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Editorial addendum

REVIVAL OF OBSIDIAN STUDIES

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The recent progress in obsidian hydration dating and characterization has gained an international interest and there exists an ongoing collaboration between colleagues from interdisciplinary fields. Since 1960s, the dating efforts culminated by recent advances employing modern technology. The analysis and characterization studies have improved with the advent of modern techniques. Such efforts, however, must be treated with due caution, and such matters will be presented in the planned international workshop on Melos, Greece, 2-6 July 2003. Along with the announcement of this international meeting I take the opportunity to summarize the steps that lead to the advent of recent OHD development and present the current activities of the Rhodes group.

The advanced techniques and mechanisms for the studies concerning the determination of age and the analysis of obsidian tools and cores have lately gained a considerable impulse. The background work on both aspects has shown the direction of research (Shackley, (ed), 1998; Green 1998; Friedman *et al.* 1997; Anovitz *et al.* 1999; Stevenson *et al.* 2000, 2001a,b; 2002; Liritzis and Diakostamatiou 2002).

In obsidian hydration dating the emphasis has been directed onto non-optical methods of rim determination. Lee *et al.* (1974), Leach and Naylor (1981), and Leach (1977) assessed the potential of several measurement methods and foresaw some promise for electron microscopy, ion spectroscopy and argon milling.

Later research promoted these earlier ideas using ion spectroscopy, in particular the secondary ion mass spectrometry (coined SIMS) has been used to determine the hydrogen and other cation profiles of obsidians, for the development of an intrinsic method following a special to ways calibration procedure by the team at Oak Ridge National Laboratory and Tennessee University (ORNL/UT) in a thoroughly presented article (Anovitz *et al.* 1999).

In fact this team applied a closest fit to the measured hydrogen profile, obtained using a fully-implicit, finite difference solution with variable distance and time-steps. This has proven to be the most stable solution, and used an equation which describes the variation of the diffusion coefficient with water concentration. While, by using "characteristic points" on the hydrogen profile (half-fall

depth, inflection point depth) simple hydration rate equations were evaluated against time constraints provided by associated C-14 dates This model has been calibrated to experimental data from Mount 65, Chalco, Mexico (personal communication with ORNL/UT team and Riciputi *et al.* 2002).

Almost the same time SIMS was used in comparison with infrared photoacoustic spectroscopy for a more accurate determination of the hydration rim by the Virginia Department of Historic Resources and Evans East team, extended to Aegean obsidians in collaboration with the Rhodes group (Stevenson *et al.* 2001b; 2002b).

The use of SIMS technique was taken up by another team at the University of the Aegean, Rhodes, Greece who proposed a different solution of 2nd Fick's law of diffusion based on the non-steady state concentration-dependent diffusion for semi-infinite medium, where diffusion coefficient varies exponentially during diffusion, and for certain initial and boundary conditions. The age equation of the obsidian diffusion dating employing SIMS derives from a differential equation that describes diffusion. An essential factor addressing this alternative model is the surface saturation (SS) plateau level at certain depth, which is the result of the diffusion mechanism in the first about 1-2 um. (Liritzis and Diakostamatiou, 2002a, 2002b). This proposed approach was coined ODDSIMS, an acronym created by the ORNL/UT team (Riciputi *et al.* 2002) and modified by the Rhodes team as ODDSIMS-SS to include the new surface saturation (SS) approach and the different method of solution of the diffusion equation.

The ODDSIMS-SS approach, coupled with the diffusion mechanism and accomplished by appropriate mathematics (based on Crank, 1975), opens a new era in the obsidian chronological studies.

Evidently, many more obsidian samples must be tested covering wider provenance areas and time range. The hydrogen profiling by SIMS needs more attention regarding involved errors, both random and systematic. Nevertheless, all such initiatives are welcome but any drawn conclusions must be treated with due caution (Stevenson *et al.* 2002b).

Along the latter notion more obsidian samples from the Aegean region, provided by the Rhodes team, is planned to be processed by the ORNL/TU team, aiming at a forthcoming joint publication

Similarly, more samples from the Aegean and other areas, are been analyzed by SIMS, in an ongoing collaboration with Virginia and Evans East group, which will soon be jointly announced.

