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NEWS AND INFORMATION

NEWS AND NOTES

Have news or announcements to share? Send them to IAOS.Editor@gmail.com for inclusion in the next issue of the *IAOS Bulletin.*

CONSIDER PUBLISHING IN THE IAOS *BULLETIN*

The *Bulletin* is a twice-yearly publication that reaches a wide audience in the obsidian community. Please review your research notes and consider submitting an article, research update, news, or lab report for publication in the *IAOS Bulletin*. Articles and inquiries can be sent to IAOS.Editor@gmail.com Thank you for your help and support!

Mark Your Calendar for the International Obsidian Conference 2026

From Magma to Artifact: The Geology and Archaeology of Obsidian
Yerevan, Armenia, 28 September – 01 October, 2026

Abstracts due May 15, 2026

See the flyer at the end of this issue of the *IAOS Bulletin*

https://ioc2026.geology.am/

NOTES FROM THE PRESIDENT

Hello IAOS members and welcome 2026! I wish you all a year of health, joy and only positively exciting adventures!

The end of 2025 was marked with the loss of a number of prominent archaeologists engaging in Mediterranean archaeology and island prehistory whose work resulted in significant contributions in global archaeological discourse. I will greatly miss my own mentor, Professor Nikos Efstratiou (Aristotle University of Thessaloniki, Greece) who guided my first steps in prehistoric fieldwork and instilled exemplary work ethos, kindness and inclusivity. Certainly, for the IAOS community, the passing of Professor Colin Renfrew (University of Cambridge, UK) is one that distinctly stands out. Professor Renfrew produced a seminal – and highly influential – study on the investigation of obsidian in the Mediterranean and Near East using geochemical methods as a means to investigate prehistoric trade/exchange. For Renfrew's contributions in the study of obsidian and the field of archaeology in general, Yaroslav (Slava) Kuzmin has prepared an obituary, published in *Radiocarbon* (2025), 67, pp. 445–449 (doi:10.1017/RDC.2025.25).

Hoping for better news in 2026, the year does have exciting obsidian events to look forward to. The next installment of the International Obsidian Conference *"FROM MAGMA TO ARTIFACT: THE GEOLOGY AND ARCHAEOLOGY OF OBSIDIAN"* is shaping up nicely with the organisation well under way to welcome delegates in Yerevan, Armenia end of September 2026. Details can be found following this link: https://ioc2026.geology.am/. We have also added the Second Circular at the end of this *Bulletin*. For those interested in submitting an abstract, submission deadline is May 15th 2026, while registration details will become available soon. I must say, the excursions programme, as always, looks very exciting!

Another major contribution to the study of obsidian comes in the form of a book that brings together an excellent set of papers on the topic of prehistoric seafaring, island exploitation and coastal adaptations from the lens of maritime obsidian. *Obsidian and the Sea: Evidence, Concepts and Social Implications of its Maritime Transportation* is currently in press by Harrassowitz and has been edited by Dr Christian Reepmeyer and myself with chapters prepared and reviewed by several of the IAOS community members. The book has been conceptualised to fill an important gap in current archaeological literature; by focusing on rare raw material maritime transports, island and coastal movements and their implications in the social evolution of early communities will move forward the ongoing discourse on early human – sea interactions. Many thanks to everyone who helped see it to fruition!

On the topic of publications, please consider submitting an article, research update, news, or lab report projects to the IAOS Bulletin. You can submit your work to Carolyn Dillian at IAOS.Editor@gmail.com.

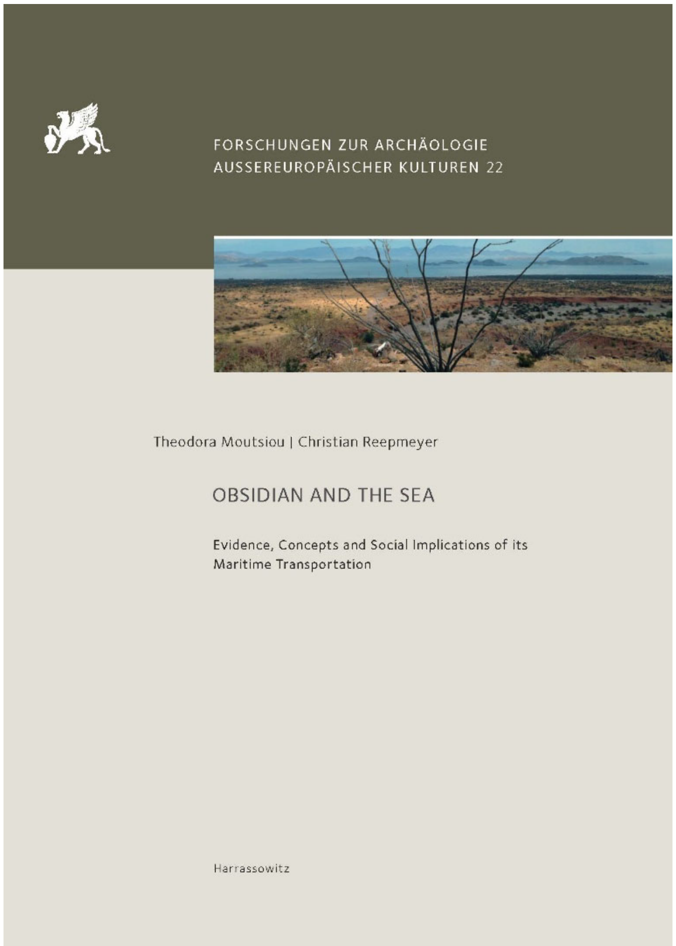
With conference season starting in the next few months and lab work under way, I am excited to see what other obsidian news will make headlines this year!

Finally, please do not forget to renew your IAOS membership dues in 2026.

Happy New Year!

Dora Moutsiou
Special Scientist
Archaeological Research Unit
University of Cyprus

NEW BOOK ALERT!



Theodora Moutsiou and Christian Reepmeyer

Obsidian and the Sea: Evidence Concepts and Social Implications of its Maritime Transportation

ISBN 9783447125277

www.harrassowitz-verlag.de

Maritime exchange and its social dimensions substantially define global relationships in our modern world. Archaeology as a discipline has a long history investigating exchange and this research has been used to understand the extent of spheres of interactions between distant communities, risk minimisation strategies of communities living in unpredictable environments, advances in technology, cultural diversification, and emergence of social hierarchies and inequalities. This volume elucidates the long-lasting human relationship with the sea, demonstrating the crucial role of the coast and open waters alike in the development of prehistoric coastal communities, human migration trajectories and island settlement in deep time. This book's novel approach is to focus on one material in particular, obsidian, to explore how it reveals the use of the sea in prehistory across different times and places. The case studies presented here demonstrate especially well that humans throughout history and across different regions have engaged with obsidian exchange not solely as an economic activity but, significantly, in a symbolic way to denote social connectivity at great distances and oftentimes in absentia, meaning without the need for face-to-face interactions. Obsidian's unique physical attributes – brilliance, iridescence, transparency, colour – an integral part of the human condition with a strong emotional impact to its consumers, facilitated the maintenance of mental maps of preferential routes and desired social networks diachronically with the sea functioning as a highway for communication.

OBSIDIAN AGE COMPUTATIONS FOR TWO SITES ADJACENT TO TOOL STONE QUARRIES ON THE SOUTHERN FACE OF WEST SUGARLOAF, COSO VOLCANIC FIELD, CALIFORNIA (CA-INY-3415, -1925/H)

Alexander K. Rogers[a] and Robert M. Yohe II[b]

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Abstract
The Coso volcanic field in southern Inyo County, eastern California, is a major obsidian source which was exploited by for Native Americans for thousands of years; both quarry sites and processing sites have been identified within the complex (Gilreath and Hildebrandt 1997). This paper documents an obsidian hydration dating (OHD) age analysis for two lithic processing sites in the Coso complex (CA-INY-3415, Rochester Cave, and CA-INY-1925/H, the West Sugarloaf Wash site). The ages for INY-3415 are Newberry period, with a mean age of 2115 ± 681 calibrated years before 2000 (cyb2k), with a probable error of the mean of 215 years (N = 10). The ages for INY-1925/H are again Newberry period, with a mean age of 3130 ± 753 cyb2k, with a probable error of the mean of 238 years (N = 10). The ages are consistent with the manufacturing technology of bifaces recovered from the sites.

Introduction

The Coso volcanic field in southern Inyo County, California, is a major obsidian source which was exploited for thousands of years by Native Americans; both quarry sites and processing sites have been identified within the complex (Gilreath and Hildebrandt 1997). At least four geochemically distinct obsidian sources have been identified in this field (Hughes 1988), with differing intrinsic water contents (Stevenson et al. 1993) and differing hydration rates (Rogers 2013). The most extensively exploited obsidian source in the Coso complex is the West Sugarloaf source, known as the "Colossal Quarry", CA-INY-415. The Coso volcanic field is located on the North Ranges of the China Lake Naval Air Weapons Station.

