ANTH 6430-001
ARCHAEOMETRY
SPRING 2015

Meeting Time: Tuesday, 4:30-7:00 pm
Old Main 245 (Anthropology Conference Room)
Instructor: Judson Finley
Office: Old Main 245f
Phone: (435)797-9621
Email: judson.finley@usu.edu
Office Hours: Tuesday and Thursday 1:00-2:30, or by appointment

Course Description

The purpose of this course is to provide an overview of applied natural sciences laboratory techniques to the analysis of archaeological materials. Prominent topics in archaeometry include dating methods, artifact source (i.e., provenance) analysis, microscopy, stable isotope geochemistry, and residue analysis. This class will focus specifically on dating methods and provenance analysis. Since this is a technical class, course time will be divided between regular lectures and topical readings. The course includes laboratory exercises that generally follow weekly topics.

Requirements

Grades for this class are based on four individual components: an annotated bibliography of the class readings (150 points), laboratory exercises (200 points), and a class project (100 points). Full participation in class discussions is expected, which means completing the weekly readings prior to class. To facilitate discussion, each student will generate an annotated bibliography of the class readings. I suggest using bibliography software such as EndNote. Annotated bibliographies for each week are due at the beginning of class. Each student is responsible for leading weekly discussions of related readings. Skills development is a major component of this course, and with a few exceptions weekly lab assignments will largely be completed outside of the classroom. The final class project is designed to introduce you to the USU Microscope Core Facility (MCF) and the new field-emission scanning electron microscope. Students will work collectively to analyze the trace element geochemistry and provenance of obsidian artifacts from a single Late Prehistoric period site in northwestern Wyoming.

Suggested Texts:

Garrison, E. G. (2003). *Techniques in Archaeological Geology*. Springer, New York.

Pollard, M., C. Batt, B. Stern and S. Young, M.M. (2007). *Analytical Chemistry in Archaeology*. Cambridge University Press, Cambridge.

Schedule:

Week 1 January 7-9, 2015	Introduction—No Class
	NO LAB
Week 2 January 12-16, 2015	Introduction to Archaeometry, and a Crash Course in Chemistry READING: De Atley and Bishop (1991); Pollard et al. (2007)
	LAB #1: The Periodic Table of the Elements
Week 3 January 19-23, 2015	Dating Techniques: Radiocarbon, Part 1 READING: Bronk Ramsey et al. (2006); Kennett et al. (2014); Reimer et al. (2013); Taylor (2009)
	LAB #2: Radiocarbon Dating: Calibration
Week 4 January 26-30, 2015	Dating Techniques: Radiocarbon, Part 2 READING: Bamforth and Grund (2012); Contreras and Meadows (2014); Kelly et al. (2013); Williams (2012)
	LAB #3: Radiocarbon Dating: Graphical Representations
Week 5 February 2-6, 2015	Dating Techniques: Radiocarbon, Part 3 READING: Breitenbach et al. (2012); Bronk Ramsey (2008); Bronk Ramsey (2009)
	LAB #4: Radiocarbon Dating: Age Models
Week 6 February 9-13, 2015	Dating Techniques: Dendrochronology READING: Dean (1997); Knight et al. (2010); Towner et al. (2009)
	LAB #5: Dendrochronology
Week 7 February 16-20, 2015	NO CLASS TUESDAY February 17, 2015—MONDAY SCHEDULE
	NO LAB
Week 8 February 23-27, 2015	Dating Techniques: Luminescence, Part 1 READING: Aitken (1997); Feathers (2003); Feathers et al. (2006); Rittenour et al. (2014)
	LAB #6: Luminescence Sample Preparation
Week 9 March 2-6, 2015	Dating Techniques: Luminescence, Part 2 READING: Eerkens and Lipo (2011); Eerkens and Lipo (2014); Rhode (1994)
	LAB #7: Luminescence Sample Preparation
Week 10 March 9-13, 2015	SPRING BREAK—NO CLASS
	NO LAB
Week 11 March 16-20, 2015	Provenance Analysis: Obsidian READING: Shackley (1998); Davis et al. (1998); Glascock et al. (1998)
	LAB #8: Obsidian Source Analysis (FE-SEM)

