



IAOS

International Association for Obsidian Studies

Bulletin

ISSN: 2310-5097

Number 64

Summer 2020

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International Association for Obsidian Studies

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Web Site: <http://www.deschutesmeridian.com/IAOS/>

NEWS AND INFORMATION

NEWS AND NOTES

Have news or announcements to share?
Send them to IAOS.Editor@gmail.com for
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!

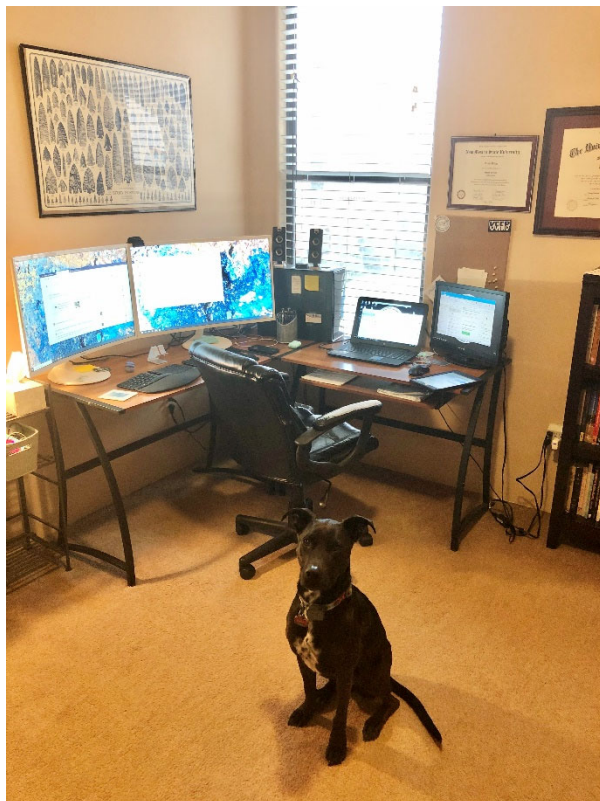
IAOS MEETING ONLINE FOR 2020

Due to the current COVID-19 pandemic, the SAA canceled its annual conference in Austin, Texas, for 2020. As a result, the in-person IAOS meeting was also canceled. However, the IAOS Executive Board held a virtual IAOS meeting instead. Please see the President's column on the second page for additional details. Minutes of that meeting can be found on the IAOS website:

http://www.deschutesmeridian.com/IAOS/Annual_Meeting_2020_Minutes.pdf

NOTES FROM THE PRESIDENT

Hello IAOS members, my name is Sean Dolan, and I am the new President of the IAOS. I take over from Kyle Freund, and I thank him for his leadership over the past few years. As a member of the Cultural Resource Management (CRM) community in New Mexico, one of my goals as your President is to network with other professional archaeologists and to encourage them to publish their obsidian research in our *IAOS Bulletin*. Many small and large compliance projects use obsidian sourcing, hydration dating, and lithic technology to help answer questions about past human behavior, and regional and temporal cultural patterns. Unfortunately, these data are often not accessible or presented at archaeological meetings, even though the accumulation of these obsidian data is of substantial interest to our readers. If you have data and would like to contribute to the *IAOS Bulletin*, please contact Carolyn Dillian at IAOS.Editor@gmail.com to submit an article, research update, news, or lab report.



Right now, the world is dealing with the impact of Covid-19. I bet many of you are adapting to life working from home or teaching and/or taking courses online while caring for your family. I am fortunate to be working from home, and my dog is enjoying the extra walks (see my photo here)! However, many archaeologists are not so lucky and have had to cancel summer field schools or field projects due to the pandemic. My research on turkey domestication in New Mexico has slowed down because university laboratories around the world have shut down or are working with reduced staff. Luckily, however, Steve Shackley has his EDXRF spectrometer in his house, and I was able to submit obsidian artifacts from southern New Mexico for analysis. I'm writing the paper, and I'll hopefully have it finished for the next issue. Now is a great time to finish those manuscripts, final site reports, or to develop new projects. I hope to see many new research articles published in future years that people started or finished during this time.

As the new year is upon us, please take care of your IAOS membership dues. Membership dues help the IAOS host conferences like the International Obsidian Conference (IOC). The next IOC will be at the University of California, Berkeley, on April 10–13, 2021, preceding the Society for American Archaeology (SAA) meeting in San Francisco. The IAOS, Far Western Anthropological Research Group, Inc., and the Archaeological Research Facility at U.C. Berkeley are hosting. IAOS members will receive a discount for conference registration. Please see the IOC circular in this issue of the *IAOS Bulletin* for additional information. We look forward to seeing everyone there, and please consider submitting an abstract to present.

Although we did not have an in-person IAOS meeting this year due to the cancellation of the SAA meeting in Austin, Texas, the IAOS

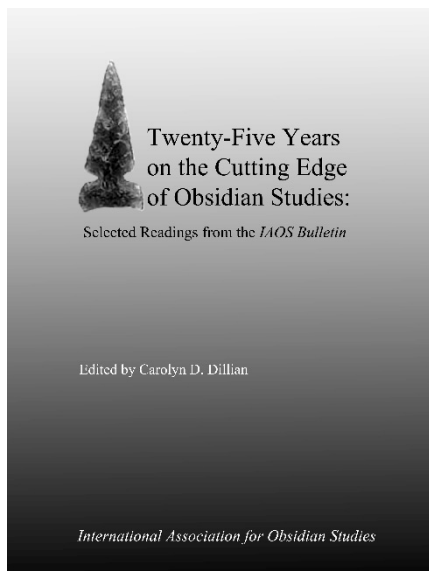
Officers met using Zoom. You can read the meeting minutes on the website, <http://www.deschutesmeridian.com/IAOS/index.html>. During the meeting, we discussed the newly passed By-law amendments (included here in the *IAOS Bulletin*), and you can also download the updated By-laws on the website. Also, Lucas Martindale Johnson takes over from Matt Boulanger as the new Secretary-Treasurer. Matt has served as the Secretary-Treasurer for the past five years, and we thank him for his work!

Since the 2020 SAA meeting was canceled, many researchers were not able to present their papers or posters. The IAOS is working towards contacting those who would have presented their obsidian research for possible submission to the *IAOS Bulletin*.

Also, I would like to congratulate Dr. Rafael Alejandro Pastrana Cruz for winning the 2020 SAA Award for Excellence in Archaeological Analysis. Dr. Pastrana has spent decades working on many aspects of the Sierra de Las Navajas obsidian source (also known as Pachuca) in Hidalgo, Mexico. Finally, be sure to check out *IAOS Bulletin* #63. This special issue by Alexander “Sandy” Rogers and Chris Stevenson is devoted to new obsidian hydration dating research.

Stay safe!

Sean Dolan, IAOS President
sgdolan@gmail.com



Twenty-Five Years on the Cutting Edge of Obsidian Studies: Selected Readings from the IAOS Bulletin

Edited volume available for purchase online!

As part of our celebration of the 25th anniversary of the IAOS, we published an edited volume highlighting important contributions from the *IAOS Bulletin*. Articles were selected that trace the history of the IAOS, present new or innovative methods of analysis, and cover a range of geographic areas and topics. The volume is now available for sale on the IAOS website for \$10 (plus \$4 shipping to U.S. addresses).

http://www.deschutesmeridian.com/IAOS/iaos_publications.html

International addresses, please contact us directly at IAOS.Editor@gmail.com for shipping information.

The Award for Obsidian Provenance Studies Given to Yaroslav V. Kuzmin by the 4th Shanghai Archaeology Forum

Yaroslav V. Kuzman

Sobolev Institute of Geology and Mineralogy, Siberian Branch of the Russian Academy of Sciences

On 14–17 December 2019, the 4th Shanghai Archaeology Forum (SAF) took place at the campus of Shanghai University, organized by the Institute of Archaeology, Chinese Academy of Social Sciences (Beijing), and by the Chinese Society of Archaeology.

The SAF was established in 2013, with the purposes to promote archaeological inquiry of past cultures and civilizations worldwide, in order to increase understanding of the human past and the relevance of this knowledge to the contemporary world; and to foster the global advancement of archaeological research by encouraging international collaboration and partnerships.

For the 4th SAF, 116 award nominations were received, and they were carefully evaluated by 71 experts from the Nomination Committee, which selected 40 applications for the shortlist. Afterwards, the Evaluation Committee, consisting of 40 scientists from 18 countries, voted for the award winners. In total, 19 Field Discovery awards and Research awards were given to scholars from USA, China, UK, Turkey, France, Germany, Philippines, Peru, Mexico, Brazil, Russia, and South Africa. Professor Jane Buikstra (Arizona State University, Tempe, AZ, USA) was given the Lifetime Achievement award for works in the field of bioarchaeology (the study of human remains in ancient settlements).

The list of all award winners can be seen at the SAF's website: <http://shanghai-archaeology-forum.org/index.php/2019-saf-awards/>.

