

**SUMMER 2023**  
**ANTH 107B**  
**STABLE ISOTOPE ECOLOGY**  
University of California at Santa Cruz  
Department of Anthropology



**Instructor:** Dr. Vicky M. Oelze  
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**Office:** SS1, room 308  
**Office hours:** after class, from 4:30pm to 5pm (or earlier if class end early 😊), which you can book [here](#)

**Class time:** Mondays and Wednesdays 1:10 - 4:30pm (somewhat flexible when we end)  
**Class location:** in the PEMA-Lab, in SS1, room 431

**Welcome to the Stable Isotope Ecology Lab class!**

**I am thrilled to get to know you and to work with you in the lab 😊**

### Course outline

This combination of lectures, lab sections and paper discussions will provide students with a comprehensive overview of stable isotope research in fossil hominins, prehistoric human populations and living non-human primates. We will discover the wide application of isotopic research in biological anthropology, bioarchaeology, primatology, forensics and wildlife ecology.

This class will primarily focus on the use of carbon and nitrogen stable isotopes to reconstruct past human diets as well as the feeding ecology of extant primates. We will discuss how the method of using carbon and nitrogen isotopes has evolved, from reconstructing C<sub>4</sub>-plant (e.g. corn) and marine resources (fish and shellfish) use in prehistoric populations, to its wide spread use in archaeology today, including the study of past subsistence strategies, human weaning behavior, social stratifications in diet as well as animal husbandry strategies. We will discuss the use of stable isotopes in primatology to reconstruct the dietary ecologies of wild primates, particularly African great apes. In the 2<sup>nd</sup> part of the class, we will discuss the use of other isotope systems such as strontium, oxygen and sulfur and their applications in bioanthropology to address past mobility and population migrations.

The potential of multi-isotope approaches combining various isotope systems will be highlighted during the last week of instructions, when students will summarize and present their own perspectives on an isotopic study. Students will gain knowledge on the limitations and pitfalls of the different isotopic methods and be enabled to critically assess the scientific literature.

## Class and lab materials

- All lecture material and scientific articles for reading will be made available on CANVAS, but will not be complete in terms of what we further discuss in class; taking notes on discussions and students paper presentations are the responsibility of the students
- Students are encouraged to bring the lecture material to class on electronic devices to follow along and take notes
- One single lecture will be provided as a video lecture recording instead of in-person class
- We will provide you with PPE (lab coats, gloves, safety goggles)
- For the lab sections lab books will be provided, shall be used to take notes on lab procedures and will collected for evaluation at the end of the quarter

## Course requirements and how to get your grade

Besides **regular attendance** (attendance will be checked in each session) and showing up in time for class, this course requires the reading and study of provided texts and the ability to ask critical questions during discussions. Being late, leaving early and missing classes will negatively impact the final grade. If you miss class more than 2 out of our 9 in-person sessions and fail to hand in (unsolicited!) solid documentation explaining why you missed class, this can lead to course failure. Use your 2 free shots to miss class wisely. You can always fall ill towards the end of the quarter!

**Active participation in discussion and labs** – 50%: given this is a very small class the active participation in activities, discussions and lab sections is required by all students to make this a successful and enjoyable learning experience. The instructor will grade the overall performance in class based on the students' participation in the different activities and the motivation to conduct lab work in a focused and precise manner. Lab participation is additionally checked by evaluation note taking and sample preparation record keeping in lab books (see above)!

**Student presentations** – 50%: Each student will prepare an oral power point presentation on a scientific isotope case study hand-picked and provided by the instructor based on your interests in a time slot of 15min minutes. After each presentation we will have a 5-10min discussion of the presentation as a group. It is expected that these presentations are well structured and organized, the presentation performance as been repeated practiced (also to stick to time limit) and is engaging, if not entertaining. A presentation half-heartedly prepared the day before will be easy to identify as such.

The aim of each presentation is to summarize, explain and critically discuss 1) the context and research question presented in the article, 2) with which material and isotopic methods this question was addressed, 3) what the results are and 4) how these results tie in the existing evidence from the respective region, time period, prehistoric culture, or primate species. A maximum of 12 slides should be used. Independent and intensive study beyond the research article itself is expected and the integration of images, tables and supplementary material is advised.

**Missing your presentation:** A missed presentation without any prior notification or being excused/accommodated by the instructor will be scored as an F. In the event of illness or emergency you are responsible to inform the instructor BEFORE the date of the presentation. Only if you do this and provide a valid documentation (i.e. doctor's note) we can schedule a make-up test.

### Student Accommodations:

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your “[Accommodation Authorization Letter](#)” from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, as soon as possible in the academic quarter, preferably within 1 week and please not later than 2 weeks. I also am open to and want to encourage you to discuss with me ways I/we can ensure your full participation in this course. If you have not already done so, I encourage you to learn more about the many services offered by the DRC. You can visit their website (<http://drc.ucsc.edu/index.html>) make an appointment, and meet in-person with a DRC staff member. The phone number is [831-459-2089](tel:831-459-2089) or email [drc@ucsc.edu](mailto:drc@ucsc.edu).

### Learning outcomes:

- Overview over all isotope systems most commonly used in archeology and ecology
- Learn about possibilities and limitations of each isotope system
- Learn about best practices in sample consideration and preparation
- Learn about lab safety
- Learn and practice how to read scientific graphs
- Gain experience with sampling of skeletal remains
- Gain experience with extracting high quality bone collagen for isotope analysis
- Gain exposure to isotope ratio mass spectrometry
- Immersion in scientific case study and reading scientific articles

## Course schedule

### SUMMER SESSION 2023

Date	session	Topic ( <i>and activity</i> )
July 31	1 C & N Isotopes	Introduction to class <i>Lab section: lab introduction and basic lab safety rules</i>
Aug 2	2 C & N Isotopes	The world of carbon and nitrogen isotopes I <i>Lab section – checking and rinsing collagen samples</i>
Aug 7	3 C & N Isotopes	The world of carbon and nitrogen isotopes II <i>Reading graphs together – practice session</i>
Aug 9	4 C & N Isotopes	Applying C and N isotopes to case studies <i>Lab section – Bone &amp; tooth sample preparation (group 1)</i>
Aug 14	5 Fossil Hominin Isotopes	Isotopes and fossil hominins <i>Lab section – Bone &amp; tooth sample preparation (group 2)</i>
Aug 16	6 Primate Isotope Ecology	Of bonobos, chimps and isotopes <i>Lab section – collagen filtration</i>
Aug 21	7 Strontium Isotopes	The world of strontium isotopes <i>Lab section – sample freeze drying</i>
Aug 23	9 Oxygen Isotopes	The world of oxygen isotopes <i>Excursion: Visit at Stable Isotope Lab and Keck lab</i>
Aug 28	10 Sulfur Isotopes	The world of sulfur isotopes (online lecture video) <i>(no in-person class, no activity)</i>
Aug 30	Final paper presentations	<b>Student paper presentations</b> (8 presentations, 20-25min with discussion each)