Particular focus on the surface status of obsidian is another field of research, which is currently under study, to examine dissolution and weathering effects (1-2 um scale) pertinent to the dating aim, along with interpretation of the water mass transport phenomenon.

Such international collaborative efforts, surely strengthens the new dating approaches.

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Melos International Workshop

Location: Melos island, Greece, 2-6 July, 2003

Organization:

Laboratory of Archaeometry, Dept. of Mediterranean Studies, University of the Aegean, Greece (c/o Prof. I.Liritzis)

International Association of Obsidian Studies (IAOS, USA) (c/o Dr C.Dillian, president).

1) **Michael Gottesman (Sherman Oaks, California)**, "Obsidian hydration dating: How good is it?"
2) **Dr Maria Rosa Iovino (Siracusa)**: "Tribology and micro wear trace analysis on obsidian (Sicily and Turkey)"
3) **Dr Wal Ambrose (Australian National University)**, "Powdered obsidian for determining hydration rates and site thermometry"
4) **Prof. Masao Suzuki (Atlanta, USA)**, "On an approach to the palaeoclimate resonstruction using obsidianhydration as a temperature indicator"
5) **Dr Carlo Pantano (Pennsylvania State University)**, "Effects of composition and network connectivity on the leaching and dissolution of aluminosilicate glasses"
6) **Dr Robin Torrence (Australian Museum)**, Glenn Summerhayes (Australian National University), Ivo Orlic (ANSTO), Philippa Rath and J.Peter White (University of Sydney) "Networks and Disasters: Changing patterns of obsidian procurement in West New Britain, Papua New Guinea"
7) **Dr Harald Behrens (University of Hannover, Germany)**, "Diffusion of water in rhyolotic glasses and melts"

8) **Prof. Catherine Perles (Universite de Paris X)**, "Why the obsidian trade?"
9) **Prof. Youxue Zhang (University of Michigan)**, "H2O diffusion in obsidian glass and issues on obsidian dating"
10) **Dr Bernard Gratuze (IRAMAT CNRS, Centre Babelon, France)**, « New investigations of the Gollu-Dag obsidian lava flows system: comparison between chemical, mineralogical and fission track data"
11) **Dr Carolyn Dillian (president IAOS)**, "Sourcing belief: using obsidian sourcing to understand prehistoric ideology in northeastern California"
12) **Dr Robert Tykot (University of South Florida, USA)**, "High-precision sourcing of obsidian assemblages from the central Mediterranean: Feasibility and utility for archaeological interpretation of the exploitation of the Italian island sources"
13) **Prof. Minoru Tomozawa (Rensselaer Polytechnic Institute, USA)** "Water diffusion in silica glass at low temperatures"
14) **Prof Michael Glascock (Missouri University, USA)** " Obsidian characterization basics: analytical techniques, elements and sources"
15) **Dr Tristan Carter (Stanford University, USA)** «Problematizing the analysis of obsidian in the Aegean and surrounding worlds»
16) **Prof. Maciej Pawlikowski (Mining and Metallurgy University, Poland)**, Mariana Tsamasfyrou and Ioannis Liritzis (University of the Aegean, Greece), "Surface microscopic investigation of obsidians"
17) **Dr. Yiannis Bassiakos (NRC Demokritos, Greece), Dr V.Kilikoglou and A.Sampson**, "Yali Island: geological and analytical evidence for a new source of workable obsidian"
18) **Dr Martin Jones (University of Auckland, NZ)**, "Archaeological soil temperature and obsidian hydration: a case study in quantifying uncertainty in OHD age estimates"
19) **Prof. R.Brodkey (Ohio State University)**, Prof. Ioannis Liritzis, Maria Diakostamatiou " Transport phenomena related to OHD"
20) **Dr Vincenzo Francaviglia (CNR, Italy)** «Discriminating between Mediterranean obsidians»
21) **Dr Chris Stevenson (Virginia Dept of Historical Resources, USA)**, Liritzis.I, Diakostamatiou.M and Novak.S.M "Further dating applications employing the ODDSIMS-SS and conventional OHD approach"

Note:
Any attendee, except of the participants, should register. Registration Fee is 250 EURO including attendance of the Workshop, conference material, two excursions in the island. All other arrangements are made by theirown.
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