Award-winning Project by Yaroslav V. Kuzmin (Sobolev Institute of Geology and

Mineralogy, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia), entitled “Obsidian Provenance in Northeast Asia: Gaining Solid Evidence for Prehistoric Exchange and Migrations” (see the link: <http://shanghai-archaeology-forum.org/index.php/2019-saf-ar-22>), is based on studies of sources of archaeological obsidian in Northeast Asia as a way of reconstructing the exchange of raw materials and migrations of the ancient populations. The results obtained during 25+ years of research in the Russian Far East (Primorye [Maritime] Province, Amur River basin, Sakhalin Island, and Kamchatka Peninsula) and Northeast Siberia (Chukotka, the Kolyma and Indigirka river basins, and the New Siberia islands) formed the basis for understanding the processes of obsidian acquisition and use in prehistory of these regions. By identifying obsidian sources used by the ancient populations of a vast area, including the Far East and North-East of Russia, Japan, Korea, Manchuria and Alaska, it was established how and when the exchange of valuable raw materials occurred, which made it possible to determine with a high degree of reliability the direction and time of migrations and contacts in the past.

The video with the 18 minute presentation by Y. Kuzmin at the 4th SAF can be seen here: <https://www.youtube.com/watch?v=Kd97QSN8XDQ>.

Throughout all these years (1992–2019), Y. Kuzmin and his colleagues were working closely with Dr. Michael D. Glascock (Missouri University, Columbia, MO, USA)

who analyzed hundreds of obsidian samples from the Far East and North-East of Russia, and his contribution to this award should be mentioned.

Professor Emeritus Colin Renfrew (Cambridge University, UK), winner of the first SAF Lifetime Achievement award (2015), attended the 4th SAF as an honorary guest and the member of the Evaluation Committee. In 1964, C. Renfrew and Johnson Cann laid the foundation for the study of obsidian sources for archeology. In December 2017, C. Renfrew suggested to Y. Kuzmin to seek the nomination of the SAF, and gave his support.

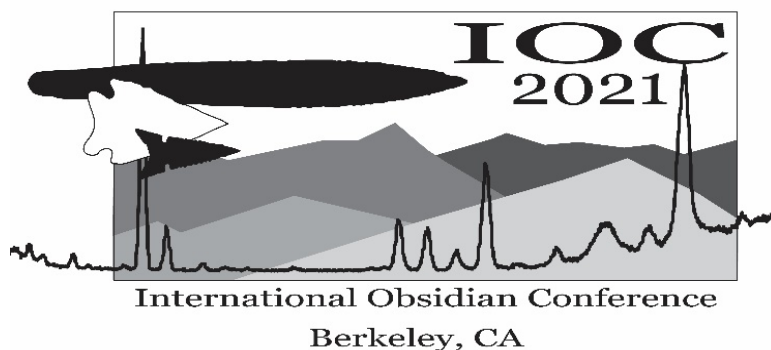
Recent Y. Kuzmin's SAF award, along with two SAA Fryxell awards for interdisciplinary research to Michael D. Glascock (2009) and M. Steven Shackley (2019), highlight the importance of obsidian provenance studies worldwide.



C. Renfrew (right) and Y. Kuzmin and the 4-th SAF, December 2019.

International Obsidian Conference 2021

2nd Circular – IOC 2021



Venue: University of California Berkeley Campus

Hosted by the *Archaeological Research Facility (ARF)*, *International Association of Obsidian Studies (IAOS)*, and *Far Western Anthropological Research Group, Inc. (Far Western)*

April 10 - 13, 2021

(Preceding the Society for American Archaeology Annual Meeting in San Francisco)



FAR WESTERN
ANTHROPOLOGICAL RESEARCH GROUP, INC.

Dear Friends and Colleagues,

We enthusiastically invite you to participate or attend the International Obsidian Conference to be held on the UC Berkeley Campus between April 10-13, 2021.

As before, our aim is to invite specialists on all aspects of obsidian studies extending from natural sciences to anthropology. Following prior meetings, we hope the conference will stay global in scope, yet highlight obsidian studies in the Americas. Because the geologies of North America are so diverse, we also aim to include semi-glassy fine-grained volcanics (FGV) used by Amerindians in the Great Basin and other regions in the Americas.

Suggestions for conference sessions and themes:

- Formation and geology of obsidian and FGV
- Sources and their characterization
- Analytical and methodological aspects
- Archaeological obsidian and FGV by chronological periods
- Lithic technology and use wear
- Theoretical and cultural concerns

Conference Updates

Minor updates of note:

- 1) There is a location for submitting registration and abstract information on the recently updated IOC homepage through the UC Berkeley Archaeological Research Facility (see below).
- 2) The dates of registration and payment options have changed to allow more time for submissions and to incentivize attendees to become members of the International Association for Obsidian Studies (IAOS).
- 3) Dr. Steven Shackley has accepted our invitation to give a Keynote speech during the conference.
- 4) The Archaeological Research Facility (ARF) plans to publish the conference proceedings in their publication series that began in 1960. This publication series has seen many seminal works on obsidian studies, and we anticipate our conference proceedings to be an important addition to this legacy.
- 5) Our excursion to Napa Valley is shaping up to include a visit to a quarry location as well as a local winery and vineyard.

Local Organizing Committee

- Nicholas Tripcevich – University of California, Archaeological Research Facility
- Lisa Maher – University of California, Anthropology
- Lucas R. M. Johnson – Far Western Anthropological Research Group, Inc.
- Kyle Freund – Indian River State College, Anthropology
- Tom Origer – Origer and Associates

Scientific Committee

- Biró, Katalin - Hungarian National Museum, Budapest, Hungary
- Glascock, Michael - University of Missouri, Columbia, MO, USA
- Kuzmin, Yaroslav - Institute of Geology & Mineralogy, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia
- Le Bourdonnec, François-Xavier - Université Bordeaux Montaigne, Pessac, France
- Lexa, Jaroslav - Earth Sciences Institute of the Slovak Academy of Sciences, Bratislava, Slovakia
- Markó, András - Hungarian National Museum, Budapest, Hungary
- Ono, Akira - Meiji University, Tokyo, Japan
- Torrence, Robin - Australian Museum, Sydney, Australia
- Tykot, Robert - University of South Florida, Tampa, FL, USA
- Vianello, Andrea - University of South Florida, Tampa, FL, USA

Partnering Institutions

UC Berkeley

Contact Persons

The conference email address is obsidian2021@gmail.com. Please direct questions to this address.

Kyle Freund, Ph.D.; Lucas R. M. Johnson, Ph.D.; Nicholas (Nico) Tripcevich, Ph.D.

Technical Information

Duration and Dates: 3 days, April 10-12, 2021

Post Conference Excursion: 1 day, April 13, 2021

Location: UC Berkeley campus (International House, Rooms Ida and Robert Sproul)

Keynote Speech: Dr. Steven Shackley

Oral Contributions: Oral contributions will be 15 minutes, followed by a 5-minute discussion. Please prepare them in common presentation format (e.g., PPT). Video conferencing will be a possibility for registered participants, but we would prefer you present in person.

Poster Presentations: The posters should be planned as standing (portrait) orientation and their size must not exceed A0 (841 x 1189 mm).

Abstracts: must not exceed 300 words

Language: The official language of the conference is English.

Deadline for submitting abstracts: January 15, 2021

Deadline for registration: January 15, 2021 for presenters (April 1, 2021 for attendees not presenting a poster or paper)

Submission location: <https://forms.gle/JnaWkzRuuxQMV4ZQ6>

Registration Fee:

Full registration	\$100 USD
IAOS Member Registration	\$80 USD
Early-bird registration (before October 1, 2020)	\$80 USD
Early-bird registration for IAOS members	\$75 USD
Distance participants (Web-based presentations)	\$50 USD
Students and accompanying persons	\$50 USD
Early-bird registration (October 1, 2020)	\$40 USD

Other costs:

Conference dinner, venue TBA	\$50 USD
Excursion to quarry and winery	TBA

Registration payment method: PayPal (no PayPal member account is required)

Post Conference Excursion

Visit to Napa Valley obsidian quarry in the mid-morning and then a visit to Hendry Vineyards. Price TBA. Duration 1 day. Lunch will likely be picnic style with deli sandwiches, etc.

Winery details:

Hendry Vineyard (<http://hendrywines.com/>).

Accommodations

UC Berkeley is located in the center of town with many hotel options. Accommodations can also be found in Oakland, Emeryville, and San Francisco. Mass transit or ride-shares are easily accessible no matter where you stay. If you stay in downtown Berkeley, most everything is just a short walk away, including restaurants and grocery.

Transportation

UC Berkeley is located in the center of town near to Bay Area Rapid Transit (BART) stops. The campus can be reached in about 30 minutes from the Oakland International Airport and about 1.5 hours from the San Francisco airports by BART. Taxi and rideshare services are faster but more expensive. Via BART the cost is about \$10-12 USD.