This paper documents an obsidian hydration dating (OHD) age analysis for two lithic processing sites which lie within the Coso complex, to the southwest of the Coso West Sugarloaf source (CA-INY-3415, Rochester Cave, and CA-INY-1925/H, the West Sugarloaf Wash site). The two sites are adjacent to the Colossal Quarry, and the occupants of the sites were undoubtedly exploiting it for tool stone. The West Sugarloaf Wash Site (CA-INY-1925/H) is a open-air processing area at an elevation of

Parameter	CA-INY-3415	CA-INY-1925/H
Elevation, ft. amsl.	3900	4100
Average annual temperature, ºC.	14.91°C	14.51
Annual temperature variation (hottest-month mean minus coldest-month mean), ºC.	16.43°C	21.79
Mean diurnal variation, ºC.	5.00°C	15.62
EHT at surface, ºC.	16.92°C	19.25

Table 1. Effective hydration temperatures.

Cat. No.	Unit	Depth, cmbs.	R_m, μ	R_{20}, μ	Age, CYB2K	SD age, yrs	Period
2b	Interior	0-10	4.4	6.97	2678	618	Late Newberry
7b	Interior	10-20	4.0	5.32	1560	364	Haiwee
13b	Interior	20-30	5.8	4.86	1300	305	Haiwee
19b	Interior	30-40	5.5	7.06	2751	638	Late Newberry
25b	Interior	40-50	6.0	6.72	2489	579	Late Newberry
29b	Interior	50-60	5.7	7.35	2979	693	Late Newberry
34	Interior	60-70	4.4	7.00	2702	630	Late Newberry
39	Interior	70-80	4.9	5.42	1617	381	Haiwee
45	Alcove	20-40	3.7	5.95	1951	454	Late Newberry
48a	Alcove	40-60	5.8	4.52	1127	266	Haiwee

Table 2. OHD ages for CA-INY-3415 specimens. cmbs = centimeters below surface; R_m = measured hydration rim; R_{20} = mean hydration rim adjusted to EHT = 20°C; CYB2K = calendar years before 2000.

4100 ft. above mean sea level (amsl) on the south side of Sugarloaf Mountain, excavated between 2005 and 2008 by Blendon Walker. Rochester Cave (CA-INY-3145) is a rock shelter located approximately 2 km. to the southwest of CA-INY-1925/H, down a dry wash at an elevation of 3900 ft. amsl; it was surveyed and excavated in the 1980s by Robert Yohe and Robert Parr.

Analytical Method

In each case a sample of 10 specimens was dated; all were assumed to be from the Coso West Sugarloaf geochemical source, due to proximity. The specimens from CA-INY-3415 were debitage, while the specimens from CA-INY-1925/H were bifaces or biface fragments. The specimens were read by Northwest Research Obsidian Studies Laboratory (Skinner and Thatcher 2006). The ages were computed here based on modeling the hydration process by temperature-dependent diffusion theory (Rogers 2007, 2012; Rogers and Stevenson 2023); the computation process is summarized in the Appendix to this paper. The basic equation for age computations is

$$t = r^2/k \qquad (1)$$

where t is age, r is the hydration rim, and k is hydration rate. The hydration rate for Coso West Sugarloaf is 18.14 μ^2/1000 years at EHT = 20°C (Rogers 2013). The hydration rate is

Seq. No.	Rm, μ	R20, μ	Age, CYB2K	Sd age, yrs	Period
1	5.5	5.74	1816	420	Late Newberry
2	7.7	8.03	3559	817	Early Newberry
3	7.4	7.72	3287	755	Early Newberry
4	8.1	8.45	3938	904	Early Newberry
5	8.2	8.56	4036	926	Late Pinto
6	7.8	8.14	3652	838	Early Newberry
7	6.2	6.47	2307	532	Late Newberry
8	6.3	6.57	2382	549	Late Newberry
9	7.6	7.93	3467	796	Early Newberry
10	6.9	7.20	2858	657	Late Newberry

Table 3. OHD Ages for CA-INY-1925/H (All specimens were surface-collected). R_m = measured hydration rim; R_{20} = mean hydration rim adjusted to EHT = 20°C; CYB2K = calendar years before 2000.

Period	Age, CYB2K
Marana	< 700
Haiwee	1800 – 700
Late Newberry	3000 – 1800
Early Newberry	4000 – 3000
Late Pinto	6000 – 4000
Early Pinto	8000 – 6000
Lake Mojave	10000 – 8000
Late Paleoindian	12000 – 10000
Early Paleoindian	14000 – 12000
Pleistocene-Holocene Transition	> 14000

Table 4. Period definitions used in this analysis.

source-specific, and is also a function of the temperature history experienced by the artifact.

The effect of temperature history is defined by effective hydration temperature (EHT), which is a function of local temperature conditions, burial depth of the artifact, and activation energy of the obsidian (Rogers and Stevenson 2023). Temperature parameters are computed by regional scaling from meteorological data from the Western Regional Climate Center, adjusted for site elevation and are further adjusted to correct for burial depth of each artifact (Table 1). Note that for CA-INY-3415, the annual variation was reduced by a factor of 0.75 and the diurnal variation was set equal to 5°C to account for the cave environment (Rogers 2012:50); CA-INY-1925/H is entirely an open-air site so no adjustment is needed.

Age computations were performed by the computer code in MatLab described in Rogers 2018, which includes the temperature model from which the data in Table 1 were computed. After computing the EHT for each artifact, the computer code adjusts the hydration rim value to the reference EHT, which is that of the hydration rate (20°C in this case), and then uses equation (1) to compute age, in calibrated years before 2000 (CYB2K

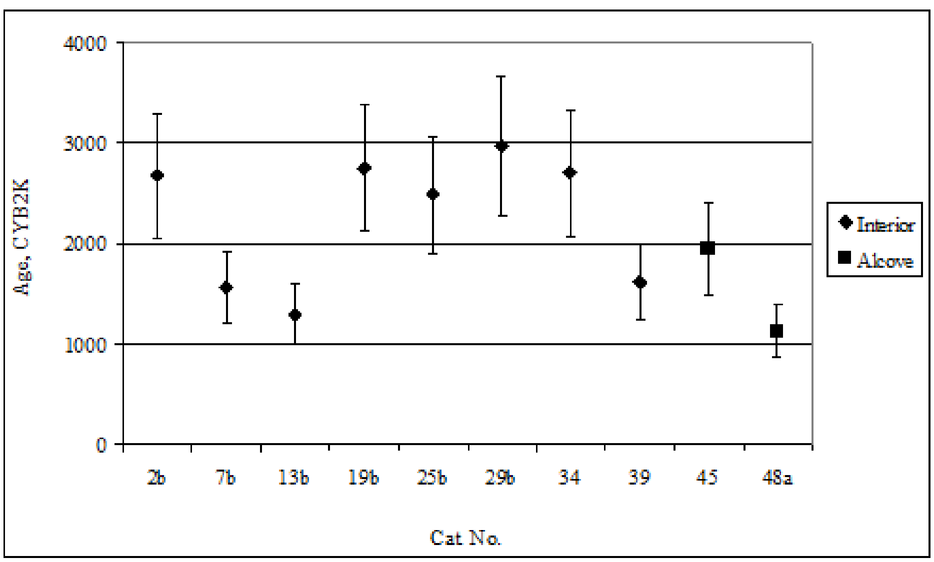

Figure 1. Ages for CA-INY-3415 obsidian specimens. Error bars are one standard deviation.

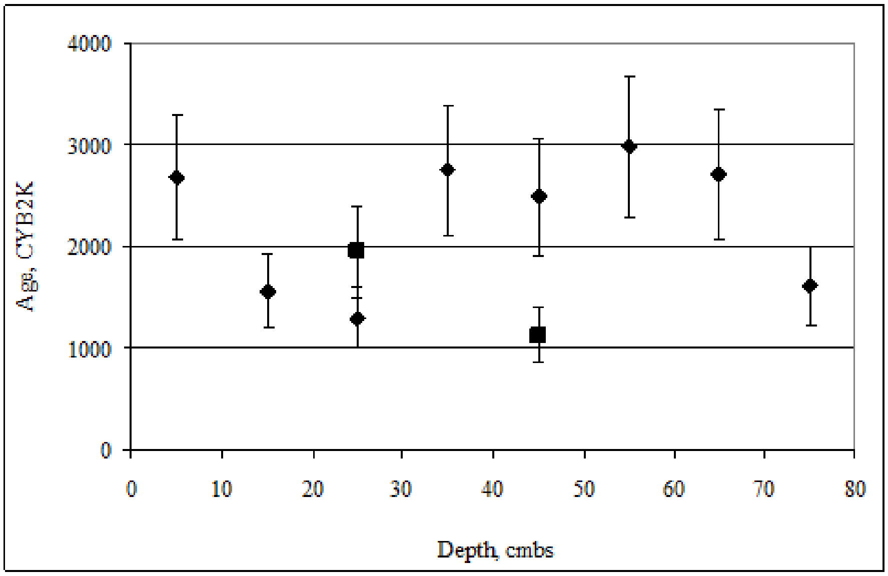

Figure 2. Variation of age with burial depth for CA-INY-3415

= cal. BP relative to year 2000). The standard deviation of the age value is computed from probable uncertainties in EHT, known laboratory experimental error, and intrinsic water variability within each obsidian source (Rogers 2008).

