

International Association for Obsidian Studies Newsletter

Number 2

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Assembled and edited by R. J. Jackson

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NEWS AND INFORMATION

IAOS Annual Meeting

The International Association for Obsidian Studies (IAOS) will hold its annual meeting at 2:00 P.M., Friday, April 6, 1990, in the Board Room of the Holiday Inn, 1221 Chess Drive, Foster City, California 94404 (telephone 415/570-5700). The IAOS Annual Meeting will be held during the Society for California Archaeology Annual Meeting.

While originally scheduled for the Annual Meeting of the Society for American Archaeology in Las Vegas in late April, 1990 (as announced in the Fall 1989 Newsletter), it became apparent that few of the current members were attending the meeting in Las Vegas (including the IAOS President and President-elect). The decision to hold the IAOS meeting in California was made after informally polling several IAOS Institutional Members and learning that many planned to attend the SCA Meeting in Foster City. The IAOS is still in its infancy, and most of its members reside and work in California. The membership will broaden in time, making national meetings the logical locations for IAOS Annual Meetings, but there are many organizational issues to resolve, warranting the attendance of the officers and a quorum of the Executive Board.

IAOS Meeting Topics

The agenda for the IAOS Annual Meeting has not been finalized, but it is important that all attendees begin thinking about and preparing for a discussion of some important topics, including:

- ☒ Goals of the IAOS
- ☒ Discussion IAOS By-Laws
- ☒ Election of New Officers

- ☒ IAOS Newsletter
- ☒ Standard Data Collection and Management
- ☒ Developing Standard Obsidian Hydration Slide Sets
- ☒ Expanding Membership

Obsidian Hydration Data Standards

One of the primary goals of the IAOS is to promulgate standards for the collection and reporting of obsidian data. Another is to establish a central data base of obsidian hydration studies. It is time to begin working toward these goals.

Standards should meet the needs of both laboratories and users, and therefore their development should involve input from a variety of sources. IAOS members represent the most sophisticated of obsidian hydration users. Your input in developing these standards is essential.

Three components are critical to a standard obsidian hydration data management system: 1) archaeological, environmental, and specimen data supplied by the submitter; 2) minimum analytic observations and laboratory data provided by the hydration technician; and 3) reported hydration results.

Obsidian hydration laboratories and analysts apply different the methods for developing hydration rate formulae and/or using hydration data. Different methods and applications sometimes require different information. To meet the needs of all users, a database must contain information that may not be perceived as important to some - information that will vary according to the application preferred by the user. The establishment of a universally useable and accepted database requires the cooperation of diverse laboratories and users of obsidian hydration data. To accomplish this, minimum data necessary for a variety of approaches should be obtained for all analyses.

The following pages address two of the three components of management system data: 1) archaeological, environmental, and specimen data supplied by the submitter; and 2) minimum analytic observations and laboratory data provided by the hydration technician.

IAOS members, particularly laboratory operators and technicians, should carefully examine the draft forms included with this Newsletter, titled:

OBSIDIAN HYDRATION ANALYSIS PROJECT DATA (form 1);

PROJECT ARCHAEOLOGICAL AND ENVIRONMENTAL DATA (form 2); and

OBSIDIAN HYDRATION SPECIMEN INFORMATION (form 3).

These forms would be supplied to clients and requested information would be provided to laboratories when obsidian specimens are submitted for analysis.

Form 1 one provides important project information and its use by clients should be strongly encouraged, if not required.

Form 2 provides valuable information that may be necessary to interpret the results of hydration data, depending on how those data are used. However, some of these data may not be available (e.g., associated radiocarbon dates, soil temperature).

Form 3 requests basic essential information for each specimen that must be supplied by the client. This basic information forms the core of the hydration data management system and should be required by laboratories before accepting the specimens for analysis.

As a long-time laboratory operator, I am aware that it is sometimes difficult to obtain basic catalog and provenience data with submitted specimens, no less the kind of information that is requested on the forms. Enlisting the cooperation of users is a problem that can be addressed once there is agreement on the kind of information that should be obtained.

The second aspect of a standard hydration management system consists of the observations made by the laboratory itself. Ideally, each laboratory should maintain a computerized database with standard data fields. Individual laboratory data could be easily converted and added to a centralized database. This goal may not be immediately realized. However, laboratories can establish standard categories of information of fixed or limited sizes (fields). Once established, backlogged data could be entered, once a computerized database is established.