Publication of Proceedings

Contributions of the Archaeological Research Facility, Berkeley
<https://arf.berkeley.edu/publications/contribution-series>

Conference Homepage

<http://arf.berkeley.edu/projects/ioc2021>

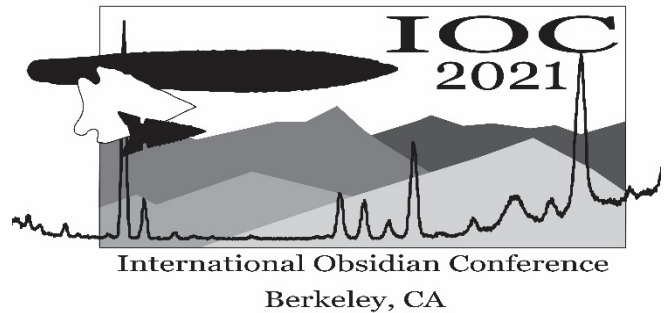
Please forward this circular to anybody who may be interested.
We look forward to seeing you in 2021!

Lucas, Kyle, and Nico

Registration Form – IOC 2021

<https://forms.gle/JnaWkzRuuxQMV4ZQ6>

International Obsidian Conference,
at the University of California Berkeley
Campus, April 10-13, 2021



Personal Information

NAME:

FIRST NAME-

FAMILY NAME-

GENDER:

TITLE:

AFFILIATION:

INSTITUTION-

DEPARTMENT-

ADDRESS-

CITY-

COUNTRY-

POSTAL CODE-

TELEPHONE-

EMAIL-

I INTEND TO PRESENT A LECTURE:
YES NO

I INTEND TO PRESENT A POSTER:
YES NO

I AM A STUDENT (CONFIRMATION NEEDED, E.G., STUDENT
ID CARD)

YES

NO

I AM AN ACCOMPANYING PERSON

YES

NO

ANY SPECIAL REQUEST(S)

On-line registration will be open from June 1, 2020 at the conference web page:

<http://arf.berkeley.edu/projects/ioc2021>

Thank you for your participation and please let us know if you have any questions:

obsidian2021@gmail.com

HANDHELD ED-XRF ANALYSIS OF OBSIDIAN FROM THE CLASSIC MAYA CITY OF PALENQUE, CHIAPAS, MEXICO

Lucas R. Martindale Johnson,^a Lisa M. Johnson,^b Jordan Kobylt,^c and Cheyenne Laux^c

^a Far Western Anthropological Research Group, Inc., Desert Branch, USA

^b University of Nevada, Las Vegas, Department of Anthropology, USA

^c University of California, Berkeley, Department of Anthropology, USA

Introduction

The Classic Period (250 – 900 A.D.) Maya city of Palenque is located on the Western border of the Maya cultural region, in what is today, Chiapas, Mexico. Following a century of excavations, epigraphy and art history, we understand Palenque as a powerful political center in the wider Maya region with far-reaching political, military, and economic ties. The core area of Palenque is roughly 2.2 square kilometers and made up of 1,500 mapped visible structures. The height of the city's occupation, reaching an estimated 4,147 – 6,220 was during the Late Classic period, between 600's and late 700's (Barnhart 2007). Much of the city's major monumental structures and a few elite residential structures immediately adjacent to these areas have been excavated by multiple archaeological projects. More recently, the Palenque Regional Project (PRP), has initiated intensive archaeological investigations within the city's residential sector to further our understanding of Palenque's social organization and life within the city. Included in that study is a series of analyses of excavated materials.

This report presents the results of a geochemical sourcing analysis of a small obsidian assemblage from an elite residential group, "Group IV." "Group IV" was the residence of a politically connected, and influential social group situated just 300 meters northeast of the city's palace compound. The residential group was composed of multiple structures enclosing a central patio space. Excavations in 2016 and 2017 were concentrated on two funerary structures within

the residential group, structures J6 and J7 (Figure 1; see also Johnson 2018: 57, Figure 5). A series of carbon dates recovered from J7 on the eastern side of the patio group range between 534 – 710 CE or Late Classic Period. Structure J6, on the northeast corner produced a carbon date ranging from 768 – 905 CE or Terminal Classic Period (see Johnson 2018, Appendix 2). The obsidian that forms the basis of this study was recovered from primary contexts including burials and ritual deposits as well as secondary contexts, particularly the mixed matrix that made up the construction "fill" in both funerary shrines. Figure 2 shows a three-dimensional image of structure J7 with a buried altar exposed that is just beneath the latest construction phase.

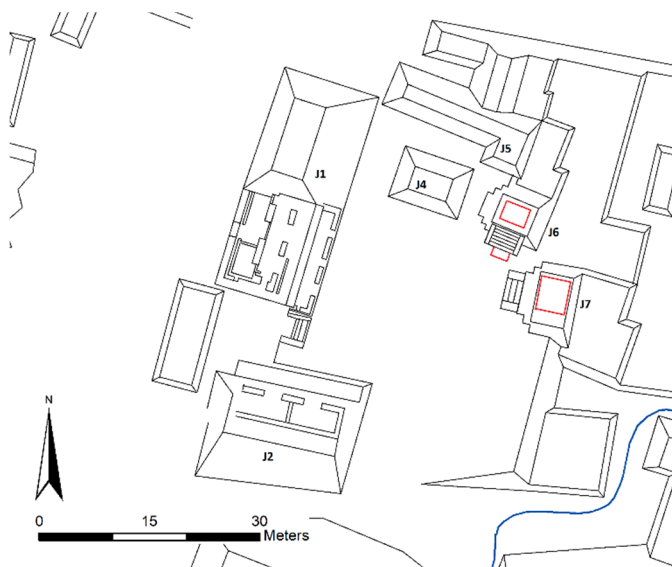


Figure 1. Overview of Group IV investigations. Note structures J6 and J7 are on the eastern side of the open central plaza (Arianna Campiani 2016, used with permission)

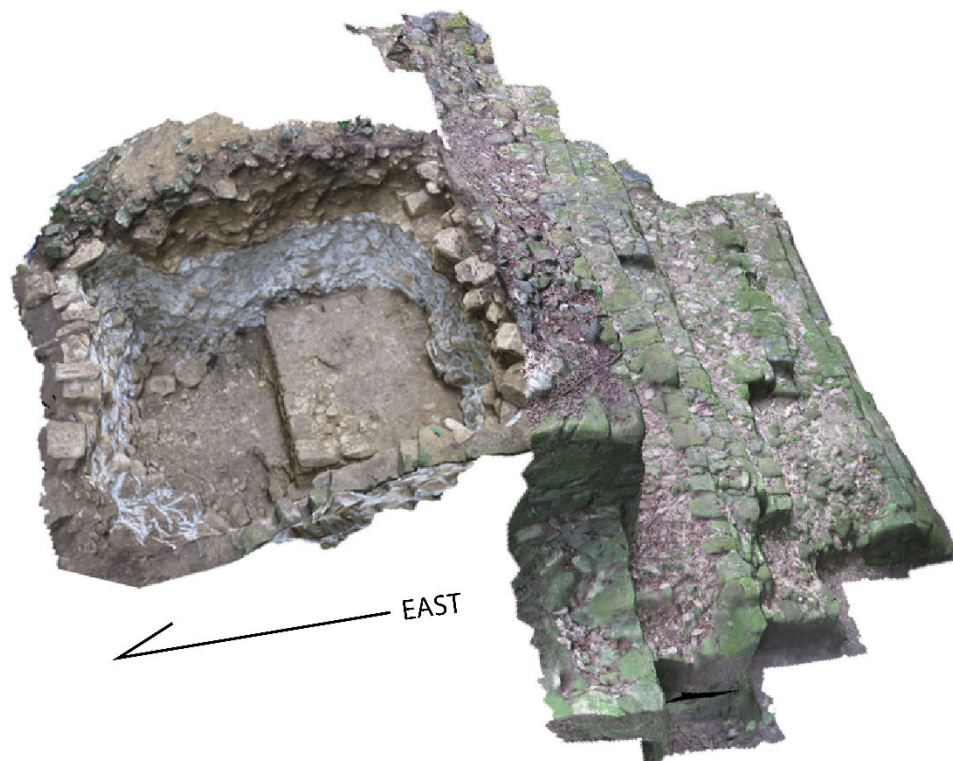


Figure 2. Three-dimensional overview of structure J7 during excavation. Note the buried central altar (Arianna Campiani 2016, used with permission).

Material and Methods

Analysis from two excavations included 189 artifacts. After initial inspection of the XRF spectra, one was determined to be a dark chert and is therefore not included in results. Cherts are easily identified during initial review of spectra; they exhibit no or very small peaks of trace elements common to obsidian spectra. If peaks are present among mid-z elements (i.e., Sr-Nb), they often equate to less than ten parts per million (ppm) for elements.

The artifacts include technological types common to Mesoamerican blade production. These include exhausted core fragments, core maintenance debitage, and used and unused blades, mostly medial fragments. Technological analysis followed those outlined by Kenneth Hirth (2006). Noteworthy here is that many of the blade specimens are relatively

thin, 1-3 millimeters and thus are likely to provide lower count rates while using XRF (see below). These lower count rates often significantly alter the predicted ppm from common obsidian calibration methods (see Davis et al. 2011; Ferguson 2012 for discussions). Due to these limitations, we used other methods beyond ppm to source smaller and thinner artifacts following those procedures outlined by Richard Hughes (2010) and others where the use of ratioed net peak counts are useful as well as the use of peak percentages.

