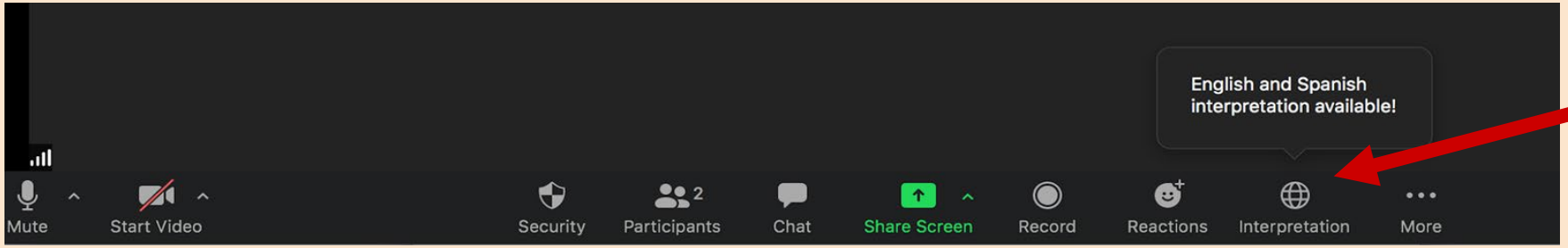
Oakwood Cemetery Archeological Project Community Update

A project in partnership with:
Austin Parks and Recreation Dept.
University of Connecticut
University of Texas

September 19, 2023

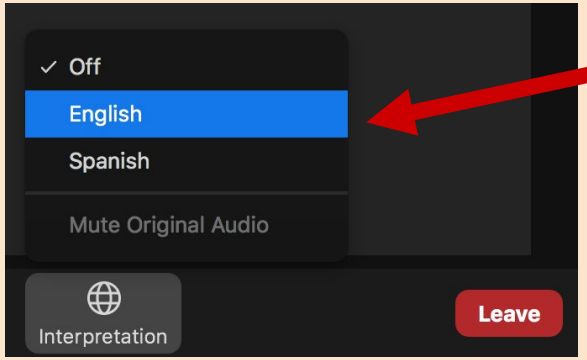
Accessing interpretation

1



Click the globe icon

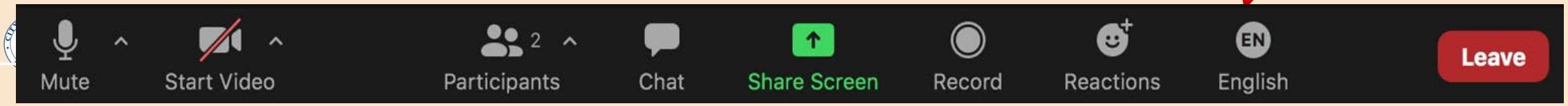
2



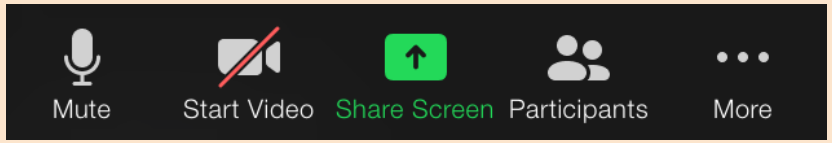
Select your preferred language

You are set!

3

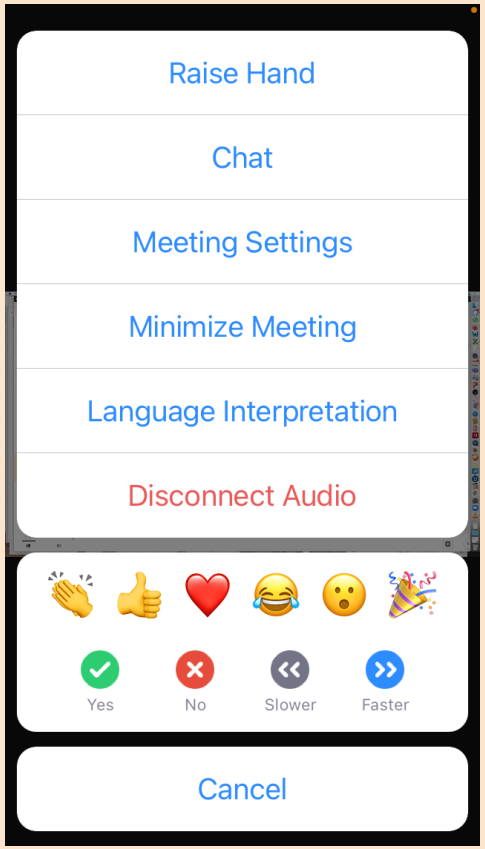


Accessing from a cell phone (or tablet)

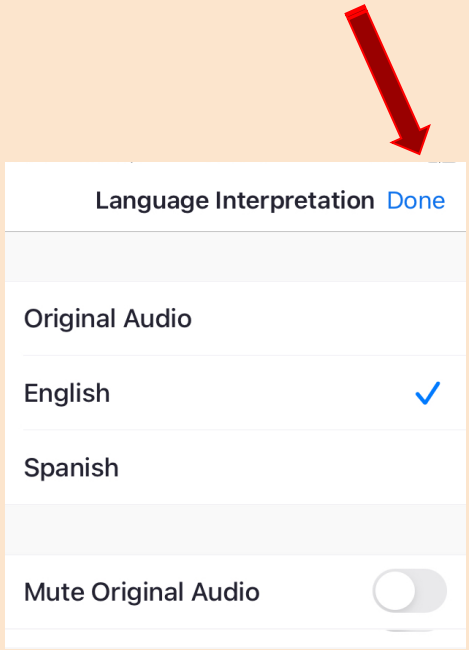


1. Click MORE to find interpretation

2. Click language interpretation



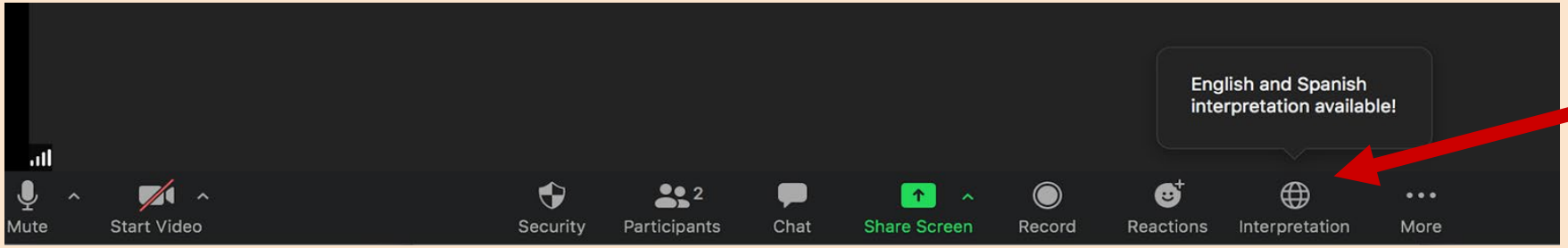
3. Click DONE and you're all set!