Table 1 presents an example of a database for an obsidian hydration management system. This data management system has been used at *Lithichron Laboratory* for several years with good success. It was developed to operate with a dBASE or compatible program, although the data structure can be read by a variety of programs when converted to a Standard Data Format. Not all of the fields may be of interest to all laboratories, but some basic data are critical to a standard data management system. Please carefully examine Table 1 and compare it with your own. The development of a standard obsidian hydration database is an important issue that will be discussed at the IAOS Annual Meeting. Standard data reporting will necessarily

follow from the establishment of data collection standards. Therefore, reporting will be deferred to later newsletters or IAOS meetings.

For those who cannot attend the IAOS Annual Meeting, please provide feedback regarding the appropriate contents for a standard database to:

R. J. Jackson
716 Proctor Court
Woodland, California 95695

Obsidian Hydration Laboratory News

Diffusion Laboratories, Spring Mills, PA.

The obsidian hydration laboratory at Archaeological and Historical Consultants, Inc. has recently separated from that company and is now known as *Diffusion Laboratories*. The laboratory continues to be operated by Christopher M. Stevenson, Ph.D. and offers the services of obsidian rate development through induced hydration, compositional analysis by X-ray fluorescence analysis, and hydration rim measurement. Please address inquiries to:

Diffusion Laboratories
RD #1, Box 199A
Spring Mills, PA 16875
Day:(814)-364-2135
Eve:(814)-422-8593

An Introduction to New Zealand and South Pacific Obsidian Research

Dr. Roger Green, Professor of Archaeology at the University of Auckland, New Zealand, recently spent a month sabbatical at the University of California, Berkeley. On February 16, 1990 Dr. Green met and discussed his obsidian research with several IAOS members at an enjoyable dinner at Mr. John and Loretta Hager-Holson's house in Berkeley, California.

Participating in the obsidian discussion after an excellent dinner were Dr. Green and Dr. Pat Kirsh, IAOS members Dr. David Fredrickson, Dr. Tom Jackson, Rob Jackson, Marshall Weisler, and John Holson. The discussion was prefaced and accompanied by excellent libations, which did not lend to copious record-keeping. I accept responsibility and apologize in advance for any errors in fact or misrepresentations of Pacific obsidian research. Perhaps we can prevail upon Dr. Green to prepare a brief and more accurate article for the IAOS Newsletter in the future.

Dr. Green has been working in the Pacific for almost three decades and is well and extensively known to students of southwest Pacific archaeology. A student of Gordon Willey at Harvard, Green introduced settlement archaeol-

ogy to Polynesia. He has written extensively on the Lapita cultural horizon. Dr. Green was also one of the first to become interested in the examination of obsidian in Polynesia, writing as early as 1962 about its analytic potential. Since that time he has developed extremely interesting approaches to the source identification of archaeological obsidian.

When Dr. Green first became interested in obsidian sources in New Zealand, it was believed that only seven sources existed. Due largely to his interest and research, the inventory of New Zealand sources has grown to more than thirty.

Green was an important contributor to pioneering studies in the use of heavy liquid to identify the source of archaeological obsidian based on differences in the specific gravity of different sources. Once specific gravity groups are identified, samples of these groups are subjected to alternative source identification methods, such as PIXE/PIGME analysis, to confirm the heavy liquid source identification. Polymetastable is a non-toxic, water miscible heavy liquid that is now used for this analysis. Based on the work and successes achieved in Pacific research, Sonoma State University is currently exploring the potential of heavy liquid to source identify obsidian from North Coast Range and western Great Basin archaeological sites.

The potential for obsidian hydration analysis as an effective dating tool in New Zealand has not been fully explored, although induced hydration experiments on Mare Island obsidian, a major New Zealand source, indicates a very slow hydration rate. Coupled with a shallow time depth for human occupation of New Zealand, obsidian hydration of at least Mare Island obsidian may not serve as an effective dating technique in New Zealand. In certain other areas of the southwest Pacific, however, where there is greater time depth to human occupation, obsidian hydration may hold much greater potential.

We hope that this initial contact with Dr. Green will lead to further communication with he and other researchers in the Pacific. It is clear that much is to be gained by an interchange of ideas and sharing methods to address similar research problems.

REPORTS AND PUBLICATIONS

The volume of so-called "gray literature" in archaeology is staggering, making it difficult for researchers who are not "plugged-in" to contract or research archaeology of a certain region to hear of and gain access to reports. The IAOS Newsletter will bring references to some of this information to its readers by reproducing abstracts and summarizing both new and old literature that may be of particular interest to IAOS members. In addition, we will announce current and upcoming publications relevant to obsidian studies.