Assigning our modest sample to known obsidian sources in Mesoamerica was possible through comparison with a sample of geological source material. The element concentrations of the geological reference materials are summarized in Table 1. These

source references were generously provided by Mike Glascock and Jeff Ferguson from the University of Missouri Research Reactor (MURR) to Lucas Johnson as part of his dissertation research through the University of Florida and the Archaeological Research Facility (ARF) at the University of California Berkeley (see Johnson 2016).

Energy dispersive XRF (ED-XRF) analysis was conducted using a Bruker Tracer III-SD handheld XRF analyzer (Serial Number T3S1330) owned by the ARF. This XRF is equipped with a rhodium (Rh) X-ray tube and specimens were analyzed at 40 kV and 12.3 μ A for 180 live seconds with a 10-square-millimeter XFlash® detector, using a “green” filter composed of six mils copper, one mil titanium, and 12 mils aluminum without a vacuum (Ferguson 2012:412). The resolution of the detector is approximately 145 eV at 200,000 counts per second. The X-ray beam

focuses on an area of approximately two by three millimeters.

Each scan records intensities for the K-alpha peaks of manganese (Mn), iron (Fe), zinc (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb), and the L-alpha peaks of thorium (Th). Trace-element peak intensities for these elements are normalized to the Compton scatter peak of rhodium (19.5–22 keV) and converted to ppm using the MURR 2 matrix-specific calibration, developed by Bruker Elemental, in collaboration with MURR (Glascock and Ferguson 2012; Speakman 2012). This factory-installed calibration is based on analysis of 40 samples of unmodified obsidian and fine-grained volcanic rock from around the world, chosen by Bruker and MURR to represent the range of trace-element concentrations known to occur in these materials. The USGS standard RGM-2, reported in Table 1, is not included in

Chemical Group	N	Elements (part per million)								
		Mn	Fe	Zn	Ga	Rb	Sr	Y	Zr	Nb
Cerro Varal	5	405±49	6987±471	41±6	19±3	128±5	74±6	23±1	121±8	17±1
El Chaval	5	603±115	6155±209	44±11	18±1	140±5	133±7	19±2	104±3	11±1
Fuentezuelas	5	206±75	14345±203	148±7	24±2	171±5	1±1	97±1	611±4	34±2
Ixtepeque	4	420±37	9149±257	44±4	21±1	100±2	146±8	18±1	161±7	10±1
La Union ¹	3	451±143	7920±434	47±7	18±1	130±12	38±6	24±4	141±6	16±3
Otumba	5	401±22	8866±364	50±7	19±2	124±5	118±6	22±1	136±3	12±1
Pachuca	5	1050±79	15709±181	208±5	23±1	195±2	4±0	109±3	891±3	88±1
Paredon	5	364±28	8777±316	62±2	22±2	165±7	4±1	48±3	201±9	41±2
San Martin	5	553±28	6510±153	47±3	18±1	109±4	172±4	15±2	110±3	9±1
Tulancingo	5	436±47	18443±706	186±13	24±2	126±5	13±1	93±5	685±31	46±1
Ucareo	5	208±17	7569±120	44±9	19±1	150±6	10±1	26±1	115±3	14±1
Zacualtipan	5	184±26	10584±552	48±4	23±2	282±9	36±2	46±2	213±5	19±1
Zaragoza	5	263±29	9595±343	46±6	22±1	138±5	26±2	32±2	189±8	17±1
RGM-2 Measured	13	269±39	12066±431	38±7	16±3	130±13	87±10	23±2	186±19	9±1
RGM-2 Recommended ²	1	273±8	13008±273	33±2	16±1	147±5	108±5	24±2	222±17	9±0

Note – ¹UC Berkeley Source, all others are provided by MURR; ²USGS RGM-2 (Wilson 2009)

Table 1. Source library summary and analysis of USGS RGM-2 pressed pellet analyzed with Bruker Tracer III-SD ED-XRF serial number T3S1330

SUMMARY DATA	ELEMENTS IN CALIBRATION (PPM)									
	Mn	Fe	Zn	Ga	Th	Rb	Sr	Y	Zr	Nb
Minimum	172	3,690	27	12	1	11	0	15	60	2
Maximum	1,775	68,537	592	32	83	436	291	415	3,066	640
Average	571	14,150	101	20	18	160	59	63	391	65
Calibration Error	25	248	4	3	1	3	1	2	4	2
r ^{2a}	0.99	0.99	0.99	0.35	0.98	0.99	0.99	0.99	1.0	0.99
Slope ^b	1.0	1.0	1.0	0.92	1.0	0.97	1.0	1.0	1.0	1.0

Notes: ^a Calculated predicted ppm values to known ppm values (Glascock and Ferguson 2012).

r² – Coefficient of determination. ^b a measurement of accuracy comparing known values to predicted.

Table 2. Calibration Ranges and Associated Statistics of MURR 2 Calibration by Element (concentrations in parts per million).

the MURR 2 calibration. Minimum and maximum values for element regression lines used for this analysis and other statistics associated with the MURR 2 calibration standards, as it pertains to serial number T3S1878, are shown in Table 2.

To accommodate analysis of small artifacts, trace element values are presented in three ways: as concentrations in parts per million, and as peak ratios and relative percentages. The latter facilitate interpretation of results for artifacts that are smaller than the two-by-three-millimeter incident X-ray beam, or thinner than “infinite thickness”, that is, the sample thickness required to absorb all incoming X-rays. For the analytical conditions used here, infinite thickness in an obsidian matrix is approximately four millimeters. For artifacts less than four millimeters thick, a portion of the incoming X-rays will escape through the back of the sample, resulting in a lower than normal signal for a given trace element in a particular obsidian (Ferguson 2012: Figure 12.4). Normalization to the Compton scatter peak of rhodium, as described above, corrects ppm concentrations for this effect down to a specimen thickness of approximately 1.5 millimeters and a diameter of four millimeters (Davis et al. 2011), but distortion in ppm values for specimens below this threshold is often considerable. For these specimens, relative peak intensities or peak

ratios are used to make source assignments in addition to parts per million (Hughes 2010), as these values are typically more stable with diminishing artifact size and thickness. Small artifacts are also compared to 95% confidence regions calculated from the non-Euclidean Mahalanobis Distance statistic (see Hamilton 2018).

Results

Multivariate trace-element analysis determined the presence of just two sources of obsidian among the two archaeological investigations at Palenque’s Group IV. El Chayal obsidian accounts for 185 artifacts and Zaragoza is represented by just three specimens (Table 3). While this sample size is biased to just two excavations, the results do support reports of both Guatemalan and Mexican obsidian sources. Flavio G. Silvia de la Mora (2018) demonstrates the overwhelming presence of El Chayal obsidian (n=1,293) in the sites east of Palenque. Zaragoza obsidian is present (n=9) as well as other Mexican obsidian (see Silva de la Mora 2018, 492-495). These results are similar to another study conducted at the site of Palenque conducted by Jay Johnson (1976).

The current Group IV sample shows that core-sized materials were imported into the site as represented by two exhausted cores that accord with El Chayal source materials. The

Type	Subtype	n=	El Chayal (parts per million)											
			<i>Counts per second</i>		<i>Rb</i>		<i>Sr</i>		<i>Y</i>		<i>Zr</i>		<i>Nb</i>	
			Mean	COV	Mean	COV	Mean	COV	Mean	COV	Mean	COV	Mean	COV
Blade	Final series	148	1032±163	16	163±11	7	155±11	7	21±2	10	117±6	5	12±1	11
Blade	Initial series	19	1174±213	18	161±14	9	153±11	7	21±1	6	117±5	5	12±1	10
Blade	Macro Blade	1	1314±0	-	155±0	-	143±0	-	19±0	-	109±0	-	10±0	-
Core	Exhausted Core	2	1615±24	1	132±2	2	128±1	1	19±1	4	102±1	1	11±1	7
Flake	Core Tablet	1	1544±0	-	141±0	-	135±0	-	20±0	-	111±0	-	10±0	-
Flake	Distal Core Rejuvenation	1	1538±0	-	136±0	-	134±0	-	22±0	-	105±0	-	11±0	-
Flake	Macro Flake	4	1191±171	14	157±9	6	146±9	6	20±1	7	117±5	4	12±2	17
Flake	Overhang Removal	2	1219±75	6	155±17	11	146±9	6	20±1	7	116±4	3	11±3	26
Flake	Small Percussion Debitage	1	1088±0	-	150±0	-	142±0	-	19±0	-	113±0	-	13±0	-
Flake	Other	1	1362±0	-	144±0	-	138±0	-	19±0	-	111±0	-	12±	-
Other	Undiagnostic	5	711±137	19	167±6	4	161±7	4	19±1	7	114±5	5	11±1	13
Subtotal		185												
Type	Subtype	n=	Zaragoza (parts per million)											
			<i>Counts per second</i>		<i>Rb</i>		<i>Sr</i>		<i>Y</i>		<i>Zr</i>		<i>Nb</i>	
			Mean	COV	Mean	COV	Mean	COV	Mean	COV	Mean	COV	Mean	COV
Blade	Final series	2	1217±6	1	150±7	5	27±0	0	35±3	8	197±1	1	20±1	7
Blade	Initial series	1	1542±0	-	137±0	-	26±0	-	32±0	-	185±0	-	19±0	-
Subtotal		3												

Table 3. Handheld portable XRF element concentration summary of artifacts grouped by source assignment and technology. Note, individual artifact geochemistry is available upon request.

