

Session abstracts

Formation and geology of obsidian

Obsidian is a volcanic rock solidified in an instantaneous way without the crystallized groundmass. It is, in other words, a natural glass, with low contents of volatile materials (gases and water). The formation is reserved to very specific chemical composition - with high amount of silica and alkaline elements, sodium and potassium and can be defined as being around a „glass optimum”. Moreover, the formation is volcanologically restricted to eruptions of viscous lavas stripped of their volatiles and effective cooling conditions (subaerial domes, magma and water/ice interaction) in various geotectonic settings of volcanism (the island arcs, active continental margins, intraplate environment), current and past. The glass is unstable at normal surface conditions. It is subjected to hydration, alteration and/or recrystallisation processes. How these conditions modify the access and chemistry, consequently, characterisation of obsidian, worldwide?

Sources and their characterisation

Obsidian is typically formed by quenching of essential quantities of volatile poor viscous silicic lava: instantaneously, at the same time and of the same chemical composition. These factors facilitate the characterisation of the sources, by the determination of the temporal, petrographic and geochemical features. This is why obsidian is especially suitable for provenance studies. The overall pattern can be, however, quite complicated by multiple sources lying very close - or very far - from each other, lava mixing, and multiple eruptions in the same district or the lack / uncertainty of the primary sources. Secondary sources can be located on eroded / weathered surfaces but cannot be usually unambiguously connected to exact lava flows and layers. How these factors influence prehistoric access and exploitation as well as modern source characterisation studies?

Analytical / methodological aspects of obsidian studies

Obsidian is extremely well suited to instrumental analyses of various types for provenancing and geochemical studies. The primary aspects for applicability are availability, efficiency, precision and accuracy with low cost and non-invasive methodology. These requirements do not always support each other. Inter-laboratory collaboration and large accessible databases will obviously help. At the same time, the modern circulation of „touristic” obsidians offer more and more challenges for authentic provenancing and underline the importance of a reliable, authentic context for our samples. Is there a best practice for analytical studies? What is the optimal level of information to make decisions by, to record and publish?

Dating of 'geological' obsidian

The formation of obsidian is an instantaneous process in geological history. It can be dated by various methods, notably fission track, K/Ar, U/Pb and (U-Th)/He zircon (apatite) dating. The resulting chronological data are important for reconstructing volcanological events, geohistory and can be also used for source characterisation. There are, however, factors influencing our efficiency like accidental or planned heat effects - which can be used, sometimes, for dating other events in connection with the life of the artefacts. How does chronological investigation interfere with sourcing and temporal arrangement of various obsidians?

Archaeological obsidian by chronological periods

The specific qualities of obsidian - perfect knappability, sharp working edge and its indisputable beauty - rendered the rock suitable and popular for making certain types of tools, later on, objects of prestige from the earliest periods of Humankind. Continental obsidian sources in Africa, Asia and Europe have been in use since the Lower Palaeolithic.

The utilisation of obsidian in artefact production is an important marker for prehistoric contacts and trade. Obsidian distribution data describe objectively the action radius of Palaeolithic communities and, later on, the social and trade networks, preferred routes and distribution centres of more recent prehistoric societies. What is the dynamism of obsidian distribution in certain geographical regions? Can we trace contacts and boundaries? Does the proximity of accessible sources motivate migration and movement?

Lithic technology and use wear

Obsidian is perfectly knappable and gives sharp though brittle edges. Even the cortexed pieces can be used advantageously. Small size is obviously no obstacle: it is perfectly suited for microblade technology. Compared to siliceous raw materials, especially limnic and hydrothermal siliceous rocks of geographically similar provenance, the raw material pieces (lumps) are transported longer and used more economically. The characteristic patterns of use-wear are also different: obsidian is softer and more easily scratched by accidental injuries, making the identification of use-wear patterns difficult. Black non-translucent obsidian varieties were, rarely, also polished and used as the first prehistoric mirrors, unusual vessels or subjects of religious sense.

Obsidian hydration dating

Obsidian is unstable under normal surface conditions. It is typically covered by visible cortex in geological perspectives that does not look „glassy” at all. In the process of some thousands of years, on the fresh cut surface of obsidian implements the formation of „hydration rind” is starting to take place, which is measurable and is proportional to the time elapsed since the fresh breakage. This phenomenon is the basis for the direct dating of obsidian, applied in large series mainly in the United States. As climatic factors and chemical composition of the glass have direct effect on the formation of the hydration layer, we have found the application of the method more problematic in Europe. Application of the isotopic paleothermometry can improve precision of the method. Moreover, the measurement of the „hydration rind” involves the production of preparata by cutting the valuable artefacts. Can we have more reliable results and less destruction to prehistoric samples?

Theoretical and cultural anthropological issues

- Exploring the allure of obsidian: symbolic, social, and practical values for obsidian

Its physical appearance often dazzles the beholder (including archaeologists), but how far can these features be used to understand how and why obsidian was valued in the past? In what ways can we explain the extensive use of obsidian at particular times and places, but not in others? What underlies the choices of obsidian for use in practical, symbolic or ritual contexts? This session will explore the broad range of values assigned to obsidian in the past both as a raw material and as manufactured items. For example, studies might consider the variables that conditioned raw material choice (e.g., obsidian vs. other raw materials or among different obsidian sources), access to raw material through exchange, manufacturing strategies, social control, prestige, symbolic meanings of obsidian and/or specific artefact forms, etc.

Super-long distance movement of obsidian in prehistory: why, how, and what for?

Obsidian was often brought by ancient people far away from the primary sources, with distance exceeding 500–800 km; these cases are numerous in the Mediterranean, the Near East, and North America. Some of the longest distances between obsidian sources and utilisation sites are known from Northeast Asia (Kamchatka and Chukotka regions, Kurile Islands, and Sakhalin Island), Oceania, and North America. In the NE Asia, there are several cases of obsidian movement on 1000–1500 km in the Mesolithic (ca. 8500 BP), and up to 2000 km in the Neolithic (ca. 7000–3000 BP). In Oceania, these distances are up to 3500 km, and in the North America – up to 4000 km. The main issues to discuss at this Session are: 1) Why did people move obsidian extremely long distances, even though other kinds of raw material were easily available? 2) What was the mechanism of obsidian acquisition (direct, via chain of middlemen, slow movement as “exotic” good, etc.)? and 3) What was the function of obsidian tools made of raw material the source of which is located far away?

Contemporary approaches to reconstructing exchange

Exchange is a central focus of a large portion of modern obsidian studies, and the reconstruction of various exchange mechanisms using provenance data has a long history in the discipline. Since the original fall-off curves employed by Renfrew and others in the 1960s, there have been a number of developments that have reshaped how archaeologists think about exchange. These include a recognition of the value of ethnographic comparisons, integrated technological analyses of lithic materials, and advances in computer-based modelling. This session explores these developments and discusses contemporary approaches to the reconstruction of exchange in the archaeological record.