**DAY 34: Fri Nov 14** CAVE BEAR stable isotopes

1. **10:00-10:15 Business—**
   1. Next Monday, your project description is due. Don’t need to bring a copy for peer editing this time🡪I can move that to **Friday** if it would help because I can’t get all your backgrounds back to you before Monday (I tried, but I want to spend a lot of time on each one. I’m spending about an hour and I don’t have 10 more hours before you need them back.
   2. Don’t put your completed message box in the folder today! You can turn it in on Monday so that what you learn today can be reflected then
   3. Why are we doing these units? Because, to work in a museum as a curator, eor even a collections manager, most people need at least a **masters and likely a PhD** these days. So **you’d be doing research, supervising research or at least contributing** to others research—and deciding if you think it is **OK to let people destructively sample** or just handle your specimens. So you should be versed in research. We read how specimens are **biological filter paper,** so now we are reading about how exactly they are retaining a signature of their environment in their tissues. I don’t expect that you fully understand the research. I will test you on things we cover in class. In particular, I want you to be able to won’t test you on anything more than what I ask you to know in reading guides (which is not a lot these days) 🡪moved this to earlier in the unit for next year
   4. Take a chart out for keeping track of the isotopes and their interpretation for the discussion section. Fill that out for Monday—maybe **\*\*We may not get to cave bears today. That’s A-OK. We want to go as fast as works for you. We can’t apply the stable isotope to a study system until we’re sure you understand stable isotopes**
2. **10:015-10:27 Review of how stable isotopes accumulate** 🡪moved this to earlier in the unit for next year
   1. show figure of fish nitrogen and write it up on the board how the stable isotope of 15N accumulates as you go up largely because it’s harder to pee out 15N
   2. same processes not happening in Carbon. Your 13C ratio is basically a reflection of the primary producers in your ecosystem, not your trophic level.
   3. 10:27--Now, look at the figures in Ben-David and Flaherty to figure out what figure shows this. Write up which figure on your board and then you can share what you thought across teams
3. **continue from Wednesday (which bulleted points or new points do these figures/tables represent)** 
   1. I am crossing out Figure 3 for a couple of reasons. Let’s start by looking at it together. I wanted you to look at this and go with the last bullet point, that physiology, biochemical and behavioral processes affect stable isotopes. You all looked at every possible interaction, so let’s do that a little bit together
   2. Table 2—variation within tissues; This is where we ended
4. **Before you go, on the blue quarter sheets, Yes, no, or not sure** 🡪moved this to earlier in the unit for next year
   1. *I understand how 13C reflects primary production and 15N reflects trophic level.*
   2. *I understand that other factors can alter stable isotope values and need to be accounted for.*
   3. *The activity (ies) today increased my understanding of stable isotope analysis*
   4. *I’m ready to move on to the Cave Bear paper for Monday*
5. **10:30 Cave Bear Activity 1:** Message Box *What are the questions we are trying to answer?*
   1. Were all cave bears herbivorous when they co-occurred?
   2. When they lived together for significant periods, did they partition their ecological niches?
   3. How flexible were the dietary habits of cave bears in relation to individual choices and phylogenetic affiliation?
   4. Is there a link between the occurrence of different cave bear types and climatic fluctuations?
6. **10:30** Results section using your charts for each isotope in the results answer these questions🡪this went really well, I was really impressed that they could do this!

Diagenesis: "*the cumulative physical, chemical and biological environment; these processes will modify an organic object’s original chemical and/or structural properties and will govern its ultimate fate, in terms of preservation or destruction*" (Wilson and Pollard, 2002

* 1. They argue that they can identify differences in water resources used by the bears. What isotopic measurement can they take in the **ancient bears** that will reflect the water resource the bears were using?
     1. **NOT** δ18OH20 in ancient bears it is δ18Ocarb
  2. They argue that they can use the δ18Ovalues basedon the carbonate fraction and don’t need to use the δ18OPO4 Why are the carbonate values good enough?
     1. The phosphate and carbonate values show the same trend and they don’t show any diagenetic indicators, so they’re good to go
  3. They say “no significant correlation was found between the isotopic values and any diagenetic indicator.” **What are the diagenetic indicators they were looking for?**
     1. Testing different correlations between markers, such as N content of whole bone that reflects the intensity of collagen loss or the percent carbonate in the bone (percent carbonate in ancient bones was 5.6 to 8.3% compared to 7.8% in modern bones)
     2. Difference between two sources of oxygen, that in carbonate and that in phosphate, were compared to that in modern mammal bones and was found to be similar (Oxygen laid down in carbonate and in phosphate comes from the same source, you expect the difference to be the same, because the discrimination in bone formation is the same—if you see a difference, then collagen has probably been destroyed

1. **10:40-10:50** discuss answers, grade each other
2. Turn in your message box!!

**THEIR PREP:**

**READ:**

Bocherens, Hervé, et al. "Niche partitioning between two sympatric genetically distinct cave bears (*Ursus spelaeus* and *Ursus ingressus*) and brown bear (*Ursus arctos*) from Austria: Isotopic evidence from fossil bones." *Quaternary International* 245.2 (2011): 238-248.

**MY PREP:**

* Team folders
  + Quarter sheets for eval of their status on stable isotopes
* Reading guide
* Grade their project backgrounds