Zaragoza material is represented by just three blades. Technological analyses are important variables to consider in obsidian sourcing as it relates directly with overall artifact morphology and more importantly to XRF fluorescence efficiency. While cores are blocky and often exceed the minimum thickness and diameter (4x4x4 millimeters) to generate sufficient counting statistics for XRF, blades often return far fewer counts (see Ferguson 2012, 415 Figure 12.4). For example, the source reference material returns count rates per second of 1,240-1,781, while the artifacts returned count rates per second of 532-1,632. Table 3 also show count rates per second by artifact type and source. The lower XRF count rates are associated with those artifacts that are thinner or smaller in diameter (see blades and undiagnostic debitage). These lower counts do

distort ppm predictions (Davis et al. 2011). Figure 3 demonstrates the distortion in strontium with many of the samples plotting far outside the 95% confidence ellipse for El Chayal obsidian. Other semi-quantitative methods are therefore employed for resolving these seemingly outliers.

Semi-quantitative methods include the transformation or manipulation of cumulative element photon counts but can include ratio transformations of ppm data (see Frahm 2016). In this analysis we make use of photon count data and do not transform predicted ppm data. Photon ratio transformations demonstrate less distortion in the ppm element concentrations (Table 4 and Figure 4). The use of element ratio data helps to normalize distortion from artifact morphology. Source assignments using ratio data can also be supported by the use of photon

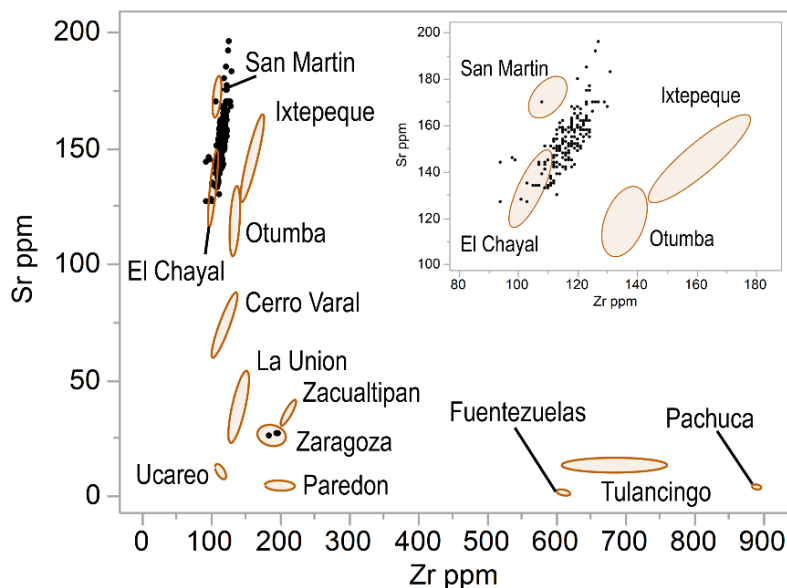


Figure 3. Zr by Sr biplot of all artifacts with obsidian sources represented by 95% confidence ellipses. Note the elevated concentration (i.e., ppm over estimation) of Sr due to thinness of many blade artifacts (see inset).

peak intensity percentages (Hughes 2010), which sums the cumulative counts for three elements (Rb, Sr and Zr) and then calculates their respective percentage of this sum (i.e., 0-100%). Data are displayed using ternary diagrams (Figure 5). While outliers still exist for both semi-quantitative approaches, they do resolve the significant strontium over-estimation shown in Figure 3 and eliminate other possible overlaps with alternative obsidian sources.

Discussion and Conclusion

While our modest obsidian study is not robust to determine site wide obsidian exchange or use patterns, we do introduce data that supports a more regional analysis (Silva de la Mora 2018; Johnson 1976). The analysis shows El Chayal obsidian continues to be the dominate source for obsidian in the Classic period regardless of regional occupation within the Maya Lowlands (see also Johnson 2016; Moholy-Nagy 2013). The next phase of

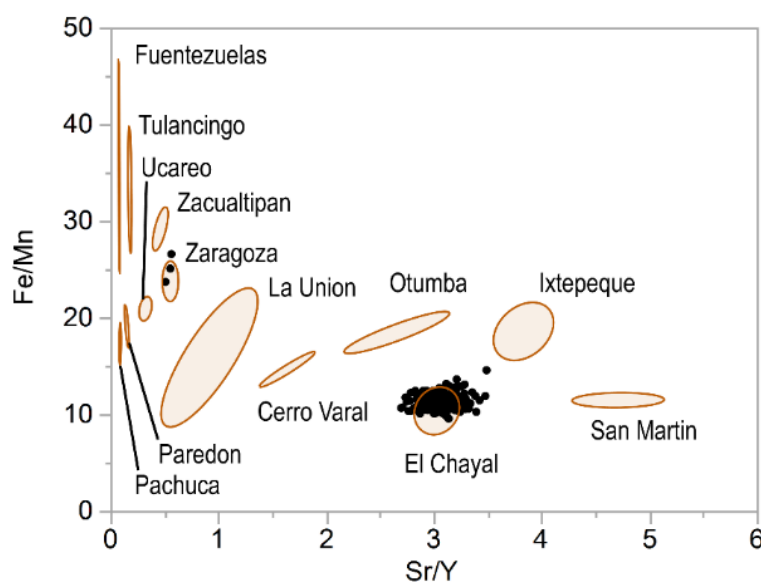


Figure 4. Fe/Mn by Sr/Y peak intensity ratio biplot with geological reference samples represented by 95% confidence ellipses.

	Sources	Σ Rb Sr Zr	Rb%	Sr%	Zr%	Fe/Mn	Rb/Sr	Zr/Y	Y/Nb	Zr/Nb	Sr/Y
Artifacts	El Chaval	6816 ±835	0.30 ±0.01	0.34 ±0.01	0.35 ±0.01	11.28 ±0.77	0.88 ±0.03	3.16 ±0.16	1.67 ±0.1	5.28 ±0.34	3.08 ±0.15
	Zaragoza	7164 ±105	0.31 ±0.01	0.08 ±0.01	0.61 ±0.01	25.10 ±1.44	3.67 ±0.15	3.92 ±0.17	1.52 ±0.05	5.95 ±0.26	0.54 ±0.03
Source References	El Chaval	7627 ±340	0.30 ±0.01	0.34 ±0.01	0.36 ±0	10.35 ±1.01	0.88 ±0.03	3.16 ±0.1	1.59 ±0.08	5.03 ±0.1	3.03 ±0.09
	Fuentezuelas	17478 ±179	0.16 ±0.01	0.01 ±0	0.83 ±0	35.62 ±4.43	13.65 ±0.73	5.77 ±0.05	2.10 ±0.06	12.13 ±0.43	0.08 ±0
	Ixtepeque	8285 ±290	0.19 ±0.01	0.33 ±0.01	0.48 ±0.01	18.56 ±1.22	0.58 ±0.02	5.61 ±0.15	1.45 ±0.05	8.13 ±0.27	3.83 ±0.11
	La Union	6605 ±381	0.33 ±0.01	0.13 ±0.01	0.53 ±0.02	15.86 ±2.93	2.49 ±0.21	3.62 ±0.36	1.37 ±0.03	4.96 ±0.59	0.92 ±0.18
	Otumba	7730 ±239	0.26 ±0.01	0.30 ±0.01	0.44 ±0	18.44 ±0.89	0.87 ±0.05	3.94 ±0.15	1.50 ±0.08	5.90 ±0.25	2.66 ±0.2
	Pachuca	24428 ±313	0.13 ±0.01	0.01 ±0	0.86 ±0	17.27 ±0.89	12.20 ±0.59	7.49 ±0.17	1.12 ±0.03	8.37 ±0.06	0.09 ±0
	Paredon	7608 ±195	0.35 ±0	0.03 ±0	0.63 ±0.01	19.07 ±0.95	11.45 ±0.65	3.12 ±0.12	1.14 ±0.04	3.56 ±0.09	0.15 ±0.01
	San Martin	8284 ±391	0.22 ±0	0.41 ±0	0.37 ±0.01	11.45 ±0.32	0.54 ±0.01	4.19 ±0.19	1.45 ±0.09	6.10 ±0.43	4.71 ±0.17
	Tulancingo	18046 ±790	0.11 ±0	0.02 ±0	0.87 ±0.01	33.21 ±2.69	4.87 ±0.28	7.07 ±0.39	1.57 ±0.03	11.11 ±0.62	0.18 ±0.01
	Ucareo	5625 ±133	0.45 ±0.01	0.06 ±0	0.49 ±0.01	20.90 ±0.51	7.31 ±0.47	2.59 ±0.03	1.63 ±0.05	4.23 ±0.17	0.32 ±0.02
	Zacualtipan	10317 ±75	0.43 ±0.01	0.08 ±0	0.49 ±0	29.16 ±0.93	5.41 ±0.3	2.86 ±0.12	2.25 ±0.12	6.44 ±0.38	0.46 ±0.03
	Zaragoza	7231 ±160	0.30 ±0	0.08± 0.01	0.61± 0.01	23.74 ±0.85	3.59 ±0.18	4.05 ±0.16	1.55 ±0.03	6.27 ±0.25	0.56 ±0.03

Table 4. Photon count ratios and peak count percentages for artifacts by source assignments and source reference materials provided by MURR and UC Berkeley.

obsidian research at Palenque plans to gather samples from those residences around Group IV as part of a neighborhood investigation carried out by the Palenque Regional Project (PRP).