Aboriginal Quarries Bibliography

The first phase of an extensive examination of the Casa Diablo obsidian source in eastern California was sponsored by the Inyo National Forest under the direction of Ms. Linda Reynolds. The study involved an extensive literature review and compilation of an annotated bibliography of works relating to aboriginal quarries for flaked-stone, primarily in the western United States. The annotated bibliography was prepared under contract by Ms. Elena Nilsson of Mountain Anthropological Research, Incorporated. The bibliography contains over 200 references that include publications, research reports, and cultural resource management documents. Copies of the bibliography can be obtained by writing to:

*California Office of Historic Preservation
P.O. Box 942896, 1416 Ninth Street
Sacramento, California 94296-0001
Attention: R. Jackson*

For more information on the bibliography, or subsequent stages of the Casa Diablo obsidian source study, contact:

*Ms. Linda Reynolds,
Forest Cultural Resources Manager,
Inyo National Forest
873 North Main Street*

Obsidian Dates IV: A Compendium of the Obsidian Hydration Determinations Made at the UCLA Obsidian Hydration Laboratory.

Clement W. Meighan and Janet L. Scalise, editors. Institute of Archaeology, University of California, Los Angeles, Monograph XXIX, 1988, xi + 511 pp. (paper).

This three-part volume continues UCLA's long and unique tradition of publishing the hydration measurement results of hydration analysis projects conducted at the UCLA Obsidian Hydration Laboratory. Part I of the compendium contains two introductory articles by C.W. Meighan. Part II contains 23 "Discussion Papers" regarding studies conducted in California and Central America. Part III of the compendium presents the results of obsidian hydration measurements on collections from California, Nevada, Arizona, New Mexico, Colorado, Wyoming, Mexico, Guatemala, Belize, Honduras, Ecuador, Peru, Chile, Easter Island, Indonesia, Georgian SSR, Greece, and Hungary made between 1973 and 1988. Part IV of the compendium offers a reference bibliography developed by Ms. Janet Scalise.

Thanks go to Tom Jackson for providing an advanced copy of his review of the UCLA Compendium, from which the above presentation was developed.

MEETING ANNOUNCEMENTS

Society for California Archaeology Annual Meeting Symposium on Obsidian Studies

A symposium on obsidian studies is scheduled for the Society for California Archeology Annual Meeting in Redwood City, Thursday, April 5, 1990. The symposium is organized by Ms. Kim Tremaine. Drs. Richard Hughes, Sacramento State University, and Tom Jackson, Biosystems Analysis, Incorporated will serve as discussants. Contributed papers and their abstracts are presented below.

◦ Re-examination of the Potential for Visual Sourcing of Western Great Basin Obsidians.

Jefferson Haney and Sunshine Psota - Sonoma State University.

Discussed are methods and results of visual sourcing tests using a reference collection of five major obsidian sources and archaeologically recovered obsidian from the Mono area. Given the intra-source macroscopic variability and inter-source similarities of these obsidians, tests were designed to determine if the obsidian sources could be reliably identified and, if so, whether the application of visual sourcing can be applied to archaeological collections in this area. Previous studies suggest that certain sources can be more reliably identified than other sources. Conclusions will focus on results of reference collection tests and XRF assignments of archaeologically recovered obsidians.

◦ Specific Density and Heavy Liquid Sorting as a Potential Method for Sourcing California and Great Basin Obsidians.

Michael Jablonowski, Kim Tremaine, and Bruce Dahlstrom - Sonoma State University.

Obsidian density measurement studies from Melanesian sources have been useful as a first step in the mass sampling of obsidian collections prior to more sophisticated sourcing techniques using chemical analyses. This paper presents preliminary results of an investigation exploring the potential for using this technique with obsidian from Eastern Great Basin, Sierran Nevada, and North Coast Range sources.

◦ Obsidian Hydration Dating as a Function of Temperature, Composition, and Relative Humidity.

C.M. Stevenson, James Mazer**, and John K. Bates** - *Diffusion Laboratories and **Argonne National Laboratories.*

Induced hydration experiments on obsidian from Easter Island, Mule Creek (New Mexico), and the Coso volcanic field (California), have been conducted at relative humidities of 100, 90, and 60%. Based upon these data, the relationship between hydration rate and % relative humidity is non-linear. The correlation of obsidian hydration rates developed at 100% relative humidity with eight glass compositions indicates that the intrinsic water con-

tent wt) is the controlling factor in the hydration process. It now appears to be possible to derive the hydration rate for any obsidian source, at a specified temperature, once the intrinsic water content of the obsidian has been determined.