Results

Resulting ages for the artifacts from the two sites are summarized in Tables 2 and 3; archaeological period definitions are in Table 4.

Site Narratives

Rochester Cave (CA-INY-3415)

Ages are plotted in Figure 1, and Table 5 summarizes the age data statistically, in terms of ages from the alcove (N = 2), the cave interior (N = 8) and the aggregate data set.

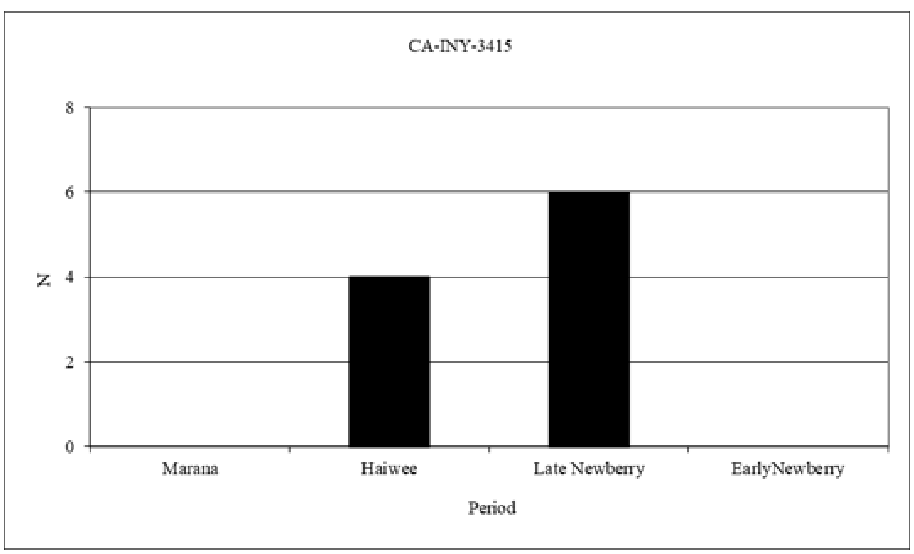

Figure 3. OHD ages for CA-INY-3415 grouped by archaeological period.

Statistics	Alcove	Interior	Aggregate
Mean age, yrs	1539	2259	2115
Std Dev of age, yrs	583	655	681
CV of age	0.38	0.29	0.32
N	2	8	10

Table 5. CA-INY-3415 OHD age data statistics

A t-test comparing ages from the interior and the alcove gives t = 1.53, but the threshold for the 95% confidence level is 2.31 (df = 8); thus, the samples are not statistically distinguishable. Further, there is no systematic variation of age with burial depth (Figure 2), so the aggregate age is a valid characterization of the data set. Figure 3 shows the tight clustering of the ages in histogram form.

West Sugarloaf Wash Site (CA-INY-1925/H)

The ages for this site are plotted in Figure 4 in histogram form. The mean age for these bifaces is 3130 ± 753 CYB2K, which places them in the Newberry period, although earlier than Rochester Cave (Figure 5). However, CA-INY-1925/H is in an area where it is difficult to compute the EHT correction with high confidence, due to local geothermal activity. If the temperature has been under-estimated, the measured hydration rims would correspond to a younger date, agreeing more closely with those from Rochester Cave. In any case, a mid-Newberry age is likely for INY-1925/H.

Conclusions

The OHD ages of specimens from these two sites fall within the Newberry period, and are consistent with the manufacturing technology of the bifaces.

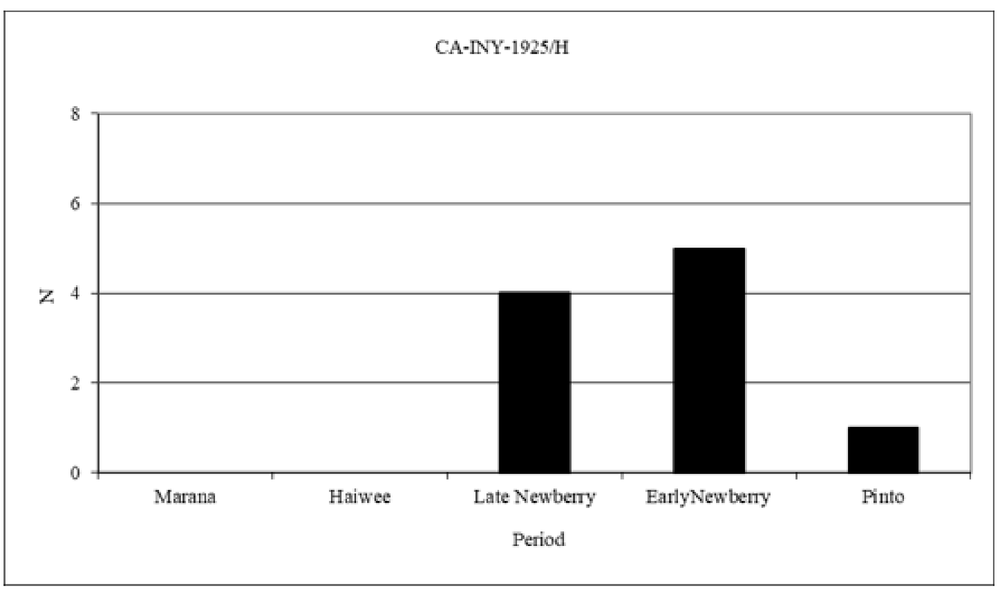

Figure 4. OHD ages for CA-INY-1195/H grouped by archaeological period.

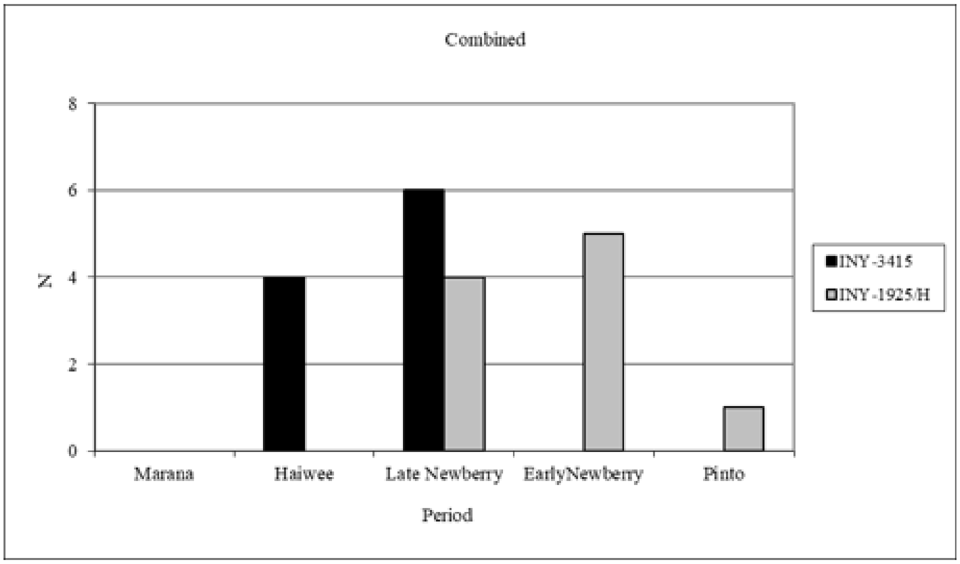

Figure 5. Age profile comparison, CA-INY-3415 and -1925/H. The apparently greater ages for INY-1925/H may be due to geothermal effects on the specimens.

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Appendix: How to Compute an Archaeological Age by Obsidian Hydration Dating

Overview of Obsidian Hydration Dating

- Obsidian hydration dating is based on the absorption of water by an obsidian specimen.
- Water diffuses into obsidian from any freshly-exposed surface, creating a hydrated layer, called a hydration rim or hydration rind. The depth of water penetration can be measured microscopically by the hydration rim thickness, and is proportional to the square root of time since exposure of the surface. The "square-root-of-time" dependence is based on diffusion theory has been verified by laboratory measurements.
- Because of the square-root-of-time relationship, the age equation is

$$t = r^2/k \tag{1}$$

  where t is age, r is the hydration rim thickness, and k is the diffusion (hydration) rate.
- The hydration rate is determined primarily by two factors: the structural water content of the obsidian, and the temperature history of the specimen.
- The structural water content of a specimen is primarily determined by the geochemical source, and is controlled by geochemical source determination.
- Effects of temperature history is controlled by computation. The hydration rate is a function of temperature by the Arrhenius equation:

$$k = A^*\exp(-Q/T) \tag{2}$$

  where A is the pre-exponential constant, Q is the activation energy, and T is temperature. A is in μ^2/unit time, and Q and T are in Kelvins (K = °C + 273.15). The archaeological hydration rate is the average of equation (2) over the life of the artifact.
- The key parameter in controlling for temperature is the effective hydration temperature (EHT). Since archaeological temperatures vary seasonally and daily, eq. (2) shows that the hydration rate varies as well. The EHT is the single temperature which yields the same hydration rim as the actual varying temperature over the same time. Here the EHT for the hydration rate is designated EHT_r, and for a specimen as EHT_s.
- Computing a valid age requires controlling for both source and temperature. Other less significant factors are included statistically in the computation of age accuracy (eq. (9) below).

