

International Association for Obsidian Studies Bulletin

Number 19

Summer 1997

Business Address: Department of Anthropology, San Jose
State University, San Jose, California, 95192-0113

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CONTENTS

- *News and Information* - 1
- *Short Reports and Reviews* - 5
- *Abstracts and Annotations* - 8
 - *Tech Notes* - 17
 - *New Books* - 20
 - *New Labs* - 21
- *About the IAOS* - 21

NEWS AND INFORMATION

From the President's Desk

by *Dr. Jonathon Ericson*
University of California, Irvine

On one particularly windy and rainy New Jersey afternoon, I sat transfixed at a picture of obsidian in Pough's Field Guide to Rock and Minerals, 1954 edition. I did not know then that the study of obsidian would consume a considerable part of my research career and would become the basis of my PhD. Thesis, let alone that I would someday become President of the International Association for Obsidian Studies. The day did come and I want to thank you for your vote of confidence. This helps close the loop of a 12-year-old roundhound.

Annual Meeting

On April 4, 1997, we had a successful meeting at the Opryland Hotel in Nashville, Tennessee. Although attendance was small we were able to address some significant issues. A detailed report of the meeting was produced by Pat Dunning (see following insert).

It is a pleasure to announce that Dr. David Fredrickson has been elected President-elect and will serve as President in 1998-99. Welcome aboard, David.

As part of the Annual Meeting Wal Ambrose of the University of Auckland was presented *in absentia* the first Excellence Award for his lifetime achievements, contributions and innovation to obsidian studies in three different areas: obsidian hydration dating, obsidian characterization, and obsidian trade. Wal's many contributions and achievements in obsidian studies are outlined on page 3 of this bulletin.

As part of my Inaugural Speech I reported on a recent workshop I attended at the National Academy of Sciences held by the National Research Council (NRC). The 1996 NRC Report, *Glass as a Waste Form and Vitrification Technology: Summary of an International Workshop, National Academy of Sciences Press, Washington, D. C., 1996*, provides the Association with an assumable challenge to contribute to the improvement of the state of knowledge of glass as a waste form for the immobilization of radioactive wastes. The NRC Report indicates the importance of natural glass analogues to confirm the hypothesized long-term behavior of nuclear waste glass in specific geochemical environments. As specialists in obsidian studies we have access to obsidian samples exposed to a variety of natural environmental conditions for up to 100,000 years, if not longer. These samples and the reconstruction of environmental conditions can provide the empirical data to evaluate the long-term stability of glasses. It will be important to come together with appropriate glass technologists to define protocols and parameters which need to be analyzed to further our knowledge on natural glass stability. Towards those ends I have organized a workshop to be held at the next Society for American Archaeology Meetings.

Workshop: Obsidian as a Natural Analogue for Nuclear Waste Form Glasses

As the President of IAOS, I would like to invite you to attend the *Workshop: Obsidian as a Natural Analogue for Nuclear Waste Form Glasses*. This will be held as part of the 63rd Annual Meeting of the Society for American Archaeology on March 25-29, 1998, at the Washington State Convention and Trade Center in Seattle with the Sheraton Seattle serving as the headquarter hotel. Some of the conveners or discussants of the NRC Workshop are being invited to provide position papers on the environmental and material parameters affecting the stability of glass under natural conditions to improve our knowledge on the stability of waste form glasses immobilizing radionuclides. We hope you will be able to participate in the workshop which will be mutually beneficial to our Association and attending glass technologists.

Outreach Session: The Status of Research on Obsidian on a Worldwide Basis

As the President of IAOS, I would also like to invite you to participate in a poster session targeted for members of the Society for American Archaeology at the 63rd Annual Meeting of SAA in Seattle.

The goal of the Outreach Session is to update the lay archaeologist on the status of research on obsidian. Unfortunately, obsidian studies have been misunderstood by many archaeologists to the point of outright rejection of research grant proposals without satisfactory scientific justification or denial of analysis of obsidian artifacts in site or regional research designs. We want to overcome biases of the past and clarify our positions as scientific researchers.

If you are interested in participating in the session, please submit your paperwork to me by August 1, 1997, on standard SAA forms. The poster paper should focus on obsidian trade, chemical characterization or hydration. I will serve to organize the session and design the overall architecture of the session. We are interested in demonstration and hands-on displays of techniques and/or equipment in a Science Fair mode. We want this Outreach Session to be comprehensive, interesting, and positive.

World-Wide Query

Please send me the location and name of any Pleistocene volcanoes overlaying limestone. My correct e-mail is JEERICSO@UCI.EDU, not as reported in IAOS literature. Thank you in advance for this information. See you all in Seattle for some interesting sessions.

*Jonathon E.
Ericson, Ph.D.*

IAOS Annual Meeting

*by Patricia Dunning
California State University, San Jose*

The ninth annual meeting of the IAOS was held at the Opryland Hotel (Nashville) on Friday afternoon, April 4, in conjunction with the 62nd annual meeting of the Society of American Archaeology. A total of eight members, officers, and a guest were present. Robin Torrence, from the Australian Museum in Sydney, traveled the farthest.

The meeting was called to order by President-Elect (now President) Jon Ericson. Tom Jackson (President) was unfortunately unable to attend. Jon announced that Dave Fredrickson was elected President-Elect for the 1997/8 year. Jon also announced that Wallace Ambrose was selected as this year's recipient of the Excellence Award in Obsidian Studies. Wal was awarded a plaque, which Robin Torrence will take to him on our behalf (see Jon's article, this *Bulletin*).

Pat Dunning presented the Treasurer's report. Our bank balance, on March 30, 1997, was \$4,984, up from \$3,838 on the same date in 1996. Income, primarily from membership dues, was \$1,900 in 96/97 versus \$1,837 in 95/96. Expenses, virtually all for printing and mailing the *Bulletin*, were \$754 in 96/97 versus \$1,143 in 95/96. Total membership at the end of the 1996/97 fiscal year included 100 members: 12 international and 88 U.S. Twelve members have Life Memberships (two new this year) and two (from Russia) are complementary. This implies that at least \$2,800 of our bank balance pertains to sending *Bulletins* to Life/Comp. Members. While 14 members were dropped for non-payment of dues (two of whom have since

rejoined), two new members joined and two previous members rejoined in 1996/7. (Five new members have joined so far in the 1997/8 fiscal year.) Dunning suggested that the sparse recent *Bulletins* may explain the membership loss. Alternatively, the increase in membership in 1993 and 1994 may be explained by the availability of the Obsidian Studies Bibliography: the bibliography cost \$10; membership, including the bibliography, cost \$20.

The consensus of the attendees was that the sparseness of the Bulletin was not the problem, but, it should be published on time, with whatever material was available, and we should invest more energy in soliciting articles.

Jon Ericson presented several proposals on how to use the available bank balance. The idea of a temporary annual membership fee reduction was rejected -- the consensus was that the annual fee was not a problem. But, it was agreed that we should do something to make the organization more available to students. The final resolution was (1) to offer free membership to students who submit either a research report on an obsidian study for publication in the *Bulletin* or an abstract of such a paper published elsewhere. Additional abstracts or research reports would extend the "free" membership for additional years. (2) Students who do not submit abstracts/reports can join for \$10 per year. Pat Dunning agreed to develop a postable page for the next Bulletin describing the new student options.

We also discussed the problems international members may have in paying in \$US. Pat Dunning agreed to investigate whether SJSU would allow their credit card facility to be used to solve this problem. In the interim, because our account is now with the Bank of America, we will accept (reluctantly) funds in foreign currencies.

Finally, to further the use of obsidian studies in archaeological research, it was suggested that the IAOS sponsor a session at the next SAA meeting (to be held in Seattle). Its objectives include dispelling myths and providing information on what obsidian studies can tell us, their reliability, and how to go about using them. After considerable discussion, a consensus concluded this should be an expanded poster session.

The discussion on the proposed workshop to provide input to the Radioactive Waste community is covered in Jon Ericson's report.

IAOS Election Results

IAOS is pleased to announce that Dr. David Fredrickson will serve as President-Elect for the 1997-1998 term and President for the 1998 - 1999 term. Dr. Fredrickson is Professor Emeritus with the Department of Anthropology, at California State University, Sonoma. He established the Cultural Resources Management program at Sonoma State University and initiated and directed (until his retirement) its Anthropological Studies Center and Obsidian Hydration Laboratory.

Dave has been involved in obsidian studies for more than 35 years and is a charter member of IAOS. While his own work focuses on the application of obsidian analysis to archaeological questions, he has encouraged research in obsidian geochemistry and a better understanding of the hydration process.

As IAOS President-Elect, Dave's focus will be on improving communication -- the exchange of ideas, methods, and techniques -- across the membership, using the Bulletin, the Web site, and personal contact to affect this result.