◦ Induced Hydration at Coso: Part III

Dr. James H. Cleland - Dames and Moore

The results of induced hydration experiments on two geochemical groups of Coso obsidian are presented. Chronometric dates utilizing induced hydration rates, corrected for effective hydration temperature and soil relative humidity, are compared to radiocarbon dates and artifact sequence dating. Variability within obsidian dates is also examined for internal consistency. Conclusions are drawn regarding the value of the induced Coso hydration rates for archaeological interpretation.

◦ Hydration Dating of Coso Obsidian: Problems and Prospects.

Mark E. Basgall - Far Western Anthropological Research Group.

Although the obsidian hydration method as been applied with success to volcanic glasses across much of California, reliable dating of obsidian from the Coso volcanic field has proven notoriously difficult. Empirical, linear rates derived using chronological data from scattered archaeological localities differ by as much as 250 years/micron. In accounting for this divergence, attention has recently shifted to the possible role of geochemical variation within the source area: chemical indices suggest that distinct subgroups could be hydrating at different rates, and induced hydration experiments indicate potential rate differences of up to 42 percent. However, these results are inconsistent with archaeological data from the surrounding area, and do little more than confuse further an already problematic situation. There is reason to think that intra-source differences are of minor concern, and that well-known factors affecting hydration can account for much of the variation observed in the regional record.

◦ A Relative Dating Approach for Bodie Hills and Casa Diablo Obsidians Derived from Accelerated Hydration Experiments.

Kim Tremaine - Sonoma State University.

Reiterating observations made by T. Jackson (1984), a clutter of hydration rates have been proposed for Bodie Hills and Casa Diablo obsidians. Given these rate options, divergent interpretations of hydration data are possible, which leaves one to regard particular scenarios suggested for the prehistoric exploitation of these resources as speculative. R. Jackson (1984), recognizing many problems involved with absolute chronometry, called for the development of interim alternative dating applications. Such developments have been undertaken in the last few years. This paper reviews the recent use of accelerated hydration experiments for relative dating purposes. Results of experiments on Bodie Hills and Casa Diablo obsidians are presented.

◦ **Intra-Operator Hydration Measurement Results: An Experiment Designed to Test Hydration Measurement Replicability.**

Joanna Freunde, Tom Origer - Sonoma State University.

At its inception, an initial optimistic response by archaeologists to obsidian hydration analysis was that it was a tool that could yield reliable absolute chronometric dates. Although a number of external factors are known to influence our ability to derive absolute dates, the internal aspects of making hydration band measurements unavoidably are dependent upon the human factor and the laboratory equipment used. Recent preliminary research has found that there is a 15% variance among inter-operator measurements. While these results are provocative, research is being conducted on a more fundamental level. This paper presents the findings of experiments designed to test intra-operator hydration measurement replicability.

◦ **Obsidian Hydration Inter-laboratory Variability Studies: Implications for Archaeological Interpretation.**

Kathleen Hull - Dames and Moore.

Results of a recent obsidian hydration inter-laboratory variability test, which included several California technicians, are reviewed. Approaches to archaeological interpretation based on obsidian hydration data are considered in light of the findings and those of earlier studies. Appropriate methods and applications are discussed, drawing on examples from central Sierra Nevada hydration studies.

◦ **Stratigraphic Layer Cake of Midden Puree: Developing Recipes for Obsidian Hydration Analysis.**

Robert Jackson - Lithichron Laboratory.

Archaeological deposits are affected by such agents as burrowing ground rodents and insects (faunalturbation), plant roots and tree-throw (floralturbation), and myriad other forms of pedoturbation. In addition, the prehistoric activities that created archaeological deposits often left ambiguous mixed, and overlapping evidence that are not without substantial interpretive challenges. Despite this complexity, obsidian hydration analysis often is conducted with "Anthro. 3" expectations for stratigraphic patterning and depositional integrity rather than a recognition of the complexity of human and natural processes that created archaeological deposits. Archaeologists must begin to develop and test "middle range" models that account for human and natural site formation processes if obsidian hydration is to be an effective analytic tool.

◦ **The Application of Obsidian Studies at CA-MEN-2247 near Laytonville.**

Sharon A. Waechter - Thomas M. Origer/Sharon A. Waechter, Consulting Archaeologists.