Controlling for Structural Water Content

- Obtain a hydration rate for each geochemical source represented in the data set (methods are described in Rogers and Stevenson 2020:15ff.). The rate should be in μ^2/1000 years, in terms of calendar years, not radiocarbon years (RCY) as use of RCY reduces accuracy.
- Determine the EHT for which the rate was computed, EHT_r (in °C); you will need this for the temperature correction process.
- Activation energy (Q), defined in eq. (2) above, is needed for hydration rim adjustment. Once you have each rate k and its corresponding EHT_r, the activation energy Q for that geochemical source is

$$Q = (EHT_r + 273.15)^*[36.29 - \ln(k)] \tag{3}$$

where ln( ) is the natural logarithm and k is hydration rate in μ^2/1000 years at EHT_r in °C.

Controlling for Temperature

- The hydration rim measured for each specimen (r_m) must be adjusted mathematically to the same EHT as the hydration rate.
- Computing specimen EHT_s requires three temperature parameters for the site (all are in °C):
  Annual average temperature (T_a);
  Annual temperature variation (V_{a0}, hottest month mean minus coldest month mean);
  Mean diurnal temperature variation (V_{d0}).
- These parameters can be computed from meteorological records or temperature sensors, and refer to conditions at the surface (methods are described in Rogers and Stevenson 2020:10ff.).
- For buried specimens, two of the parameters (V_{a0} and V_{d0}) must be adjusted for burial depth. The depth adjustment is

$$V_a = V_{a0}*\exp(-0.44*z) \quad (4a)$$

$$V_d = V_{d0}*\exp(-8.50*z) \quad (4b)$$

  where z is artifact burial depth in meters.
- If the site is in a cave or rock-shelter, multiply V_a by 0.75 and set V_d = 5°C.
- Paleotemperature changes do not affect computed age significantly for ages < ≈13 Kyrs.
- EHT for each specimen is computed as

$$EHT_s = T_a + 0.0062*(V_a^2 + V_d^2) \quad (5)$$

- Once EHT_s is known, the rim correction factor is

$$RCF = \exp[(Q/2)*(1/EHT_s - 1/EHT_r)] \quad (6)$$

  where Q is the activation energy computed in eq (3).
- The EHT-adjusted hydration rim r_c is

$$r_c = r_m * RCF \quad (7)$$

  where r_m is the measured hydration rim.

Computing Age and Age Accuracy

- The age is computed as

$$t = 1000*r_c^2/k \quad (8)$$

  where t is age in calendar years, r_c is the EHT- adjusted rim in microns, and k is hydration rate in μ^2/1000 years at EHT_r.

- The coefficient of variation of the computed age is (Rogers and Yohe 2021)

$$CV_t = sqrt[(0.16/r_m)^2 + 0.007*k_{20} - 0.0581] \quad (9)$$

where r_m is defined above and k_{20} is the rate at EHT = 20°C. If your hydration rate k_x is for another EHT, say EHT_x, convert it to 20°C by the following equation before computing accuracy:

$$k_{20} = k_x*exp[Q*(1/293.15 - 1/EHT_x)] \quad (10)$$

- The standard deviation of the computed age is

$$\sigma_t = CV_t * t \quad (11)$$

Both t and σ_t are in calendar years before the present.

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OBSIDIAN PROCUREMENT AND PRODUCTION IN THE SOUTH-CENTRAL PERUVIAN HIGHLANDS: A CASE STUDY FROM ARPIRI (1100-500 BC)

Julia Sjödahl, Tulane University

Introduction

During the late Initial Period (1100-800 BC) and Early Horizon (800-400/500 BC), ancient peoples travelled and traded across the mountains, jungle, and coastal regions of Peru. Exchange networks intensified during the early first millennium BC in what is referred to as the Chavín Interaction Sphere. Materials circulated included objects such as obsidian, cinnabar, pottery, and spondylus shell (Burger 2008; Burger and Nesbitt 2023), which travelled hundreds of kilometers to different sites in this interaction sphere. Obsidian was principal among these items, having been as offerings in galleries and domestic contexts at Chavín de Huántar (Burger 1984; Lumbreras 1993; Rick 2017), and further north in the Cajamarca region at sites such as Kuntur Wasi and Pacopampa (Nagaoka et al. 2019; Tripcevich and Mackay 2011). Sourcing studies indicate that these objects came from the Quispisisa obsidian quarry hundreds of kilometers to the south, in the Huancasancos department of Ayacucho (Burger and Glascock 2009; Contreras 2011; Matsumoto et al. 2018).

This obsidian source is one of many located in the southern highlands, but research on archaeological cultures of this region is less understood than societies in the north. This report details excavations and archaeometric analysis using x-ray fluorescence of a small sample of obsidian artifacts from Arpiri, an archaeological site located in the south-central highlands of Peru, fifteen kilometers to the north of Cerro Jichja Parco obsidian quarry, which is part of Quispisisa.

Background

Obsidian sources in the Andes are located within the modern departments of Ayacucho, Andahuaylas, and Arequipa. The Quispisisa

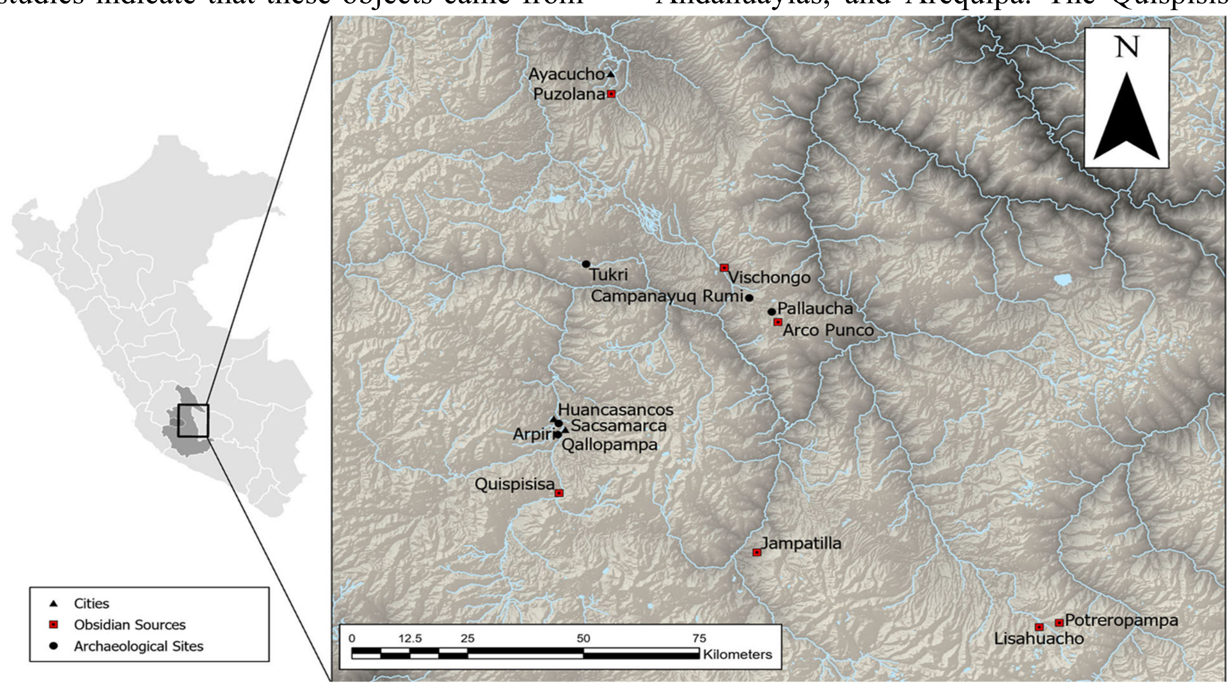

Figure 1. Regional map of Initial Period and Early Horizon sites and obsidian sources.

quarry (Burger and Glascock 2000a; Tripcevich and Contreras 2013) is the major obsidian source in Ayacucho; minor sources include Puzolana (Burger and Glascock 2000b), and Jampatilla (Burger et al. 1998). The Lisahuacho, Potreropampa (Burger, Fajardo Ríos, and Glascock 2006), and Anillo sources are located within Andahuaylas. Within Arequipa, ancient peoples also utilized obsidian from Chivay (Tripcevich and Mackay 2011) and Alca (Menaker and Rademaker 2023; Rademaker et al. 2022; Tripcevich 2010).

At Chavín de Huántar, obsidian came to replace local chert tool types, such as quartz (Burger 1984; Burger et al. 2006; Matsumoto et al. 2018). Obsidian served a variety of functions, such as camelid shearing (Nesbitt et al. 2019a; Tripcevich 2007), hunting and butchering, and as a ceremonial object (Matsumoto 2012; Rick 2017).