EXCELLENCE IN OBSIDIAN STUDIES AWARD WINNER

WALLACE AMBROSE

*Nomination Speech as Read by Dr. Jonathon Ericson
at Annual Meeting*

For lifetime achievement in obsidian research, Wallace Ambrose is hereby awarded the Excellence Award in obsidian studies. He has been nominated by his peers and selected by the International Association for Obsidian Studies to be internationally recognized for his contributions and innovations to obsidian studies in three areas: Obsidian Hydration Dating, Obsidian Characterization, and Obsidian Trading Systems:

Obsidian Hydration Dating

- ◆ invention of the thermal cell, patented in U.S., U. K., and Japan, which has been adopted for obsidian hydration dating, racemization dating, soil development and climatology on a worldwide basis;
- ◆ innovative measurement of stable hydration band by digitized computer imaging and application of nuclear profiling;
- ◆ innovative measurement of stable fissure bands internal to obsidian;
- ◆ discovery of surface dissolution of hydration layer in chemically aggressive environments;
- ◆ innovative experimentation on relationships of surface area and relative humidity to the rates of hydration
- ◆ innovative experimentation on the role of normal terrestrial temperatures on induced hydration of obsidian;

Obsidian Source Characterization

- ◆ invention of a new characterization technique using relative density of obsidian which has become a surrogate measure for determining hydration rates;
- ◆ innovation of characterization of obsidian by physical appearance and refractive index;
- ◆ collaborative research establishing reference file on composition of Pacific obsidians using PIXE/PIGME, SEM, EDS, and neutron activation analytical systems;

Obsidian Trading Systems

- ◆ innovative research on prehistoric quarries and associated settlements in Papua, New Guinea;
- ◆ first research to recognize that in highly active volcanic areas not all obsidian sources are equally accessible throughout prehistory; and,
- ◆ one of the first researchers to recognize the misuse of direct analogy from ethnographic records involving Lapita pottery raising a whole series of important issues about comparison of archaeological and ethnographical data.

The following statements provided by Dr. Ambrose's colleagues for his nomination emphasize his many contributions to obsidian studies and archaeology the world over.

"His outstanding publications speak for themselves, he has been intimately involved in all aspects of obsidian studies – discovering sources, collecting samples, digging up artifacts, developing methods in dating and characterization, applying a range of characterization methods, and finally producing meaningful results for archaeology... Very few physicists, chemists, geologists or archaeologists have made such broad ranging or substantial contributions to the field of obsidian studies" (Robin Torrence, Letter of Jan 10, 1997).

"The breadth of his archaeological engagement, the insight and originality he brings to his work, the formidable scientific self-education on which he can draw, the wide and appropriate reading which he undertakes and the practical experience and skills on which he can call for testing and improving and adapting. He is withal the most helpful of people, as solid behind his colleagues as over the years he was behind the stumps for his departmental cricket team" (Jack Golson, 1997).

"Wallace Ambrose is a model archaeologist of whom Brothwell and Higgs noted the lack in their landmark publication of 1963, *Science in Archaeology*, one with sufficient scientific knowledge to cast a discriminating eye over the mass of scientific evidence upon which much of his ultimate conclusions will in the future be based" (Brothwell and Higgs, 1963 quoted in Jones 1982:25; Jack Golson 1997).

Congratulations go out to Dr. Ambrose for a award truly deserving!

SHORT REPORTS & REVIEWS

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Short Reports & Reviews provides an archaeological context in which to report obsidian research and related information. Reviews of recent studies, research in progress, older findings, regional, site, and artifact specific summaries, as well as other reports, announcements, etc. of pertinent interest are encouraged. To submit contributions to Short Reports or for an outline of recommended archaeological/obsidian information for the Short Report format contact Mike Rondeau.

Notice to Readers

At the end of 1997 I will be stepping down as the Short Reports and Reviews editor. I plan to submit one additional column following this current issue. I have chosen to make the announcement known now to allow ample time to find a replacement for this position. Being editor of the Short Reports and Reviews column has been an interesting and educational experience. I recommend it highly!

Obsidian Razors from Mexico and New Guinea

Submitted by
Alice C. Gorman,

Department of Archaeology and Palaeoanthropology,
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Australia

As part of my Ph.D. research on use-wear and residues on flaked stone and bottle-glass razors, I examined two obsidian razors from the Pitt Rivers Museum in Oxford (U.K.). A razor can be defined as any sharp-edged cutting tool that is generally used on the human body, whether for shaving, hair-cutting, surgery, scarification or tattooing. Obsidian and bottle glass are ideal raw materials for razors. Extremely sharp edges can be obtained, although they also blunt very

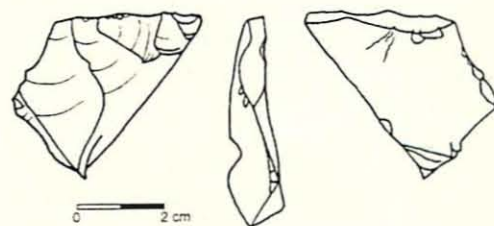
quickly. The smallest flakes can be used as long as there is enough purchase for two fingers.

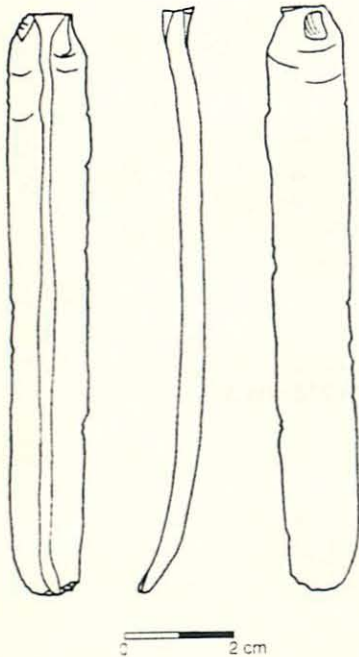
The "Mexican" razor, identified as such by the label, is a long curved blade from the valley of Oaxaca, dated 1498 and belonging to the original Pitt Rivers collection. It is 107 mm long with two dorsal ridges and has fine scalar retouch on the distal end. There are some doubts about its identification: there is no documentation apart from the museum label, the date is dubious, and the presence of distal retouch is puzzling.

The New Guinea razor comes from Goodenough Island. It was collected by Diamond Jenness, who was informed of its function by the islanders, and was donated to the Pitt Rivers Museum in 1913. It is a flake, 34 mm long, and unlike most razors, quite chunky.

The wear and residues are consistent with other glass razors I have studied (for example, from the Andaman Islands). Polish is present but undeveloped and undiagnostic. Striations are virtually absent. Edge scarring is frequent, consisting mostly of clusters of feather terminations of less than 1 mm. Polish and edge scarring tend to occur together on the same face, indicating a scraping-like motion. Combined with the residues observed on the razor edges, such as fragments of human hair, skin cells and blood, these characteristics may be used to identify possible use of obsidian artifacts as shaving tools.

Obsidian razor use in Mexico and New Guinea is well documented ethnographically (Crabtree 1968; Prescott 1843; Specht 1981). In sum, comparing the lateral use-wear and residues on the "Mexican" razor with razors from secure contexts such as that from New Guinea, the function of the flake as a razor seems very likely.





Double Hydration Band Widths from Abiquiu Reservoir, New Mexico

A Review

Two CRM reports of interest for obsidian studies resulted from the Abiquiu Reservoir studies under the U.S. Army Corps of Engineers, Albuquerque District. Those studies were accomplished by Mariah Associates, Inc. (Bertram et al 1989, Earls et al 1989). The first, completed in January of 1989 (Earls et al), reports on the study of three cobble ring sites. A total of 294 pieces of obsidian were studied. Criteria for selection of obsidian specimens for source and band width studies were discussed. One criterion was the preference for subsurface pieces since those on the surface were thought to have a greater likelihood of having been recycled. The reason(s) that surface pieces were thought to have a greater chance of having been recycled would have been of interest to know.

Two sources of volcanic glass were reported, Polvadera and Cerro del Medio. The formulas for converting band widths into calendrical dates were provided. However, the actual hydration data were not provided. What was provided, however, was selected illustrations of artifacts with the hydration cut locations. This was of particular interest for the 11 double band width specimens recovered from the three sites studied. Both projectile points and flakes yielded reuse evidence. Those specimens were interpreted as evidence of obsidian recycling in the region.

The second report, October 1989 (Bertram et al), added a third volcanic glass source, that of Obsidian Ridge. Discussions regarding various issues influencing hydration readings, including rind stability, recycling and context were provided. Two hundred and forty-eight specimens of glass were submitted for study. Multiple band widths were suggested for a minimum of 45 pieces. The designation of having been reused was applied to flakes, points and other obsidian tools. A series of interpretative analyses followed. The report provides the actual hydration data for independent evaluation. Again, calendrical dating was provided based on included hydration studies by Christopher Stevenson. It was concluded that "Obsidian surface scatters sometimes can be recomposed into culturally meaningful study assemblages, using hydration analysis" (Bertram et al 1989:304). For both reports the hydration studies were also accomplished by Stevenson and the chemical characterizations by Richard Hughes.