Recent studies of obsidian sourcing and hydration for sites in the North Coast Ranges have suggested some interesting patterns; specifically, Fredrickson noted a major

decrease in the use of Borax Lake obsidian at the time period represented by 3.5 microns, with an increase again at about 1.5 microns. Layton noticed an influx of Clear Lake obsidians in western Mendocino County at roughly this same time, which he believes may represent the westward expansion of the Pomo out of their homeland in the Clear Lake Basin. Data from recent excavations at CA-MEN-2247 near Laytonville in northern Mendocino County are applied to these hypotheses.

◦ **Obsidian Studies for the Austin Creek State Recreation Area**

Susan H. Alvarez - California Department of Parks and Recreation

The Austin Creek State Recreation Area (ACSRA), north of Armstrong Redwoods State Reserve, Sonoma County, is rugged country cut by perennial streams above the redwood belt. Mixed-evergreen/oak forests, grassy open areas, and riparian vegetation offer a variety of resources. Little information is available regarding pre-American use of this hinterland at the eastern edge of ethnographic Kashaya territory. Studies of obsidian from recently identified prehistoric sites within ACSRA boundaries should provide data pertinent to occupation and land use time depth and regional exchange dynamics.

Society for American Archaeology Symposium

In the Fall 1989 issue of the IAOS Newsletter, we announced that Dr. J. E. Ericson planned to chair a symposium titled "Advances in Hydration Measurement, Hydration Experiments and Chemical Characterization of Lithic Sources" at the 55th Annual Meeting of the Society for American Archaeology Symposium at the Riviera Hotel in Las Vegas, Nevada. The SAA Annual Meeting will be held Wednesday, April 18 - Sunday, April 22, 1990. Since that time, Dr. Ericson and participants of the symposium have been notified that the symposium has been scheduled as a poster session. The final disposition and arrangements of the session have not been made available at the time of this printing. Therefore, we will simply list the proposed symposium papers with no additional information or assurance that these papers will be presented as listed.

J. Regester and J. Hendersen - *Hydrogen Profiles of Obsidian Using Proton Beam.*

B. Scheetz, C.M. Stevenson, and K. Vadem - *Spectroscopic Ellipsometry: An Alternative Analytic Method to Achieve Angstrom Resolution of Obsidian Hydration Rims.*

I. Friedman, F. Trembour, and F. Smith - *Obsidian Hydration Rates as a Function of Relative Humidity.*

C. Stevenson, J.J. Mazer, and J.K. Bates - *The Effect of Relative Humidity on the Rate of Hydration: Implications for Obsidian Hydration Dating.*

K. Tremaine - *The Complexities of Glass Surface Reactions and Implications for Obsidian Dating.*

G. Pope - *Quartz hydration of Glacial Till, Eastern California as a Dating Tool.*

P. Bouey - *Recognizing the Limits of Obsidian X-ray Fluorescence Analyses.*

J. Ericson and J. Kimberlin - *Chemical Differentiation of Flows and Source Areas in California by Instrumental Neutron Activation and Statistical Analyses.*

M.S. Shackley - *Early Hunter-Gatherer Procurement Ranges and Mobility in the American Southwest: Evidence from Obsidian Geochemistry and Lithic Technology.*

J.R. Newman - *Notes on the X-ray Fluorescence Characterization of the Rhyadocite Sources of the Taos Plateau, New Mexico.*

About the IAOS

The IAOS was established to:

- 1) develop standards for analytic procedures and ensure inter-laboratory comparability;
- 2) develop standards for recording and reporting obsidian hydration and sourcing 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 advances in obsidian studies and the analytic capabilities of various laboratories and institutions.

Membership

The activities described above require modest financing. Initial mailings were performed largely at personal expense, but as we grow this cannot continue. We need membership to ensure the 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\$20.00/year
- ☒ Institutional Member\$50.00/year

Regular members are individuals or institutions who are interested in obsidian studies, and wish to support the goals of the IAOS. Regular members will automatically be subscribed to the Society for Archaeological Sciences (SAS) Bulletin, issued quarterly. If you already subscribe to the SAS Bulletin, deduct \$10.00 from the membership dues. The SAS Bulletin shall be the regular forum for meeting announcements and developments of the IAOS. Regular members will also receive any general mailings; announcements of meetings, conferences, and symposia; newsletters; and papers distributed by the IAOS during the year. Regular members are entitled to attend and vote in Annual Meetings.