The goal of the pilot excavations was to articulate Arpiri's role as a settlement associated with the processing and circulation of Quispisisa obsidian. The uncovered artifacts and architectural remains from Arpiri speak to diversity of archaeological settlements of the Ayacucho area, and this site's importance in local economic developments of the south-central highlands.

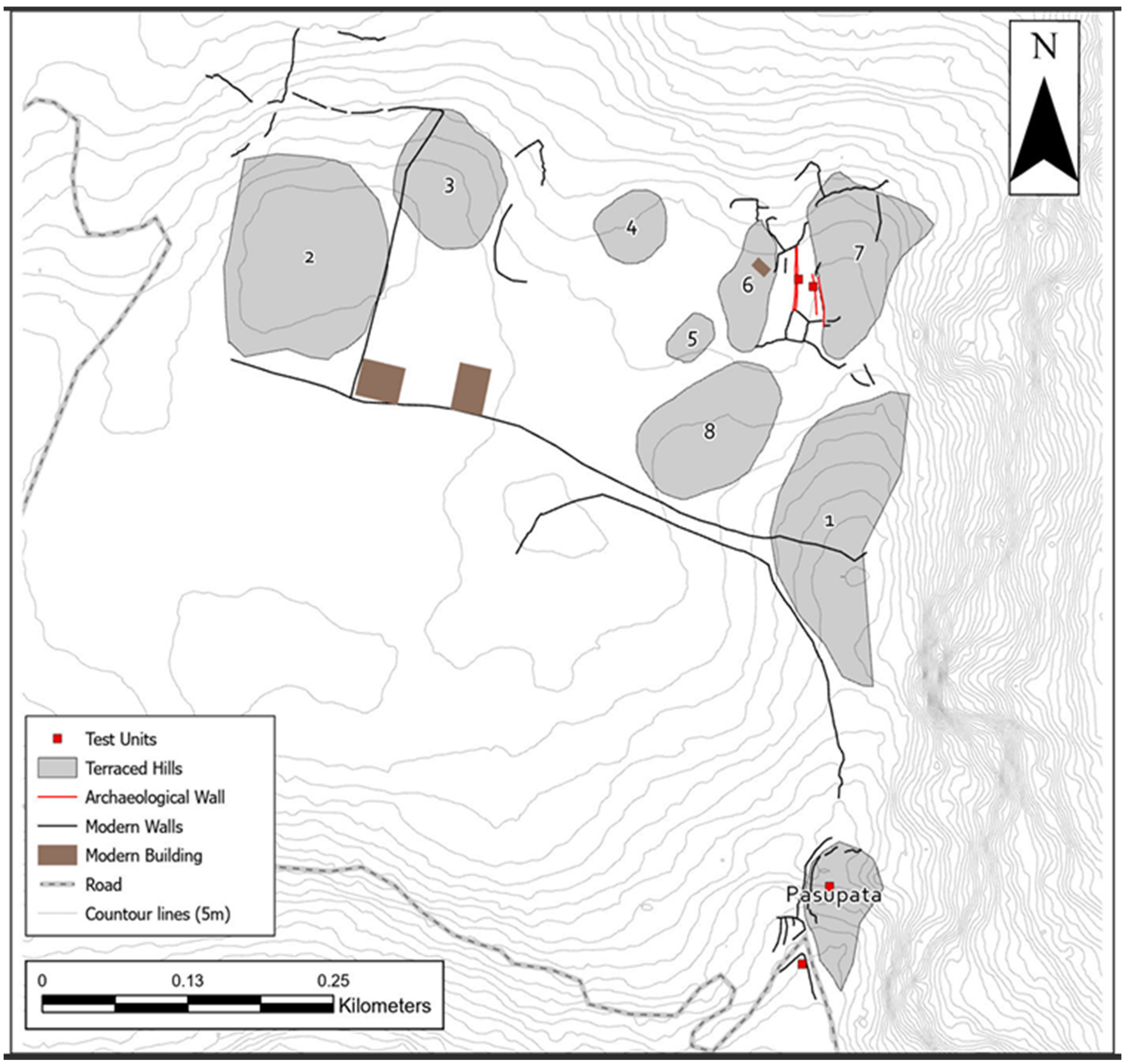

Figure 2. Map of the Arpiri site and test unit locations.

Arpiri is located in the Huancasancos province of Ayacucho, Peru. It is situated at 3,530 m.a.s.l. along a ridgetop above the west bank of the Caracha River (Figure 1). The layout consists of nine modified natural hills, two of which surround a rectangular plaza. Eight of the hills are found in the northernmost part of the site (Figure 2). The ninth hill to the south is called Pasupata, and is divided by a modern-day road, where we identified a petroglyph. In August of 2024, a team of archaeologists led by Yuri Cavero Palomino (Universidad Nacional Mayor de San Marcos) and I carried out pilot excavations. Two of the units were placed along the walls of the plaza, while the other two were placed within Pasupata. We anticipated that there would be a high quantity of obsidian at Arpiri based on previous surface survey.

The four test excavations indicated that most of the activities such as lithic production, butchering, and cooking took place in Pasupata. In this area, we uncovered a circular structure with abundant lithic, ceramic, and faunal assemblages. Radiocarbon dates taken from the Unit 3 context indicate construction beginning around 1100 BC, with a fill context deposited between 800-500 BC. Units 1 and 2 in the plaza revealed much less material, but this was anticipated as ceremonial areas, which are often kept clean. Overall, the four test excavations yielded 3,331 pieces of obsidian, some of which exhibited a mahogany or red iron-oxide inclusion, which is typical of obsidian from Quispisisa (Burger and Glascock 2000a: 259). Tool types included flakes, cores, scrapers, and projectile points. More than half of the assemblage was microdebitage, which was likely the result of tool manufacture.

Given the site's proximity to Quispisisa, Nesbitt et al. (2019b) hypothesized that Arpiri functioned as a node in down-the-line (sensu Renfrew 1975) obsidian exchange with nearby sites such as Campanayuq Rumi, Chupas, Tukri-Apu-Urku, and Pallaucha (Mendoza et al. 2020). These nodes of exchange would continue throughout the coast and highlands, which eventually contributing to a prestige economy associated with Chavín de Huántar.

Figure 3. Flaked obsidian tools from Arpiri exported for geochemical analysis.

	Mean (ppm)	Mean Error (ppm)	Mean Error (%)	SD (ppm)	CV (%)
Mn	351.18	57.32	16.37	26.79	7.63
Fe	5417.95	147.91	2.73	318.37	5.88
Zn	34.05	7.77	22.86	2.16	6.35
Ga	13.73	4.86	35.75	1.63	11.87
Rb	164.77	7.09	4.31	6.30	3.82
Sr	115.64	4.32	3.73	4.07	3.52
Y	11.50	3.00	26.36	1.20	10.41
Zr	90.00	4.00	4.45	3.12	3.47
Nb	8.05	3.00	38.31	1.33	16.54
Th	17.50	3.45	19.76	0.99	5.65

Table 1. Summary of analyzed samples and elemental values from exported artifacts at Arpiri.

Methods and Results

The obsidian artifacts selected for export were chosen for their status as complete or semi-complete tools, specifically scrapers and broken projectile points (Figure 3). Following excavation, twenty-two flaked obsidian tools were exported to the Tulane Center for Archaeology to undergo analysis using the Burker Tracer 5i portable x-ray fluorescence (pXRF), which generated measurements with an operating voltage of 50 kV/39 µA. The machine produces a vacancy in the inner-shell of an atom which it then fills with an outer-shell electron. During this process, x-ray energy is carried out and emits levels unique to each atomic element (Glascock 2011). The homogenous nature of obsidian indicates characteristic levels of certain elements corresponding to geological sources, and pieces from these sources will thus exhibit the standard quantities associated with that specific area.

Before measuring the artifacts, the instrument was calibrated 10 times before each session using an obsidian control sample provided by Bruker. After this, each archaeological sample was irradiated for 60 seconds. The samples were compared with 123 geological samples from major obsidian quarries. Some of these samples were too small, which contributed to noise within the readings and were removed from the analysis because they had high error rates or irregular readings, which narrowed down the sample number to 86.

Statistical Analysis of Geological Sources

We began by testing the variation between the geological samples, to determine whether they would cluster based on similar elemental values specific to each source and/or sub source. The array of sources sampled in this study include both major and minor sources throughout the Andes. This study utilizes the major sources of Quispisisa and Alca. Within the Alca source, there are 7 geochemically distinct subsources, 6 of which were included in this study (Rademaker et al. 2022). Minor source samples came from Anillo and Puzolana (Burger and Glascock 2000b). Samples from Alca, Anillo, and Quispisisa were generously provided by Kurt Rademaker from Texas A&M, while Yuichi Matsumoto (National Museum of Ethnology, Osaka, Japan) and Jason Nesbitt (Tulane University) provided samples from Arco Punco.

The elements recorded by the Bruker Tracer during initial analysis included Fe, Ga, Mn, Nb, Rb, Sr, Th, Y, Zn, and Zr (Table 1) After removing any sample which had a percentage error above 25%, the following elements remained: Fe, Mn, Nb, Rb, Sr, Y, Zn, and Zr.