Tip: Make sure to connect using internet audio

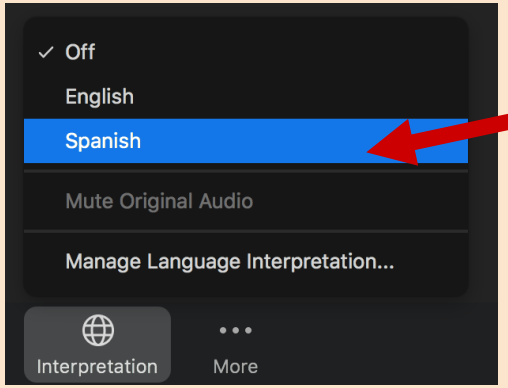
Cómo acceder a la interpretación

1



Haz clic en el ícono del globo

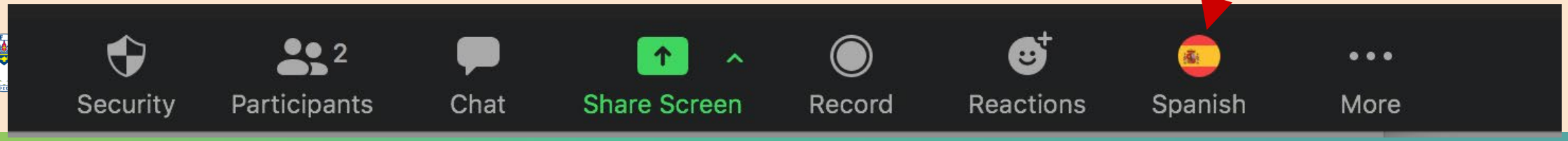
2



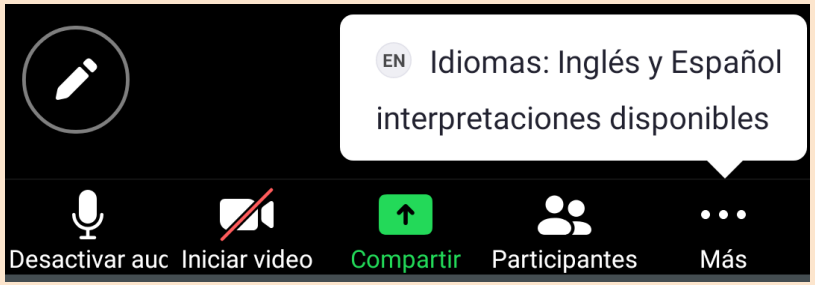
Elige tu idioma de preferencia

¡Listo!

3

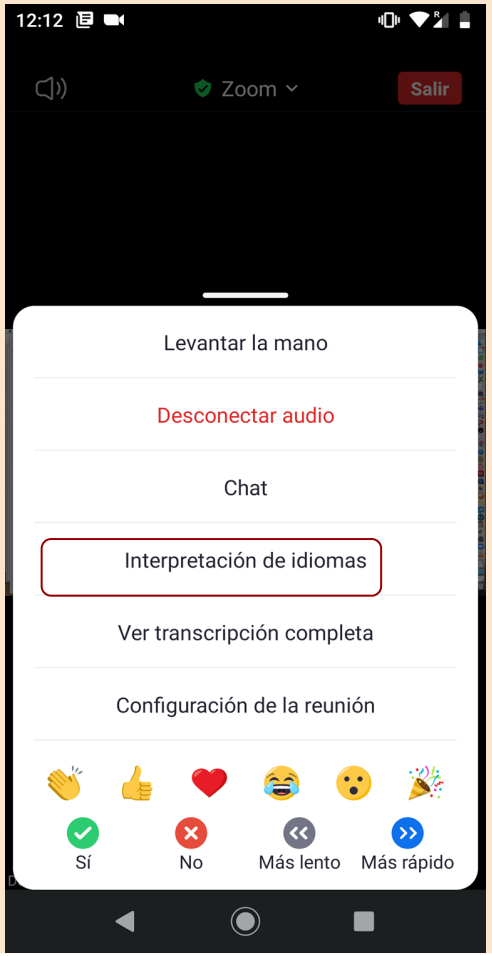


¿Cómo me conecto desde mi celular o tableta?

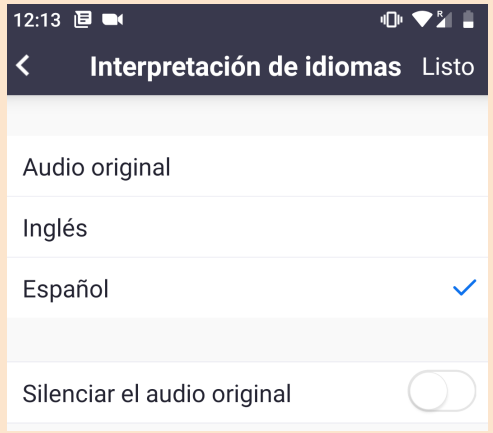


1. Haz clic en **MÁS** para encontrar interpretación

2. Haz clic en **interpretación de idiomas.** Podrás elegir tu idioma.



3. Después de elegir español, no olvides presionar **Listo**.



Consejo: *¡Asegúrate de llamar a través de internet!*

Agenda

- Introductions
- Project timeline
- Isotopic Analysis
- DNA analysis
- Next steps
- Q & A

Introductions

Samantha Archer

PhD Candidate

Anthropology Department

University of Connecticut

Corrin Laposki

PhD Candidate

Anthropology Department

University of Connecticut

Dr. Deborah Bolnick

Professor

Anthropology Department

University of Connecticut

Dr. Maria Franklin

Professor

Department Associate Chair

Anthropology Department

The University of Texas at Austin

Introductions

Historic Preservation & Tourism Program

- Kim McKnight, Program Manager
- Sarah Marshall, Program Coordinator

Oakwood Chapel Museums & Cultural Programs

- Jennifer Chenoweth, Site Coordinator

Communications & Engagement

- Justin Schneider, Community Engagement Consultant

Cemetery Operations Division

- Jason Walker, Interim Division Manager
- Caitlen Hill, Program Manager
- Ryan Dees, Environmental Program Coordinator

Project timeline

2016-2017

- Initial discovery by archeologists of individuals buried beneath footprint of Oakwood Chapel during its restoration; Construction halted.
- Community engagement led to exhumation of 36 men, women, and children before resuming construction.
- Texas State University Forensic Anthropology Research Laboratory conducted bio-archeological analysis; Artifacts analyzed by archeological team.