Institutional members are those individuals, facilities, and institutions who are active in obsidian studies and wish to participate in inter-laboratory comparisons and standardization. If an institution joins, all members of that institution are listed as IAOS members, although they will receive only one mailing per institution. Institutional members will receive assistance from, or be able to collaborate with, other institutional members. Institutional members are automatically on the Executive Board, and as such have greater influence on the goals and activities of the IAOS. In addition, Institutional members will automatically receive the SAS Bulletin and all other mailings sent to Regular members. If you wish to become an institutional member and already subscribe to the SAS Bulletin, deduct \$15.00 from the membership dues.

This second newsletter is sent to everyone who has expressed an interest in the IAOS, current members and non-members alike. **If you do not join the IAOS, you may not receive future mailings.** While preparation of newsletters, mailings, the development of standards, and bibliographies is performed on a volunteer basis, reproduction and mailing costs cannot be supported without your help. If you wish to join us, mail a check or money order to the IAOS:

Ms. Kathleen Hull, Secretary-Treasurer
P.O. Box 235
El Portal, California 95318

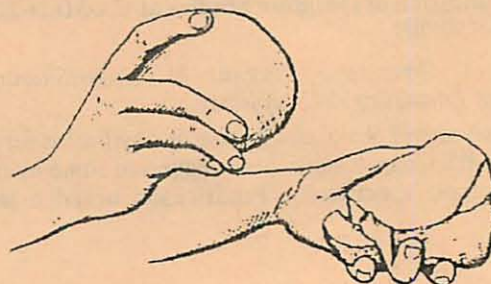
Call For Articles and Information

If you are interested in submitting a short article or announcement for inclusion in the next newsletter, the submission should be received by February 15, 1990. We accept electronic media on IBM compatible 3.5" or 5.25" disk, in Wordperfect (4.2 or 5.0), Wordstar, or ASCII text formats, as well as hard copy submissions if electronic media cannot be provided. Send your information to:

IAOS, Kathleen Hull, Secretary-Treasurer
P.O. Box 235
El Portal, California 95318

IAOS Officers, 1989-1990

President: Robert J. Jackson
Vice-President/President-Elect: Christopher M. Stevenson
Secretary-Treasurer: Kathleen Hull



IAOS BY-LAWS

By-Laws for the IAOS were drafted shortly after its formation. These By-Laws borrow heavily from other organizations' by-laws and policies. The draft IAOS By-Laws were developed because the organization needed some basic, initial operating policies, of particular concern when money (i.e., dues) is involved. With the first meeting of the IAOS close at hand, it is time to provide IAOS members with an opportunity to review the By-Laws and provide comments on the document. A copy of the draft By-Laws is attached to the Newsletter. Print size has been reduced in the interest of saving space. The microscopists among you should be equipped to read the document.

In conducting your review, please do not regard any of the provisions as sacred. Drafting by-laws was a new experience for me. Consider them simply interim guidance and a basis for discussion. In particular, be sensitive to provisions that may be difficult to fulfill, such as notification, election, and decision-making requirements that may limit flexibility. It might be prudent to establish flexible rules for a new organization, adding restrictions in the face of specific problems rather than attempting to anticipate problems that may never occur by adopting restrictive policies. Please be prepared to discuss the By-Laws at the Annual Meeting. If you cannot attend, please telephone me at (916) 322-9602 (work) or (916) 666-1754, or provide written comments prior to the meeting.

By-Laws

ARTICLE I -- NAME

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

ARTICLE II -- 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 archaeology.
2. The specific and primary purposes of 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 community in becoming more aware of problems and potentials of the application of techniques from the physical and natural sciences in archaeology; (c) to promote interdisciplinary research designs in archaeology; (d) to encourage research and the preparation of papers and reports on the investigation of natural glasses and the application of the results of such studies to archaeological problems; (e) to endeavor to maintain high technical standards in related archaeological studies; (f) to assist new and existing laboratories to adopt 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 other archaeological associations and societies; and (i) to advance relations with governmental agencies and the public in general; all without pecuniary profit to any director, officer, or member.

ARTICLE III -- 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 IV -- MEMBERSHIP

1. Membership in the IAOS is open to any person in sympathy with the objectives of the IAOS, as set forth in Article II, 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. Minimally, membership shall consist of Institutional members, defined as those persons and organizations active in performing obsidian source, hydration, or other physical studies. Non-institutional members are those persons or organizations interested in obsidian studies, although these persons or organizations do not perform obsidian studies. Non-institutional members may, for instance, be archaeologists involved in applying of using obsidian data for archaeological interpretations.
 - a. Institutional members are entitled to one representative and one vote on the Executive Board. The Institutional representative to the Executive Board shall be designated at the time of membership application.
 - b. Institutional affiliate members can be named under the auspices of the Institutional membership, as long as those individuals are actively involved with the obsidian studies program at that institution. Each named member shall have the voting rights of non-institutional members.
 - c. Each Institutional member shall receive one copy of all mailings from the Secretary-Treasurer.
 - d. Institutional affiliate members may, by application and payment, additionally become non-institutional members and receive all mailings. An individual is entitled to a single vote, however.

