

Curriculum Vitae

Brandon Lee Drake
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Education

University of New Mexico - Department of Anthropology - Albuquerque, NM
Doctorate (Ph.D.) - Anthropology - July, 2012

University of New Mexico - Department of Anthropology - Albuquerque, NM
Masters of Science (M.S.) - Anthropology - May, 2009

University of Wyoming - Department of Anthropology - Laramie, WY
Bachelors of Arts (B.A.) - Anthropology - May, 2007

University of Wyoming - Department of Biology - Laramie, WY
Bachelor of Science (B.S.) - Biology - May, 2007

Appointment and Employment History

Paleoresearch Institute (Golden, CO) <i>Vice-President</i>	2017 - Present
University of New Mexico, Department of Anthropology (Albuquerque, NM) <i>Adjunct Faculty</i>	2012 - Present
Bruker Nano (Berlin, DE) <i>Senior Applications Scientist</i>	2013 - 2017
Robert Wood Johnson Foundation for Health Policy (Albuquerque, NM) <i>Writing and Statistical Support for Dissertation Fellows</i>	2010 - 2012
University of New Mexico, Department of Education (Albuquerque, NM) <i>Data Analyst</i>	2009 - 2010
University of New Mexico, Museum of Southwestern Biology (Albuquerque, NM) <i>GIS Technician/Data Analyst</i>	2007 - 2009

Professional Publications

Blanco-Gonzalez, A., Lillios, K.T., López-Sáez, **Drake, B.L.**
2018 The 4.2 ky BP event in Iberia. An interregional multiproxy comparison of cultural, demographic and environmental dynamics of the Copper and Bronze Ages (3300-1500 BC). *Journal of World Prehistory*. doi:10.1007/s10963-018-9113-3

Hamilton, M.I., **Drake, B.L.**, Wills, W.H., Jones, E.L., Conrad, C., Crown, P.L.
2017 Stable oxygen isotope sourcing of archaeological fauna from Chaco Canyon, New Mexico. *American Antiquity* 83(1): 163-175

Drake, B.L.

2018 Source & Sourceability: Towards a probabilistic framework for dendroprovenance based on hypothesis testing and Bayesian inference. *Dendrochronologia* 47: 38-47. doi:10.1016/j.dendro.2017.12.004

Drake, B.L., Blanco-Gonzalez, A., Lillios, K.

2017 Regional dynamics in the Neolithic Transition in Iberia: Results from Summed Calibrated Date Probability Distributions. *Journal of Archaeological Method and Theory* 24(3): 796-812. doi: 10.1007/s10816-016-9286-y

Marwick, B., Guedes, J.A., Barton, C.M., Bates, L.A., Baxter, M., Bevan, A., Bollwerk, E.A., Bocinsky, R.K., Brughmans, T., Carter, A.K., Conrad, C., Contreras, D.A., Costa, S., Crema, E.R., Daggett, A., Davies, B., **Drake, B.L.**, Dye, T.s., France, P., Fullagar, R., Giusti, D., Graham, S., Harris, M.D., Hawks, J., Heath, S., Huffer, D., Kansa, E.C., Kansa, S.W., Madsen, M.E., Melcher, J., Negre, J., Neiman, F.D., Opitz, R., Orton, D.C., Przystupa, P., Raviele, M., Riel-Salvatore, J., Riris, P., Romanowska, I., Smith, J., Strupler, N., Ullah, I.I., Van Vlack, H.G., VanValkenburgh, N., Watrall, E.C., Webster, C., Wells, J., Winters, J., Wren, C.D.

2017 Open science in archaeology. *The SAA Archaeological Record*, September 2017: 8-14. DOI: 10.17605/OSF.IO/3D6XX

Drake, B.L.

2017 Changes in North Atlantic Oscillation drove Population Migrations and the Collapse of the Western Roman Empire. *Nature Scientific Reports* 7: 1227 doi:10.1038/s41598-017-01289-z

Brent, R.N., Wines, H., Luther, J., Irving, N., Collins, J., **Drake, B.L.**

2017 Validation of handheld X-ray fluorescence for in situ measurement of mercury in soils. *Journal of Environmental Chemical Engineering*. 768-776

Drake, B.L., Hansen, D.T., Lowrey, T., Sharp, Z.