Project timeline

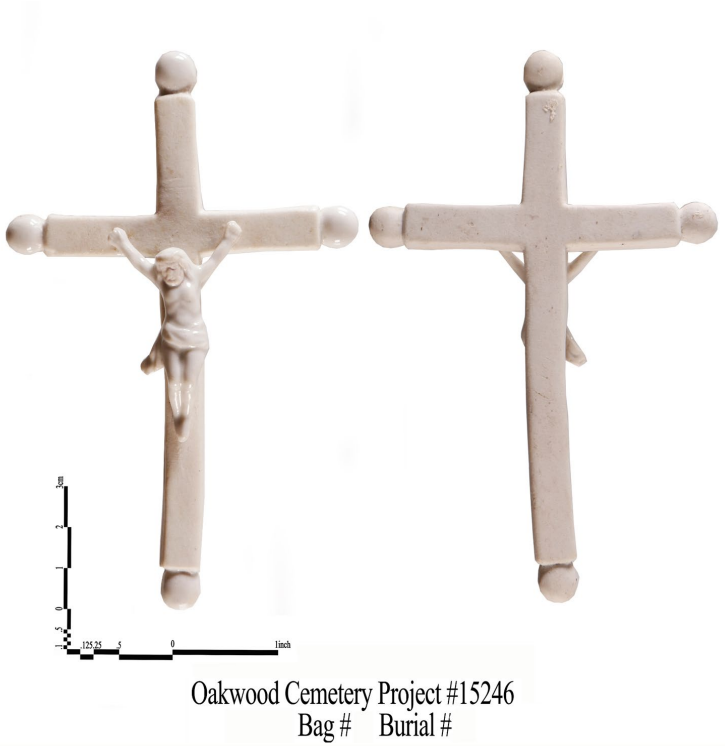
2018-2019

- Oakwood Cemetery Chapel restoration completed and opened to public.
- Community Engagement continues with non-profit and community groups with associations with the cemetery and public history.

Project timeline

2020

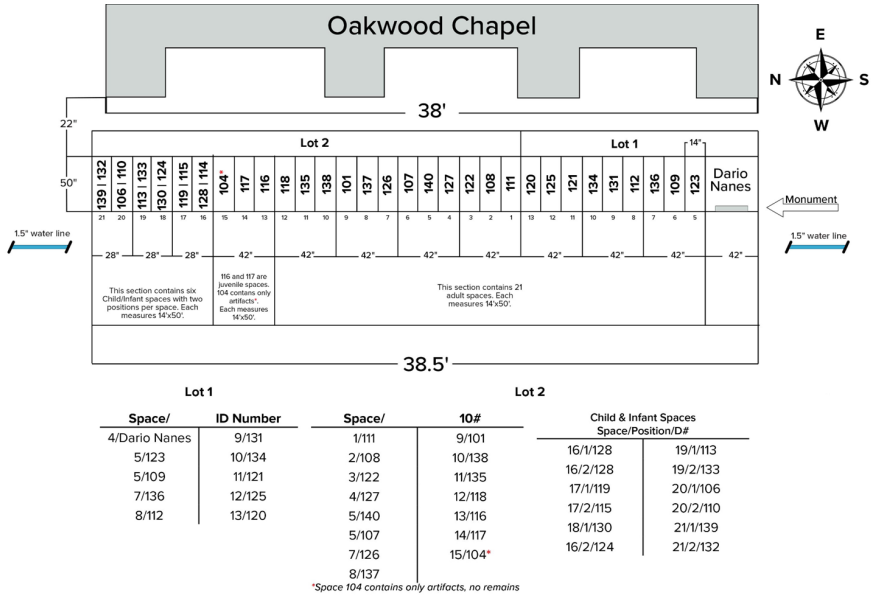
- Completion of archeological and bio-archeological analysis.
- Partnership opportunity with UConn and UT Austin for DNA and isotopic analysis announced.
- *All Together Here: A Community Symposium for Discovery,* an online educational symposium and digital exhibit, hosted by PARD, attended by more than 300 people. Featured sessions from 40 nationally renowned archeologists, anthropologists, historians, and community activists about the archeological findings and comparative projects from around the country.
- DNA and isotopic analysis begins.



Project timeline

2021

- Archeologists supervised the reinterment of the 36 men, women, and children in a space immediately adjacent to the Oakwood Chapel.
- A small-scale public blessing event was held shortly after the reinterment by PARD with participation from Interfaith Action of Central Texas; Mt. Zion Baptist Church, and St. Theresa Catholic Church.
- PARD staff held a community meeting for feedback on the design for a permanent memorial.



Lot 1

Space/	ID Number
4/Dario Nanes	9/131
5/123	10/134
5/109	11/121
7/136	12/125
8/112	13/120

Lot 2

Space/	10#
1/111	9/101
2/108	10/138
3/122	11/135
4/127	12/118
5/140	13/116
5/107	14/117
7/126	15/104*
8/137	

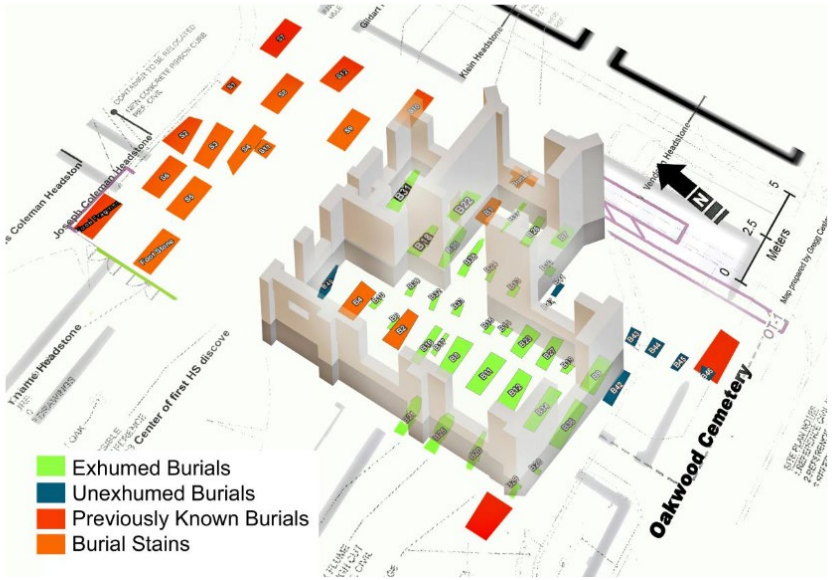
*Space 104 contains only artifacts, no remains

Child & Infant Spaces Space/Position/D#	
16/1/128	19/1/113
16/2/128	19/2/133
17/1/119	20/1/106
17/2/115	20/2/110
18/1/130	21/1/139
16/2/124	21/2/132

Project timeline

2022

- A report on the reinterment is completed by the archeological team.
- Oakwood Chapel publishes digital exhibit *To Emancipate*, which contextualizes the lives of enslaved people buried in the Historic Colored Grounds.



