ANBI 146 Stable Isotopes in Ecology Winter 2017

Meetings: Thursday 9-11:50, SSB 269 Spiro Library
Instructor: Professor Margaret J. Schoeninger/Dr. Melanie Beasley
Office hours: By appointment
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GOAL: Stable isotope ratios of carbon, nitrogen, oxygen, sulfur and hydrogen, and the radiogenic isotopes of strontium in animal tissues, plant tissues, and soils indicate aspects of diet and ecology. This course will introduce students to this approach for reconstructing paleodiet, paleoecology, paleoclimate, and migration patterns. Students are expected to learn the basics of stable isotope systematics, to understand the kinds of questions that can be addressed, and to interpret the results published thus far.

Class Organization will be a mixture of lecture and discussion depending on the specific topic of the week. You will be expected to articulate the main points in class and also to discuss any data presented. I will try to guide you in sorting out the most important points; but you will have to read carefully and you will be expected to understand the points I emphasize. You will have to draw on those points later when you begin reading the primary literature. Be sure to bring the required readings to be able to discuss specific graphs during class. After the first few weeks, groups of students will be expected to lead the discussion.

Grading:
25% In class discussion
25% Weekly: 2 page (double spaced) summary of the main points in the readings. Due in class each week.
15%: Annotation of chosen topic readings,
35%: Topic presentation or 10-page double spaced term paper.

Academic Integrity: Students are expected to do their own work, as outlined in the UCSD Policy on Academic Integrity published in the UCSD General Catalog. Cheating will not be tolerated, and any student who engages in suspicious conduct will be confronted and subjected to the disciplinary process. Cheaters will receive a failing grade on the assignment or the exam and/or the entire course. They may also be suspended from UCSD.

Week	Date	Topics
Week 1	Jan. 12	Introduction to class and background

Discussion of readings week 6-10, based on students' interests

Week 2	Jan. 19	Isotope systematics

Sulzman, Elizabeth 2007 Stable isotope chemistry and measurement: a primer. In: Stable Isotopes in Ecology and Environmental Science. Robert Michener and Kater Lajtha (eds.) Blackwell Publishing, pages 1-21.

Katzenberg, M. Anne 2008 chapter 13. Stable isotope analysis: A tool for studying past diet, demography, and life history. In: Biological Anthropology of the Human Skeleton. M. Anne Katzenberg and Shelley Saunders (ed.), pages 413-441.

For those interested in more detailed readings:
Hoefs, Jochen 2004 Theoretical and experimental principles. In: Stable Isotope Geochemistry, 5th ed., by Jochen Hoefs, Springer, pages 1-30.

Hoefs, Jochen 2004 Isotope fractionation mechanisms of selected elements. In: Stable Isotope Geochemistry, 5th ed., by Jochen Hoefs, Springer, pages 31-76.

Week 3	Jan. 26	C,H,O, & N variation in plants stable&radiogenic isotopes in vertebrates

Readings:
Marshall, John D., Brooks, J. Renée, and Kate Lajtha 2007 Sources of variation in the stable isotopic composition of plants. In: Stable Isotopes in Ecology and Environmental Science. Robert Michener and Kater Lajtha (eds.) Blackwell Publishing, pages 22-60.

Koch, Paul L. 2007 Isotopic study of the biology of modern and fossil vertebrates. In: Stable Isotopes in Ecology and Environmental Science. Robert Michener and Kater Lajtha (eds.) Blackwell Publishing, pages 99-154.

Skim the following:
Post, David M. 2002 Using stable isotopes to estimate trophic position: Models, methods, and assumptions. Ecology 83(3):703-718.

Week 4	Feb. 2	Forensics (Dr. Melanie Beasley)

Ehleringer, James R. et al. 2010 A framework for the incorporation of isotopes and isoscapes in geospatial forensic investigations. Chapter 17 In: J.B. West el al. (eds) Isoscapes: Understanding Movement, Pattern, and Process on Earth Through Isotope Mapping. Springer Science pages 357-387.

Bartelink, Eric J., Gregory E Berg, Melanie M. Beasley, and Lesley A. Chesson 2014 Application of stable isotope forensics for predicting region of origin of human remains from past wars and conflicts. Annals of Anthropological Practice 38.1: 124-136

Week 5 Feb. 9 Bioarchaeology (Dr. Melanie Beasley)
Giacomo Gaggio

Knudson, Kelly, Goldstein, Paul, Dahlstedt, Allisen, Somerville, Andrew, and Margaret J. Schoeninger 2014 paleomobility in the Tiwanaku diaspora: biogeochecmical analyses at Rio Muerto, Moquegua, Peru. American Journal of Physical Anthropology 155:405-421

Somerville, Andrew D., Fauvelle, Mikael and Froehle, Andrew W. 2013 Applying new approaches to modeling diet and status: isotopic evidence for commoner resiliency and elite variability in the Classic Maya lowlands. Journal of Archaeological Science 40:1539-1553.