Furthermore, the obsidian study shows how artifact morphology may create problems in obsidian sourcing. Small and thin artifacts do

not generate similar XRF counting statistics like those of more robust samples, including source library references that meet or exceed four millimeters. The use of other methods, often termed “semi-quantitative”, require extracting photon count data from element spectra. These peak intensity measures are available through various XRF manufacturers’

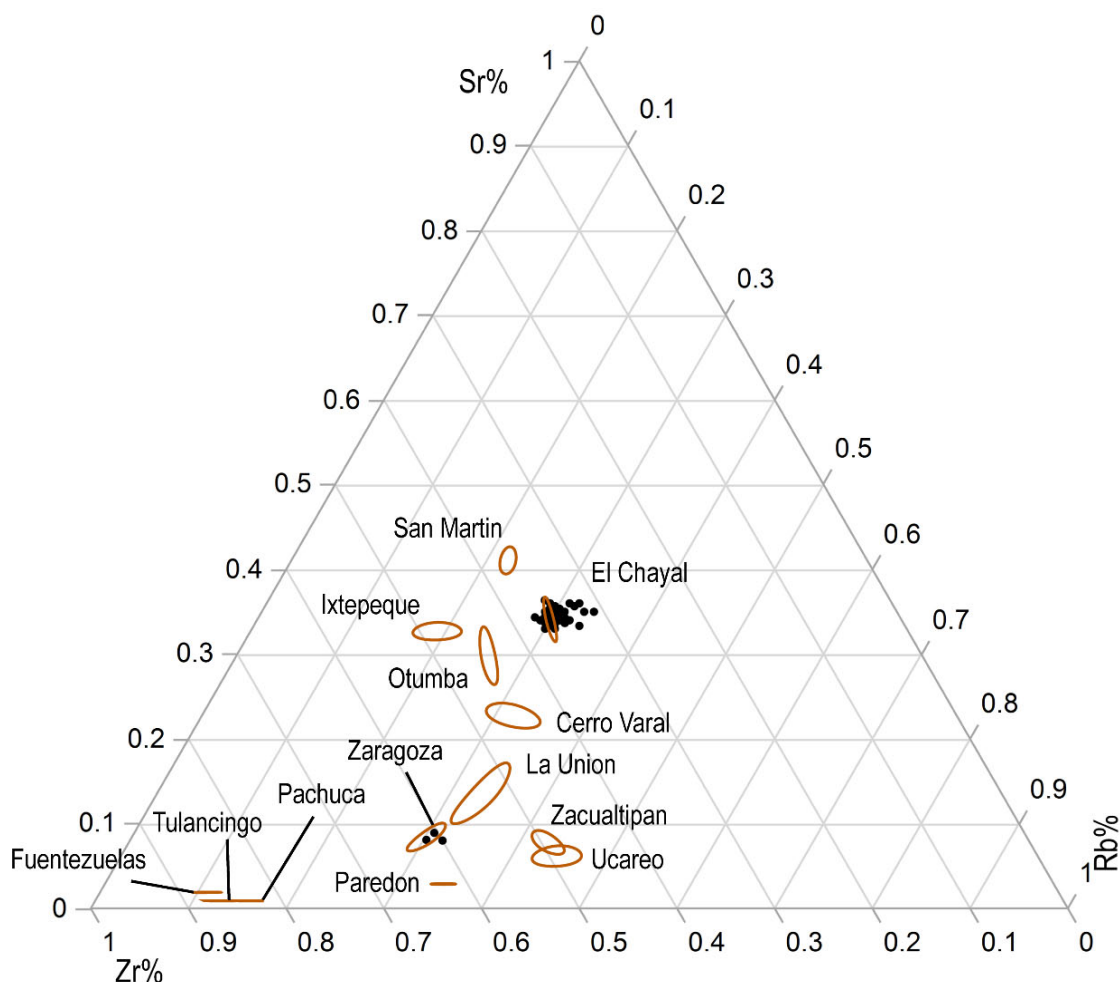


Figure 5. Ternary plot using peak intensity percentages for all artifacts with 95% confidence regions for obsidian reference samples. Note, confidence regions are constructed in R using the package ggtern that uses the Mahalanobis non-Euclidian distance statistic (see Hamilton 2018; R Core Team; Johnson et al. 2018 for a discussion).

software. Bruker's is typically extracted from calibration worksheets or other software, whereas Olympus' is a selected export within the general export functions. It is advisable to curate both ppm and photon count data, including overall count rates, as part of an obsidian study. With the growth of XRF use, these varied measures of element concentration help to further data transparency.

Acknowledgments

These data were collected and analyzed with the help of Rosemary Joyce and Nicholas Tripcevich of the Archaeological Research

Facility at the University of California Berkeley. Rodrigo Liendo from the Universidad de Nacional Autónoma de México, Instituto de Investigaciones Antropológicas is the project permit holder and supervised the excavations. Mike Glascock and Jeff Ferguson of the University of Missouri Research Reactor provided obsidian source reference materials and Nickolas Hamilton, the creator of ggtern for R, instructed in the use of open-source coding. This research was made possible through funding from a UC MEXUS Dissertation Research Grant DI-15-7 and Wenner Gren Dissertation Grant #9543

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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!

CALL FOR ARTICLES

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.

http://www.saa.org/Portals/0/SAA%20Style%20Guide_Updated%20July%202018.pdf

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.

Deadline for Issue #65 is December 1, 2020.

Email or mail submissions to:

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Coastal Carolina University
P.O. Box 261954
Conway, SC 29528
U.S.A.

Inquiries, suggestions, and comments about the *Bulletin* can be sent to IAOS.Editor@gmail.com Please send updated address/email information to Lucas Martindale Johnson at lucas@farwestern.com

MEMBERSHIP

The IAOS needs membership to ensure success of the organization. To be included as a member and receive all of the benefits thereof, you may apply for membership in one of the following categories:

Regular Member: \$20/year*

Student Member: \$10/year or FREE with submission of a paper to the *Bulletin* for publication. Please provide copy of current student identification.

Lifetime Member: \$200

Regular Members are individuals or institutions who are interested in obsidian studies, and who wish to support the goals of the IAOS. Regular members will receive any general mailings; announcements of meetings, conferences, and symposia; the *Bulletin*; and papers distributed by the IAOS during the year. Regular members are entitled to vote for officers.

*Membership fees may be reduced and/or waived in cases of financial hardship or difficulty in paying in foreign currency. Please contact the Secretary-Treasurer with a short explanation regarding lack of payment.

NOTE: The IAOS asks that all payments be made using the PayPal link on our website:

<http://www.deschutesmeridian.com/IAOS/membership.html>

For more information about membership in the IAOS, contact our Secretary-Treasurer:

Lucas Martindale Johnson

lucas@farwestern.com

Membership inquiries, address changes, or payment questions can also be emailed to

lucas@farwestern.com

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

***BY-LAWS OF THE INTERNATIONAL ASSOCIATION FOR
OBSIDIAN STUDIES***

(April 25, 2020)

ARTICLE 1 – NAME

This organization shall be known as the International Association for Obsidian Studies (IAOS).

ARTICLE 2 – PURPOSE

1. The general objective of the IAOS shall be to provide a professional association for those involved in the study of the physical properties and processes that affect natural glasses, including geological formation, geographic distribution, chemical characterization, hydration, and the application of these studies to archaeological and geological problems, including dating.
2. The specific and primary purposes of the IAOS are:
 - a. To establish a forum from which current issues and advances in the study of natural glasses may be presented and discussed.
 - b. To promote awareness and provide informational programs that will aid the archaeological and geological community in becoming more aware of problems and potentials of the application of techniques from the physical and natural sciences in archaeology and geology.
 - c. To promote interdisciplinary research designs in archaeology.
 - d. To encourage research and the preparation of papers and reports on the investigations of natural glasses and the application of the results of such studies to archaeological and geological problems.
 - e. To endeavor to maintain high technical standards in related archaeological and geological studies.
 - f. To assist new and existing laboratories in adopting or conform to acceptable and comparable standards for analysis and reporting.
 - g. To establish a code of conduct directed towards these ends.

