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?

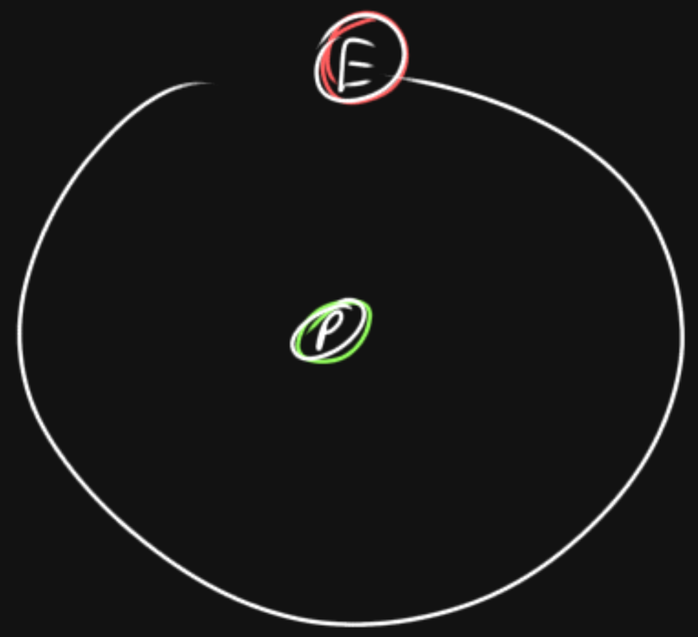
Forensic Anthroplogy

”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*)

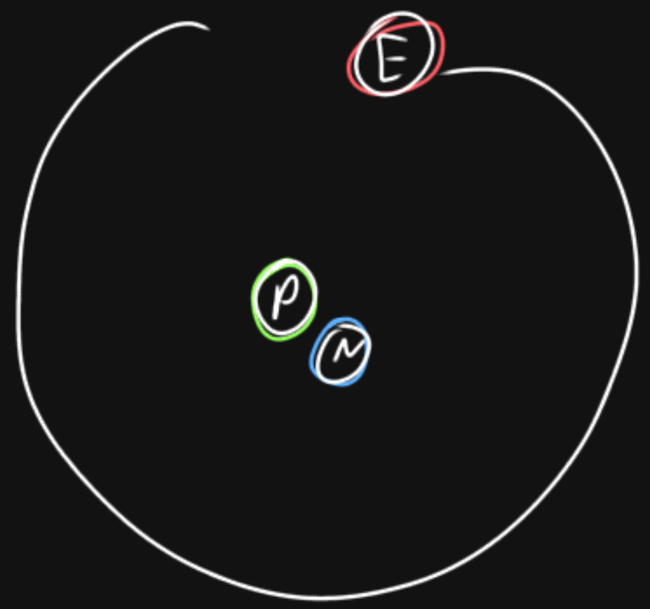
PROTIUM (1H)

Protium is the most common stable isotope of Hydrogen, as well as the lightest. It contains 1 proton and 0 neutrons.



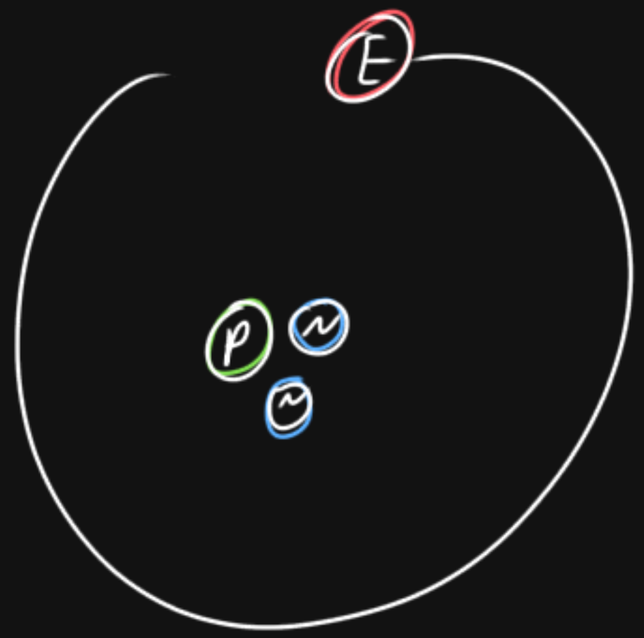
DEUTERIUM (2H)

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



TRITIUM (3H)

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.

CARBON

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

^{14}N ^{15}N

99.6% of stable Hydrogen isotopes are 14N, while 0.4% of stable Hydrogen isotopes are 15N.

^{12}C ^{13}C

98.1% of stable Carbon isotopes are 12C, while the other 1.1% of stable Carbon isotopes are 13C.

PLANTS

Our primary producers

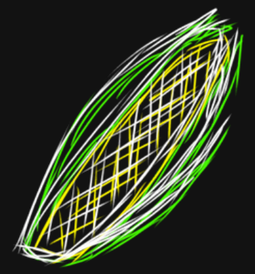
C_3 PLANTS

Low Carbon levels

Best fit for cooler and wetter environments, these plants make up ~85% of plant species.

C_4 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

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.