2017 The carbon fertilization effect over a century of anthropogenic CO₂ emissions: higher intracellular CO₂ and more drought resistance among invasive and native grass species contrasts with increased water use efficiency for woody plants in the US Southwest. *Global Change Biology* 23(2): 782-792 doi: 10.1111/gcb.13449

Towett, E.K., Shephard, K., **Drake, B.L.**,

2016 Plant elemental composition and portable X-ray fluorescence (pXRF) spectroscopy: Quantification under different analytical parameters? *X-Ray Spectrometry* 45(2): 117-124

Homsher, R.S. Tepper, Y., **Drake, B.L.**, Adams, M.J., David, J.

2015 From the Bronze Age to the “Lead Age”: Observations on sediment analysis at two archaeological sites in the Jezreel Valley, Israel. *Mediterranean Archaeology and Archaeometry* 16(1): 187-204

Lillios, K., Blanco-Gonzalez, A., **Drake, B.L.**, López-Sáez, J.A.

2016 Holocene climate, demography, and cultural dynamics in Iberia: a multi-proxy approach. *Quaternary Science Reviews* 135: 138-153

Vogel, M., Fowler, J., **Drake, B.L.**

2015 Geochemical Evidence for the Use of Lead in Prehispanic Metallurgy at El Purgatorio, Casma Valley, Peru. *Journal of Archaeological Science: Reports* 4: 326-335

Wills, W.H., **Drake, B.L.**, Dorshow, W.B.

2014 Prehistoric Deforestation in Chaco Canyon? PNAS 111(32): 11584-11591

Drake, B.L., Wills, W.H., Hamilton, M.I., Dorshow, W.B.

2014 Strontium Isotopes and the Reconstruction of the Chaco Regional System: Evaluating Uncertainty with Bayesian Mixing Models. PLoS One: DOI: 10.1371/journal.pone.0095580

Drake, B.L.

2014 Using Models of Carbon Isotope Fractionation During Photosynthesis to Understand the Natural Fractionation Ratio, *Radiocarbon* 56(1): 29-38

Drake, B.L.

2013 $\delta^{13}\text{C}$ Values from Radiocarbon-Dated Plant Matter as an Important but Underexploited Resource for Terrestrial Paleoclimate Analysis and Archaeology, *Radiocarbon* 55 (2-3): 1702-1711

Drake, B.L.

2012 The Influence of Climatic Change on the Late Bronze Age Collapse and the Greek Dark Ages, *Journal of Archaeological Science* 39: 1862 - 1870

Drake, B.L., Wills, W.H., Eckhard, E.B.

2012 The 5.1 ka Aridization Event, Expansion of Piñon-Juniper Woodlands, and the Introduction of Maize (*Zea mays*) in the American Southwest, *The Holocene* 22(12): 1353-1360

Drake, B.L., Hanson, D.T., Boone, J.L.

2012 The Use of Radiocarbon-Derived $\Delta^{13}\text{C}$ as a Paleoclimate Indicator: Applications in the Lower Alentejo of Portugal, *Journal of Archaeological Science* 39: 2888 - 2896

Nazaroff, A.J., Prufer, K.M., **Drake, B.L.**

2010 Assessing the Applicability of Portable X-ray Florescence Spectrometry for Obsidian Provenance Research in the Maya Lowlands, *Journal of Archaeological Science*, 37(4): 885-895

Drake, B.L., Nazaroff, A.J., Prufer, K.M.

2009 Error Assessment of Portable X-Ray Florescence Spectrometry in Geochemical Sourcing, *Society of Archaeological Science*, 32(3): 14-17

Manuscripts in Review

Drake, B.L.

2018 The Exceptional Mediocrity of the Holocene. Currently with Quaternary Science Reviews

Published Book Chapters

Drake, B.L.

2016 Portable XRF: A (very) brief introduction. In: Homem, P.M. (ed.) Lights On... Cultural Heritage and Museums. Porto: LabCR | FLUP, pp. 140-161

Manuscripts In Preparation

Drake, B.L.

Megafauna Populations Increased with Late Pleistocene Warming, Decreased with Rapid Expansion of *Homo sapiens*. Quaternary International

Towett, E.K., Shephard, K.S., Drake, B.L.