Project timeline

2023

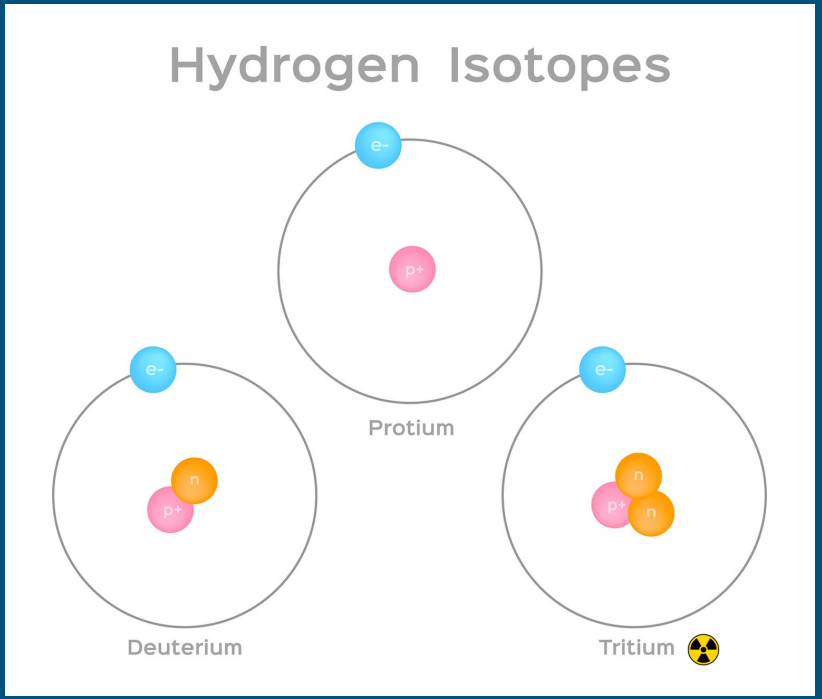
- April: Monument installed to mark the burials and memorialize individuals.
- May: PARD hosted *All Together Here: Monument Dedication and Memorial Event*, a 3-day series of events:
  - Guided tours of the Historic Colored Grounds and the Oakwood Chapel,
  - Historian talk,
  - Racial healing event,
  - Dedication of the monuments, a walking procession, and
  - Homegoing celebration.

Oakwood & Isotopes

Assessing Diet and Migration

What Is An Isotope?

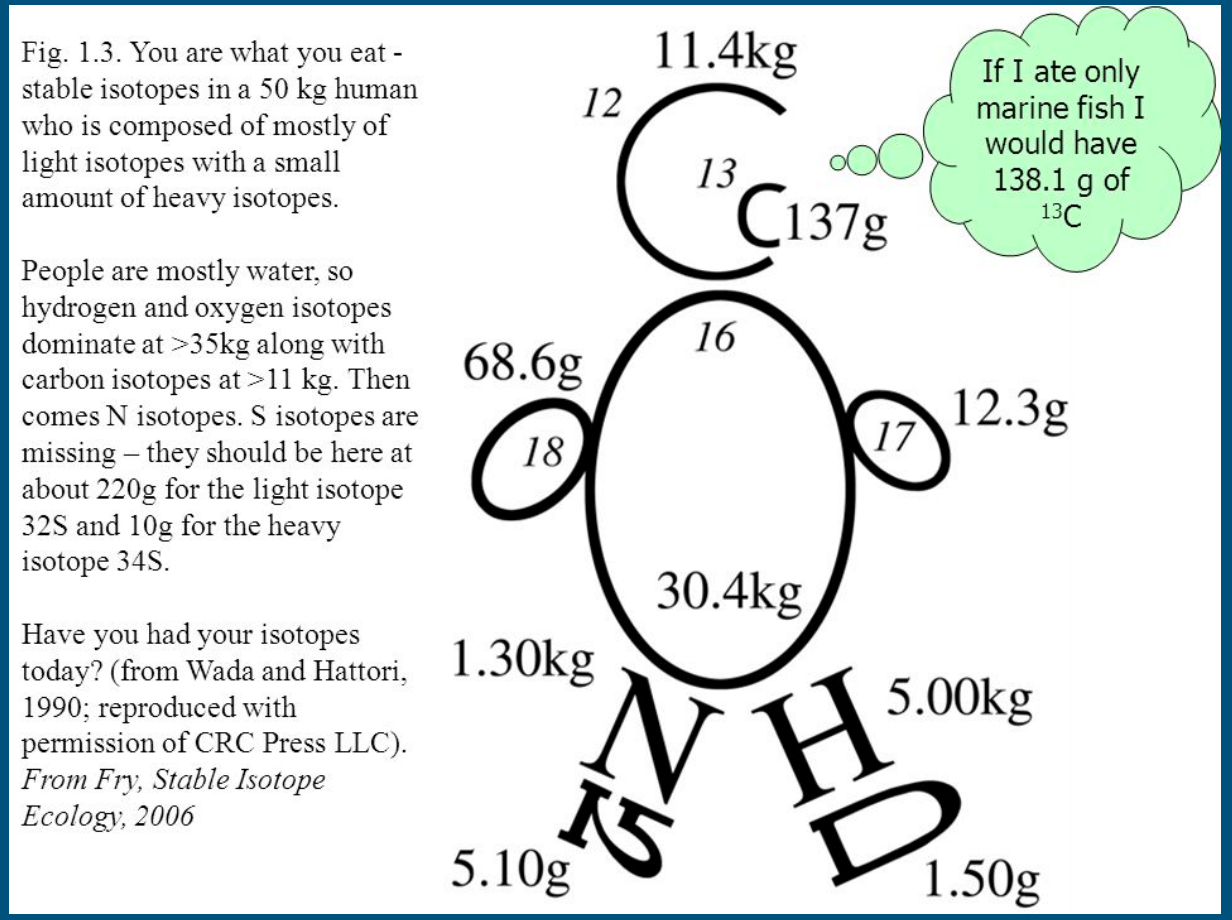
- Isotopes are two or more atoms of the same element that have equal numbers of protons, but different numbers of neutrons in their nuclei.



Hydrogen Isotopes.Image Credit to: *Isotope Basics*, National Isotope Development Center, Retrieved from: https://isotopes.gov/isotope-basics.

Stable Isotopes & Bioarchaeology

- Stable Isotopes do not decay over time and are not hazardous. In fact, stable isotopes reside inside each of us!
- Bioarchaeologists typically use carbon, nitrogen, and oxygen isotopes to reconstruct life history in human remains.

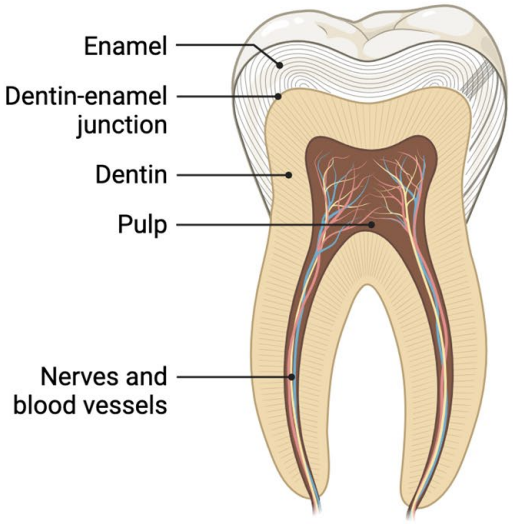


Oakwood Isotopes

- Teeth were used as the basis for Oakwood’s isotopic analysis. Teeth are much more resistant to environmental decay over time and provide better records of an individual's isotopic values.