- h. To cooperate with archaeological, geological, and other natural and social scientific associations and societies.
- i. To advance relations with governmental agencies and the public in general; all without pecuniary profit to any directory, officer, or member.
- j. Treat all members professionally, with no toleration for discrimination, misconduct, or harassment by the IAOS, its officers, or its members towards others (members and non-members alike).
- k. Encourage diversity within the IAOS and the profession.

ARTICLE 3 – POWERS

- 1. IAOS shall have the power to receive, administer, and disburse dues, assessments, and other grants to further its ends; to acquire, hold absolutely or in trust for the purposes of the IAOS; to publish newsletters, reports, bulletins, journals, and monographs; to affiliate with other organizations in the pursuit of common aims, and to appoint delegates or representatives to such organizations; to establish branches, sections, or divisions, on a regional or functional basis; and to engage in such other activities as are in keeping with the objectives of the association.
- 2. No part of the net receipts of the IAOS shall insure to the benefit of or be distributable to its members, officers, committee members, or other private persons, except that the association shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes of the IAOS as set forth in these By-laws.
- 3. No substantial part of the activities of the IAOS shall be the carrying on of propaganda or otherwise attempting to influence legislation, and the IAOS shall not participate in, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of the candidate for public office.

ARTICLE 4 – MEMBERSHIP

- 1. Membership in the IAOS is open to any person in sympathy with the objectives of the IAOS, as set forth in Article 2, without regard to age, sex, race, religion, or nationality.

2. The IAOS may have several classes of membership as determined by a vote of the membership. Membership shall consist of Regular Members, Lifetime Members, and Student Members. Each member shall have one (1) vote in the transaction of the business of the IAOS and shall be eligible for any elected or appointive office in the IAOS, subject only to restrictions defined elsewhere in these By-laws.
 - a. Regular Members
 - i. Regular Members are those persons or organizations interested in obsidian studies or who perform obsidian studies. Regular members may, for instance, be archaeologists involved in applying or using obsidian data for archaeological interpretations.
 - b. Lifetime Members
 - i. Lifetime Members pay a one-time fee determined by the Executive Board and receive a membership that is active for the lifetime of the member or lifetime of the IAOS.
 - ii. Lifetime Members are a special category of Regular Members and maintain the same rights and privileges and Regular Members.
 - c. Student Members
 - i. Student Members enjoy all privileges of Regular Members. Students will receive a year's free membership if they submit an obsidian-related article for publishing in the IAOS Bulletin or an abstract of such article published elsewhere. Students are eligible for membership for a lower fee.
3. The Executive Board may, by a three-quarters (3/4) vote, remove from the membership rolls any member whose acts are contrary to the ideals, objectives, and accepted standards of the IAOS as set forth in Article 2, and the code of conduct established by vote of the membership of the IAOS. The action of the Executive Board may be subject to an appeal to the IAOS membership at its Annual Meeting.
4. The Secretary-Treasurer shall be empowered to discontinue the membership of any person or organization for non-payment of dues for the annual membership.
5. No member shall be personally liable to any creditor of the IAOS for any indebtedness or liability, and any and all creditors shall look to the IAOS assets for payment.

6. The use of IAOS membership contact information is only for purposes that accord with the general objectives described in these By-laws. The Executive Board shall make decisions regarding use of the membership contact information. Except for regular distribution of the IAOS Bulletin by the Bulletin Editor, only the Secretary-Treasurer or the President shall send emails using the IAOS email list.

ARTICLE 5 – ORGANIZATION

1. The Officers of the IAOS shall consist of a President, a Vice-President/President Elect/Past-President, a Secretary-Treasurer, the Bulletin Editor, and the Webmaster, representing no fewer than two (2) institutions or laboratories.
2. IAOS policies and directions shall be established by the Executive Board, the Advisory Board of Directors, and other IAOS members selected by the Executive Board.
3. The President shall serve as the IAOS's chief executive officer and its representative in official affairs and transactions. The President shall make certain that all resolutions of the Executive Board are implemented.
4. The Vice-President shall be elected for one year, at the conclusion of which he/she shall succeed to the office of President to serve a two-year term. He/she will then serve one year as Past President.
5. The Secretary-Treasurer shall be elected for a two-year term and may be renewed consecutively either by a majority vote of the IAOS or by unanimous decision of the remainder of the Executive Board.
6. The Executive Board of the IAOS shall consist of the President, Vice President, Secretary-Treasurer, and the Editor of the IAOS Bulletin.
7. No restriction is placed on officers seeking election to the same office in which he/she has previously served, nor a different office within the IAOS provided that terms of the President's office are not served consecutively.
8. In the event of the absence, death, resignation, or incapacity of the President, the Vice President shall assume the duties of the President for the remainder of the President's term.
9. The offices of President, Vice President, and Secretary-Treasurer shall be elected by a majority vote of the IAOS members.

ARTICLE 6 – DUTIES OF THE OFFICERS

1. President

- a. The President shall serve as the IAOS's chief executive officer and its representative in official affairs and transactions. The President shall make certain that all resolutions of the Executive Board are implemented. The President shall preside over all meetings of the IAOS. If the President cannot attend a meeting, the Vice President shall preside in his/her place. The President shall have the usual appointive power and shall exercise all the duties and responsibilities commonly associated with this office, except as provided by the By-laws.
- b. The President may appoint representatives of the IAOS to other societies, agencies, or councils or select such representatives from slates submitted by other societies and agencies.
- c. Acting in consultation with the Vice President, the President shall appoint all necessary committees and define their duties.
- d. Acting in consultation with the Vice President, the Presidential shall appoint all necessary committees to represent the interests of the IAOS in that region.
- e. The President, Vice President, and Secretary-Treasurer shall sign all written contracts authorized by a majority vote of the Executive Board or the IAOS members at the Annual Meeting, or by mail or email ballot, except for basic contracts for printing, and other matters necessary to routine publication, as well as contracts for products or services to be provided at IAOS sponsored events. Such contracts may be signed by the President, Vice President or Secretary-Treasurer.
- f. The actions of the President in exercising the duties and responsibilities of the office shall be subject to review and approval of the Executive Board.

2. Vice President

- a. The Vice President shall consult with and assist, as appropriate, the President in completing his/her duties.
- b. The Vice President shall preside over all meetings at which the President cannot attend and shall assume the President's responsibilities of the duration of that meeting.

- c. The Vice President shall assume the title and duties of the President after serving his/her term as Vice President.
- 3. Secretary-Treasurer
 - a. The Secretary-Treasurer, subject to the directives of the President in consultation with the Vice President, shall be responsible for maintaining contact with the President and Vice President, have charge of administrative matters under the direction of the President, be responsible for the administration of the finances of the IAOS subject to provisions in these By-laws. Duties of the Secretary-Treasurer are to:
 - i. Announce all meetings to the membership of the IAOS, either by mail, email, or through the IAOS Bulletin.
 - ii. Maintain and distribute minutes of all meetings to the Executive Board.
 - iii. Keep and update membership rolls of the IAOS on both electronic and written media, maintain a minimum of two (2) backup copies of electronic membership, By-laws, Working Policies, and other documents authorized or adopted by the IAOS.
 - iv. Maintain records of all financial transactions in accordance with standard bookkeeping practices.
 - v. Have custody of all money and securities for the IAOS.
 - vi. Assemble and mail or email articles and announcements to the membership.
 - vii. Mail/email and receive applications for membership.
 - viii. Conduct elections as described in Article 9.
 - b. The Secretary-Treasurer is directed to correspond with every IAOS member each year, encouraging them to renew their membership, informing them of any changes in annual dues, IAOS activities, and officers. This correspondence may be included in a bulletin or newsletter that discusses other IAOS matters.
 - c. As soon as possible following the Annual Meeting, the Secretary-Treasurer will mail or email to all members of the Executive Board a copy of the current By-laws, a copy of the minutes of the Executive Board and Annual Meeting, and a copy of membership materials and IAOS stationary.

4. Bulletin Editor
 - a. The Bulletin Editor shall be responsible for the coordination, editing, and production of the IAOS Bulletin.
 - b. The Bulletin Editor shall coordinate with the Secretary-Treasurer to update the annual membership list for distribution of the IAOS Bulletin.
5. Any duty or responsibility delegated to any officer or member may be temporarily re-delegated by mutual consent of the President and Vice President, or re-delegated for the duration of the elected year by a majority vote of the membership, or a majority vote of the Executive Board.