Calibration of plants, soils, and fertilizers: A comprehensive agronomy calibration for handheld XRF.

Jusseret, S., Besonen, M., Cline, E., **Drake, B.L.**, Langgut, D., Moody, J., Macklin, M., Roberts, N., Rohling, E., Wenniger, B., Driessen, J.

The Late Bronze Age Collapse: Collapse by Climate Change? Intended for Quaternary Science Reviews

Martindale, L.J., **Drake, B.L.**, Prufer, K.M., Brandt, S.A.

Reproducibility and Validity of ED-XRF Equipment: A Comparison of Spectral and Quantitative Results from Homogeneous, Partially Homogeneous, and Heterogeneous Samples. Intended for Journal of Archaeological Science

Drake, B.L., Ingram, W., Kaiser, B., Nelson, N., Fellows, S., DeGraffenried, J.

Megadrought in the Bølling-Allerød? A Holocene/Pleistocene lake core from Dugway Proving Grounds, north-central Utah. Intended for Quaternary International

Drake, B.L., Stora, J., Goderis, S., Claeys, P., Tocheri, M.

Rare-Earth Saturation into Bone as a Chronological Tool: Case Studies from Motala-Stradvagen, Sweden and Liang Bua, Indonesia. Intended for PLoS

Project Collaborations

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| 2015 - Present | Collaborative Research Three Dimensional Archaeological Landscape Reconstruction and Land Use Modeling at Chaco Canyon, New Mexico. Wills, W.H. and Dorshow, W. National Science Foundation (US) |
| 2015 - Present | Investigating premodern and modern human dispersals to island southeast Asia: the evidence from Liang Bua, Flores. Tocheri, M. Social Sciences and Research Council of Canada (CA) |
| 2013-2015 | Assessing the Role of Ecological Change on Economic and Demographic Transformations Between the Late Neolithic and Early Bronze Age in the Sizandro River Valley, Portugal. Lillios, K. National Science Foundation (US) #1153568 |

Published Abstracts and Conference Presentations

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| 2016 | MicroLIBS analysis of archaeological objects: Elemental analysis and fingerprinting. 11th LACONA Conference. Krakow, Poland |
| 2016 | Handheld XRF as a spectrometer: Quantitative, qualitative, and everything in between. 41st International Symposium on Archaeometry. Kalamata, Greece |
| 2015 | Waste as a Hedge to Variation. Session: Exploring Human Geography: Global Case Studies in Landscape Archaeology. 114th Annual Meeting of the American Anthropological Association. Denver, Colorado. |
| 2015 | Assessing the 4.2 kya event in the Iberian Peninsula and its Relationship to Culture Change Using a Large Dataset of Radiocarbon Dates and Associated Delta 13C Values. Session: What Have Isotopes Done for Archaeology Lately? With Lillios, K., Blanco-Gonzalez, A., |

- and Lopez-Saez, A. 21st Annual Meeting of the European Association of Archaeologists. Glasgow, UK
- 2015 The Onset of Agriculture in Early Neolithic Iberia (5500-3500 CAL BC). Fresh Research Lines from Summed Probability Radiocarbon Distributions. Poster: SA1. with Blanco-Gonzalez, A. and Lillios, K. 21st Annual Meeting of the European Association of Archaeologists. Glasgow, UK
- 2015 X-ray fluorescence: Principles and Practice. Lights On: Cultural Heritage and Museums. Universidade do Porto. Porto, Portugal
- 2015 Quantitative, qualitative, and everything in between: XRF and non-homogenous materials. Portable X-Ray Fluorescence Spectrometry (Handheld and Macro): Friend or Foe? Stichting Restauratie Atelier Limburg. Maastricht, Netherlands.
- 2013 X-ray fluorescence in archaeology. Hellenic Society for Archaeometry Symposium 2013. Athens, Greece, Presentation
- 2012 Using reported $\delta^{13}\text{C}$ values from radiocarbon dates to calculate $\Delta^{13}\text{C}_\text{p}$ rates for terrestrial paleoclimate analysis. 21st Annual Radiocarbon Conference. Paris, France, Presentation
- 2012 Sea Surface Temperatures and Archaeology: Identifying Climatic Change in Bronze Age Greece. Society of American Archaeology, Memphis, TN, Presentation
- 2011 Isotopic Chemistry & You: New Ways to Detect Drought. Society of American Archaeology, Sacramento, CA, Presentation
- 2009 Examining the Validity of PXRF for Obsidian Sourcing in the Maya Lowlands (co-author), Society of American Archaeology, Atlanta, Presentation
- 2009 The Effects of Pig Husbandry in the Pacific on Long-Term Reproductive Fitness, Society of American Archaeology, Atlanta, Presentation
- 2005 A Preliminary Analysis of Cranial Suture Variation in *Allosaurus*, Society of Vertebrate Paleontology, Denver, CO, Poster Presenter
- 2004 A New Specimen of *Allosaurus* from North Central Wyoming, Society of Vertebrate Paleontology, St. Paul, MN, Poster Presenter