Seeing Dots, Clear Lake Basin, California

A Review

The Doctoral dissertation *Dots on a Map: Using Cultural Resource Management Data to Reconstruct Prehistoric Settlement Patterns in the Clear Lake Basin* by John Parker cannot be done adequate justice or injustice by a review in this limited column. Nonetheless, two elements will be provided below. The first is a quick skim over some of the topics that the dissertation was designed to cover, thereby indicating the degree to which that dissertation extends beyond the scope of this column. The second area covered is a brief discussion of the basis for the use of obsidian studies as a temporal data set helping to determine diachronic settlement patterns.

The dissertation delved into: 1) the theoretical foundations of settlement pattern studies; 2) the cultural and environmental elements of the study region; 3) a review of paleo-environmental and archaeological data of the Clear Lake Basin; 4) elements of least cost modeling; 5) analysis of the ethnographic data towards its use along with archaeological information in using least cost concepts to predict settlement pattern changes through time; 6) a review of CRM data to

develop an understanding of the regional distribution of prehistoric sites and the general patterns they suggest; 7) the selection of sites for additional obsidian hydration sampling for temporal control; 8) a review of dating methods and the temporally diagnostic regional data sets; 9) the development of diachronic settlement patterns; 10) a comparison of those patterns to earlier predictions that were offered regarding colonization, population expansion, and economic changes in the region through time; and 11) an evaluation of both those expectations that were supported by the findings as well as those that were not.

A total of 1119 hydration readings representing 100 sites in the region were used. This provided an average of 11 specimens per site with the actual number of pieces per site ranging from one to 200. Citations were presented in support of two to three or five specimens being adequate for chronological control at single sites. Why this should be so was not explored. For those sites revisited by the author (N = 48), five obsidian specimens each were collected. That appears to total 240 pieces although only 211 were used. The reason for this is not explained, but would probably have been apparent if the obsidian hydration data involved in this study had been included. Since that data was not included, the sampling strategy, the representative nature of the resultant data, nor the validity of subsequent uses of that information could not be evaluated. Tom Origer provided the additional hydration band width analyses that were undertaken specifically for the doctoral study.

References

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1989 Report of Surface Collection and Testing at 18 Sites Near Abiquiu Reservoir,, Northern New Mexico. U.S. Army Corps of Engineers, Albuquerque.
- Crabtree, D.
1968 Mesoamerica polyhedral cores and prismatic blades *American Antiquity* 33:446-478.

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1989 Analysis of Three Cobble Ring Sites at Abiquiu Reservoir, Rio Arriba County, New Mexico. U.S. Army Corps of Engineers, Albuquerque.

- Parker, John W.
1994 Dots on a Map: Using Cultural Resource Management Data to Reconstruct Prehistoric Settlement Patterns in the Clear Lake Basin. Ph.D. Dissertation, University of California, Los Angeles.

- Prescott, William H.
1843 History of the conquest of Mexico, with a preliminary view of the ancient Mexican civilization, and the life of the conqueror, Hernando Cortes New and rrevised edition John Foster Kirk (ed) Swan Sonnenschein and Co, London.

- Specht, Jim
1981 Obsidian sources at Talasea, West New Britain, Papua New Guinea *Journal of the Polynesian Society* 90(3):337-356.

News from the Pacific Region

by Dr. Robin Torrence

In terms of publications, it has been a very productive year for Pacific obsidian research with many studies reporting results: a number of abstracts are included in this bulletin. In addition, the Sixth Australasian Archaeometry conference (at the Australian Museum, Sydney, February 10-14, 1996) was a huge success with nearly 200 participants. Five papers on obsidian were presented in a session which ended with the presentation of a book of 15 essays to Wal Ambrose, one of the pioneers in obsidian hydration dating and characterization studies. Wal is so integral to obsidian studies in Pacific research that he turned up as an author in his own festschrift!! At the ceremony Wal was completely taken by surprise and for once rendered nearly speechless!

In contrast to what was reported in a recent paper in *Archaeometry*, we are happy to report that two non-destructive techniques used in obsidian sourcing in the Pacific region (energy dispersive XRF and PIXE-PIGME) are producing excellent, reproducible, and reliable results.

ABSTRACTS AND ANNOTATIONS OF 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 or to hear of and gain access to reports. In addition, the proliferation and number of journals, and the interdisciplinary nature of obsidian and glass studies make it difficult to keep abreast of all relevant current literature. The IAOS Bulletin will alert readers to some of this information by reproducing abstracts and summarizing literature that may be of particular interest to IAOS members.

** Please note that the abstract reported in Bulletin No. 18 "Obsidian in the Sinjar" was written by Bader, Merpert, Munchaev, Chataigner, Francaviglia and Gratuze and not by M.-C. Cauvin. We are sorry for any confusion that this error in reporting may have occurred.*

Ambrose, W.

1996 Obsidian hydration dating of the Reef/Santa Cruz Lapita sites in J. M. Davidson, G. Irwin, B. F. Leach, A. Pawley, and D. Brown (eds.) *Oceanic Culture History: Essays in Honour of Roger Green*, pp. 245-255. Dunedin: New Zealand Journal of Archaeology Special Publication.

Abstract

A reevaluation of an early attempt to use obsidian hydration dating in a tropical setting illustrates recent advances in this technique. Obsidian hydration determinations made in 1973 have been remeasured by computer imaging techniques on concealed cracks and recalculated using new data concerning local site temperature and hydration rate. The effects of surface dissolution are also discussed. New data concerning experimental determination of hydration rates based on long term readings of Talasea obsidian exposed to the lower temperatures of 30° and 40° C is presented. Taking into account these new developments, the hydration dates do not differ greatly from radiocarbon dates from the same levels. The prospects for obsidian hydration dating at high

rainfall tropical sites have significantly improved in the past twenty years.

1997 Obsidian dating prospects. Paper presented at the Sixth Australasian Archaeometry Conference, Australian Museum, Sydney, February 10, 1997.

Abstract

Developments in the nuclear industry have shown that some of the problems related to the glassification of waste for long term storage are centered on the rate of glass weathering in various repositories. Long term weathering of artificial glasses is paralleled by the archaeological problem of determining hydration rates in obsidian artifacts as a means of dating their manufacture. Figures available for sites in Papua New Guinea indicate that the weathering rate is sufficiently fast to render conventional hydration measurement completely unreliable. This follows from the range of calculated surface reduction rates which range between .0002 μm to .004 μm per year depending on the site's location and the obsidian source. Hydration rates for key Papua New Guinea obsidians have been determined from long term experimental laboratory exposure and these are used to evaluate the age of obsidians from selected archaeological sites. By adopting a strategy of measuring hydration in concealed fissures, both the weathering rate and the dating of the Papua New Guinea obsidian have been successfully achieved. The dissolution rates of natural obsidians could be useful in considering weathering rates for artificial glasses. An improved system for calculating the annual effective hydration temperature is presented which gives a better control of micro-environmental temperature in its crucial determining role. The combined result of these developments gives obsidian hydration dating an enhanced capacity to be a useful and independent dating system.

Anderson, A., Ambrose, W., Leach, F., Weisler, M.

1997 Material sources of basalt and obsidian artifacts from a prehistoric site on Norfolk Island, South Pacific. For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 39-46.

Abstract

Recent discovery of a prehistoric archaeological site at Emily Bay, Norfolk, enables the question of settlement origins to be revisited. Analysis of a sample of basalt flakes by non-destructive, energy-dispersive XRF analysis indicates that there was local adze production, not merely refurbishment, suggesting that quarry and reduction sites might yet be discovered. Analysis of an obsidian blade by major elements and PIXE shows that it originated in a Raoul Island (Kermadecs) source. It is hypothesized that the colonization history of the Norfolk group belongs with those of other temperate archipelagoes (Kermadecs, Chathams, Snares) which appear to have originated in New Zealand rather than tropical Polynesia.

Anderson, J., and T. Origer

1997 Adding a Little Fuel to the Fire: Some Thoughts on Fire and Obsidian Hydration. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

This paper is a continued exploration into the affects of fire on obsidian hydration. This study began in 1993 when a wildfire swept Salt Point State Park. This study has focused on CA-SON-458, which was chosen as a case study because it had been subjected to archaeological investigations prior to the fire. This paper will compare the outcome of the post-fire research done at CA-SON-458 to the results of hydration studies done prior to the wildfire. Also included in this paper will be a discussion of experiments that have been done to further enhance our understanding of the relationship between fire and obsidian. (see this issue for entire paper)

Bird, R., Torrence, R., Summerhayes, G., and Bailey, G.

1997 New Britain Obsidian Sources. For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 61-67.

Abstract

The natural occurrence of obsidian in volcanic flows in West New Britain has been thoroughly investigated and new measurements of the composition of field samples have been made with a proton dose of 150 μC - increased by a factor of three compared to analyses reported in early studies. New data on precision and accuracy of PIXE-PIGME show that measurement error is not a significant factor in interpretations of chemical variability among source and artifact samples. The results provide evidence for 5 readily distinguishable groups of source samples (Gulu, Kutau/Bao, Baki and Mopir) plus two subgroups (GaralaB and GaralaC) which differ from the Baki source for a few elements and have higher standard deviations from most elements. An unusual degree of variability within the Hamilton and Garala source samples must be taken into account during the classification of artifact collections.

