first paper great care was taken to disentangle the confusion that has prevailed with different designation of the same source by different laboratories and by imprecise description of the exact sampling locations of geological source samples. This combined with analytical results of varying quality from many different laboratories amounted to a formidable task.

The result is a rather clear identification of the most prominent sources that can be recognized in the archaeological record, *e.g.* the newly found Galata source northwest of Ankara in artifacts from sites along the Marmara sea, or the source formerly designated "Ciftlik" or "2b" by Renfrew and co-workers as a group of three flows on the eastern flanks of the Göllü Dagi. An important discovery was the observation that there occur two completely different types of obsidian at Bingöl that have both been exploited in the Neolithic, now termed as Bingöl calcalkaline (formerly group 1g) and Bingöl peralkaline, (formerly group 4c) which is similar to Nemrut Dagi. It was the good fortune of the earlier investigators that they picked with Ba and Zr two of the most important discriminating elements for their group definitions so that the general picture remains essentially unchanged. Two major regions supplied most of the obsidian in the Neolithic of the Near East: the Cappadocian obsidian is

mainly found in central Anatolia and in the Levant while the eastern Anatolian sources have a wide distribution along the western part of the Zagros mountains and the Caucasian sources appear to have a more limited distribution. This does not devalue the present study which provides a much more detailed picture on a broader sample base with a far better time resolution than previously known.

Although much remains to be done in source characterisation and without doubt new sources will be found it seems that we are approaching a situation that archaeologists dream of. With a single analysis of an artifact there is a high probability that the geological origin can be determined and thus contact between different regions proven. It is now possible to study procurement and trade of obsidian in whatever form and possible variations over time in much more detail than it was ever possible. This book is an important milestone on the way there.