Special Skills

- Launched CloudSpectra, an online HTML5 website powered by R which allows users to upload x-ray fluorescence spectra, process elemental counts, and perform a variety of statistical analysis, including principle components analysis, k-means cluster analysis, time series analysis, ternary diagrams, and elemental ratio plots.
- Created a spectrum viewer using HTML5 and R for laser induced breakdown spectroscopy (LIBS) that allows users to upload spectra, produce count data for select elemental lines, and perform principle components analysis.
- Designed an x-ray fluorescence community website for art conservators and archaeologists, www.xrf.guru, which receives thousands of page views each week and plays a critical role in the training of both experienced and new scientists.

- Proficiency with x-ray fluorescence (XRF) analysis, including qualitative analysis, development of new quantitative calibrations, and Bayesian deconvolution. Applications of XRF in research settings include art conservation, artifact sourcing, metallurgical analysis, identification of toxins, and rare earth elemental analysis.
- Past work on Geographic Information Systems (GIS), which includes field data collection using a variety of equipment such as base station and rover GPS systems, handheld GPS systems, and total stations. Data analysis abilities include importation of GPS data from a wide variety of devices into ArcGIS (versions 10.1 - 3), the synthesis of multiple types of data (soil, terrain, vegetation, etc.), and the creation of 3-dimensional spatial terrains.
- Knowledge of software coding for data analysis and the creation of graphics for scientific publications in the R language.
- Fluency in Spanish, Proficiency in French

Workshops Organized

2017	Paleoclimatic Analysis of Cores: Integration of Bayesian ¹⁴ C Chronologies and Geochemistry. September 25-29. Red Lab, The University of Utah. Salt Lake City, UT
2017	Advanced X-Ray Fluorescence Analysis in Architectural Conservation. August 26-29. Hong The University of Hong Kong. Hong Kong, H.K.
2015	X-Ray Fluorescence as a Diagnostic Tool for In-Situ Identification of Radioactive Wound Contamination. September 14. National Institute for Radiological Sciences. Chiba, Japan
2015	X-Ray Fluorescence, Principles and Practice. July 22nd. Departamento de Ciências e Técnicas do Património, Universidade do Porto.
2015	World Agroforestry Center X-Ray Fluorescence Workshop: XRF and Plant Nutrition. January 20-23rd. Soil-Plant Spectral Diagnostics Laboratory. United Nations Avenue. Nairobi, Kenya.
2014	X-Ray Fluorescence Applications in Food and Soil Science. August 21-22, Department of Environmental Science and Technology, University of Maryland, College Park. Maryland, US.
2013	Forbes Advanced X-Ray Fluorescence Workshop, September 10-11th, Freer Gallery, Smithsonian Institution, Washington DC. Co-taught with Bruce Kaiser, Chief Applications Scientist, Bruker Elemental
2013	Workshop on X-Ray Fluorescence Physics, August 26-27th, Chhatrapati Shivaji Maharaj Vastu Sangrahalaya Museum, Mumbai, India. Co-taught with Anupam Shah, Head of Art Conservation, Research, and Training, CSMVS Museum, and Aviva Burnstock, Head of Department of Conservation and Technology, The Courtauld Institute of Art
2013	Las Systemas de Rayas-X y Sus Utilization en Arcaeologia. July 30-31, Instituto Nacional de Antropología e Historia, Moneda 16, Col. Centro, México D.F. 06060
2013	La Physica de la Fluorecensia de las Rayas-X, April 22nd, Ministerio de Cultura, Museo de la Nacion, San Borja, Peru. Co-taught with Bruce Kaiser, Chief Applications Scientist, Bruker Elemental, and Isolda Maria de Castro Mendes, Intituto de Ciências Exatas, Universidade Federal de Minas Gerais
2013	University of Massachusetts Advanced X-Ray Fluorescence Workshop, March 19-20th, Boston, MA. Co-taught with Bruce Kaiser, Chief Scientist, Bruker Elemental.