- Third molars were preferentially used since they reflect an individual’s life history after weaning.

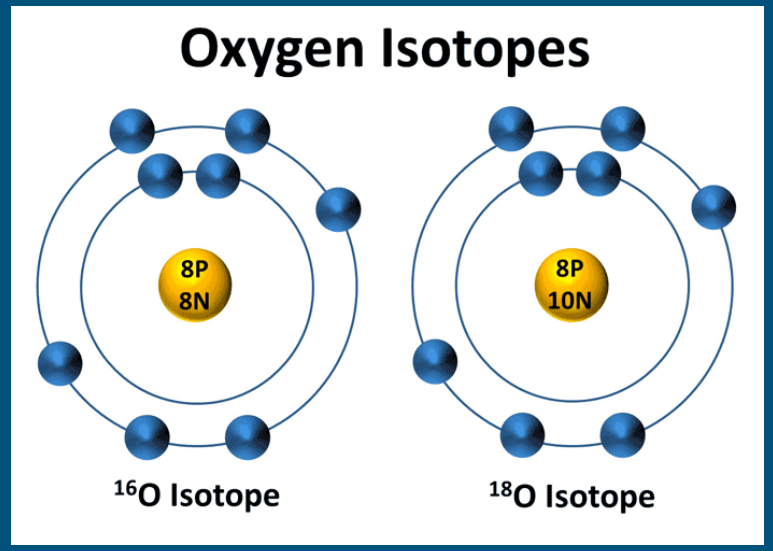
Isotopes in Teeth



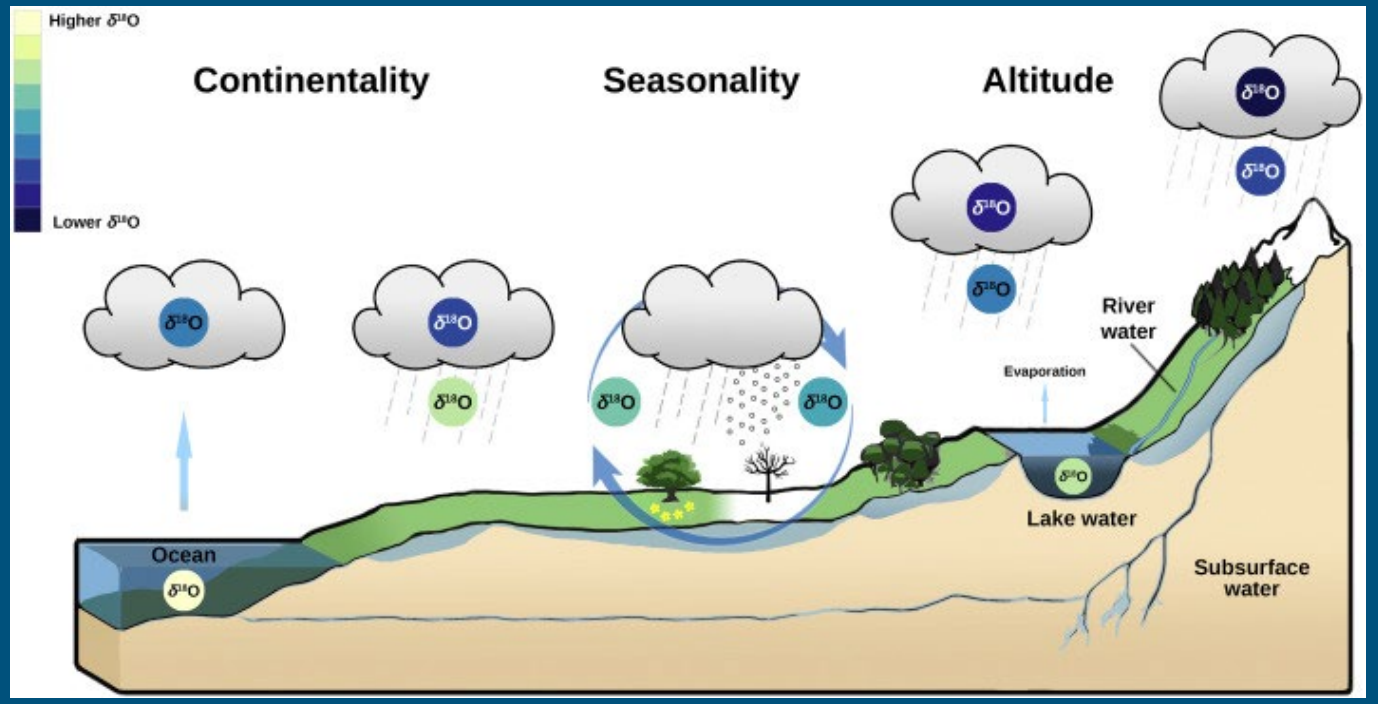
	Isotopes Analyzed	What They Tell Us
Enamel	Oxygen Carbon	Drinking Water Diet
Dentin	Carbon Nitrogen	Diet