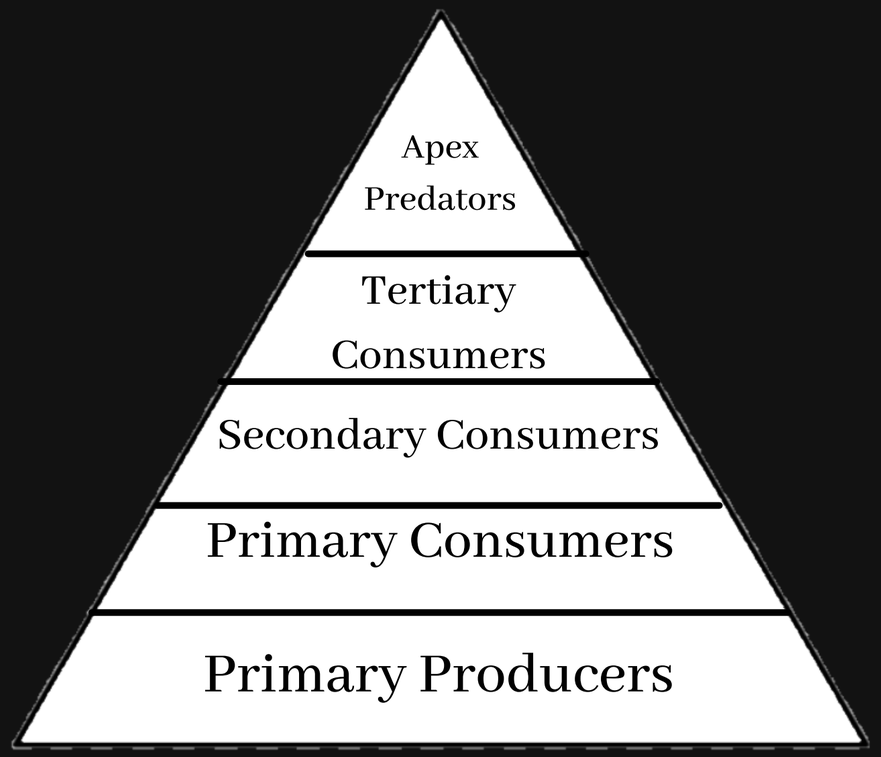
CARNIVORES

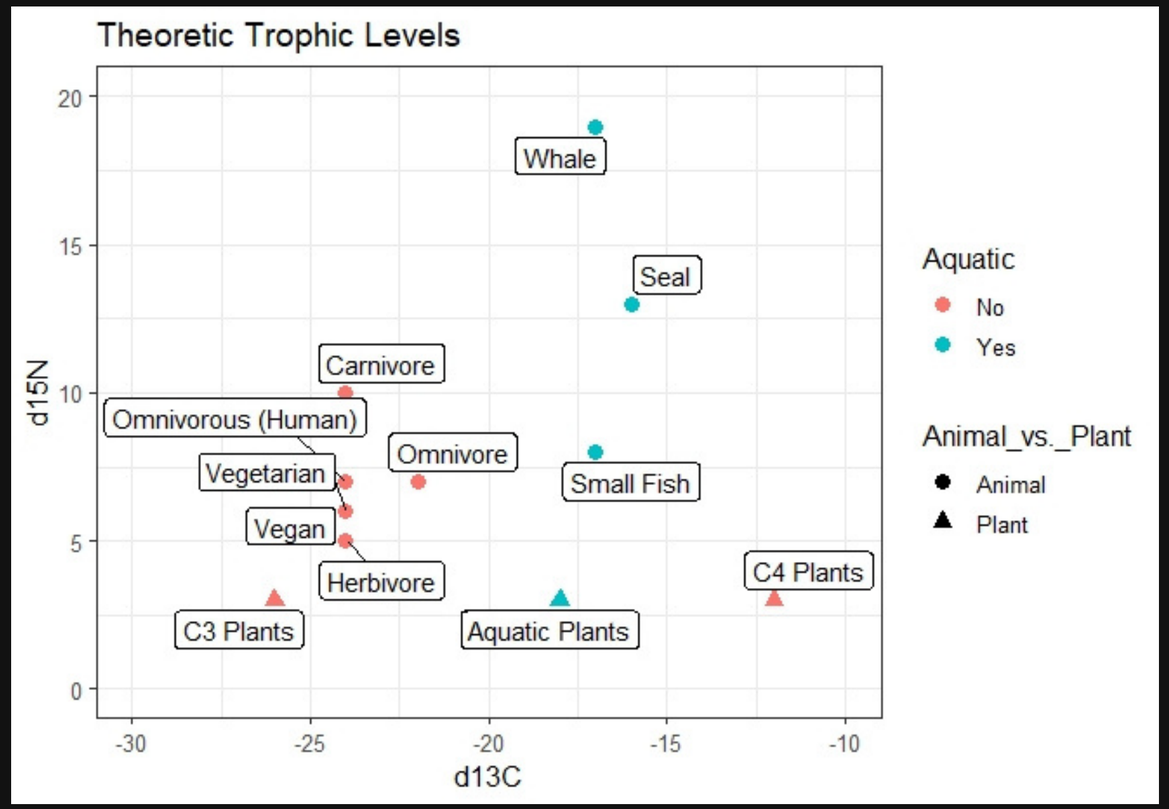
Highest Nitrogen levels

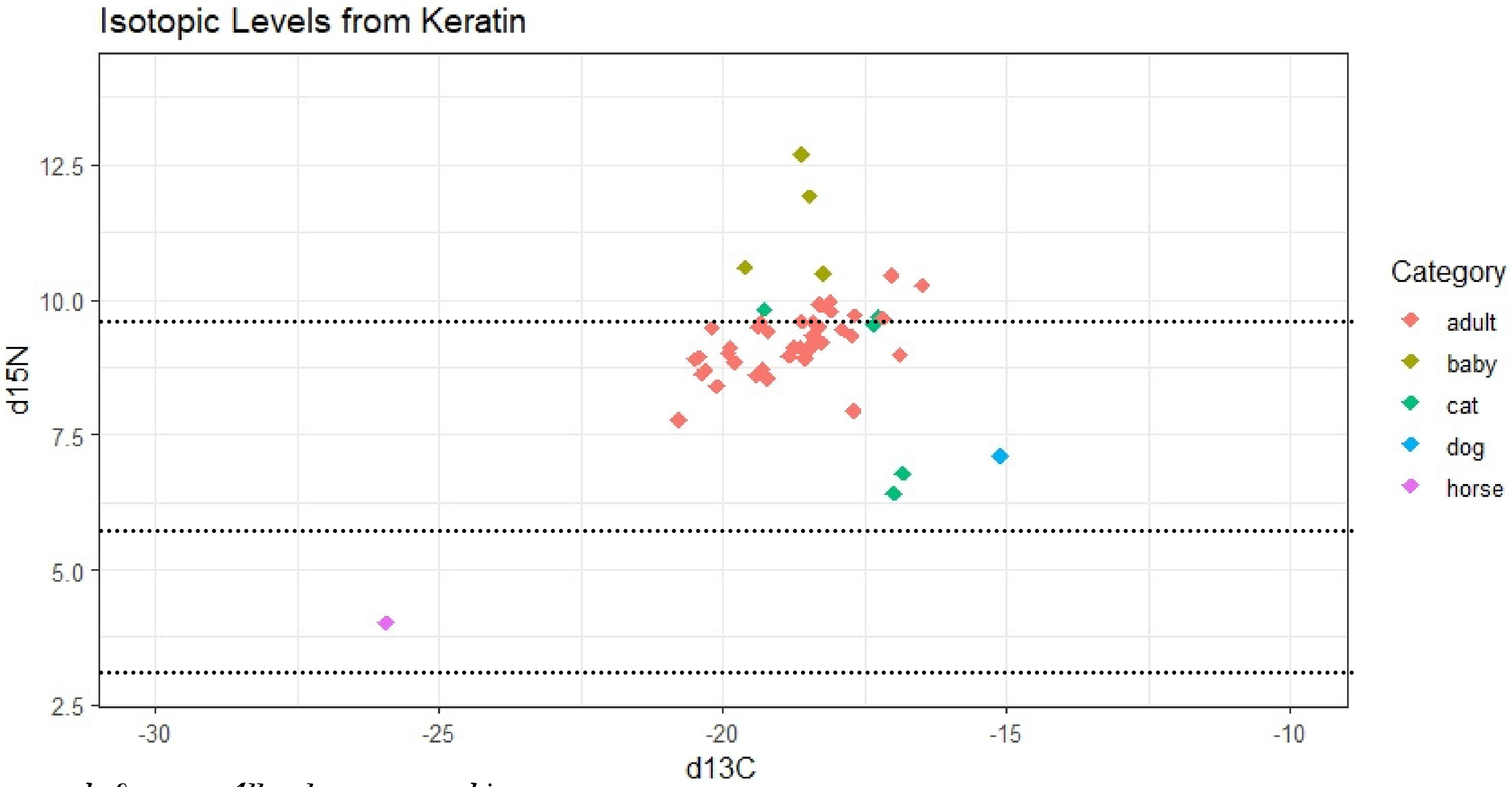
Tend to eat only meat, tertiary consumers and apex predators.