Courses Taught

2012	Problems ARR (ANTH 597) University of New Mexico
2012	Data Analysis in Anthropology (ANTH 450) University of New Mexico
2012	World Archaeology (ANTH 220) University of New Mexico
2010	Human Anatomy Lab (BIO 247IL) University of New Mexico
2009 - 2010	Introduction to Archaeology Lab (ANTH 121L) University of New Mexico

Research & Travel

2016 - present	Obsidian Sourcing in Kyushu Island, Japan, research with Atshushi Uemine, Hakubi Scholar at the University of Kyoto
2013 - present	Diagenesis as a tool for chronology, research with Janne Stora of the University of Stockholm
2013 - present	Recovery of World War II remains, identifying US and Japanese soldiers using X-ray fluorescence. Research with Mark Noah of Historical Flights.
2013 - present	Analysis of ^{13}C Discrimination of C_3 plants in Neolithic and Early Bronze Age Iberia, research with Dr. Katina Lillios of the University of Iowa.
2012 - 2013	Re-appraisal of Strontium Isotope data from Chaco Canyon, New Mexico, with Dr. Wirt Wills, Dr. Wetherbee Dorshow, and Marian Hamilton
2010 - 2012	Linear modeling of vegetation patterns using pollen data, <i>with Dr. Wirt Wills</i>
2010 - 2012	Site assessments in Chaco Canyon Cultural Park, <i>with Dr. Wirt Wills</i>
2009	Hawaiian Archaeological Research Project, archaeological excavation, <i>with Dr. Michael Graves</i>
2009 - 2010	Assessment of PXRF accuracy and precision in obsidian sourcing, <i>with Dr. Keith Prufer</i>
2008 - 2010	Stable carbon isotope composition of atmospheric CO_2 , <i>with Dr. Zach Sharp and Dr. David Hanson</i>
2008	Proyecto Ynalche, Peru, archaeological survey <i>with Dr. Frances Hayashida</i>
2006	Megiddo Expedition, Israel, Archaeology excavation and documentation, <i>with Dr. Israel Finkelstein</i>

Service to the Profession: Activity

2016	Created CloudSpectra, an online statistical toolkit written in HTML5 and R to aid others in doing quantitative analysis with XRF spectra
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- 2014 Created interactive website with animated tutorials and videos to help users of X-ray fluorescence equipment (www.xrf.guru).
- 2010 - 2012 Organized writing workshops for graduate students in multiple departments, including sociology, psychology, economics, political science, and anthropology.
- 2010 Served on the Student Fee Review Board and with 8 other students oversaw the allocation of \$9 million USD in funding requests
- 2009 - 2012 Assisted archaeological field schools for undergraduate students in Hawaii and New Mexico
- 2008 - 2010 Served on the Graduate and Professional Students Association as representative for the Department of Anthropology

Service to the Profession: Peer Review

- Nature: Scientific Reports (1)
- National Geographic Explorer Grant (1)
- Journal of Archaeological Science (2)
- Journal of Archaeological Science: Reports (4)
- Journal of Historical Sociology (1)
- PLoS One (2)
- X-Ray Spectrometry (1)
- Archaeometry (1)

Theses

- 2012 Doctoral Dissertation: New Paleoclimate Reconstruction Techniques in Archaeology: Applications in Greece, New Mexico, and Portugal. July 2012, University of New Mexico. Advisors: Wirt H. Wills, Frances Hayashida, James Boone, David Hansen
- 2007 Honors Thesis: Multivariate Regression Analysis of Consumer Trends, Gas Prices, and Presidential Approval. May 2007, University of Wyoming. Advisors: Duncan Harris.