Bonetti, R. Guglielmetti, Malerba, F., Oddone, M., Bird, R., and Torrence, R.

1997 Age Determination of obsidian source samples from north Queensland, New South Wales, and Papua New Guinea by means of the fission track method. Paper presented at the Sixth Australasian Archaeometry Conference, Australian Museum, Sydney, February 10, 1997.

Abstract

The fission track method applied to obsidian samples allows one to determine their geological age by counting etched tracks due to spontaneous fission of Uranium impurities, usually in the ppm-tens of ppm range. Analysis of recently discovered obsidian in North Queensland and New South Wales yield dates from 85.5-92.3 Ma and place them among the oldest obsidians ever dated by fission track dating. The method has also been applied to the much younger obsidians from the Williaumez peninsula in Papua New

Guinea. In this case it seems likely that the obsidian widely traded in the past is nearly contemporary with or actually younger than the first human settlement in the region.

Brennan, P., and Sagona, A.

1997 Obsidian from volcanic sequences and recent alluvial deposits, Erzurum District, North-Eastern Anatolia: Chemical Characterization and archaeological implications. Paper presented at the Sixth Australasian Archaeometry Conference, Australian Museum, Sydney, February 10, 1997.

Abstract

Recent geoarchaeological research in the Erzurum district, north-eastern Anatolia, has revealed an abundance of obsidian at numerous Neolithic and Bronze Age sites. Geochemical characterization using neutron activation analysis indicates that the obsidian was obtained from several sources that are chemically distinct from the major sources already known from Central Anatolia in the Lake Van area. Multiple sources are represented in the samples collected from at least two of the sites, namely the sites of *Sos* and *Pulur*. The primary source of some of the obsidian utilized at the site of *Sos* has been located in the volcanic sequence outcropping to the north-west of *Pasinler*. Field survey, however, has shown that the alluvial deposits along the main rivers and some of their tributaries were the main sources of the obsidian utilized at the sites near Erzurum. Trade or exchange of obsidian with sites outside the Erzurum area seems to have been limited.

Buvit, I., and T. Goebel

1997 Analysis of Projectile Points from Mt. Hebron Paleoindian Site. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

Over 300 bifacial projectile points and point fragments have been collected from the Mt. Hebron Paleoindian site located in northeastern Siskiyou County, California. All but a handful of these points were manufactured on obsidian procured from various obsidian flows in the southern Oregon-northern California region. The overwhelming majority of points fall into lanceolate and stemmed "types" commonly

referred to as "Windust", "Haskett", "Cougar Mountain", "Parman", "Silver Lake", "Scottsbluff", etc. Archaeologists have long sought to understand why such variability in projectile point forms existed during the late Paleoindian period in the Far West. In order to test whether these variable point forms are related to distance from raw material source and differential resharpening/curation, a sample of points from Mt. Hebron was subjected to obsidian sourcing and detailed morphological and metric attribute analysis. This paper presents the results of this analysis, and reviews implications significant to the interpretation of interassemblage lithic variability in Paleoindian contexts.

Cassidy, J.

1997 A Glimpse at Prehistoric Foragers on the Upper McCloud River. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

The study of prehistoric obsidian reduction strategies on the McCloud River is a fruitful avenue for understanding both patterns of forager mobility across the northern California landscape and variability among sites. From the obsidian quarries at Grasshopper Flat south to the headwaters of the McCloud River is long approximately 18 air miles. In this distance, large obsidian flake blanks were carried from the Grasshopper Flat obsidian source to sites along the upper McCloud River. Once on the McCloud River, however, flake blanks were reduced into different forms. Obsidian hydration data suggest that differences in age, and by implication, different cultures, may be responsible for differences in reduction strategies.

Cauvin, M.-C., N Balkan, Y. Besnus, and F. Saröglü

1986 Origin of Obsidian of *Cafer Höyük*, (Turkey): First Results. *Paléorient* 12(2).

Abstract

The chemical analysis of obsidian from the Anatolian site Cafer Höyük shows two different compositions. In addition, investigations in the Bingöl-Sohlan region revealed several natural sources of obsidian. Analysis of samples from one source (Çavuşlar) showed not one, but two chemical compositions. These same two types

are present in the obsidian at Cafer Höyük. It therefore appears that Çavuşlar was the obsidian source used by the prehistoric inhabitants of Cafer Höyük and that a single source can contain several types of obsidian.

Cauvin, M. -C, Y. Besnus, J. Tripier, and R. Montigny
1991 New Analysis of Obsidian from Orient: Models of Geochemistry of Magmas Uses for the Archaeological Research. *Paléorient* 17(2).

Abstract

Research on the origins of obsidian was carried out on 52 geological and archaeological samples, by means of multi-element chemical analyses; 27 major elements and trace elements were examined using spark, flame and plasma emission spectrometry (ICP). These analyses were exploited by using models of the geochemistry of magmas: partial fusion, fractionated crystallization, partition coefficients. Their specific characteristics lead to particular focus on the elements called "hygromagmaphiles", which are concentrated in a magma during its evolution. Here these are four lanthanides, La, Ce, Yb, Lu, as well as Y, Zr, Nb and Zn.

Five samples, chosen from the geochemical families of Bingöl, were moreover tested by thermoluminescence, tests which led to a relative chronology in three parts: two successive outflows with, for the oldest, an age probably much more than 1 million years, and a sample artificially heated at about 8000 B.P.

The method leads us to consider two types of criteria which permit the attribution of objects to the same geological site. 1) Identity of chemical compositions, particularly in hygromagmaphile elements: provenance of the same outflow. 2) Different chemical compositions, but conservation of relations between hygromagmaphile elements: provenance of successive outflows coming from the same magma. It is thus that the two families of Bingöl are confirmed and explained: they are comagmatic and correspond to outflows of different ages, which are confirmed by thermoluminescence tests. One sample indicates that it could come from a third outflow at Bingöl, which would be interesting to investigate in the field.

These analyses show the particular importance of the Anatolian stratum at Bingöl for the supply of obsidian to Neolithic (P.P.N.B.0 and Chacolithic villages, not only in the Taurus and in upper Mesopotamia, but also well to the south, in an oasis of the Syrian desert (El Kowm).

Clayton Fredericksen
1997 Changes in Admiralty Islands obsidian source use: the view from Pamwak. **For the experimental archaeologist: papers presented to Wal Ambrose.** Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 68-73.

Abstract

I report the results of characterization analysis of obsidian from *Pamwak* shelter on *Manus* in the Admiralty Island (Papua New Guinea). Evidence is presented that the first transport of obsidian to the shelter occurred in the terminal Pleistocene, probably from an offshore source. A mid Holocene change to the use of predominantly Pam Islands obsidian is noted. The use of significant amounts of Lou obsidian, a material widely used and traded after 3500 BP, is identified as occurring only late in the sequence. The implications of these changes in the context of Wal Ambrose's research are discussed.

Gates, G.
1997 CA-MOD-1976: "Battle Site" Trilogy. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

A unique site on the Devil's Garden Lava Plateau, Modoc County contains a large rock circle with four associated loci of broken and whole projectile points. Over 300 projectile points are represented in this collection, so far, primarily either Gunther Barbed/Guntheroid or Rose Spring series. Based on a preliminary analysis of the points, their distribution, and breakage patterns, it would appear that one possible explanation is that this phenomenon represents a late prehistoric "battle" site. Or perhaps, a type of ritualized "conflict resolution" site as described by D'Angulo? Obsidian sourcing and hydration data will be used to attempt to confirm or deny these interpretations. The site area lies within a border area between Pit River and Modoc bands.

Golson, J.

1997 W. R. Ambrose: an archaeological boffin.

For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 4-12.

Abstract

Wal Ambrose has a special status in his profession because he is both archaeologist and archaeometrician. This paper discusses not only the nature of his contributions in conservation and materials analysis, particularly of obsidian, but also the archaeological contexts in which the work was done. It is a celebration of the achievements of an individual of remarkable talents who has put his colleagues greatly in his debt in the fields in which he has operated.

Green, R.

1997 What have we achieved in Pacific obsidian research? Paper presented at the Sixth Australasian Archaeometry Conference, Australian Museum, Sydney, February 10, 1997.

Abstract

This paper looks over nearly forty years in the obsidian sourcing and dating business in the Pacific. In particular, it examines the networks and players that produced the most important developments, since these underpin the present healthy state of research in this field.

Green, R. C.

1997 Working with Wal: from innovative technician to valued archaeological researcher.

For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 54-60.

Abstract

From the perspective of 'working with Wal' on problems of obsidian sourcing and dating, I provide a personal assessment of Ambrose's contributions to Australian archaeometry and Pacific archaeology over the past 35 years.