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.



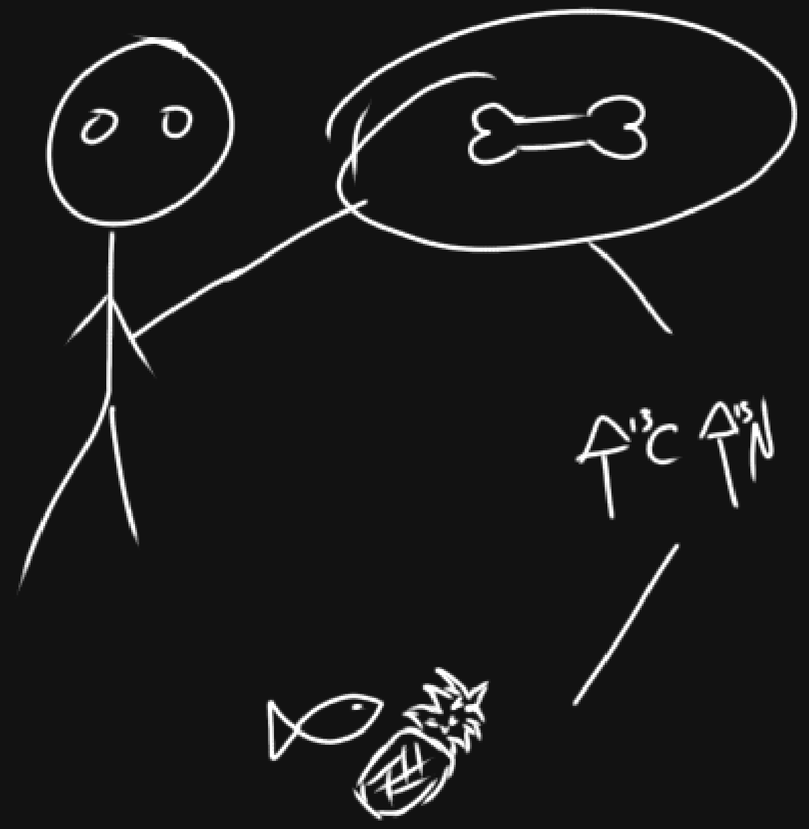




d=δ *All values measured in ‰*

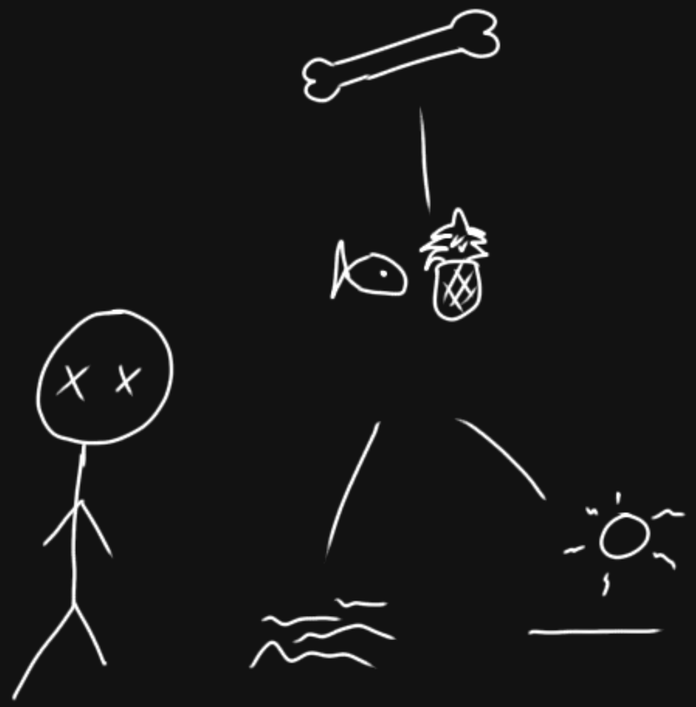
What for?

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


^{13}C ^{15}N

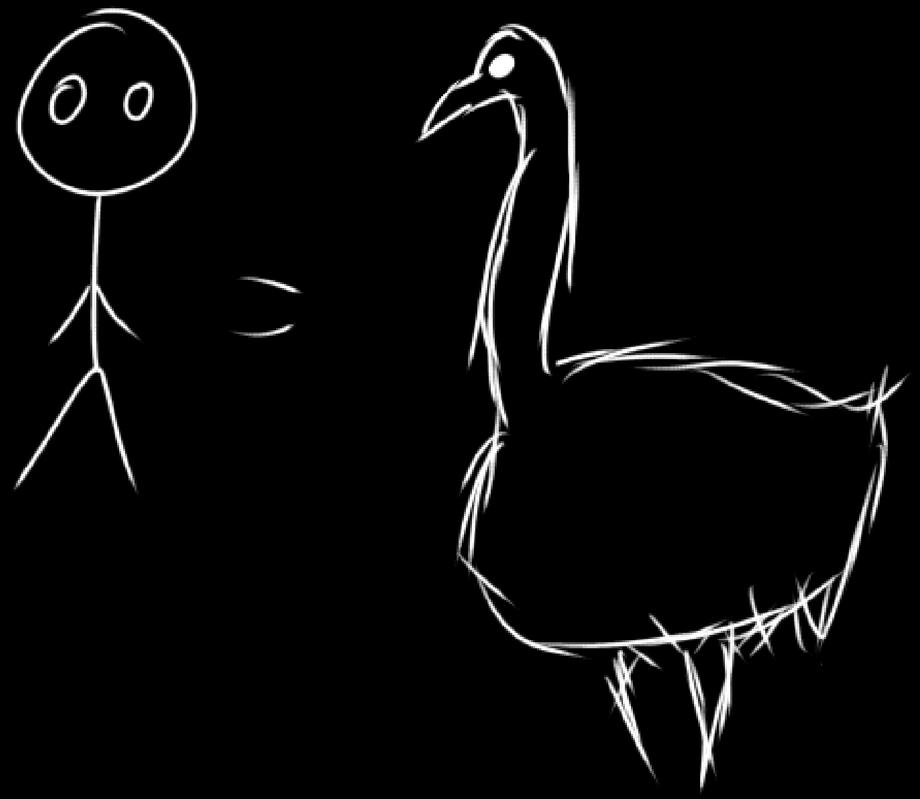
And why do we care?

