ISOTOPES IN FORENSIC ANTHROPOLOGY

Using the isotopic values in keratin to determine the diet and climate of humans and animals
What Are Isotopes?

And what’s Forensic Anthropology?
Forensic Anthropology

"Forensic anthropology is a special sub-field of physical anthropology (the study of human remains) that involves applying skeletal analysis and techniques in archaeology to solving criminal cases."

(The Smithsonian Museum of Natural History)
Protium is the most common stable isotope of Hydrogen, as well as the lightest. It contains 1 proton and 0 neutrons.

Deuterium is the rarer stable isotope of Hydrogen, and is heavier than Protium. It contains 1 proton and 1 neutron.

Tritium is the longest living unstable isotope of Hydrogen, and is heavier than both Protium and Deuterium. It contains 1 proton and 2 neutrons.
Isotopes In Keratin

**NITROGEN**

Nitrogen is used to measure the amount of meat consumed.

- 99.6% of stable Hydrogen isotopes are $^{14}\text{N}$, while 0.4% are $^{15}\text{N}$.

**CARBON**

Carbon is used to measure the type of plant matter consumed.

- 98.1% of stable Carbon isotopes are $^{12}\text{C}$, while the other 1.1% are $^{13}\text{C}$. 

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PLANTS

Our primary producers

C₃ PLANTS
Low Carbon levels
Best fit for cooler and wetter environments, these plants make up ~85% of plant species.

C₄ PLANTS
High Carbon levels
Best fit for warmer and sunnier environments, these plants make up ~3-4% of plant species.

CAM PLANTS
High Carbon levels
Best fit for hot and dry environments, these plants make up ~7% of plant species.
Animals

**CARNIVORES**
*Highest Nitrogen levels*
Tend to eat only meat, tertiary consumers and apex predators.

**HERBIVORES**
*Lowest Nitrogen levels*
Tend to eat only plants, primary consumers.

**OMNIVORES**
*Moderate Nitrogen levels*
Eat both plants and meat, tend to be secondary or tertiary consumers.
Trophic Levels

Trophic levels are essentially where something stands on the food chain, usually in the shape of a pyramid. Trophic levels can be determined using isotopes.
Isotopic Levels from Keratin

$d = \delta$

All values measured in $\%$
What for?

With this, by using a preserved keratin (or bone) sample, we can figure out what various life ate.
And why do we care?

By finding out what various life ate, we can make a hypothesis of what type of a climate/region that life lived in.
Jeffery Land

Emily

Jeffery Land

Yesterday
Jeffery Land

Yesterday
Any Questions?
Fun Stuff I Did

That has nothing to do with my project

Yay Geopaths
Coming soon
Blame the software
Thanks to:
Floyd Nichols
Mia Tuccillo
Suzan van der Lee
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Maggie Osburn
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All Mentors!

For making this project possible

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Hannah Bausch

For showing me fun science stuff

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My Confused Friends

For the hair