Week 12 March 23-27, 2015	Provenance Analysis: Obsidian READING: Frahm (2012); Hughes (1998); Eerkens and Rosenthal (2004); Eerkens et al. (2008)
	LAB #9: Obsidian Source Analysis (FE-SEM)
Week 13 March 30-April 3, 2015	Provenance Analysis: Chert, Part 1 READING: Glascock and Neff (2003); Cackler et al. (1999); Huckell et al. (2011); Speer (2014)
	LAB #10: Obsidian Source Analysis (FE-SEM)
Week 14 April 6-10, 2015	Provenance Analysis: Chert, Part 2 READING: Hubbard et al. (2004); Parish (2011); Parish et al. (2013)
	CLASS LAB PROJECT
Week 15 April 13-17, 2015	Ceramic Analysis: Ceramics, Part 1 READING: Glascock et al. (2004); Neff (1998); Eerkens et al. (2002)
	CLASS LAB PROJECT
Week 16 April 20-24, 2015	Ceramic Analysis: Ceramics, Part 2 READING: Finley et al. (2015); (Ownby et al. 2014); Simms et al. (1997);
	CLASS LAB PROJECT

Readings: The readings for this course are available as electronic files on the course Canvas site.

READING LIST

Aitken, M.J. (1997). Luminescence Dating. In *Chronometric Dating in Archaeology*, edited by R. E. Talyor and M. J. Aitken, pp. 183-216. Plenum Press, New York.

Bamforth, D.B., and B. Grund (2012). Radiocarbon Calibration Curves, Summed Probability Distributions, and Early Paleoindian Population Trends in North America. *Journal of Archaeological Science* 39:1768-1774.

Breitenbach, S.F.M. et al. (2012). Constructing Proxy Records from Age Models (COPRA). *Climate of the Past* 8:1765-1779.

Bronk Ramsey, C. (2008). Depositional Models for Chronological Records. *Quaternary Science Reviews* 27:42-60.

Bronk Ramsey, C. (2009). Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51:337-360.

Bronk Ramsey, C., C.E. Buck, S.W. Manning, P. Reimer, and H. van der Plecht (2006). Developments in Radiocarbon Calibration for Archaeologists. *Antiquity* 80:783-798.

Cackler, P.R., M.D. Glascock, H. Neff, H. Iceland, A. Pyburn, D. Hudler and T.R. Hester, and B.M Chiarulli (1999). Chipped Stone Artifacts, Source Areas, and Provenance Studies of the Northern Belize Chert-Bearing Zone. *Journal of Archaeological Science* 26:389-397.

Contreras, D.A., and J. Meadows (2014). Summed Radiocarbon Calibrations as a Population Proxy: A Critical Evaluation Using a Realistic Simulation Approach. *Journal of Archaeological Science* 52:591-608.

Davis, M.K., T.L. Jackson, M.S. Shackley, T. Teague and J.H. Hampel (1998). Factors Affecting the Energy-Dispersive X-Ray Flourescence (EDXRF) Analysis of Archaeological Obsidian. In *Archaeological Obsidian Studies: Method and Theory*, edited by M.S. Shackley, pp. 159-180. Plenum Press, New York.

Dean, J.S. (1997). Dendrochronology. In *Chronometric Dating in Archaeology*, edited by R.E. Taylor and M.J. Aitken, pp. 31-64. Plenum Press, New York.

De Atley, S.P. and R.L. Bishop (1991). Toward an Integrated Interface for Archaeology and Archaeometry. In *The Ceramic Legacy of Anna O. Shepard,* edited by R. L. Bishop and F. W. Lange, pp.358-380. University Press of Colorado, Niwot.