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
7Mily


Jeffery
Land
Yesterday



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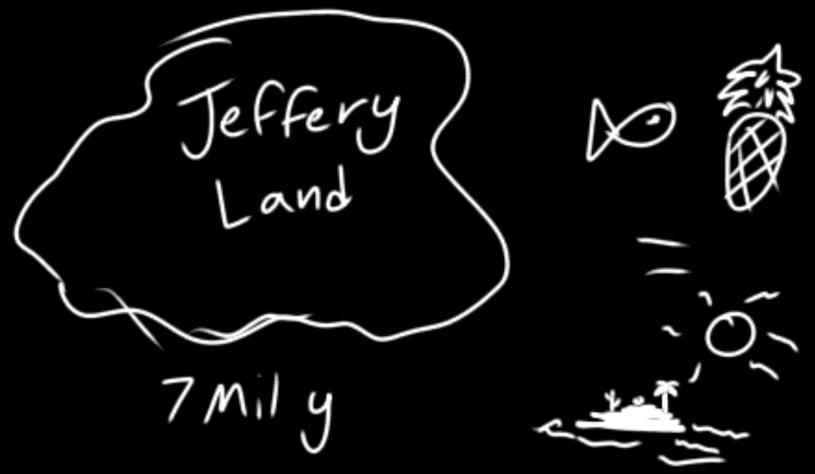
Yesterday


Jeffery
Land
Yesterday


Jeffery
Land
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Jeffery
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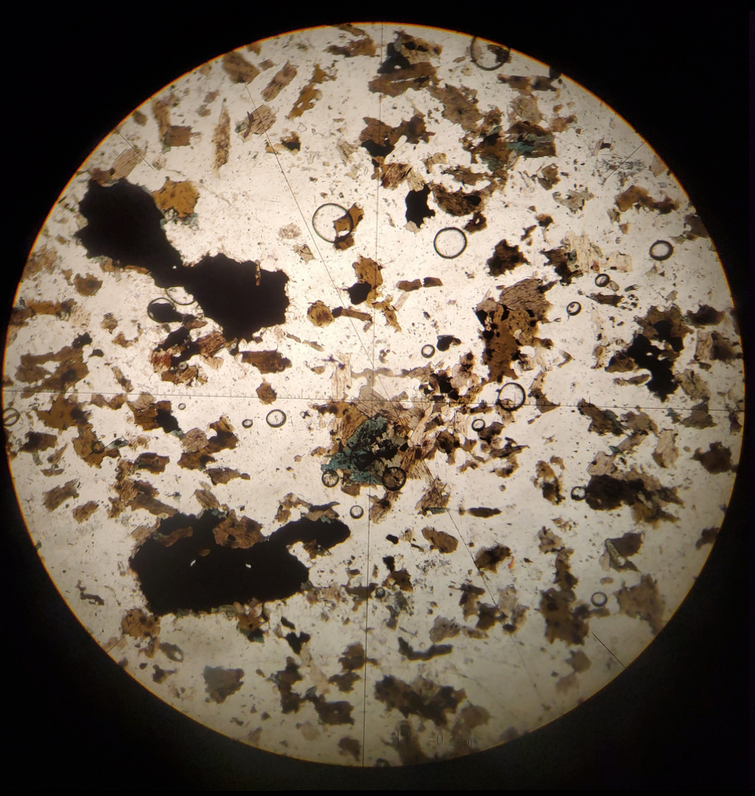
Yesterday

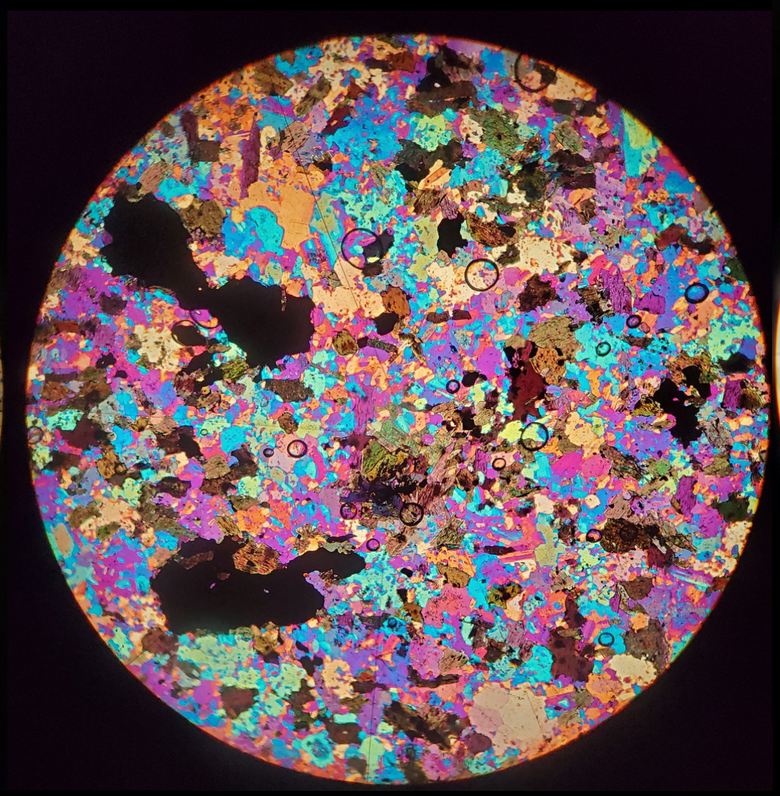
Any Questions?