Each member shall have one 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.
3. The Executive Board may, by a three-quarters 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 II, 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 at its Annual Meeting.
6. The Secretary-Treasurer shall be empowered to discontinue the membership of any person or organization for non-payment of dues for one full year.
7. No member shall be personally liable to any creditor of the IAOS for any indebtedness of liability, and any and all creditors shall look to the IAOS assets for payment.

8. Membership in IAOS requires subscription to the Society for Archaeological Sciences (SAS) Bulletin, a quarterly newsletter. Subscription costs to the SAS Bulletin are included in IAOS dues.

ARTICLE V -- ORGANIZATION

1. The Officers of the IAOS shall consist of a President, a Vice-President/President-Elect, a Secretary-Treasurer, representing no fewer than two institutions or laboratories.
2. IAOS policies and directions shall be established by an Executive Board, consisting of institutions, laboratories, and/or researchers active in the field of natural glass studies (Institutional Members).
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 a one-year term, at the conclusion of which he/she shall succeed to the office to President to serve a one-year term. The President and Vice-President must be Institutional members of IAOS, unless a nomination of a Non-Institutional member is supported by a two-thirds vote of the Executive Board.
5. The Executive Board of the IAOS shall consist of the President, Vice-President, Secretary-Treasurer, and Institutional members of the IAOS.
6. No restriction is placed on officers seeking election to the same office in which he/she has previously served, nor different office within the IAOS.
7. 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 President's term.
8. In the event of the absence, death, resignation, or incapacity of the Secretary-Treasurer, the President shall:
 - a. in consultation with the Vice-President, assume Secretary-Treasurer responsibilities for the remainder of the elected term, or
 - b. appoint an acting Secretary-Treasurer from among the Institutional members of the IAOS. Upon accepting the position, the acting Secretary-Treasurer will complete the remainder of the one-year term.
9. The offices of President, Vice-President, and Secretary-Treasurer shall be elected by a majority vote of the IAOS member-attenders of an annual meeting. A minimum of one half of the Executive Board (Institutional members) must be present at the annual meeting to elect new officers, vote by mail or by proxy.

ARTICLE VI -- DUTIES OF 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 in these 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, agencies, or councils.
 - c. Acting in consultation with the Vice-President, the President shall appoint all necessary committees and define their duties.
 - d. The President, in consultation with the Vice-President, may designate members in various regions to represent the interests of the IAOS in that region.

- c. The President, Vice-President, and Secretary-Treasurer shall sign all written contracts authorized by majority vote of IAOS members at an annual meeting, or by special mail ballot, except for basic contracts for printing and other matters necessary to routine publication. Such contracts may be signed by the President or Vice-President, and the 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 for duration of the meeting.
 - c. The Vice-President shall assume the title and duties of President after serving one year 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 meeting to the membership of the IAOS;
 - 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, maintaining a minimum of two 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 of the IAOS;
 - vi. assemble and mail articles, and announcements to the membership and/or the Society for Archaeological Science Bulletin.
 - vii. mail and receive applications for membership, and ballots.
4. 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 of vote by the membership, or a majority vote of the Executive Board.

ARTICLE VII -- EXECUTIVE BOARD

1. Subject to the general directives and limitations imposed by the membership at the Annual Meetings or by mail ballot, the Executive Board shall have authority to execute on behalf of the IAOS all powers and functions of the IAOS, as defined in these By-Laws.
2. The Executive Board may hold special meetings at the call of the President.
3. A Quorum of the Executive Board shall consist of a majority of the Institutional Members 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 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 proxy for that meeting. But no person by virtue of holding

proxies shall have the right to cast more than one 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 ballot. Ballots shall be 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 for return to the Secretary-Treasurer. This date shall be not less than fifteen (15) days from the date they were placed in the mail nor more than thirty (30) days from the date they were placed in the mail by the Secretary.
6. Reports of officers, representatives, delegates, committees, and agents shall be approved by the Executive Board. 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 by the Executive Board to the Annual Meeting for approval.