Eerkens, J.W., H. Neff and M.D. Glascock (2002). Ceramic Production among Small-Scale and Mobile Hunters and Gatherers: A Case Study from the Southwestern Great Basin. *Journal of Anthropological Archaeology* 21:200-229.

Eerkens, J.W. and J.S. Rosenthal (2004). Are Obsidian Subsources Meaningful Units of Analysis?: Temporal and Spatial Patterning of Subsources in the Coso Volcanic Field, Southeastern California. *Journal of Archaeological Science* 31:21-29.

Eerkens, J.W., A.M. Spurling and M.A. Gras (2008). Measuring Prehistoric Mobility Strategies Based on Obsidian Geochemical and Technological Signatures in the Owens Valley, California. *Journal of Archaeological Science* 35:668-680.

Eerkens, J.W., and C.P. Lipo (2011). Luminescence Dating of Pottery from Owens Valley and Death Valley. *Pacific Coast Archaeological Society Quarterly* 47:101-114.

Eerkens, J.W., and C.P. Lipo (2014). A Tale of Two Technologies: Prehistoric Diffusion of Pottery Innovations Among Hunter-Gatherers. *Journal of Anthropological Archaeology* 35:23-31.

Feathers, J.K. (2003). Use of Luminescence Dating in Archaeology. *Measurement Science and Technology* 14:1493-1509.

Feathers, J.K., V.T. Holliday and D.J. Meltzer (2006). Optically Stimulated Luminescence Dating of Southern High Plains Archaeological Sites. *Journal of Archaeological Science* 33:1651-1665.

Frahm, E. (2012). Evaluation of Archaeological Sourcing Techniques: Reconsidering and Re-Deriving Hughes' Four-Fold Assessment Scheme. *Geoarchaeology: An International Journal* 27:166-174.

Glascock, M.D., G.E. Braswell and R.H. Cobean (1998). A Systematic Approach to Obsidian Source Characterization. In *Archaeological Obsidian Studies: Method and Theory*, edited by M. S. Shackley, pp. 15-65. Plenum Press, New York.

Glascock, M.D. and H. Neff (2003). Neutron Activation Analysis and Provenance Research in Archaeology. *Measurement Science and Technology* 14:1516-1526.

Glascock, M.D., H. Neff and K.J. Vaughan (2004). Instrumental Neutron Activation Analysis and Multivariate Statistics for Pottery Provenance. *Hyperfine Interactions* 154:95-104.

Hubbard, M. J., D. A. Waugh and J. D. Ortiz (2004). Provenance Determination of Chert by VIS/NIR Diffuse Spectrometry. *The Compass, Earth Science Journal of Sigma Gamma Epsilon* 78:119-129.

Huckell, B.B., J.D. Kilby, M.T. Boulanger, and M.D. Glascock (2011). Sentinel Butte: Neutron Activation Analysis of White River Group Chert from a Primary Source and Artifacts from a Clovis Cache in North Dakota, USA. *Journal of Archaeological Science* 38:965-976.

Hughes, R.E. (1998). On Reliability, Validity, and Scale in Obsidian Sourcing Research. In *Unit Issues in Archaeology: Measuring Time, Space, and Material*, edited by A.F. Ramenofsky and A. Steffen, pp. 103-114. University of Utah Press, Salt Lake City.

Kelly, R.L., T.A. Surovell, B.N. Shuman, and G.M. Smith (2013). A Continuous Climatic Impact on Holocene Human Population in the Rocky Mountains. *Proceedings of the National Academy of Science* 110:443-447.

Kennett, D., B.J. Culleton, J. Dexter, S.A. Mensing, and D.H. Thomas (2014). High-Precision AMS ^{14}C Chronology for Gatecliff Shelter, Nevada. *Journal of Archaeological Science* 52:621-632.