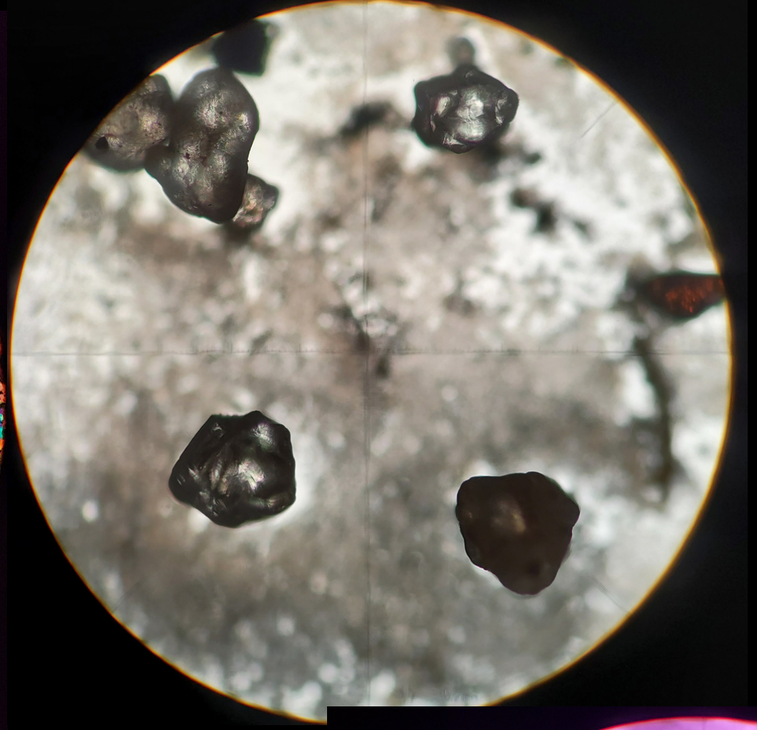
Fun Stuff I Did

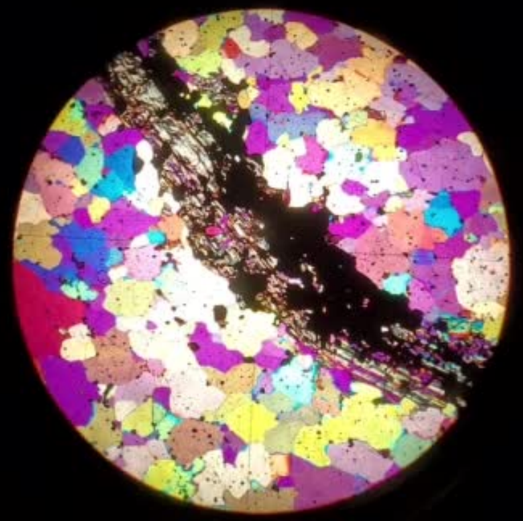
That has nothing to do with my project

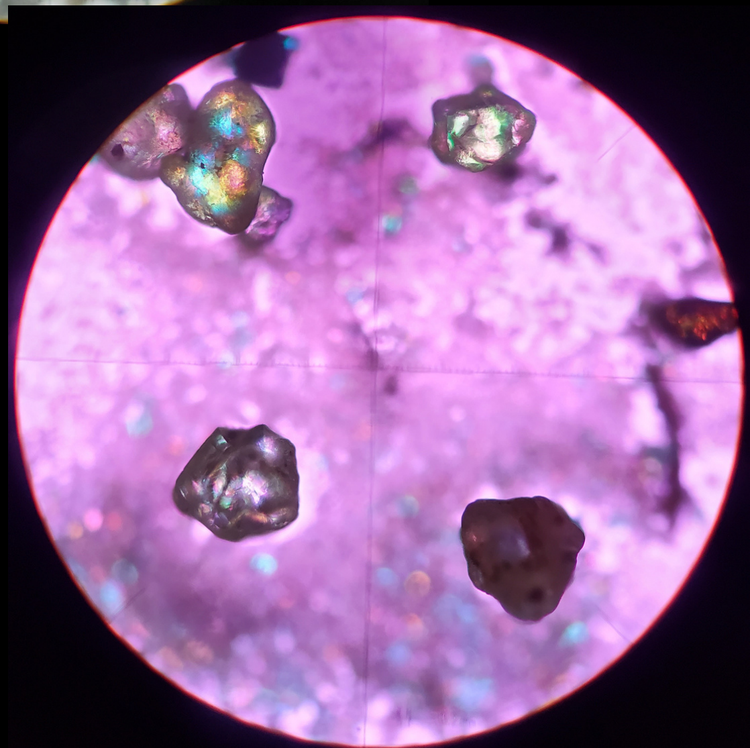
Yay Geopaths









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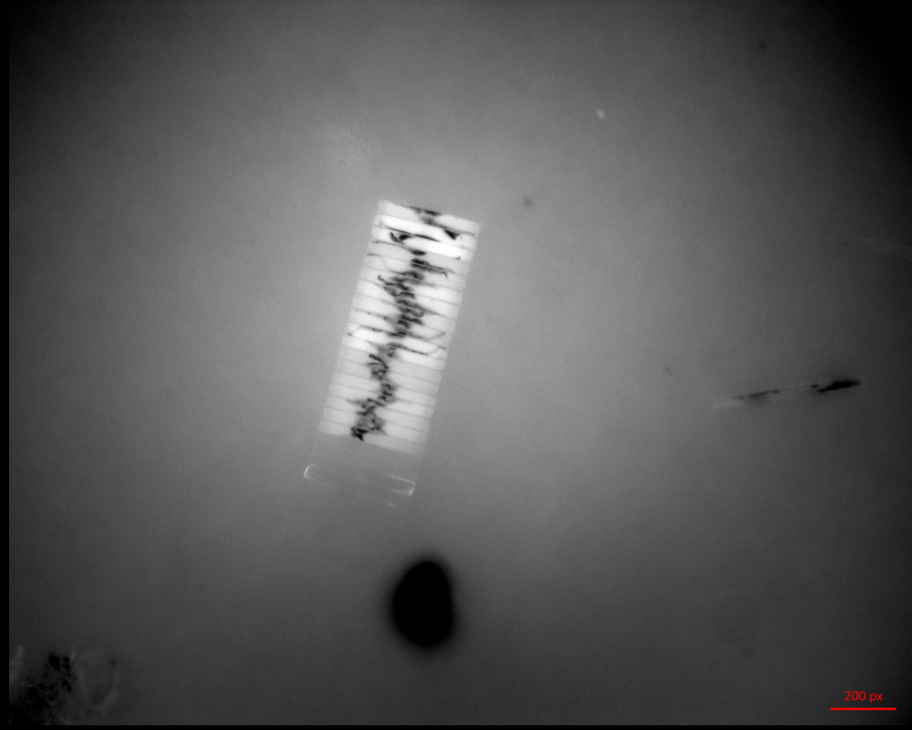
