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SOURCE PROVENANCE OF OBSIDIAN ARTIFACTS FROM CA-LAN-63, WEST LOS ANGELES COUNTY CALIFORNIA

by

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Report Prepared for
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30 September 2004

INTRODUCTION

As expected for Intermediate and Archaic (Millingstone) periods in southern California, all the obsidian artifacts from these sites were produced from Inyo and Mono County sources in eastern California; the West Sugarloaf dome in the Coso Volcanic Field, Inyo County, the Mono Glass Mountain source and the Casa Diablo source in Mono County farther north.

ANALYSIS AND INSTRUMENTATION

All archaeological samples are analyzed whole. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate x-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Archaeological XRF Laboratory, Department of Earth and Planetary Sciences, University of California, Berkeley, using a Spectrace/ThermoNoran™ QuanX energy dispersive x-ray fluorescence spectrometer. The spectrometer is equipped with an air cooled Cu x-ray target with a 125 micron Be window, an x-ray generator that operates from 4-50 kV/0.02-2.0 mA at 0.02 increments, using an IBM PC based microprocessor and WinTrace™ reduction software. The x-ray tube is operated at 30 kV, 0.14 mA, using a 0.05 mm (medium) Pd primary beam filter in an air path at 200 seconds livetime to generate x-ray intensity Kα-line data for elements titanium (Ti), manganese (Mn), iron (as Fe^T), thorium (Th), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology

(NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). Further details concerning the petrological choice of these elements in obsidian is available in Shackley (1995, 2004; also Mahood and Stimac 1990; and Hughes and Smith 1993). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1, SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLO-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, and BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994). In addition to the reported values here, Ni, Cu, Zn, and Ga were measured, but these are rarely useful in discriminating glass sources and are not generally reported.

The data from the WinTrace software were translated directly into Excel for Windows software for manipulation and on into SPSS for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. RGM-1 is analyzed during each sample run to check machine calibration (Table 1).

Trace element data exhibited in Table 1 and Figure 1 is reported in parts per million (ppm), a quantitative measure by weight. Source nomenclature is from Hughes (1988, 1994) Jack (1976), and Gilreath and Hildebrandt (1997).

Discussion

The presence of Inyo and Mono County, California obsidian in southern California Intermediate and Archaic period sites is typical (Hughes and True 1985). The one biface produced from obsidian originally procured from Mono Glass Mountain exhibits a quality not generally found today at that dome. I have seen good quality Mono Glass Mountain obsidian,

but it is relatively uncommon. Much of the glass at the source today is more vitrophyric than this specimen.

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Table 1. Elemental concentrations for archaeological samples. All measurements in parts per million (ppm).

Sample	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
1	1045	315	9177	245	20	43	127	49	West Sugarloaf
2	899	291	9422	235	13	50	151	40	West Sugarloaf
3	886	326	6751	174	9	25	91	24	Mono Glass Mtn
4	803	294	8824	247	16	52	134	48	West Sugarloaf
5	818	251	9593	247	14	50	138	46	West Sugarloaf
6	795	258	9598	272	17	49	141	56	West Sugarloaf
7	892	283	8722	245	10	55	138	51	West Sugarloaf
8	957	318	9044	251	10	53	139	40	West Sugarloaf
9	1036	303	8990	246	16	51	133	45	West Sugarloaf
10	918	311	9541	274	10	61	146	56	West Sugarloaf
11	807	259	9161	263	11	53	141	53	West Sugarloaf
12	1102	284	9808	137	90	19	170	7	Casa Diablo
RGM1-S1	1524	315	13169	144	108	23	218	8	standard

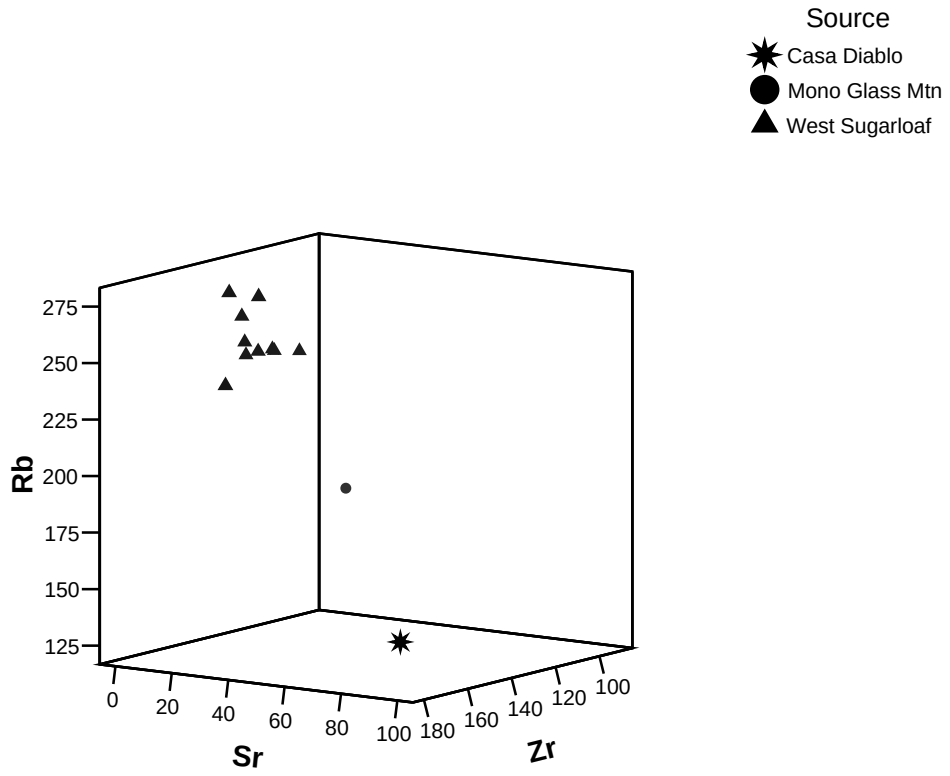

Figure 1. Rb, Sr, Zr three-dimensional plot of the archaeological specimens. Assignment to West Sugarloaf dome in the Coso Volcanic Field based on compositional ranges reported by Hughes (1988).