Knight, T.A., D.A. Meko, and C.H. Baisan (2010). A Bi-Millennial Length Tree-Ring Reconstruction of Precipitation for the Tavaputs Plateau, Northeastern Utah. *Quaternary Research* 73:107-117.

Neff, H. (1998). Units in Chemistry-Based Ceramics Provenance. In *Unit Issues in Archaeology: Measuring Time, Space, and Material*, edited by A. F. Ramenofsky and A. Steffen, pp. 115-128. University of Utah Press, Salt Lake City.

Neff, H. and D.M. Glowacki (2002). Ceramic Source Determination by Instrumental Neutron Activation Analysis in the American Southwest. In *Ceramic Production and Circulation in the Greater Southwest: Source Determination by INAA and Complementary Mineralogical*

Investigations, edited by D.M. Glowacki and H. Neff, pp. 1-14. Cotsen Institute of Archaeology Monograph 44, Los Angeles.

Ownby, M.F., D.L. Huntley, and M.A. Peeples (2014). A Combined Approach: Using NAA and Petrography to Examine Ceramic Production and Exchange in the American Southwest. *Journal of Archaeological Science* 52:152-162.

Parish, R.M. (2011). The Application of Visible/Near-Infrared Reflectance (VNIR) Spectroscopy to Chert: A Case Study from the Dover Quarry Sites, Tennessee. *Geoarchaeology: An International Journal* 26:420-439.

Parish, R.M., G.H. Swihart, and Y.S. Li (2013). Evaluating Fourier Transform Infrared Spectroscopy as a Non-Destructive Chert Sourcing Technique. *Geoarchaeology: An International Journal* 28:289-307.

Pollard, M., C. Batt, B. Stern and S. Young, M.M. (2007). *Analytical Chemistry in Archaeology*. Cambridge University Press, Cambridge.

Reimer, P.J., et al. (2013). INTCAL13 and MARINE13 Radiocarbon Age Calibration Curves 0-50,000 Years Cal BP. *Radiocarbon* 55:1869-1887.

Rhode, D. (1994). Direct Dating of Brown Ware Ceramics Using Thermoluminescence and Its Relation to the Numic Spread. In *Across the West : Human Population Movement and the Expansion of the Numa*, edited by D. B. M. a. D. Rhode, pp. 124-130. Univeristy of Utah Press, Salt Lake City.

Rittenour, T.M., L.L. Coats, and D. Metcalf (2014). Investigation of Late and Post-Fremont Alluvial Stratigraphy of Range Creek, East-Central Utah: Use of Radiocarbon When OSL Fails. *Quaternary International* In Press.

Shackley, M.S. (1998). Current Issues and Future Directions in Archaeological Volcanic Glass Studies: An Introduction. In *Archaeological Obsidian Studies: Method and Theory*, edited by M. S. Shackley, pp. 1-14. Plenum Press, New York.

Simms, S.R., J.R. Bright and A. Ugan (1997). Plain-Ware Ceramics and Residential Mobility: A Case Study from the Great Basin. *Journal of Archaeological Science* 24:779-792.

Speer, C.A. (2014). LA-ICP-MS Analysis of Clovis Period Projectile Points from the Gault Site. *Journal of Archaeological Science* 52:1-11.

Taylor, R.E. (2009). Six Decades of Radiocarbon Dating in the New World. *Radiocarbon* 51:173-212.

Towner, R.H., M.W. Salzer, J.A. Parks, and K.R. Barlow (2009). Assessing the Importance of Past Human Behavior in Dendroarchaeological Research: Examples from Range Creek Canyon, Utah, U.S.A. *Tree-Ring Research* 65:117-127.

Williams, A.N. (2012). The Use of Summed Probability Distributions in Archaeology: A Review of Methods. *Journal of Archaeological Science* 39:578-589.

IN COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT (ADA), qualified students with disabilities may be eligible for reasonable accommodations. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, 797-2444 voice, 797-0740 TTY, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.

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