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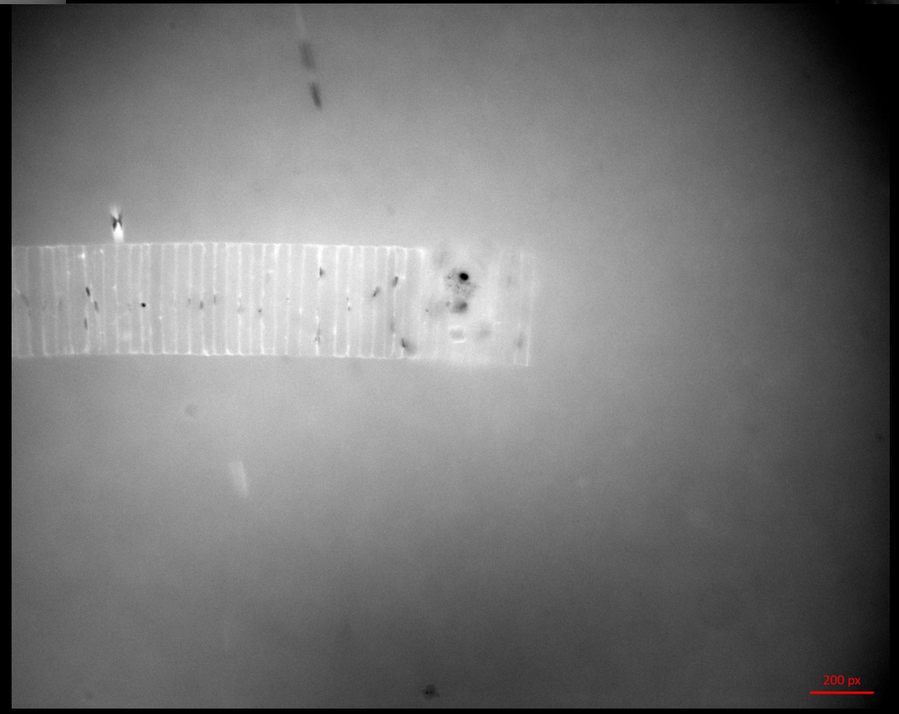
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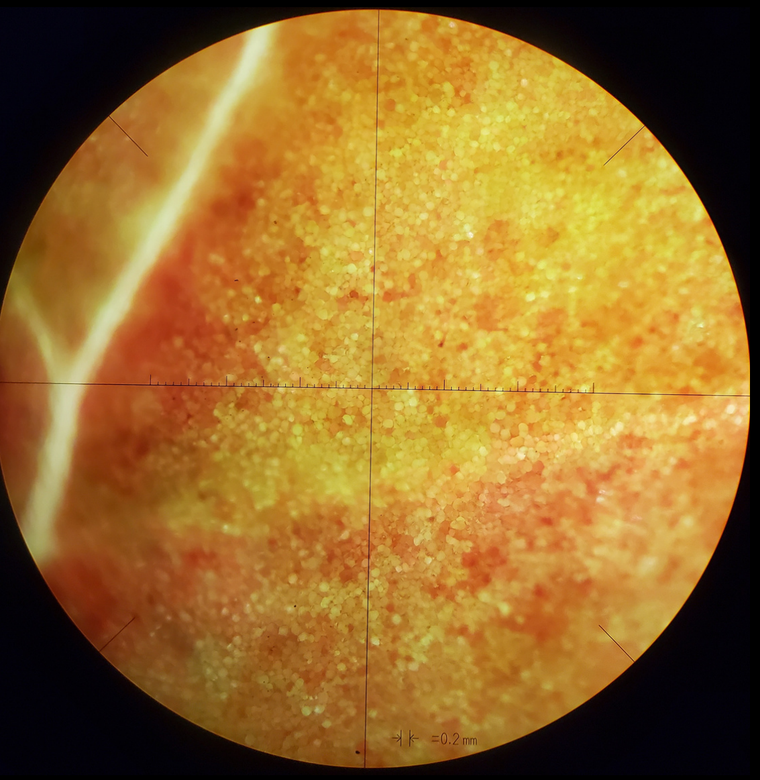
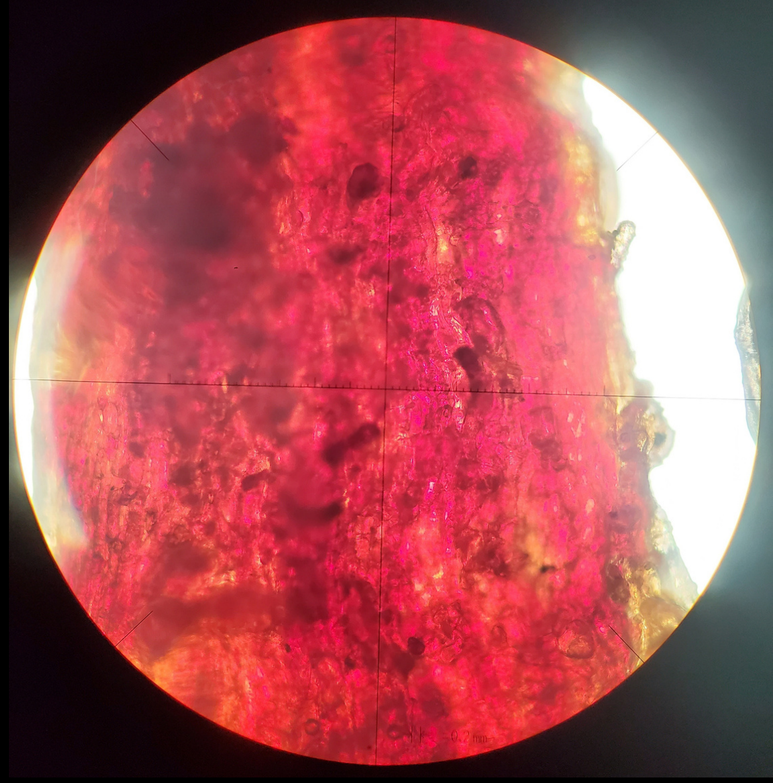
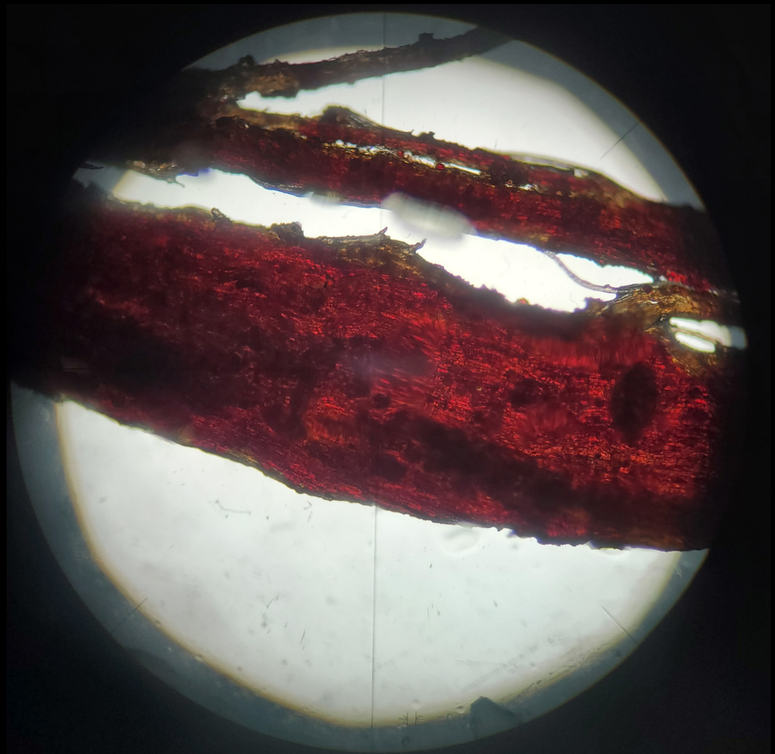