Hildebrandt, W.R., and P. Mikkelsen

1997 Prehistoric Land-use Pattern Change on the Modoc Plateau. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

Archaeological investigations on the Modoc Plateau indicate the area was used by mobile foragers between about 6500 and 4500 B.P. Archaeological components dating to this period represent short-term residential bases occupied by people who used local resources, including Medicine Lake Highlands obsidian. Between 3500 and 1800 B.P., use of local quarries intensified, reflected by a dramatic increase in the frequency of biface production areas. Obsidian hydration profiles from the Plateau are matched by those in several outlying areas, indicating obsidian production and exchange reached peak proportions during this interval. By the Late Period (1800 B.P. - contact), the frequency of discrete component areas decreases significantly, with most of the archaeological record consisting of a thin veneer of projectile points and other hunting-related material. This paper focuses on the general trend toward a more specialized Late Period use of upland areas, presumably accompanied by increased sedentism in the adjacent lowlands.

Hitchcock, J.

1997 Overview of the Red Switchback Obsidian Source, Siskiyou County, California. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

Described in the literature as "small," classified with three other scattered sources as a chemical group, the initial impression of the Red Switchback obsidian area is one of insignificance. In actuality, this source covers approximately 500 acres, is diverse in appearance, and includes outcrops containing mahogany and/or red obsidian. Complex terrain and geology create a striking backdrop. Despite historic-era disturbances, evidence for prehistoric mining is present.

Irwin, G. & S. Holdaway

1996 Colonisation, trade and exchange: from Papua to Lapita in J. M. Davidson, G. Irwin, B. F. Leach, A. Pawley, and D. Brown (eds.) *Oceanic Culture History: Essays in Honour of Roger Green*, pp.225-35. Dunedin: New Zealand Journal of Archaeology Special Publication.

Abstract

The obsidian and chert sequences from archaeological sites in two areas sharing common themes but otherwise unrelated in culture historic terms are compared in order to try and find a means of distinguishing archaeologically the process of colonization from that of regional interaction, i.e. trade. The first example concerns the Mailu settlements associated with the appearance of pottery along the coasts of the Massim and south Papua nearly 2000 years ago. The second considers the Lapita sites in the Reef/Santa Cruz Islands. In both cases imported stone was present at the beginning and continued to arrive afterwards. The authors compare changes through time in the availability, use, and technological characteristics of obsidian and chert. In the early parts of the sequence are characterized by similar patterns, while they differ in the later period. The similar pattern for both areas is interpreted as colonization followed by trade.

Jean K.

1997 The loneliness of an obsidian source in southwest Manus. For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 85-96.

Abstract

Of two obsidian source areas in the Admiralty Islands (Manus Province, Papua New Guinea), only the Lou-Pam Islands source has a well-established place in archaeological distributions both local and regional. From the other source area in southwest Manus Island, many sites have been recorded following their exposure by bulldozers. These sites contain retouched obsidian point fragments like those from the Emsin workshop site excavated on Lou Island. Comparison of the two sets confirms the close similarity. The evidence suggests that manufacture and use are both represented in the southwest Manus collection and, since the only point fragment so far analyzed derives from

Lou, that material from both sources was being used. A review of the ethnographic evidence suggests that the regional integrative network in the past might not have distinguished obsidian by source as strongly as in the period of ethnographic description.

Jones, M. D., P. J. Sheppard, and D. G. Sutton
1997 Recent developments in obsidian hydration dating. Paper presented at the Sixth Australasian Archaeometry Conference, Australian Museum, Sydney, February 10, 1997.

Abstract

For the past three years the Center for Archaeological Research at Auckland University has been running a research program directed at developing obsidian hydration dating (OHD). The major focus has been on understanding and providing accurate controls for the total hydration mechanism. The three components of OHD (rim measurement, glass rate chemistry, and soil temperature history) have been studied as part of an integrated research program, and techniques for accurately and practically implementing each component have been developed and evaluated. It is now possible to realistically define the limits of this dating technique, and outline a standardized dating protocol that will ensure the long-term usefulness of OHD.

This paper makes use of these developments to present a series of archaeological case studies in OHD. These case studies demonstrate both the realized potential of OHD and the practical implementation of the techniques necessary for producing a date. In particular, an emphasis will be placed on predicting soil temperature histories, and providing hydration rate controls.

The results of this field test allow an evaluation of the performance of OHD from an empirical and theoretical perspective. The results demonstrate that OHD is now a fully functional stand-alone dating technique that if applied correctly can provide cheap, rapid, high precision dates.

Peterson, J., D. R. Mitchell, and M. S. Shackley

1997 The Social and Economic Contexts of Lithic Procurement: Obsidian from Classic-Period Hohokam Sites. *American Antiquity* 62(2):231-259.

Abstract

The social and economic organization of obsidian procurement has been a topic of particular interest in southwestern archaeology as a result of recent work identifying and characterizing a number of sources throughout Arizona, New Mexico, and northern Mexico. Recent studies have attempted to explain temporal and spatial variability of obsidian distribution in the larger contexts of regional exchange networks, socially bounded territories, and elite redistributive efforts. This study reviews the current state of research as reflected in three models. Patterns in obsidian source diversity and reduction stage data are assessed relative to model expectations and an analysis of obsidian acquisition and distribution. The likelihood of elite members of an increasingly formalized socioeconomic system playing a role in these processes should be considered, while at the same time noting that kin-based raw material procurement and ritual item mobilization may explain many of the obsidian patterns. The emerging perspective suggests that obsidian moved in a variety of spheres, concurrently serving a number of social and economic purposes. This study highlights the importance of modeling individual, nonlocal commodities before attempting to generate monolithic exchange models.

Rondeau, M. F.

1997 Technology as Context for Obsidian Hydration Studies. *Lithic Technology* 22(1):86-98.

Abstract

Anomalous obsidian hydration band width readings have plagued interpretive endeavors and have been used to question the general utility of obsidian hydration as a method for establishing relative chronologies. It is argued that many anomalous band width readings follow from a failure to establish context and, therefore, appropriate controls for sample selection. The results of recent techno-hydration studies indicate that numerous anomalies can be explained. A range of interpretive benefits from

combining technological and hydration analyses are recognized.

Peterson, M.

1997 Pragmatic Procurers: A Look at Site Distribution Along the Bonita Obsidian Highway. Paper presented at the 31st Annual Meeting for Society for California Archaeology, Rohnert Park, California.

Abstract

In the last decade various archaeological investigations have taken place in the Red Switchback/Callahan Flow area. The majority of these undertakings have been performed by the U. S. Forest Service during required reconnaissance of proposed project areas. A significant number of lithic scatters have been discovered and reveal an interesting pattern of site distribution along what might be called the "Bonita Obsidian Highway." This paper discusses the site distribution and surface findings of over two hundred sites that appear to radiate from the obsidian sources at Red Switchback and the Callahan Flow. Vegetation patterns, geology, and other environmental overviews are presented, as well as a description of the methods employed by the Forest Service in these investigations.

Torrence, R., Specht, J., Fullagar, R., and Summerhayes, G.

1996 Which obsidian is worth it? in J. M. Davidson, G. Irwin, B. F. Leach, A. Pawley, and D. Brown (eds.), *Oceanic Culture History: Essays in Honour of Roger Green*, pp.211-24. Dunedin: New Zealand Journal of Archaeology Special Publication.

Abstract

Using a series of interrelated research projects including (1) systematic fieldwork and recording at outcrops, (2) enhancements to the PIXE-PIGME technique, and (3) a very large characterization program involving 176 source samples and 1200 artifacts, we compare and contrast the effects of environmental and social factors on the mix of obsidian sources found at sites dating from 20,000 B.P. to the present in Melanesia. The aim is to find out why some sources were preferred during some periods and not in others. We conclude that differences between the Mopir and Williaumez Peninsula regions have largely been determined by changes in accessibility caused by alterations in sea level

and tectonic activity within the two areas. A contrast is made with an intraregional study of changes through time in the use of subsources from the Williaumez Peninsula. In this case a changing social order must have been responsible for differences in obsidian consumption at sites in this region. The methodology developed in the paper makes an important contribution to the study of prehistoric exchange.

Torrence, R. and Summerhayes, G.
1997 Sociality and the short distance trader: intra-regional obsidian exchange in the Willaumez region, Papua New Guinea. For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 74-84.

Abstract

An analysis of changes in the assemblage composition of obsidian from different sources was undertaken on 12 assemblages from sites dating over the past 6,000 years in the Willaumez region (including the peninsula and nearby islands) in West New Britain, in order to investigate Ambrose's (1978) prediction that Lapita obsidian trade differed from recent ethnographic systems. The history of obsidian use on Garua Island, where sites contain various mixes of local and imported obsidian, points to the existence of an intra-regional system of exchange between communities specializing in one or more goods during the time of Lapita pottery (c. 3,500-2,000BP). The method of obsidian procurement is shown to have been significantly different from both the earlier and later phases. It is argued that the widespread distribution of obsidian on Lapita sites in both Near and Remote Oceania is the result of movement between a loosely integrated series of local, intra-regional systems and not long-distance trade over the entire area as proposed by previous scholars.