Created with BioRender.com

Oxygen: Movement on the Landscape

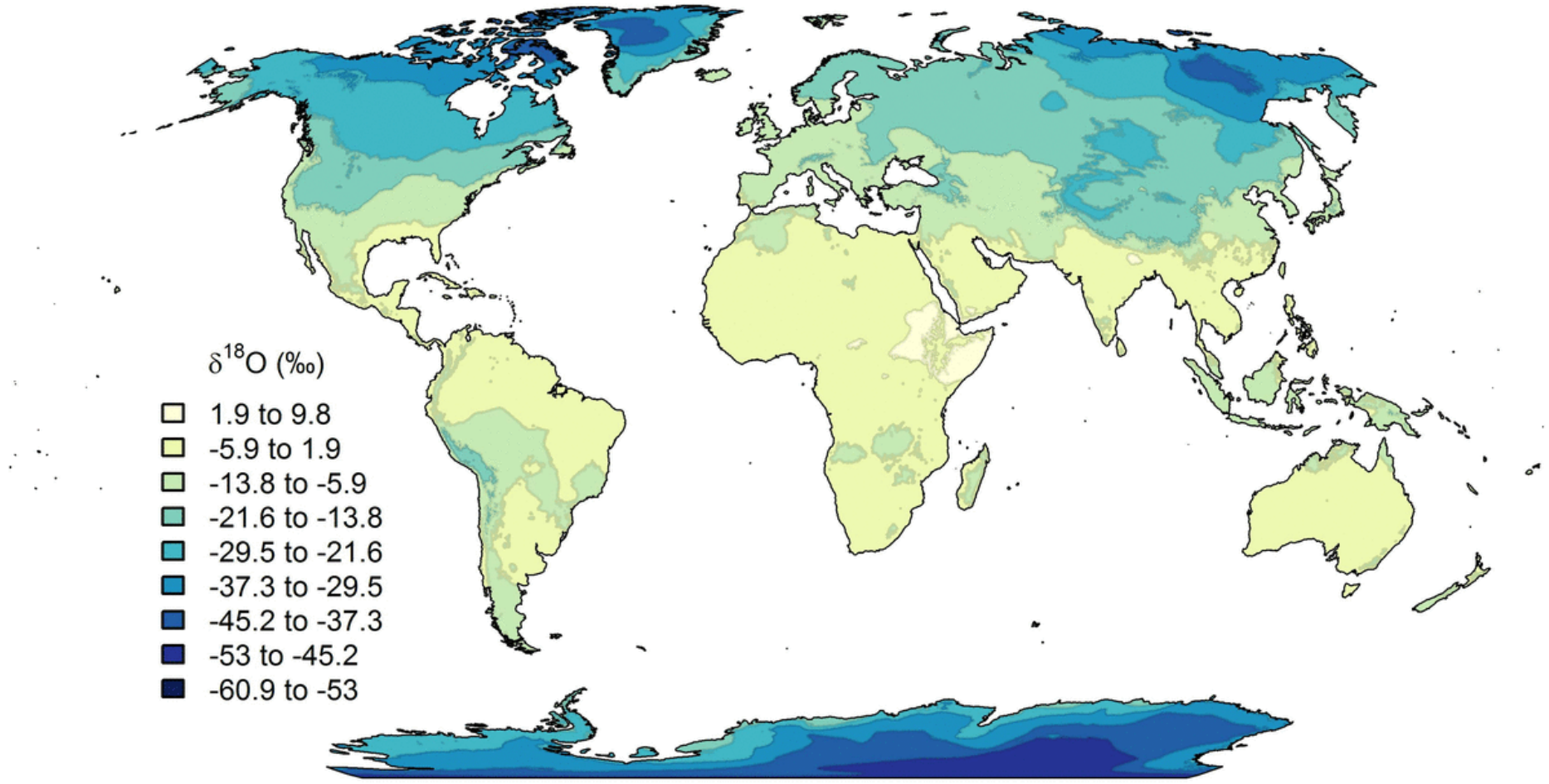


Oxygen Isotopes. Image credit to: *Climate Science Investigations*. NASA. Retrieved from: https://www.ces.fau.edu/nasa/module-3/how-is-temperature-measured/isotopes.php

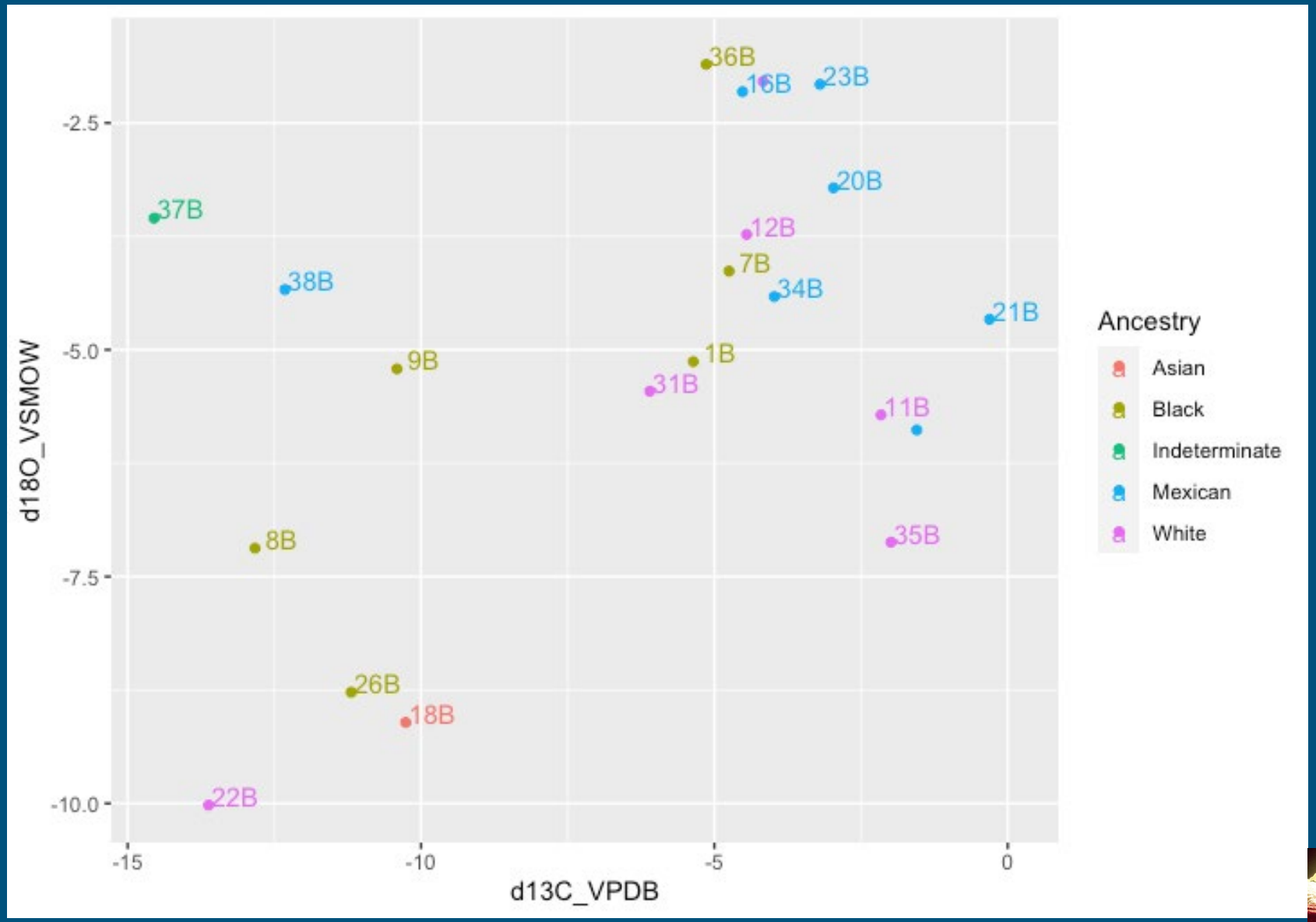


Schematic depicting oxygen isotope fractionation across landscapes and seasons. Image credit to: Pederzani, S., & Britton, K. (2019). Oxygen isotopes in bioarchaeology: Principles and applications, challenges and opportunities. *Earth-Science Reviews*.