=0.2 mm



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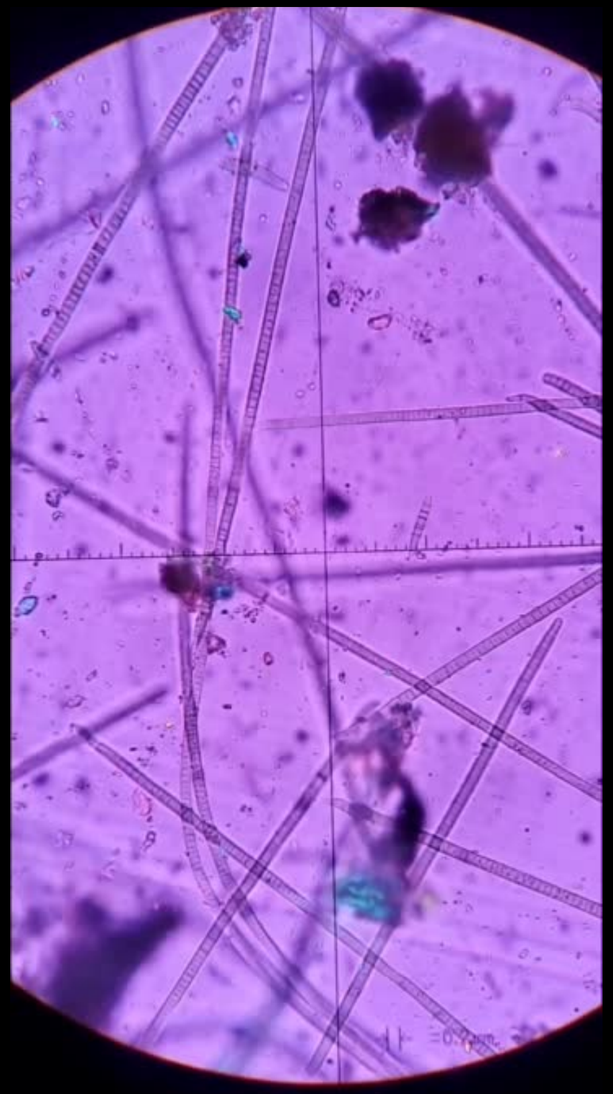
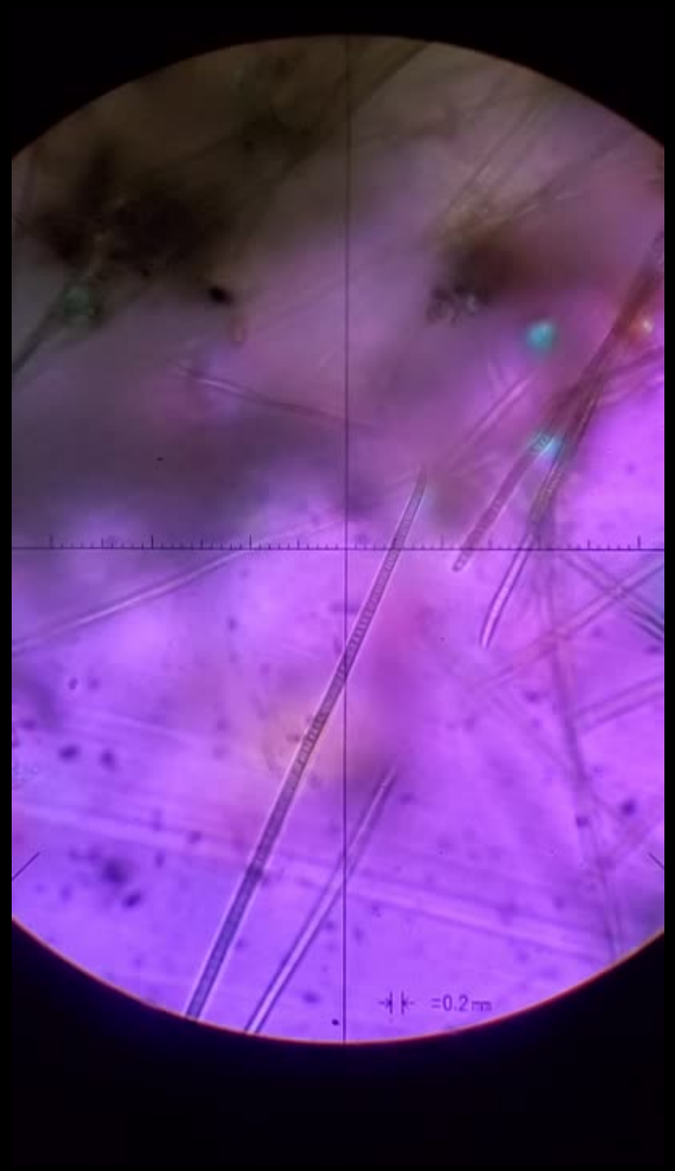
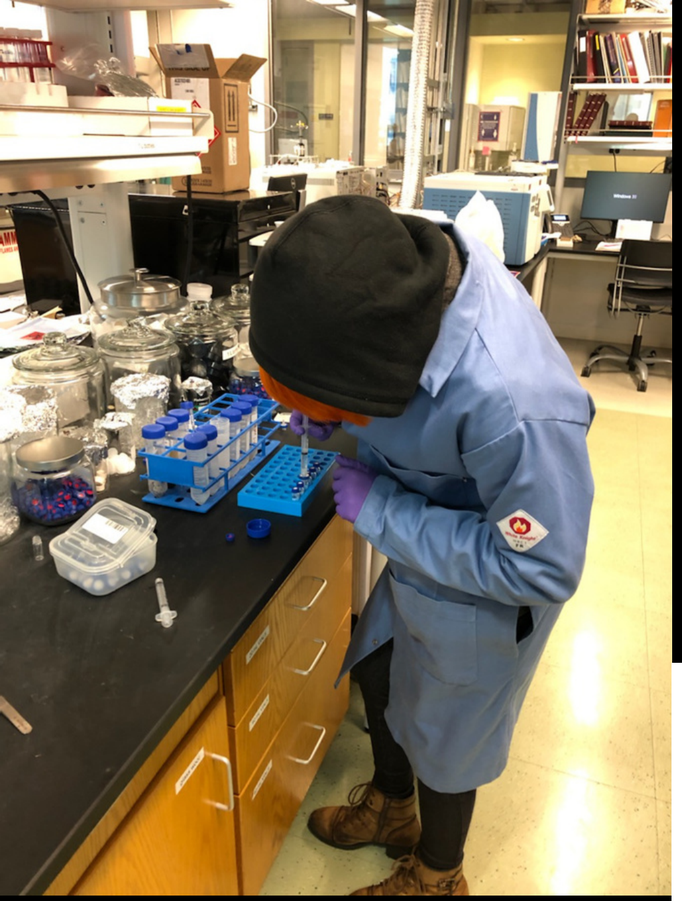