Tycot, R. H.
1995 Appendix I: Obsidian Provenance. In *Ustica I. The Results of the Excavations of the Regione Siciliana Soprintendenza ai Beni Culturali ed Ambientali Provincia di Palermo in Collaboration with Brown University in 1990 and 1991*, edited by R.R. Holloway & S.S. Lukesh. *Archaeologia Transatlantica* XIV: 87-90. Providence and Louvain-La-Neuve.

Abstract

Twelve obsidian artifacts from the small island of Ustica (north of Sicily), dating to the Milazzese period, ca. 1500-1200 BC, were visually examined. Eleven were attributed to Lipari (black to grey, transparent) and one to Pantelleria (green, opaque). This visual assessment was then confirmed by chemical analysis using an electron microprobe with wavelength dispersive spectrometers.

Tycot, R. H.
1996 Obsidian Procurement and Distribution in the Central and Western Mediterranean. *Journal of Mediterranean Archaeology* 9(1): 39-82.

Abstract

Obsidian has long been recognized as an indicator of long-distance, maritime-based exchange networks in the Neolithic central and western Mediterranean. Earlier studies have identified and chemically characterized the major island sources, but few subsequent efforts have been directed at determining the provenance of significant numbers of artifacts from secure archaeological contexts. This paper presents new interpretations of obsidian procurement and distribution based on the chemical and visual sourcing of more than 2700 artifacts from island and mainland sites in France and Italy, and discusses the spatially and temporally dynamic economic and social role of obsidian. Finally, it is suggested that long-distance prestige exchange of obsidian and other materials was an important way of maintaining ethnic or kin connections in increasingly sedentary Neolithic societies.

Tykot, R. H.
1996 The Geological Source of an Obsidian Ear (04.1941) from the Museum of Fine Arts, Boston. *Revue d'Égyptologie* 47: 177-179.

Abstract

This study attempts to determine the source of an Egyptian sculpted ear at the Museum of Fine Arts, Boston (MFA 04.1941). The object is quite glassy and somewhat translucent, with a slight greenish tint to its otherwise black color. A sample was analyzed for 11 major and minor elements using the electron microprobe with WDS. The composition of the MFA sample was then compared to existing data for obsidian sources in the Mediterranean, Europe, the Near East, the Red Sea region, Northeast and East

Africa. The only match obtained was with a single geological specimen reported from Arafali on the Buri peninsula of Ethiopia, and an 18th dynasty statuette from a tomb at Tell el-Amarna. Caution in making a confident attribution is warranted, however, since the match with Arafali is based on only a single geological specimen, and depends on comparing analyses done in three separate laboratories.

Tycot, R. H.

1997 Characterization of the Monte Arci (Sardinia) Obsidian Sources. *Journal of Archaeological Science* 24: 467-479.

Abstract

In the western Mediterranean, obsidian from four volcanic island sources was used beginning in the Neolithic period. The geological sources on Lipari, Palmarola, and Pantelleria have been located and chemically characterized; until now, however, the Monte Arci source in Sardinia was better known from the analysis of archaeological rather than geological specimens. The results of a comprehensive field survey and characterization study of the obsidian sources in Sardinia are presented here, and finally allow all obsidian artifacts of western Mediterranean origin to be attributed to specific sources using minimally destructive and relatively inexpensive methods of analysis. Five chemically distinct sources in the Monte Arci region were exploited, with their location and the physical properties of the obsidian itself contributing to chronologically and spatially diverse frequency-of-use patterns.

Tycot, R. H., and S. Chia

1997 Long-distance Obsidian Trade in Indonesia. In *Materials Issues in Art & Archaeology V*, edited by J.R. Druzik, J. Merkel, J. Stewart, & P.B. Vandiver. Materials Research Society Symposium Proceedings 462, Pittsburgh, 1997.

Abstract

Long-distance trade in obsidian from sources in Melanesia, Polynesia and New Zealand already has been well-documented for the Lapita cultural complex in the southwest Pacific, ca. 1600-1000 BC. New analyses of obsidian excavated by Chia at the archaeological site of Bukit Tengkorak in southeastern Sabah (Borneo) indicates that obsidian also was traded extensively in Malaysia, as early as the 5th millennium BC. Quantitative elemental analyses

by electron microprobe using wavelength dispersive spectrometers of artifacts from this site indicate that obsidian from four distinct sources was utilized. One of these has been identified as Talasea in New Britain, more than 3000 km away; another source in the Admiralty Islands may also be present. The locations of the other two obsidian sources represented at Bukit Tengkorak are unknown, but as yet untested sources may exist in Indonesia or the Philippines. The knowledge that interactions between island southeast Asia and the western Pacific were common three millennia prior to the Lapita colonization strengthens the hypothesis that these people originated in southeast Asia. Further research on obsidian distribution patterns in Indonesia will enhance our understanding of cultural relations between these regions.

Tycot, R. H., and S. M. Young

1996 Archaeological Applications of ICP-Mass Spectrometry. In *Archaeological Chemistry. Organic, Inorganic, and Biochemical Analysis*, edited by M.V. Orna, pp. 116-130. Washington, DC: ACS Symposium Series 625.

Abstract

Inductively coupled plasma-mass spectrometry (ICP-MS) is a relatively new analytical technique increasingly used in the Earth Sciences in the last decade, and in "consumer" fields such as archaeology in the last few years. For archaeologists, ICP-MS has several important advantages over neutron activation and X-ray fluorescence analysis: (1) only a tiny powdered sample is required, so the technique is minimally destructive to valuable artifacts; (2) the large number of elements that can be accurately and precisely analyzed is particularly important for characterization and provenance studies; (3) isotope ratio measurements to three significant figures are possible without extensive sample preparation; and (4) the combination of small sample size and low per-sample cost allows assemblages of artifacts rather than individual objects to be studied. These advantages will be illustrated by the trace element characterization and source tracing of obsidian, the compositional analysis of copper-based artifacts, and the lead isotope ratio analysis of turquoise.

White J. Peter

1996 Rocks in the head in J. M. Davidson, G. Irwin, B. F. Leach, A. Pawley, and D. Brown (eds.), *Oceanic Culture History: Essays in Honour of Roger Green*, pp.199-209. Dunedin: New Zealand Journal of Archaeology Special Publication.

Abstract

The paper starts from the recognition that the actual distribution of obsidian in the recent past from three known source areas in Papua New Guinea transcends the scale of all ethnographically known exchange systems, rendering these systems indistinguishable in this material record. The distribution of obsidian at three periods in the past -->3300 BP, 3300-2500 BP, 2500-1500 BP-- is then examined. No evidence of the scale or nature of exchange systems is evident: any of the mechanisms known in the recent past, or others not so known, could have been responsible. In particular, the obsidian data are not evidence for large-scale prehistoric exchange systems at any time.

White, J.P. and M-N Harris

1997 Changing sources: early Lapita period obsidian in the Bismarck Archipelago. For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. *Archaeology in Oceania* 32: 97-107.

Abstract

This paper argues that obsidian movement in the Bismarck Archipelago at the start of the Lapita period shows continuity with earlier patterns and that changes in sources used occur later than the introduction of ceramics. We base our argument on the analysis of obsidian from two ceramic sites in the Duke of York Islands. The sites contain very differently decorated pottery, but both radiocarbon and obsidian hydration dating show they are very close in time, dating to around 3000 years ago. Density and PIXE-PIGME analysis show that nearly all the obsidian from the putatively older site (SEE), containing 'classic' Lapita, came from West New Britain, mostly the Kutau/Bao sources. The possibly slightly later site (SDP), with very thin walled pottery decorated only by rim notching, was initially supplied exclusively from the Umrei source in the Admiralties, with a subsequent reversion to West New Britain. The first two stages in this history appear to be repeated in the

similarly dated sequence from EKQ on Mussau Island

Pre-Lapita data from New Ireland, Nissan and the Papua New Guinea mainland show an extensive distribution of obsidian, exclusively using West New Britain sources, while in the same period Admiralty obsidian has not been found beyond the Admiralties. Thus the use of West New Britain sources in the probably oldest Lapita levels in the Duke of Yorks and Mussau suggests continuity in obsidian distribution with the preceding period. Some other evidence of continuity is noted.

TECHNOTES

This section of the newsletter is devoted to sharing new techniques, innovative ideas, source of equipment and supplies, and discussing new technologies. Obsidian analysts are invited to submit information relating to these topics.

**ADDING A LITTLE FUEL TO THE FIRE:
SOME THOUGHTS ON FIRE AND
OBSIDIAN HYDRATION**

By Jessica Anderson and Thomas M. Orieger

(presented with permission by the authors from a paper presented at the 31st Annual Meeting of the Society for California Archaeology, April 1997)

Salt Point State Park is located on the northern Sonoma County coast approximately 70 miles north of San Francisco and offers a diverse array of cultural resources. The Salt Point Archaeological District was placed on the National Register of Historic Places in 1970 and includes at least 139 recorded archaeological sites.

In November of 1993 a wildfire broke out in Salt Point State Park, affording a perfect opportunity to study the effects of fire on cultural resources. This paper reports on the continuation of a Santa Rosa Junior College study that began in 1993. The initial study was a broad look at the effects of fire on archaeological resources; however, the current study is focused on the effects of fire on obsidian hydration.