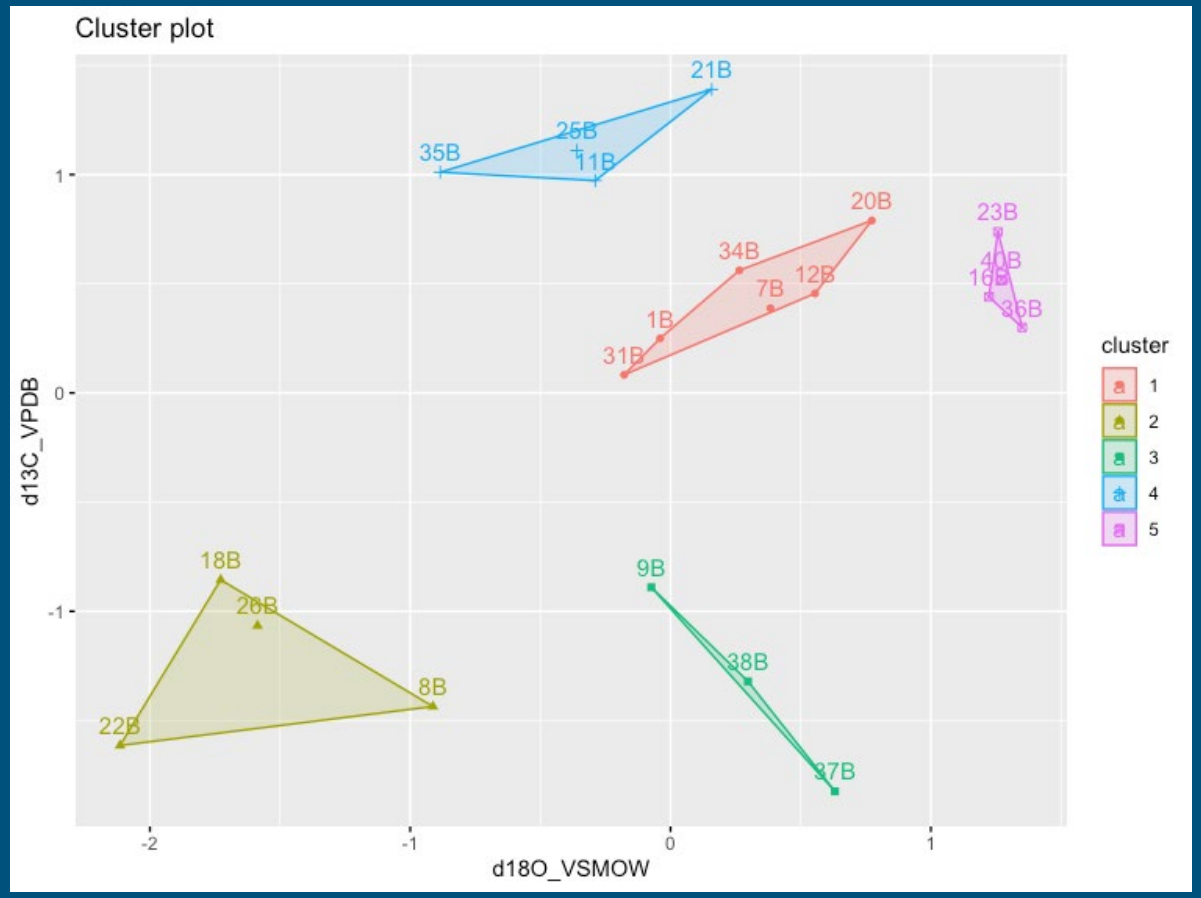
Jan

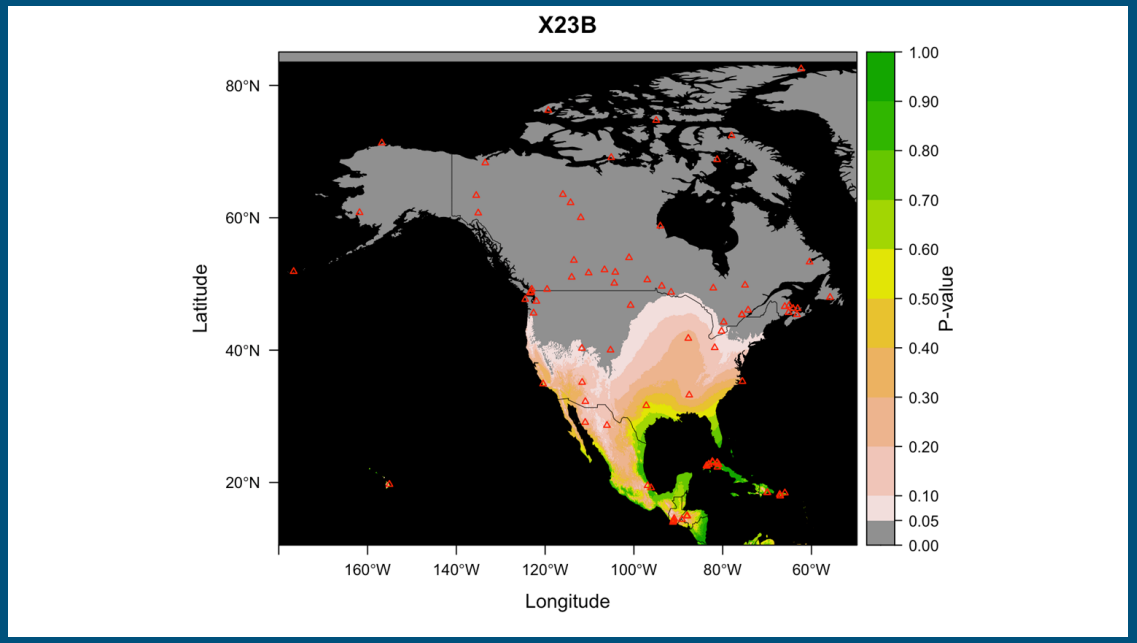


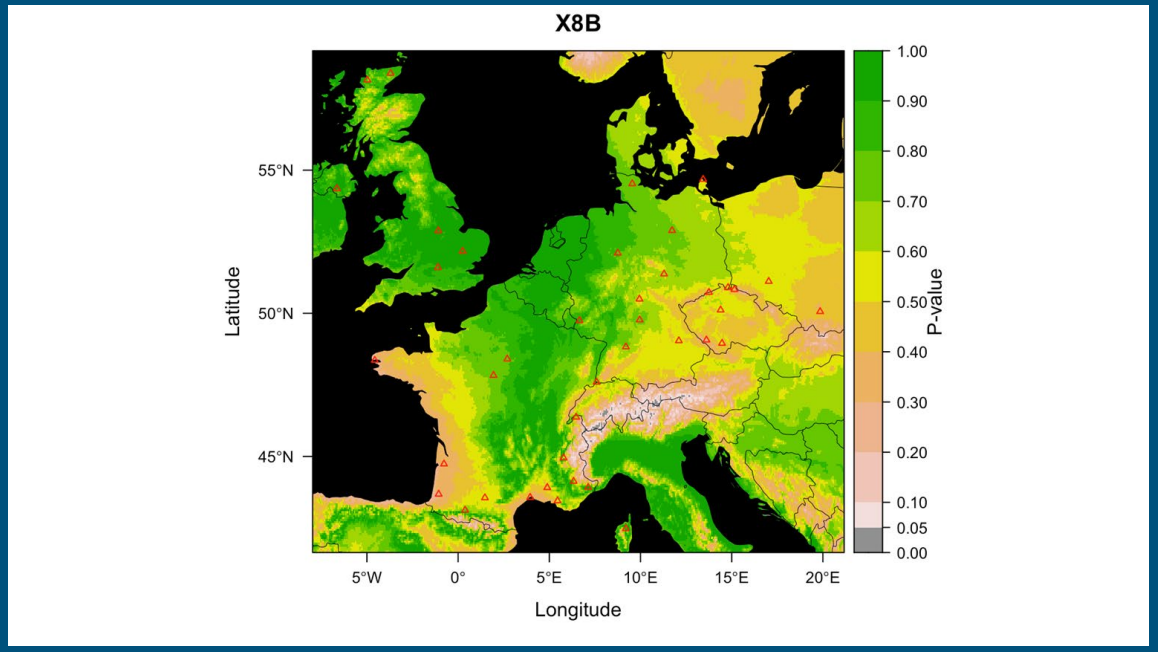
http://waterisotopes.org

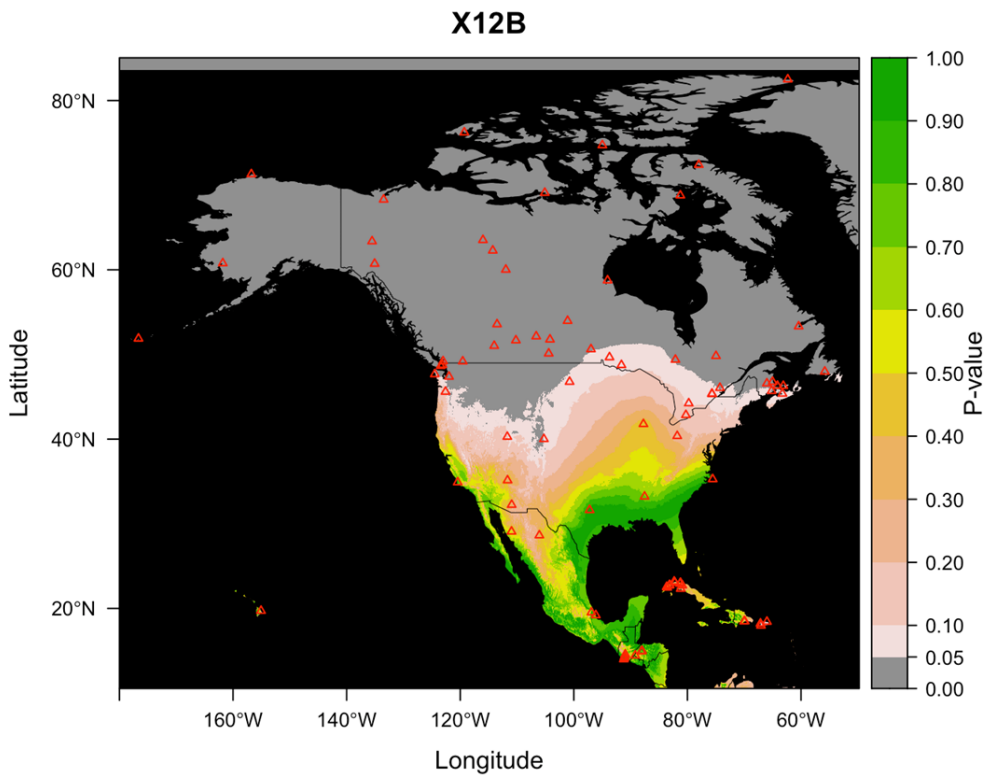

36B
16B
23B
20B
37B
12B