ARTICLE VIII -- ELECTIONS

1. Before December 1, of each year, the Secretary-Treasurer shall submit an announcement of election of new officers in the Society for Archaeological Sciences Bulletin. This announcement shall solicit nominations and provide information regarding the submission of absentee ballots.
2. Any person receiving two 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. Additional nominations can be solicited at the Annual Meeting, regardless of the mailed nominations. Each nomination at the Annual Meeting must be supported by a second.
3. Each active member shall be entitled to vote for one candidate for each office. The election shall be conducted at the Annual Meeting, during the spring (usually late-March or early April) of each year.
4. Officers shall be elected by a simple majority vote of member-attenders and absentee ballots at the Annual Meeting.
5. Any office 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.
6. If an officer is unable to complete the term of office the Executive Board, by Special Meeting, ballot, or telephone conference, appoint a member to fill the unexpired term, so long as not inconsistent with other provisions of these By-Laws.

ARTICLE IX -- 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 meeting annually. 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 Annual Meetings will be determined by the geographic distribution of members, to ensure maximum participation and minimize inconvenience for the majority of Institutional members. When appropriate, Annual Meetings will be scheduled to coincide with other professional meetings (e.g., Society for American Archaeology Annual Meetings) to provide an economy of travel and increase opportunities for participation.
3. Due notice of the place and time of the ensuing Annual Meeting shall be published in the Newsletter of the Society for Archaeological Sciences and mailed 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, providing that at least half of the Institutional Members are represented.
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 or the general membership so directs by majority vote. 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 request of at least three (3) members of the Executive Board. Special Meetings of the Executive Board may not be called with less than fifteen (15) days notice to all members of the Board.
8. All matters of the business of the IAOS may be decided by means of a referendum vote by mail 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.

ARTICLE X -- FINANCES

1. The fiscal year of the IAOS shall be set by the Executive Board so long as not inconsistent with the laws of the State of California.
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., Institutional Member, Regular Member).
4. Dues shall be payable on 1 January of each year.
5. Failure to pay dues by 180 days after 1 January of the year in which they become due will result in automatic dismissal of a member. To be reinstated, a former member must re-apply for membership or pay a late fee, to be established by the Executive Board.
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.
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. Any provision herein notwithstanding, such transactions shall be consistent with the laws of the State of California.
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 membership 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 as available funds.

ARTICLE XI -- 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 501(c) (3) of the Internal Revenue Code of 1954 (or the corresponding provision of such future

Internal Revenue law as may be in effect).

ARTICLE XII -- 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 IX, paragraph 3. The By-Laws may also be amended by mail 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 LAOS. The proposed amendments shall be mailed to the members of the LAOS by the Secretary at least thirty (30) days before a Annual Meeting or thirty (30) days before a Special Meeting. In the case of a mail ballot upon an amendment, members shall address ballots to the Secretary 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. 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.

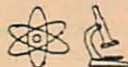
WORKING POLICY

1. The fiscal year of the LAOS runs from January 1 through the following December 31.
2. The organizational year of the LAOS is determined by the timing of the Annual Meeting, which now runs from about March/April to the following March/April. Officers are elected for terms running one year beginning at the time of the Annual Meeting to the following Annual Meeting.

3. Important dates in the business calendar of the LAOS are as follows:

- a. As quickly as possible following the Annual Meeting, the Secretary-Treasurer should mail to all Executive Board members the following items: a) a copy of the current By-Laws and Working Policy, b) a copy of the membership list, c) a packet containing 10 copies of LAOS stationary/envelopes, d) a copy of the addresses and telephone numbers of all members of the Executive Board, and e) 10 copies of membership materials.
 - b. As quickly as possible following the Annual Meeting, the Secretary-Treasurer should mail copies of the minutes of the Executive Board and Annual Meeting to all members of the Executive Board.
 - c. As quickly as possible following their election, the names and addresses of the new LAOS officers should be printed in the LAOS Bulletin and/or a separate mailing to the membership.
4. At its Annual Meeting, the following tasks should be accomplished:
- a. Any amendments to the By-Laws must be proposed and voted upon, if a quorum of the membership or Executive Board is present.
 - b. The LAOS 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 LAOS, and activities toward achieving those goals.
5. The Secretary-Treasurer is directed to correspond with every LAOS member each year, encouraging them to renew their membership, informing them of any changes in annual dues, LAOS activities, and officers. This correspondence may be included in a bulletin or newsletter that discusses other LAOS matters.
6. 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 LAOS.

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