The majority of the hydration studies data presented in this paper comes from CA-SON-458, one of the many sites located in Salt Point State Park. This site was chosen as a case study because it had been subjected to archaeological investigations prior to the fire. Hydration data from Dowdall's subsurface investigations in 1990 and 1991 and Bramlette's 1987 surface collection was used for comparison with the post-fire hydration studies.

The first part of this study included a surface collection that was done in February of 1994. Measurements and bearings were taken of each collected specimen relative to the site datum. One hundred seventeen obsidian specimens were collected compared to the twenty-five obsidian specimens collected in 1987. The vast difference in quantities is undoubtedly related to the change in visibility created by the fire.

The wildfire had affected the obsidian on both a macroscopic and microscopic level. The obsidian exterior was altered, and some specimens were difficult to source based on macroscopic attributes. Also, the macroscopic differences between obsidian and dark-colored chert became much less pronounced which led to identification mistakes. Some of the specimens collected for hydration analysis were in fact burned chert. Hydration slides were made from 21 of the 117 collected specimens. Only three of the specimens had measurable hydration bands.

Subsequently, further investigations were performed. The first was an excavation that took place in April of 1994. Four 1 x 0.5 meter units were excavated at CA-SON-458 in five centimeter levels. These units were placed primarily in areas that had been found to have the greatest density of obsidian specimens during the surface collection in February. Also areas exhibiting any visible disturbance were avoided during the placement of the units. These units were excavated in five-centimeter levels after all surface specimens were collected. Five-centimeter levels were used for greater control and to achieve more detailed determination of the depth of the fire's effects. None of the units exhibited evidence of turbation, so it is assumed that the specimens were probably recovered from the same provenience as when the fire occurred.

In order to increase the sample size a second excavation was done at CA-SON-458 in

September of 1994. Thirteen units were excavated; seven measured 1 x 1 meters and six measured 1 x 2 meters. The unit size was increased in an attempt to efficiently achieve higher yields of obsidian specimens. These units were only excavated to a depth of five centimeters. This was done because the obsidian sample from the 0 to 5 cm level was poorly represented in the April excavation. Due to the ten month time period between the wildfire and this excavation, extreme caution was used to avoid disturbed areas when placing the units. An increase in human use was apparent on the site. Rescue vehicles had driven through one portion of the site in order to rescue an individual from the ocean.

Hydration analysis was performed on specimens from the surface collection and from each of the excavations. Our results are shown on this table compared with previous hydration results from Dowdall and Bramlette. Twenty-two post-burn surface specimens resulted in an 86% failure rate - only three specimens had measurable hydration bands. Post-burn hydration analysis was performed on eleven specimens from the 0 - 5 cm level with a 36% success rate. It is possible that these specimens with measurable hydration were at or near the bottom of the level, while the specimens without measurable hydration may have been in the upper portions of the level. Future excavation or experiments that use smaller depth increments may be able to determine if this is the case.

Analysis of specimens from both the 5 - 10 cm level and the 15 - 20 cm level resulted in 100% success rates; however, in the 10 - 15 cm level 75% of the specimens yielded measurable hydration bands. It is impossible to ascertain whether this decrease in success is a result of the fire or some other factor.

Each of these studies occurred within one year of the wildfire; however, the time interval is large enough to raise questions regarding the direct effects of the fire. We have studied effects, but it is difficult to say that the results we have achieved are the effect of the November 1993 fire. In order to refute or support these conclusions we conducted an experiment to recreate a burn environment. Our experimentation was meant to create effects that a wildfire could produce.

Our "pseudo fire" experiment involved the heating of obsidian with charcoal briquettes. Obsidian specimens that had recently been subjected to hydration analysis with successful results were used in order to have measurements for comparison. Also included in this experiment were freshly manufactured obsidian flakes. These fresh flakes were used as a control sample.

For the purpose of this experiment two holes were dug measuring approximately 25 x 25 cm with a depth of five centimeters. One hole was sprinkled with water to simulate a rain soaked environment and the other was left dry. This difference was established in order to determine if the moisture level of the soil altered the effects of fire in any manner. Five previously analyzed specimens known to have hydration bands were placed at the five centimeter level of each hole and the holes were backfilled. The soil used to fill the "wet hole" was dampened. Fourteen specimens were placed on the surface of each of the holes. Ten specimens were those that had been previously subjected to hydration analysis and the remaining four were the newly manufactured flakes. Hot charcoal briquettes were then piled on top of the specimens. In order to determine an approximate temperature, kiln cones were placed among the briquettes. Kiln cones are used in firing ceramics and are designed to show when certain temperatures are reached. The cones used in this experiment suggest that a temperature of 1000 - 1200° Fahrenheit was achieved by the end of the experiment.

After five minutes under the briquettes one of the fresh flakes was removed from the surface of each hole. Five previously analyzed specimens and one new flake were removed from the surface of each hole after thirty minutes under the briquettes. After one hole of exposure to the briquettes the remaining specimens were removed from the surface and then the specimens were removed from the five centimeter level.

Each of the specimens was subjected to hydration analysis. All surface specimens lacked measurable hydration. The newly manufactured flakes, as expected, did not have measurable hydration; however, each of the other specimens that had previously yielded measurable hydration now lacked hydration. This result was consistent in both the wet and dry holes. The moisture content of the soil did not seem to make a

difference in the effect of the "fire" on the hydration. All specimens that were placed in the holes at a depth of five centimeters had measurable hydration bands. Apparently, the five centimeters of soil was sufficient to protect these specimens from the damaging effects of the fire.

The results in this experiment were obtained immediately after our "pseudo fire". There is virtually no gap of time in between the pre-burn hydration analysis, the burn, and the post-burn analysis; therefore, these results are seen to be the direct effect of the burn. The hydration analysis outcome of our "pseudo fire" experiment was very comparable to the studies of the wildfire's effects. As in the case of the wildfire, our "pseudo fire" surface specimens lacked measurable hydration. The "pseudo fire" subsurface specimens were unaffected as were the majority of the subsurface specimens from the wildfire studies.

The studies performed at CA-SON-458 and the "pseudo fire" experiment give us results regarding the effects of fire on obsidian within a short period of time. However, are the effects of the fire *still* obvious after an extended period of time? What do we find now, some three years after the wildfire? In an attempt to answer these questions, another surface investigation was performed at CA-SON-458 in November of 1996, almost exactly three years after the fire. Once again measurements and bearings were taken of each collected specimen relative to the site datum. Only eleven specimens were observed and collected. In the three years following the fire, the vegetation had regrown and visibility was poor in most areas of the site, which may account for the low quantity of specimens collected. The previous intensive surface collections may offer another explanation for the small quantity of obsidian, especially the post-burn collection which had excellent visibility.

Each of the collected specimens was subjected to hydration analysis. Three of the specimens lacked measurable hydration; however, the majority of the collected specimens yielded measurable hydration. This is an 84.6% success rate compared to the meager 14% success rate achieved with the first post-burn surface collection. There is a very marked difference, but is it *really* noteworthy or remarkable? To

assess this, we examined the success rate for Bramlette's pre-fire surface collection for all sites within Salt Point State Park and that success rate was 89.5%. The 84.6% success rate of our recent surface collection fits in quite well for the Salt Point area. Apparently, it takes very little time to disguise the effects of fire.

It is likely that the specimens with measurable hydration had been beneath the surface when the fire occurred, and that turbation, wind erosion, and/or human use caused the specimens to be exposed. Although this is the most likely possibility, we cannot discount other possibilities, such as accelerated re-hydration rate of burned specimens. It is possible that following exposure to fire the rate at which the obsidian naturally hydrates is altered.

This possibility can be explored through induced hydration. Performing induced hydration on specimens that have been exposed to fire can determine whether the obsidian will continue to hydrate at the expected rate after exposure to fire, but this is a topic for a future paper.

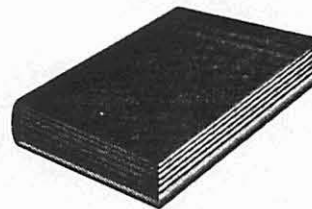
To summarize, a study of the effects of fire on obsidian hydration was begun as a result of the November 1993 wildfire at Salt Point State Park. Both surface collections and excavations were used to acquire specimens for obsidian hydration analysis. Analysis of the specimens from the initial surface collection and excavations resulted in a lack of measurable bands for the surface specimens. The majority of the subsurface specimens yielded measurable bands and appeared to be unaffected by the fire; however, 64% of the specimens from the 0 - 5 cm level failed to yield measurable hydration bands. These results were tested through our "pseudo fire" experiment. The results from the experiment were comparable to those from the studies of the wildfire. The surface specimens lacked measurable hydration, and the specimens placed at five centimeters were not affected by the heat of the briquettes.