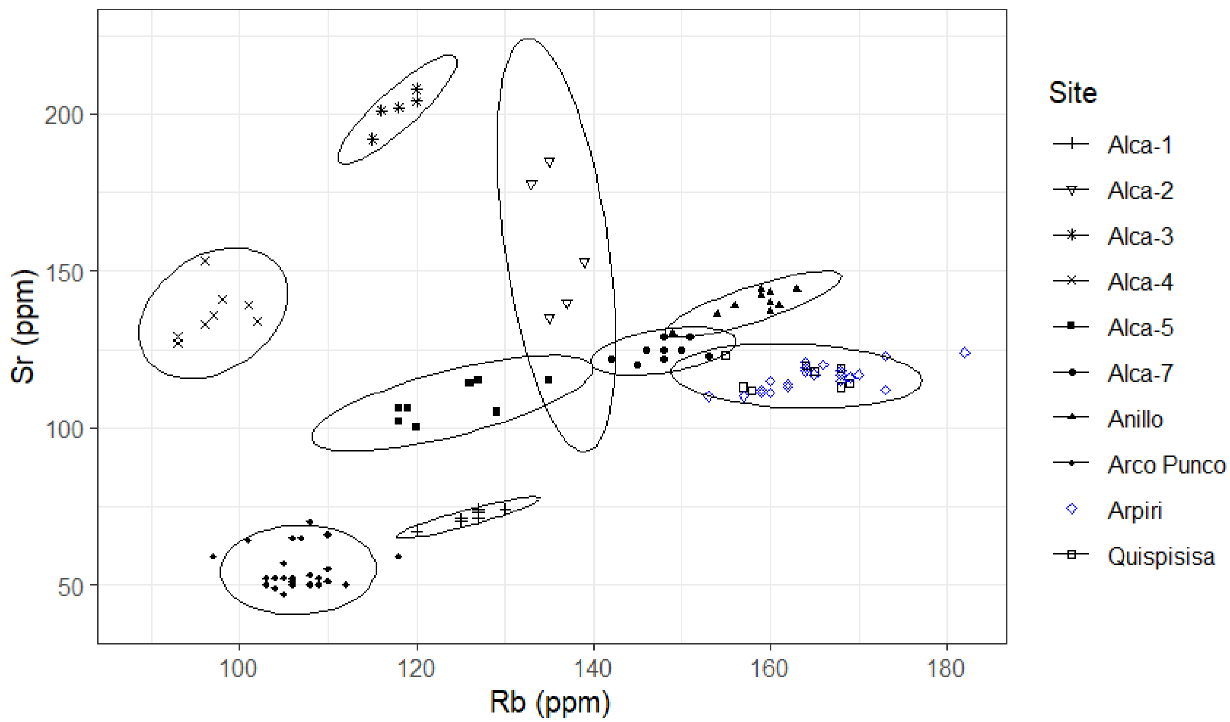

Figure 4. Strontium and Rubidium concentrations among Arpiri obsidian samples and geological sources. Ellipses are made at the 90% confidence interval.

Once the distinctions between different sources were verified, we added the readings from the exported samples to the analysis. All samples were plotted on a biplot showing parts per million (ppm) of rubidium and strontium. The author created 90% confidence ellipses using RStudio 4.4.1. Provenance assignments were made based on proximity to the ellipses of three elements: Rb, Sr, and Zr (Glascock 2011; Menaker and Rademaker 2023). Statistical analysis of the exported obsidian determined all samples originated from the Quispisisa source (Figure 4). This is a unique finding, as other sites in the Ayacucho region indicate a variety of different obsidian sources were utilized (Matsumoto et al. 2018; Mendoza et al. 2020).

Discussion

Arpiri was likely a locus of obsidian production contemporaneous with the obsidian's increased importance in the late second and early first millennia BC. The residents of Arpiri and Pasupata would have exploited the Quispisisa source because of its proximity. It's equally as probable that Arpiri was chosen specifically to utilize the Quispisisa source. The residents of Arpiri would have been working obsidian at the household level and using it in everyday tasks. Obsidian was also traded with other communities, both within the Ayacucho region and to its neighbors on the southern coast within the Ica region, specifically with the Paracas and Nazca cultures. In a survey of Paracas sites along the Cangallo River, DeLeonardis and Glascock (2021) found substantial quantities of obsidian, and provenanced a portion of these to Quispisisa.

Ayacucho is located in a corridor which leads to the southern coast, specifically the Nazca-Palpa region (Mader 2019). The Paracas culture flourished simultaneously with Chavín culture, and Paracas-style sherds have been found throughout formative period sites in the Ayacucho region (Matsumoto

2019). At Arpiri, Paracas-style sherds appeared throughout the stratigraphy of Units 3 and 4, indicating that Arpiri may have been involved in exchange between the coast and highlands.

During survey in Huancasancos, employees of the municipality introduced the excavation team to a nearby site known as Qallopampa. The site is a large, terraced hill and a north-facing plaza context with abundant obsidian on the surface. Qallopampa displays masonry in styles reminiscent of the late Initial Period and Early Horizon, suggesting that it was contemporary with Arpiri and that the two might have been enmeshed in shared obsidian working practices.

Conclusion

Based on the assemblage found at Arpiri, we can thus far assume that the site had obsidian workshops which utilized raw materials from the nearby Quispisisa source. Further excavations will be necessary to better understand the full scope of mining, production, and distribution. We also intend to examine the flaking patterns and tool use at Arpiri to contextualize local tool preferences and site activities. While the extent of occupation at Arpiri has yet to be determined, ceramic styles indicate that there was extensive contact with other settlements in the southern highlands and coast. In these contexts, people would have traded obsidian as well, which eventually would have made its way to the central and northern highlands.

This research contributes to an emerging narrative that suggests that the south-central highlands exhibited a unique trajectory towards social complexity that was partially independent of regions to the north, such as Conchucos or Cajamarca (Matsumoto and Cavero Palomino 2023). We speculate that one reason for this region's pathway to complexity is connected to its access to obsidian, as well as its position along east-west (Mader 2019) and north-south (Matsumoto et al. 2018) exchange routes. Future research at Arpiri will evaluate these ideas through more extensive excavations and more intensive archaeometric analyses of obsidian artifacts.

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ABOUT OUR WEB SITE

The IAOS maintains a website at http://www.deschutesmeridian.com/IAOS/ The site has some great resources available to the public, and our webmaster, Craig Skinner, continues to update the list of publications and must-have volumes.

You can now become a member online or renew your current IAOS membership using PayPal. Please take advantage of this opportunity to continue your support of the IAOS.

Other items on our website include:

- World obsidian source catalog
- Back issues of the *Bulletin.*
- An obsidian bibliography
- An obsidian laboratory directory
- Photos and maps of some source locations
- Links

Thanks to Craig Skinner for maintaining the website. Please check it out!

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Submissions of articles, short reports, abstracts, or announcements for inclusion in the *Bulletin* are always welcome. We accept submissions in MS Word. Tables should be submitted as Excel files and images as .jpg files. Please use the *American Antiquity* style guide for formatting references and bibliographies.

Submissions can also be emailed to the *Bulletin* at IAOS.Editor@gmail.com Please include the phrase "IAOS Bulletin" in the subject line. An acknowledgement email will be sent in reply, so if you do not hear from us, please email again and inquire.

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Regular Member: $20/year*
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ABOUT THE IAOS

The International Association for Obsidian Studies (IAOS) was formed in 1989 to provide a forum for obsidian researchers throughout the world. Major interest areas include: obsidian hydration dating, obsidian and materials characterization ("sourcing"), geoarchaeological obsidian studies, obsidian and lithic technology, and the prehistoric procurement and utilization of obsidian. In addition to disseminating information about advances in obsidian research to archaeologists and other interested parties, the IAOS was also established to:

1. Develop standards for analytic procedures and ensure inter-laboratory comparability.
2. Develop standards for recording and reporting obsidian hydration and characterization results
3. Provide technical support in the form of training and workshops for those wanting to develop their expertise in the field.
4. Provide a central source of information regarding the advances in obsidian studies and the analytic capabilities of various laboratories and institutions

NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF ARMENIA

INSTITUTE OF GEOLOGICAL SCIENCES

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SECOND CIRCULAR

INTERNATIONAL OBSIDIAN CONFERENCE IOC–2026

FROM MAGMA TO ARTIFACT: THE GEOLOGY AND ARCHAEOLOGY OF OBSIDIAN

Yerevan, Armenia, 28 September – 01 October, 2026

Obsidian Hearth, sculpture by Jean-Michel Othoniel (b. 1964), France, 2014, Boghossian Foundation Collection, Lovers Park, Yerevan, 143x200x220 cm