ARTICLE 7 – EXECUTIVE BOARD

1. Subject to the general directives and limitations imposed by the membership at the Annual Meeting or by mail/email ballot, the Executive Board shall have the authority to execute on behalf of the IAOS all powers and functions of the IAOS, as defined by these By-laws.
2. The Executive Board may hold special meetings at the request of the President.
3. A Quorum of the Executive Board shall consist of the President, Vice President, and Secretary-Treasurer of the IAOS.
4. Questions shall be decided by the Executive Board by a majority of the votes cast at any meeting and/or by mail or email ballot. In the case of a tie vote, the decision of the President shall be final. If a member of the Executive Board is unable to attend a meeting, the member may, by written authorization, appoint any active member of the IAOS to serve as a proxy for that meeting. But no person by virtue of holding proxies shall have the right to cast more than one (1) vote.
5. The President may on his/her own initiative or shall at the written request of any member of the Executive Board, ask the Board to vote on specific questions by mail/email ballot. Ballots shall be mailed/mailed by the Secretary-Treasurer who shall specify on the ballots the date on or before which they are to be placed in the mail or emailed to the Secretary-Treasurer. This date shall not be less than fifteen (15) days from the date they were placed in the mail or emailed no more than thirty (30) days from the date they were placed in the email or emailed by the Secretary-Treasurer.

6. The Executive Board shall approve reports of officers, representatives, delegates, committees, and agents. At the discretion of the Executive Board, these reports may be presented in full or in brief at the Annual Meeting.
7. The Executive Board shall act upon the budget provided by the Secretary-Treasurer. A budget shall be submitted to the Executive Board at the Annual Meeting for approval.

ARTICLE 8 – ADVISORY BOARD OF DIRECTORS

1. The Executive Committee has the option to nominate an Advisory Board of Directors. The Advisory Board of Directors will normally be composed of those senior researchers who have made important and life-long contributions to obsidian research. These Directors shall receive Lifetime Member status and shall be permanently installed unless declined by the individual. These Directors may be called upon by the Executive Committee from time to time for advice on any topic relevant to the goals of the IAOS.

ARTICLE 9 – ELECTIONS

1. Before December 1 of each year or January 1 for the March-April election, the Secretary-Treasurer shall submit an announcement of the election of new officers in the IAOS Bulletin. This announcement shall solicit nominations and provide information regarding the election process.
2. Officers are elected for terms running one or two years beginning at the time of the Annual Meeting until the following Annual Meeting.
3. Any person receiving two (2) or more nominations shall, upon acceptance of the nomination, be placed on the ballot. If no nominations are received by the Secretary-Treasurer, nominations will be solicited at the Annual Meeting. Each nomination at the Annual Meeting must be supported by a second.
4. Each active member shall be entitled to vote for one (1) candidate for each office. The election shall be conducted by mail or email prior to the Annual Meeting.
5. Officers shall be elected by a simple majority vote of ballots received.
6. The results of any election shall be announced at the Annual Meeting.
7. Any officer or member of the Executive Board may be removed for cause or without cause at any Annual or Special Meeting of the IAOS by a two-thirds (2/3) vote of

members in good standing present, provided that notice of such proposal shall have been stated in the announcement of the meeting.

8. If an officer is unable to complete the term of office, the Executive Board, by Special Meeting, ballot, email, or telephone conference, may appoint a member to fill the unexpired term, so long as not inconsistent with other provisions of these By-laws.

ARTICLE 10 – MEETINGS

1. The IAOS shall hold Annual Meetings at times and places designated by the Executive Board, although the IAOS shall hold at least one (1) Annual Meeting. The location and date for the meeting for the subsequent year will be determined at the Annual Meeting.
2. In general, the location and time for the Annual Meeting will be determined by the geographic distribution of members, to ensure maximum participation and minimization inconvenience for the majority of Institutional members. Where appropriate, Annual Meetings will be scheduled to coincide with other professional meetings (e.g., Society for American Archaeology Annual Meetings; International Symposium on Archaeometry) to provide an economy of travel and increase opportunities for participation.
3. Due notice of the place and time of the ensuing Annual Meeting along with an optional agenda shall be published in the IAOS Bulletin and mailed (or emailed) to all active members no later than the announcement soliciting nominations for new officers.
4. The attending members of the Annual Meeting shall constitute a Quorum.
5. The business of the IAOS shall be discussed at the Annual Meeting. The order of business at the Annual Meeting shall be as determined by the President. Papers and other matters of scientific interest, as well as symposia, may be presented at the Annual Meeting.
6. Special Meetings of the IAOS shall be called by the President at any time the Executive Board of the general membership so directs by a majority vote. Special Meetings may be held in person, by email, on a telephone conference call, or Internet web meeting, or in another manner in which the meeting is easy and cost-effective for members to attend. Any matter of business may be decided at a Special Meeting, provided notice of such business was specified in the call. Special Meetings may not be called with less than thirty (30) days' notice to all members of the Executive Board.

7. Special Meetings of the Executive Board may be held at the call of the President, in consultation with the Vice President, or upon written or email request of at least three (3) members of the Executive Board. Special Meetings of the Executive Board may not be called less than fifteen (15) days' notice to all members of the Executive Board.
8. All matters of the business of the IAOS may be decided by means of a referendum vote by mail or email ballot under conditions specified in these By-laws.
9. The President may rule on questions of order and procedure coming before the meeting or submit such questions to the vote of the meeting.
10. At its Annual Meeting, the following tasks should be accomplished:
 - a. Any amendments to the By-laws must be proposed and voted upon, if at least ten (10) members, including two (2) officers are present.
 - b. The IAOS budget needs to be reviewed and approved, as appropriate, by vote from the Executive Board and/or membership.
 - c. Review and discuss, as appropriate, the goals and objectives of the IAOS, and activities toward achieving those goals.
11. Coordination of the arrangements and program for the Annual Meeting is vested in a standing committee consisting of the President, Vice President, and Secretary-Treasurer of the IAOS.
12. Official sponsorship of scientific symposia presented at another meeting (i.e., Society for American Archaeology) shall be given after consideration by the Executive Committee. The Executive Committee may seek a majority vote of the body.

ARTICLE 11 – FINANCES

1. The fiscal year of the IAOS shall run from January 1st to December 31st.
2. A dues assessment, to be levied on an annual basis, shall be established by the Executive Board.
3. The annual dues structure may vary, according to the type of membership (e.g., Student Member, Regular Member).
4. Dues shall be payable on January 1st of each year.
5. Failure to pay dues by 180 days after January 1st of the year in which they become due will result in automatic dismissal of a member.

6. The funds of the IAOS shall be deposited in the name of the IAOS in such bank or trust company as the Secretary-Treasurer shall designate and shall be drawn out by checks, drafts, or other orders for the payment of money signed by the Secretary-Treasurer or by such person or persons as shall be designated by the Executive Board. Any expenses related to official IAOS business, such as routine expenses for IAOS Bulletin mailings, IAOS Annual Meeting or event support, over the amount of \$250.00 (US), or expenses of any amount that are outside of regular IAOS business, shall require prior approval from the IAOS Executive Board.
7. All deeds, mortgages, releases, conveyances, contracts, or other instruments of the IAOS authorized by the Executive Board shall be executed on behalf of the Council by the officer or officers authorized by the Executive Board. Said officer or officers shall be authorized to accept gifts of money or kind on behalf of the IAOS and to deposit these with the funds of the IAOS or hold them in trust pending instructions by the Executive Board.
8. The income from annual dues and from investments and other sources shall constitute the working fund of the IAOS, available for operating, publications, and other current expenses consistent with the purposes of the IAOS as the Executive Board may direct.
9. No financial obligation in excess of the funds available in the treasury shall be assumed by the Executive Board or by any officer on behalf of the IAOS except when approved by a two-thirds (2/3) vote of the members of the IAOS present at a regular Annual Meeting or at a Special Meeting, provided that for the purpose of this section, estimated receipts from annual dues and other accounts receivable for the current year may be considered available funds.

ARTICLE 12 – DISPOSAL OF ASSETS

1. Upon the dissolution of the IAOS, whether voluntary or involuntary, after paying all of the liabilities of the IAOS, the IAOS shall dispose of its assets exclusively for the scientific and educational purposes set forth in these By-laws by donating them to an institution or organization exempt from taxation under paragraph 503 c (3) of the Internal Revenue Code of 1954 (or the corresponding provision of such future Internal Revenue laws as may be in effect).

ARTICLE 13 – AMENDMENTS

1. The By-laws may be amended by a two-thirds (2/3) vote of the members present at a business meeting of the Annual Meeting or at a Special Meeting called in accordance with Article 10, paragraph 3. The By-laws may also be amended by mail or email ballot provided that a proposed amendment is approved by two-thirds (2/3) vote of the votes cast.
2. Amendments may be proposed by the Executive Board or by any ten (10) members of the IAOS. The proposed amendments shall be mailed or emailed to the members of the IAOS by the Secretary-Treasurer at least thirty (30) days before an Annual Meeting or Special Meeting. In the case of a mail ballot upon amendment, members shall address ballots to the Secretary-Treasurer and place them in the mail and postmarked not more than thirty (30) days from the date they were mailed out and postmarked by the Secretary-Treasurer. An amendment shall go into effect immediately upon approval unless otherwise specially provided.
3. The provisions of these By-laws, as amended, shall be effective immediately upon their adoption and shall supersede and nullify all previous enactments in conflict with them.