Through a surface collection three years after the occurrence of the fire, the final investigation in this study showed that the obvious effects and occurrence of the fire can be disguised quite rapidly. Analysis of the collected specimens resulted in a success rate that was similar to the success rate of analysis done on surface specimens from the Salt Point area before the fire occurred.

As you can see, through surface collections, excavations, and experimentation we have been able to determine some of the more obvious effects of fire, but the study of fire's effects on obsidian hydration is far from finished. Including induced hydration, there are many more avenues of inquiry and experimentation to be explored before we can fully understand the complete effects of fire on obsidian hydration.

COMPARISON OF OBSIDIAN HYDRATION DATA FROM CA-SON-458
BEFORE AND AFTER THE NOVEMBER 1993 FIRE

Event	Provenience	Number	Success	% Success
Pre-fire				
1987 Survey	surface	3	3	100
1990-1991 Excavation	0-10 cm	20	20	100
Post-fire				
1994 Survey	surface	21	3	14
1994 Excavations	surface	1	0	0
	0-5 cm	11	4	36
	5-10 cm	4	4	100
	10-15 cm	8	6	75
	15-20 cm	2	2	100



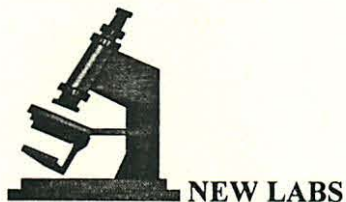
NEW BOOKS

For the experimental archaeologist: papers presented to Wal Ambrose. Edited by Robin Torrence and J. Peter White. Special issue of *Archaeology in Oceania*. Volume 32, Number 1 1997.

(Available for US\$30 from Oceania Publications, 116 Darlington Road H42, University of Sydney NSW 2006, Australia. Payment can be made by credit card to d.koller@oceania.usyd.edu.au giving name on card, card type, number, expiration date).

Oceanic Culture History: Essays in Honour of Roger Green.

Edited by J. M. Davidson, G. Irwin, B. F. Leach, A. Pawley, and D. Brown Dunedin: New Zealand Journal of Archaeology Special Publication.



ASHE ANALYTICS

JOHN B. ASHE

ASHE ANALYTICS is a 6 year old laboratory which uses energy-dispersive x-ray fluorescence (XRF) as an analytical approach. We have been working primarily on environmental soil samples for the characterization of Superfund sites. Although my obsidian characterization had been limited to the characterization of source specimens, I wish to become more active in obsidian characterization.

I am seeking contact with an archaeologist who may have a modest program of obsidian characterization. I will perform the characterization at no cost to your program. If interested, please contact me at:

John B. Ashe
ASHE ANALYTICS, INC
1309 KAW Ave.
Butte, MT 59701
(409) 723-2080 (voice or fax)
jbashe@ibm.net

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 characterization results;
- (3) provide technical support in the form of training and workshops for those wanting to develop their expertise in the field, and;
- (4) provide a central source of information regarding the advances in obsidian studies and the analytic capabilities of various laboratories and institutions.

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 \$20.00/year
- Institutional member \$50.00
- Student member \$10.00/year or free with submission of paper to newsletter and copy of current student identification
- Life-Time Member \$200.00

Regular members are individuals or institutions who are interested in obsidian studies, and wish to support the goals of the IAOS. Regular members will receive any general mailings; announcements of meetings, conferences, and symposia; bulletins; 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.

*Membership fee may be reduced and/or waived in cases of financial hardship or difficulty in paying in foreign currency. Please complete the form and return to the Secretary with a short explanation regarding lack of payment.

**Because membership fees are very low, the IAOS asks that all payments be made in US dollars in international money orders or checks payable on a bank with a US branch. If you do not do so, much of your dues are spent in currency exchange. If you wish to join us, mail a check or money order to the IAOS:

Pat Dunning, Secretary-Treasurer
Department of Anthropology
One Washington Square
San Jose State University
San Jose, California 95121-0113
408.997-9183

CALL FOR ARTICLES AND INFORMATION

Submissions for articles, short reports, abstracts, or announcements for inclusion in the newsletter are accepted at any time. We accept electronic media on IBM compatible 3.5" or 5.25" diskettes in a variety of word processing formats, but Wordperfect (5.n) or Word for Windows 95 is preferred. A hard copy of the text and any figures should accompany diskettes.

Deadline for submission for the Summer Bulletin is October 15, 1997. Send to:

Blossom Hamusek,
PAR ENVIRONMENTAL SERVICES, INC.,
P.O. Box 160756, Sacramento, CA 95816-0756,
USA. Voice: 916.739-8356; FAX: 916.739-0626

NEW MEMBERS:

Jeff Alteschul, Statistical Research, Inc.
John B. Ashe, Ashe Analytics, Inc.
John Dougherty
Kathy Dowdall, Caltrans
Tom Mallard, Independent Researcher
Joe Moore, Nevada Department of
Transportation
Carleen Sanchez, UC Santa Barbara

International
Association for
Obsidian
Studies

Business Address:
IAOS
Department of Anthropology
San Jose State University
San Jose, CA 95192-0113
(408) 997-9183

July 24, 1997

Dear IAOS Members,

Attached is the summer Bulletin. Thanks to all members who have paid their 1997 dues. Unfortunately, many of you have not. If your dues are current, the upper right hand corner of your address label says 1997 (or Life or Comp). If the label indicates any earlier year, you are in arrears. Please, if you support the objectives of the IAOS, pay your dues.

In an attempt to broaden the IAOS membership, we have instigated a student membership program, which waves membership fees with the submission of a paper or abstract and otherwise sets a fee of \$10 for student memberships (requires submission of student ID). The reverse of this letter provides a postable announcement of the new student options for membership in the IAOS.

We welcome suggestions on how service can be improved, to make the Association more valuable to our members. If there is anything I can do to help, please do not hesitate to ask.

Yours Truly,



Patricia A. Dunning
IAOS Secretary-Treasurer

STUDENTS: THREE NEW WAYS TO JOIN

International Association for Obsidian Studies



- (1) Submit a research paper you have written on an obsidian-related topic for publication in the IAOS Bulletin.
- (2) Submit an abstract of a research paper you have written and published elsewhere.
- (3) Pay the new \$10 student membership fee.

In all cases, please submit a copy of your student ID. Free student memberships (1 & 2) are for one year. They may be renewed by submitting an additional paper or abstract.

New members receive a copy of the diskette-based (PC format) IAOS Obsidian Bibliography. All members receive the IAOS Bulletin, published three times per year, which summarizes recent results of obsidian studies.

-----Copy-----

Yes, I'd like to become a student member of IAOS. I have enclosed either an obsidian-related article for publication in the IAOS Bulletin or an abstract of such an article published elsewhere. Please send my first issue of the IAOS Bulletin and a copy of the diskette-based (IBM PC-compatible) IAOS Obsidian Bibliography. Please indicate disk format required: 5 1/4 360 KB or 3 1/2 1.44 MB. (One year free membership per article/abstract.)

Yes, I'd like to become a member of IAOS. A check or money order for the annual membership fee is enclosed (see below). Please send my first issue of the IAOS Bulletin and a copy of the diskette-based (IBM PC-compatible) IAOS Obsidian Bibliography. Please check disk format required: 5 1/4 360 KB or 3 1/2 1.44 MB.

Not convinced, but want to know more?

Please send me a complimentary issue of the latest IAOS Bulletin.

Name _____
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My check or money order is enclosed for the following amount (please check one):

\$20 Regular \$10 Student (send copy ID) \$50 Institutional \$200 Lifetime

Please return this form to : IAOS ♦ Department of Anthropology ♦ San Jose State University ♦ San Jose, CA 95192-0113.

INTERNATIONAL ASSOCIATION FOR OBSIDIAN STUDIES

◆ Membership Application ◆

Yes, I'd like to renew my membership. A check or money order for the annual membership fee is enclosed (see below).

Yes, I'd like to become a member of IAOS. A check or money order for the annual membership fee is enclosed (see below). Please send my first issue of the IAOS Bulletin and a copy of the diskette-based (IBM PC-compatible) IAOS Obsidian Bibliography. Please check disk format required: 5 1/4 360 KB or 3 1/2 1.44 MB.

I am a student (copy of ID enclosed) and I am enclosing an abstract for a published obsidian related article or submitting a paper to the IAOS for printing in the Bulletin. Please enter my free membership. Please send the bibliography on 5 1/4 360 KB or 3 1/2 1.44 MB diskette.

Not convinced, but want to know more?

Please send me a complimentary issue of the latest IAOS Bulletin.

Please send me a copy of the IAOS Obsidian Bibliography (5 1/4 or 3 1/2) and a complimentary copy of the IAOS *Bulletin*. My check or money order for \$10 (refundable if I join IAOS this calendar year) is enclosed.

Name _____

Title _____

Street Address _____

City, State, Zip _____

Country _____

Affiliation _____

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Home Phone (optional) _____

E-Mail Address(es) _____

My check or money order is enclosed for the following amount (please check one):

\$10 Student (submit ID)

\$20 Regular Member

\$50 Institutional Member

\$200 Lifetime Member

Please return this application to :

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San Jose State University

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