Beasley, M.M, AM Martinez, D.D Simons, E.J. Bartelink 2013 Paleodietary analysis of a San Francisco Bay area shellmound: stable carbon and nitrogen isotope analysis of late Holocene humans from the Ellis Landing site (CA-CCO-295) Journal of Archaeological Science 40:2084-2094.

Suggested:

Valentine, Benjamin, Kamenov, George and John Krigbaum 2008 Reconstructing Neolithic groups in Sarawak, Malaysia through lead and strontium isotope analysis. Journal of Archaeological Science 35:1463-1473.

Week 6 Feb. 16 Conservation (Dr. Carolyn Kurle)

Calandra N.T. Tomaszewicz, Jeffrey A. Seminoff, S. H. Peckham, Larisa Avens, and Carolyn M. Kurle 2016 Intrapopulation variability in the timing of ontogenetic habitat shifts in sea turtles revealed using $\delta 1^5$N values from bone growth rings. Journal of Animal Ecology.

Carolyn M. Kurle et al. 2016 Terrestrial scavenging of marine mammals: cross-ecosystem contaminant transfer and potential risks to endangered california condors (*Gymnogyps californianus*). Environmental Science and Technology.

Carolyn Kurle 2016 The dangerous diet of coastal condors. Conservation Ecology: Biosphere 32-41.

Week 7 Feb. 23 Climate Change (Dr. Isabel Rivera-Collazo)

Rosen and Isabel Rivera-Collazo 2012 Climate change, adaptive cycles, and the persistence of foraging economies during the late Pleistocene/Holocene transition in the Levant. Proceedings of the National Academy of Sciences of the United States 109(10)3640-3645.

Ramsey et. al. 2016 Risk, reliability and resilience: phytolith evidence for alternative 'Neolithization' pathways at Kharaneh IV in the Azraq Basin, Jordan. PLOS ONE 1/26.

Mannino, MA et al. 2016 Novel isotopic approaches to investigating human palaeoecology: An introduction. Environmental Archaeology 21(3):193

Fernandes, R. et al. 2016 Towards the use of radiocarbon as a dietary proxy: establishing a first wide-ranging radiocarbon reservoir effects baseline for Germany. Environmental Archaeology 21(3):285.

Week 8	March 2	Nonhuman primates (Dr. Melanie Beasley) Isabel Hermsmeyer

Oelze, VM et al. 2011 Exploring the contribution and significance of animal protein in the diet of bonobos by stable isotope ratio analysis of hair. PNAS 108(24): 9792-9797.

Fahy, GE et al. 2013 Stable isotope evidence of meat eating and hunting specialization in adult male chimpanzees. PNAS 110(15):5829-5833.

Oelze VM et al 2014 Niche differentiation and dietary seasonality among sympatric gorillas and chimpanzees in Loango National Park (Gabon) revealed by stable isotope analysis. Journal of Human Evolution 66:95-106.

Schoeninger MJ et al. 2015 Environmental variables across Pan troglodytes study sites correspond with the carbon, but not the nitrogen stable isotope ratios of chimpanzee hair. American Journal of Primatology .

Week 9	March 9	Paleoecology&human/animal interactions (Dr. Andrew Somerville)

Balasse M and A Tresset 2002 Early weaning of Neolithic domestic cattle (Bercy, france) revealed by intra-tooth variation in nitrogen isotope ratios. Journal of Archaeological Science 29:853-859.

Losch S et al. 2006 Stable isotopes and dietary adaptations in humans and animals at pre-pottery Neolithic Nevali Cori, Southeast Anatolia. American Journal of Physical Anthropology 131:181-193.

Somerville AD et al. 2016 Leporid management and specialized food production at Teotihuacan: stable isotope analysis of cottontail and jackrabbit bone collagen. Archaeological and Anthropological Sciences.

Somerville AD et al. 2016 Animal management at the ancient metropolis of Teotihuacan, Mexico: stable isotope analysis of leporid (cottontail and jackrabbit) bone mineral. PLOS ONE August 17, 2016. 1/21.

Week 10	March 16	Paleoecology/Human evolution (Dr. Melanie Beasley) Julianna Santillan Goode

Sponheimer, M., Lee-Thorp, J., de Ruiter, D., Codron, D., Codron, J., Baugh, A.T., Thackeray, F. 2005 Hominins, sedges, and termites: new carbon isotope data from Sterkfontein Valley and Kruger National Park. Journal of Human Evolution 48:301-312.

Tipple 2016 Capturing climate variability during our ancestors' earliest days. PNAS 2016.

Kingston and Harrison 2006 Isotopic dietary reconstructions of Pliocne herbivores at Laetoli: Implications for early hominin paleoecology. Palaeogeography Palaeoclimatology, Palaeoecology 243: 272-306.

Schoeninger MJ 2014 Stable isotope analyses and the evolution of human diets. Annual Reviews of Anthropology.