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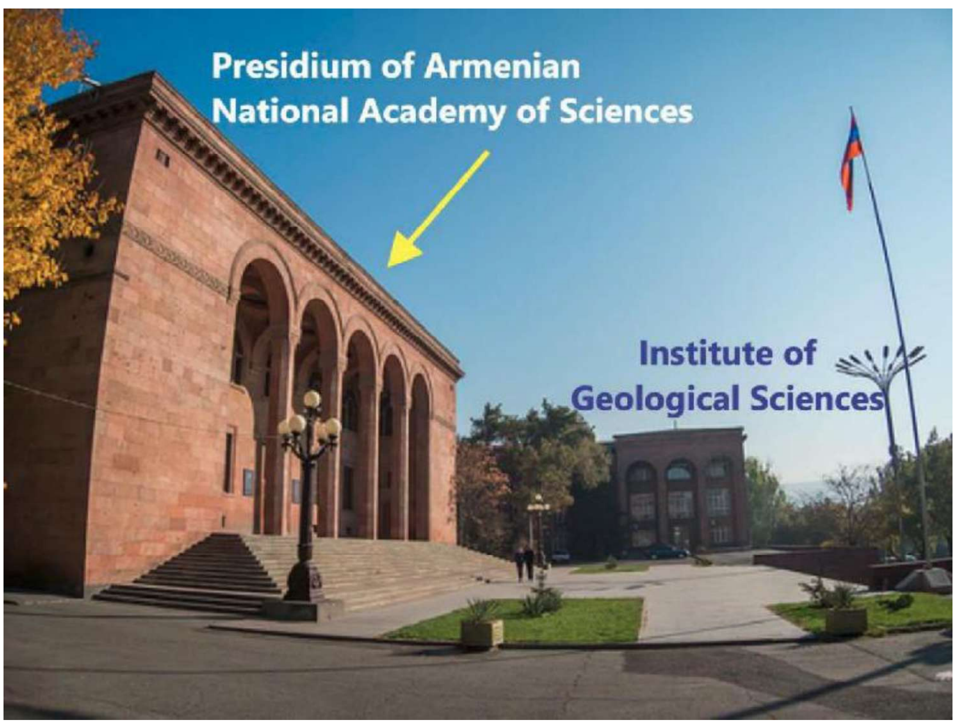
CONFERENCE TOPICS

- **Petrology and geochemistry of obsidians**
- **Volcanic processes and physical properties of rhyolite melts**
- **Provenance studies of archaeological obsidian: source exploitation and raw material distribution**
- **Typological, technological, and use-wear analysis of archaeological obsidian**
- **History and methods of provenance studies in archaeology**

Abstracts volume with ISBN and DOI will be printed and distributed over conference web-site

CONFERENCE VENUE

ROUND HALL OF THE PRESIDIUM OF ARMENIAN NATIONAL ACADEMY OF SCIENCES



VISA INFORMATION

- ***Citizens of all European Union countries, Switzerland, UK, the USA, China, Iran, Japan, Brazil, Argentina and the states of former USSR republics do not need visas to enter Armenia.***
- ***Citizens of many countries can easily get visa on arrival at the Yerevan Zvartnots international airport (visa fee is ~ USD 6).***
- ***Citizens of some countries are required to apply for visa beforehand***

For more information about the visa policy of Armenia, please check the regularly updated websites:
http://mfa.am/en/visa/
https://en.wikipedia.org/wiki/Visa_policy_of_Armenia

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The new terminal of Yerevan Zvartnots International Airport was built in 2013. Currently more than 30 airlines operate flights to and from Yerevan, totally about 40 flights per day from/to Europe, Asia, Russia and the Middle East. Among them: Air Armenia, Air France, FlyOne, Lufthansa group/Austrian Airlines, Qatar Airways, Aeroflot, S7 Airlines, China Southern Airlines, Lot Polish Airlines, Air Arabia, Aegean Airlines, Brussels Airlines, WizzAir and others.

Airport website: www.zvartnots.aero

HOTELS IN YEREVAN

A large selection of hotels is available in Yerevan – from luxury to affordable.

BACKGROUND: OBSIDIAN OCCURENCES IN ARMENIA

Evidence of the Quaternary and Holocene volcanism in Armenia include plateau-basalt lavas, several large stratovolcanoes (e.g. Aragats) and associated ignimbrites. In Armenia, there are more than 500 Quaternary–Holocene monogenetic volcanoes located in several volcanic fields/highlands and forming one of the densest volcano clusters on the Earth. Compositionally, Armenian Quaternary magmas range from picrobasalts and basanites to rhyolites, and reveal unique geochemical fingerprints of collision zone volcanism that differ from those at island arcs, continental intraplate/oceanic islands settings and mid-ocean ridges. Armenia, with its extensive Pliocene–Quaternary volcanism, hosts high-quality obsidian in five volcanic provinces. Many sources are accessible and show archaeological evidence of prehistoric use. Obsidian was a valuable raw material in prehistoric times across the Caucasus, Near East, and Mediterranean, often found far from its geological sources. Its geochemical properties enable precise provenance tracing, shedding light on ancient trade routes and regional resource utilization. Unlike metals, obsidian retains its composition during tool production, and its distinct geochemical signatures allow clear source differentiation.

Distribution of obsidian sources in Armenia, Georgia and Eastern Turkey (after Meliksetian et al., 2024).

CONFERENCE SCHEDULE

DATES: 28 September – 01 October 2026

CONFERENCE FORMAT

The conference format will be onsite.

Abstract submission deadline: May 15, 2026

REGISTRATION FEES

Onsite regular participants – 200,000.00 Armenian drams (~500 USD)

Onsite student participants 100,000.00 Armenian drams (~250 USD)

Accompanying persons - 100,000.00 Armenian drams (~250 USD)

Online (Remote) participants – 20,000.00 Armenian drams (~50 USD)

Payment on site will be possible, but an additional fee of 50 USD will be charged.

The Registration fee includes:

- ***Attendance at the scientific sessions***
- ***Coffee breaks and lunches during the meeting***
- ***Printed abstracts volume and excursion guide***
- ***Transportation and lunch during two mid-conference field trips***
- ***Conference banquet***
- ***Conference materials and an obsidian souvenir***
- ***Guided tour to the History Museum of Armenia***
- ***Welcome "Icebreaker" event***
- ***Special sightseeing travel program will be offered to the registered accompanying persons***

The registration fee refunds will be available up to one month prior to the conference.

The registration fees do not include the costs of international travel and accommodation in Yerevan.

Abstracts should be prepared in the following format:

Font: Times New Roman, 12 pt

Line spacing: 1.5

Margins: 2.5 cm on all sides

Maximum length: 400 words

Include title, authors, affiliation, and email

Indicate preferred presentation type via email (oral or poster)
Please submit your abstract in Word to IOC2026@geology.am

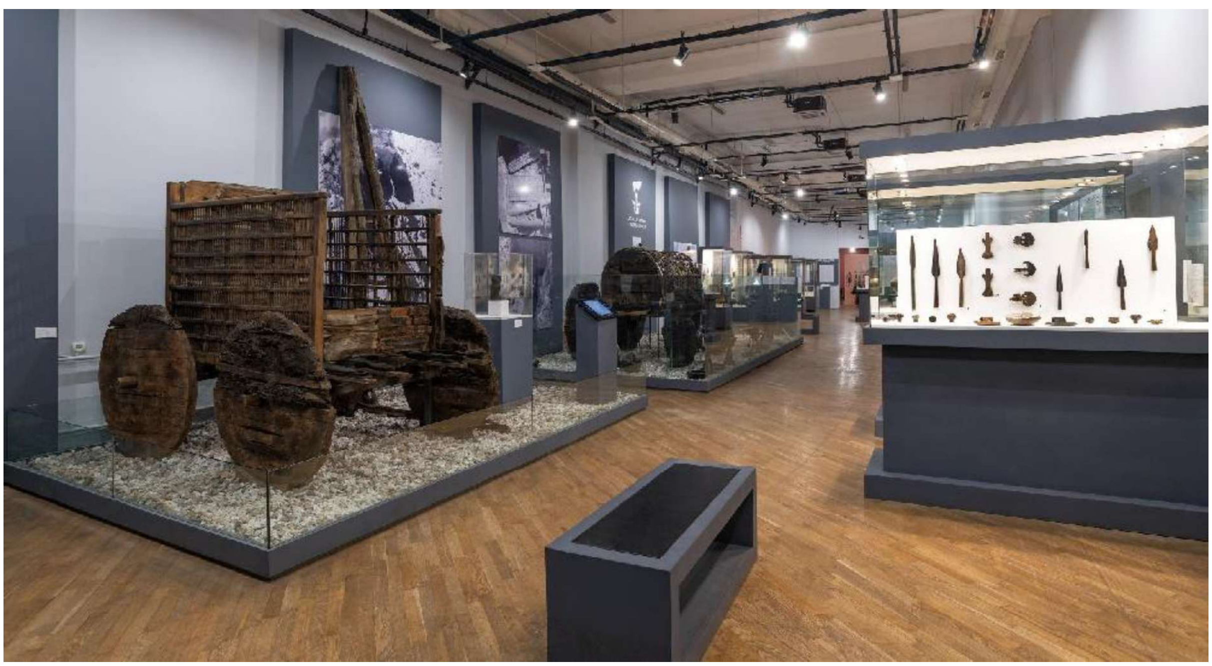
GUIDED TOUR TO THE HISTORY MUSEUM OF ARMENIA

The History Museum of Armenia is a nationally significant cultural institution dedicated to preserving and showcasing Armenia's heritage. With a collection of over several hundreds of artifacts spanning from Paleolithic times to today, the museum serves as a bridge between the past and the future, contributing to science, education, and tourism.

