

XRF Seminar, The Field Museum, Chicago, June 2008

By Cheryl Podsiki

The Department of Anthropology at The Field Museum in Chicago, IL hosted its second two-day seminar, *Hand-held XRF in Museums: Applications and Quantification for Anthropology and Natural History Collections* on June 5 and 6, 2008. The hands-on workshop was designed to be an open discussion forum to address many of the issues facing XRF users in museums. The basic fundamentals and physics of XRF theory and its applications were discussed through presentations, demonstrations and experiments using participant instruments. Issues focused on the reasons why users need to understand basic XRF theory and the complications that exist for interpretation of results when used on anthropological collections, especially on organic substrates. Updates were provided on various uses and experiments using the instrument; values and protocol for reporting results; the status of pertinent reference materials being developed for use in determining appropriate calibrations; and the instrument's importance within conservation and the archaeological field as a screening tool that provides qualitative results and in some cases, such as with obsidian, where it can provide quantitative results. Presentations included (*seminar presenter):

Issues related to using handheld XRF on Anthropology Collections. Aaron Shugar, Ph.D.*, Assistant Professor of Conservation Science in the Art Conservation Department at Buffalo State University, NY, T: 716-878-5031, shugaran@buffalostate.edu

Portable XRF for obsidian based provenance research. Jeff Speakman, Ph.D.*, Archaeologist and Head of Technical Studies at the Smithsonian's Museum Conservation Institute (MCI), T: 301-238-1242, SpeakmanJ@si.edu.

Obsidian Analysis at The Field Museum using an Innov-X Systems portable XRF. Mark Golitko*, Ph.D. Candidate, Department of Anthropology at University of Illinois-Chicago and research assistant at The Field Museum, T: 312-665-7870, mgolitko@yahoo.com; and Laure Dussubieux, Ph.D., Manager of the LA-ICP-MS Laboratory in the Department of Anthropology at The Field Museum, T: 312-665-7898, ldussubieux@fieldmuseum.org

The Exponential Nature of the Physics of X-Ray Interactions, Bruce Kaiser, Ph.D.*, Physicist and Application Scientist, Bruker-AXS, Kennewick, WA, T: 509-528-7608 pantainst@aol.com

Assessment of biocide determination in ethnological collections, Helene Tello*, Conservator, Ethnological Museum of National Museums, Berlin, T: 030-8301-296, h.tello@smb.spk-berlin.de; and Dr. Boas Paz, Diplom-Chemiker, Rathgen-Research-Laboratory at the National Museums Berlin, T: 030-32674916, b.paz@smb.spk-berlin.de

In addition to the five presentations two sets of papers were furnished by absentee presenters:

X-Ray Fluorescence Analyses Report, 13 February 2007. Marei Hacke, Ph.D., Conservation scientist, The British Museum, London 02073238953, mhacke@thebritishmuseum.ac.uk

The limitations of hand-held XRF analyzers as a quantitative tool for measuring heavy metal pesticides on art objects. Özge Gencay Üstün, Conservator at the Southwest Museum, Graduate of UCLA/Getty Archaeological and Ethnographic Materials Conservation Program, ozge.ustun@gmail.com; and Charlotte Eng, Associate Conservation Scientist, Conservation Center, Los Angeles County Museum of Art

The Field Museum and seminar participants gratefully acknowledge the three corporate sponsors of the seminar: Bruker-AXS, Inc., Innov-X Systems and Thermo Fisher Scientific (Niton analyzers), all manufacturers of hand-held XRF analyzers. The manufacturers provided their top scientists to actively participate in the seminar and to provide technical support for the other participants. The corporate scientists included Dr. Bruce Kaiser, physicist and museum applications scientist, Bruker-AXS with support from Kathleen Tighe, sales manager; Jessica Feuer, applications scientist, Innov-X Systems; Stan Piorek, physicist and applications scientist, Thermo Fisher Scientific with support from Julia Kleyman, archaeometry specialist. In addition to their participation the three manufacturers generously provided funding for all meals served throughout the two-day seminar.

Discussion, seminar evaluation and follow-up survey remarks included the following areas felt to be the most important issues to recognize and address at present:

- The increase in inexperienced XRF users in museums dictates the need to establish regular communication networks and regular training sessions among more experienced users and new users to share experiences, technical issues, present updates on research, and discuss problems and solutions. Suggestions for networking include the use of Webinar seminars and physically meeting about every 6 months instead of annually with the idea that institutions could host specifically focused workshops or seminars on a rotating basis. Panel discussions, tips sessions, case studies and specific applications are all welcome components for future XRF seminars and workshops.
- Due to the physical nature of x-ray fluorescence, the limitations of instrument software, the current inappropriate (for anthropological materials) instrument standards, and operator subjectivity and error margin, the analyzer's use on museum and archaeological materials highly indicates that data number results cannot be trusted especially on organic substrates. The spectrum must always be consulted and interpreted by trained personnel regardless of the data results.
- Qualitative results may be the best that the instrument can achieve on organic substrates due to the variability involved with the material itself. Once appropriate

reference materials are developed and available for use for instrument calibrations then semi-quantitative results might be obtained on at least some materials, remembering that the result is only pertinent to the sample taken unless the material is homogenous. It is generally felt that quantitative results on organic substrates will not likely be achieved.

- There is recognition by most users that collaboration among institutions would be highly beneficial for sharing information and for developing general best practice guidelines and protocols for reporting results. Collaboration might help to streamline the very complex and time consuming testing process.
- There is a need to increase the awareness level of the medical profession about the complex issues involved with hazardous materials such as pesticide usage in museum environments. Active involvement and guidance by toxicologists are needed to develop specific health and safety protocols.
- There is a need for manufacturers and museums to collaborate on application use and clearly define the capabilities and limitations of the instrument on anthropological collections. Pertinent and specific training is a necessity in addition to the general training for instrument use normally provided.
- There is a need for manufacturers to train their sales representatives and technicians about the complex issues involved with museum uses and the differences between museum and industrial applications. One suggestion is to increase the number of representatives who are dedicated to museum training and who would be directly available for technical and spectra interpretation assistance.

A new meeting date and place for a future XRF user group seminar was discussed but has not yet been proposed. The present tough economic climate does not allow for The Field Museum to host an XRF seminar in 2009. The “group” includes all users who wish to participate in developing practical solutions to common problems by addressing general and specific issues and tackling them one at a time. By far the most important concern raised at the museum’s 2008 seminar was that a firm foundation of networking for museum XRF users be established. Initiatives and suggestions on how to develop an active and time efficient networking system would be most welcomed.

A good example of networking and reaching out to other pertinent professionals for suggestions and guidance in adapting XRF technology to collection based applications was the inclusion of a Cultural Heritage component at the 2008 annual Denver X-ray Conference (DXC) (see: <http://www.dxcicdd.com/08/callforpapers.htm#workshops>). After hearing about some of the complex issues faced by XRF users at The Field Museum’s 2007 seminar, Dr. Karen Trentelman, analytical scientist and spectroscopist at the Getty Conservation Institute initiated a request to include a Cultural Heritage program at DXC specifically to spread the awareness of issues to the many international scientists who attend the conference. The program’s debut in August 2008 highlighted the various XRF uses on both art objects and natural history collections, showcased innovative use of technology and included a lively discussion of XRF results from participation in a Round

Robin testing experiment. The Cultural Heritage component was met with an overwhelming positive response by users and scientists who had never heard of the issues involved with museum applications. The DXC program committee is now looking into the possibility of including a Cultural Heritage program at least every other year.

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