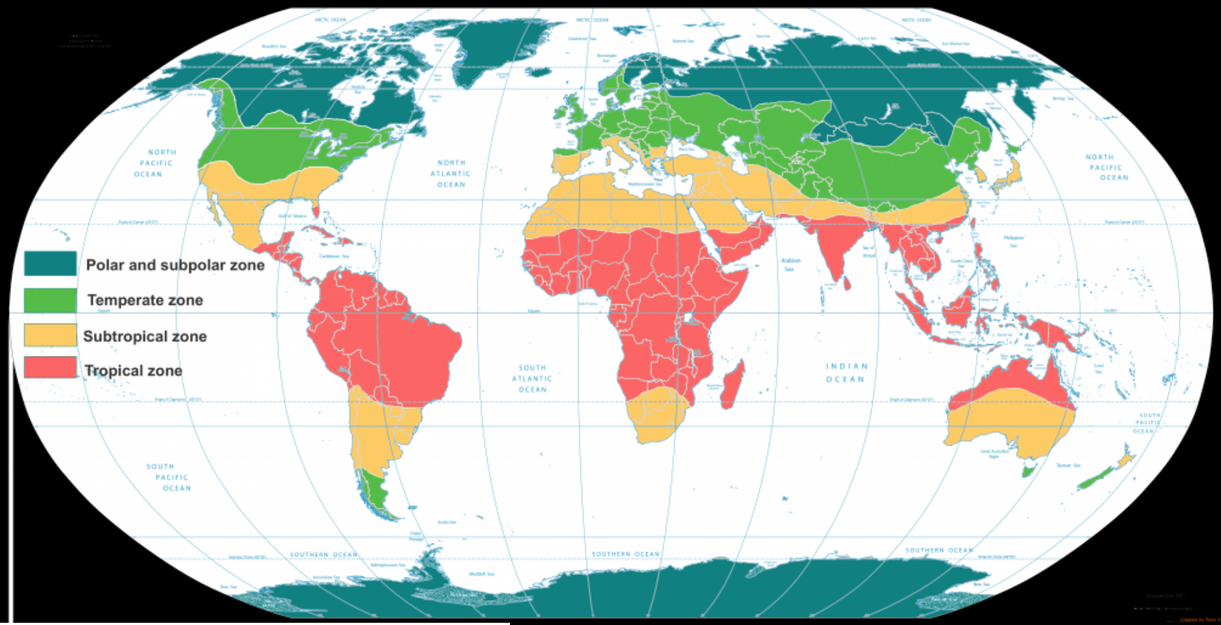

=0.2mm

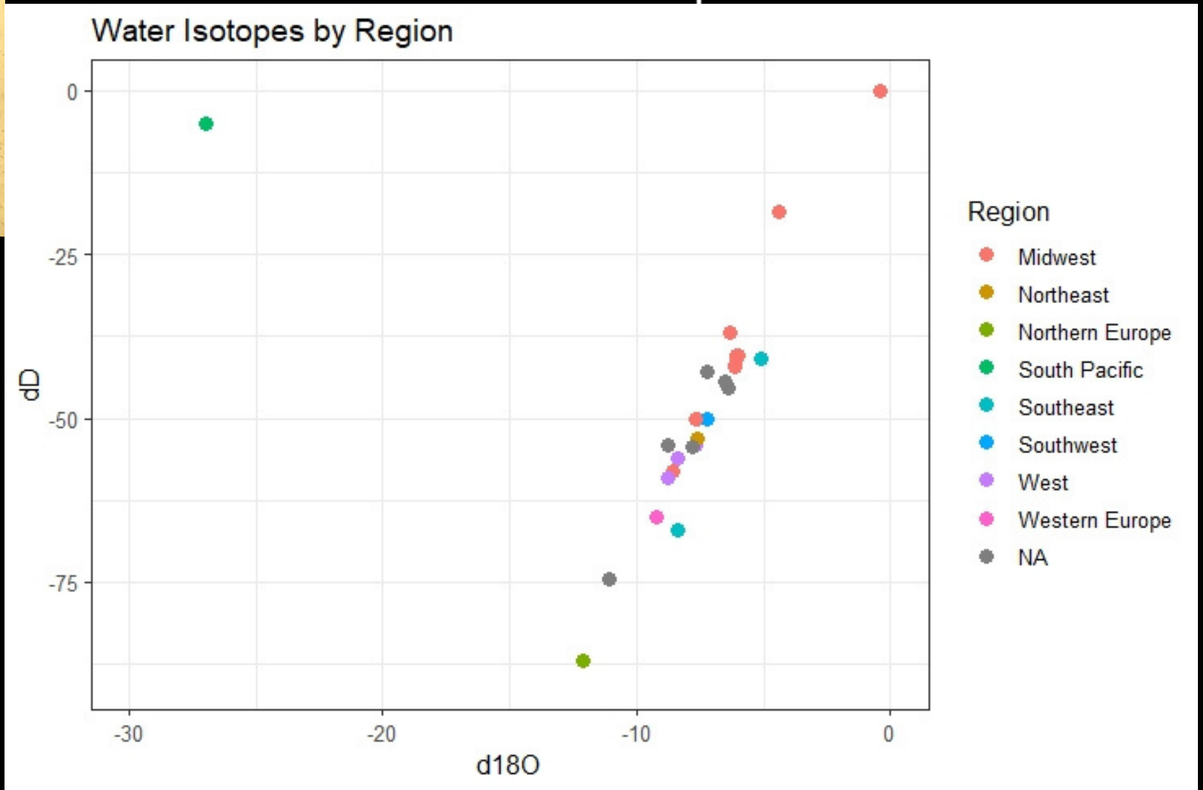

Lois


GH-3 sed
LF-P 2
LFP-2 Sed
LM-3 Sed
LM-1 Sed
LM-2 Sed
LFP-3 Sed
Lf -1 Sed
GH-3 Sed


LIFEGUARD ON DUTY




Polar and subpolar zone
Temperate zone
Subtropical zone
Tropical zone
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
SOUTH PACIFIC OCEAN
SOUTHERN OCEAN


Water Isotopes by Region
dD
0
-25
-50
-75
d18O
-30
-20
-10
0
Region
Midwest
Northeast
Northern Europe
South Pacific
Southeast
Southwest
West
Western Europe
NA

Coming soon

Blame the software

Thanks to:

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Suzan van der Lee

Tracy Davis

Maggie Osburn

Google

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For making this project possible

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Andy Masterson

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Hannah Bausch

For showing me fun science stuff

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Gio Justo

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Suzan van der Lee

My Confused Friends

For the hair