History Museum of Armenia

Obsidian nuclei (Neolithic, VI Mil. BC) in the museum exhibition

Exhibition of History Museum of Armenia



Exhibition of History Museum of Armenia

MID CONFERENCE FIELD TRIP 1: ONE DAY, INCLUDING ARTENI OBSIDIAN SOURCE AND BAROZH-12 MIDDLE PALEOLITHIC SITE

Arteni rhyolite (obsidian) volcano

Arteni volcanic complex is located within Aragats volcanic province. The age of Arteni rhyolites considered to be Early Pleistocene; K-Ar ages are: for Mets Arteni 1.45–1.5 Ma (Chernishev et al., 2002); fission track ages –1.27 Ma (Oddone et al., 1999) and 1.26 Ma for Pokr Arteni (Lebedev et al., 2011). Thus, rhyolitic eruptions and the formation of domes of Arteni volcano correspond to the Early Pleistocene. Eruption products of Arteni volcano are covered by more recent Middle Pleistocene andesitic lava flows of neighboring Ddmasar cinder cone and ignimbrites of Aragats stratovolcano.

Arteni is the most compound rhyolitic volcanic complex in Armenia, and it consists of two independent rhyolitic volcanoes: Mets (Big) and Pokr (Little) Arteni (2047 and 1754 m asl, respectively). Volcanic activity began with an eruption of perlite-pumice pyroclastics, followed by eruptions of detrital perlite and zonal obsidian that flowed westward and southward; shorter flows also went northward. Arteni obsidian is of high quality; "smoky quartz" of the translucent, reddish-brown, black, and other varieties are known.

Arteni volcanic complex in Armenia, Aragats volcanic province.

Products of explosive eruptions of rhyolite pumice and perlite pyroclastics (left). Obsidian cliff in small modern quarry across a lava flow erupted from Pokr Arteni volcano(right).

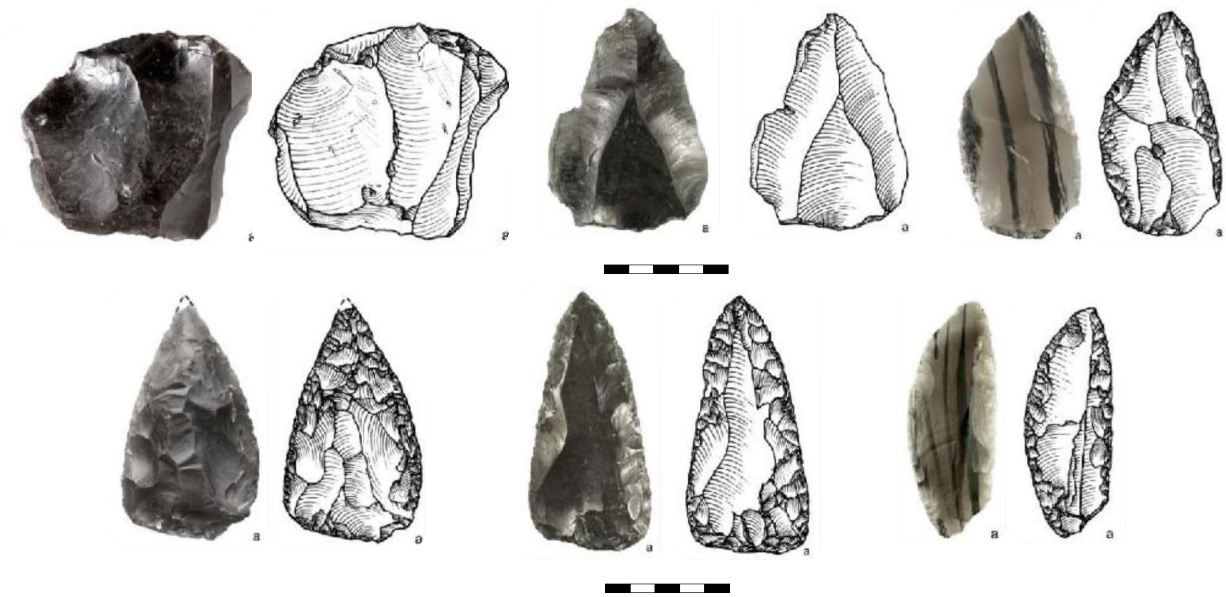
Barozh-12, Middle Paleolithic open-air site and obsidian workshop

Located in western Armenia, at the edge of the Ararat Depression near the Mt Arteni volcano, the open-air Middle Paleolithic site of Barozh-12 was excavated by an international–Armenian archaeological team from 2009 – 2014 (Glauberman et al., 2020a,b). This site yielded significant data on Late Middle Paleolithic technology, land use, and hominin behavior in a region that has heretofore been little explored. The lithic assemblage appears similar to those from other contemporaneous Middle Paleolithic sites in the region, and luminescence age estimates indicate the site was occupied around 60 – 31 ka, the time range when archaic and anatomically modern humans may have overlapped temporally and/or geographically. Barozh-12 is a large, high-density Middle Paleolithic site. A total of 4.85 m^3 of excavated sediments yielded 17,317 obsidian artifacts with densities ranging from 1600–5200 artifacts / m^3 according to stratigraphic unit.

Unidirectional-convergent and unidirectional Levallois core reduction techniques dominate in the core and flake assemblage, and retouched pieces are numerous. These are mainly retouched Levallois points and convergent and other unifacial scraper forms on Levallois blanks.

View of Barozh-12 open-air Paleolithic site and test trench.
Arteni volcano is in the background.

Surface and excavated artifacts are of all size classes and technological categories, including tool re-sharpening flakes and core trimming elements. Artifacts class frequencies and cortex analysis also suggest that all stages of core reduction and tool use, maintenance and discard occurred on site. While artifact assemblage analysis also reveals that site occupation intensity varied over time at the site.
The extent of a 'raw material exploitation territory' is suggested by obsidian sourcing. Results of portable X-Ray fluorescence (pXRF) analysis of samples of obsidian artifacts from all strata (n = 318) indicate that most were manufactured from local (1 – 2 km) Pokr and Mets Arteni material, while a smaller number of mainly retouched artifacts were manufactured on material that originates between 40 and 190 linear km away. Artifact transports overlap with sources in the Armenian Highlands and eastern Anatolia, and other Middle Paleolithic sites within the same time range. Interestingly, obsidian sourcing at the Upper Paleolithic site of Aghitu-3, around 200 km to the south of Barozh-12 also shows exploitation of the same obsidian sources. This suggests overlapping mobility ranges of hominins that employed both Middle and Upper Paleolithic technologies in the region starting around 40 ka.



Selected artifacts from Barozh-12: 1 Levallois core; 2 Levallois point; 3 Double straight-convex scraper; 4 Mousterian point; 5 Convergent scraper; 6 Double straight-convex scraper (modified after Glauberman et al. 2020a)

References

Glauberman, P., Gasparyan, B., Wilkinson, K., Frahm, E., Nahapetyan, S., Arakelyan, D., Raczynski-Henk, Y., Haydosyan, H., Adler, D.S., 2020a. Late Middle Paleolithic technological organization and behavior at the open-air site of Barozh 12 (Armenia). *Journal of Paleolithic Archaeology* 3, 1095-1148.

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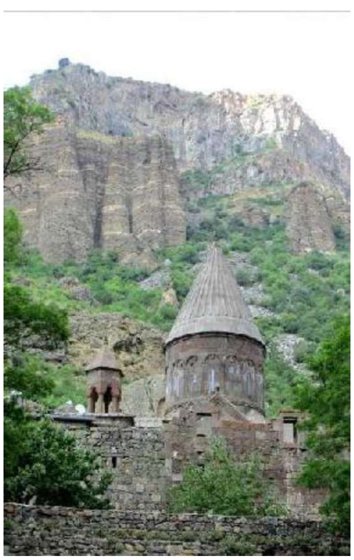
MID-CONFERENCE FIELD TRIP 2: GARNI HELLENISTIC TEMPLE, COLUMNAR JOINTS LAVA FLOW, GEGHARD MONASTERY, GUTASNAR OBSIDIAN SOURCE

Garni and Geghard

a. Visit to 1st century AD Classical Hellenistic temple of Garni.
b. Visit to gorge of Azat River, spectacular columnar joints lava flow and Garni active fault.
c. Visit to 4th – 13th Century AD Geghard monastery and view of Voghjaberd volcanoclastic suite of Upper Miocene – Pliocene age.
d. Gutansar volcano and obsidian outcrops.

Garni Hellenistic temple



Geghard Monastery

Columnar lava flow in Garni, 127 ka

Jraber extrusive body related to the Gutansar volcanic complex.
Obsidian outcrop on the Yerevan-Sevan highway