7B
38B
34B
21B
9B
1B
31B
11B
8B
35B
26B
18B
22B
-2.5
-5.0
-7.5
-10.0
d18O_VSMOW
-15
-10
-5
0
d13C_VPDB
Ancestry
Asian
Black
Indeterminate
Mexican
White

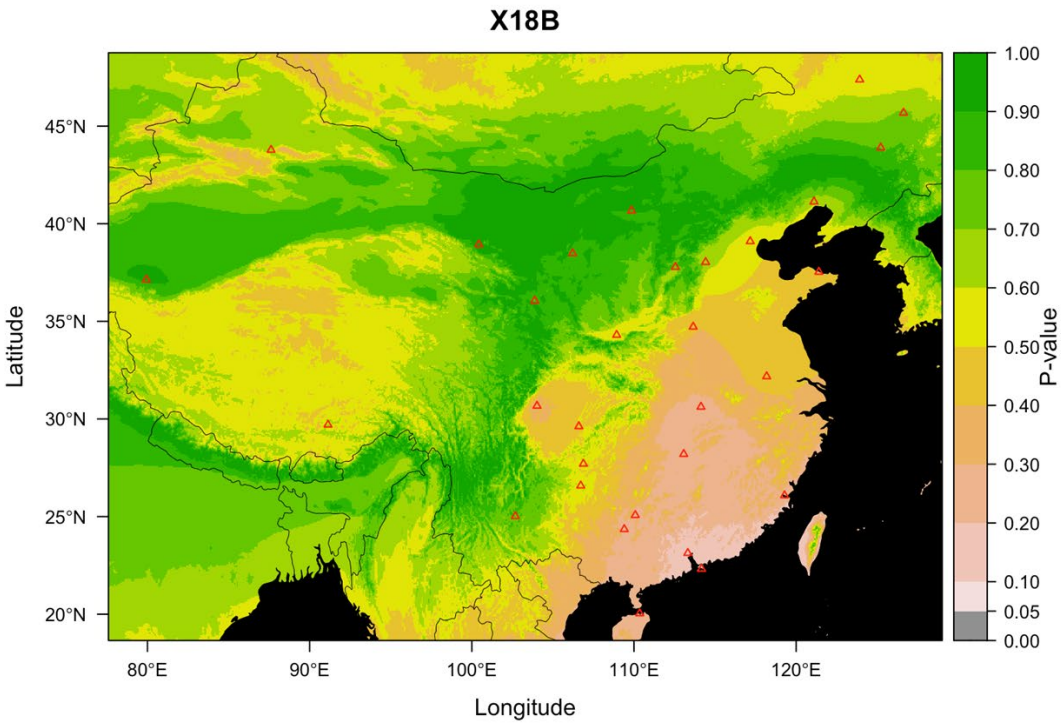
Initial Patterns: Enamel



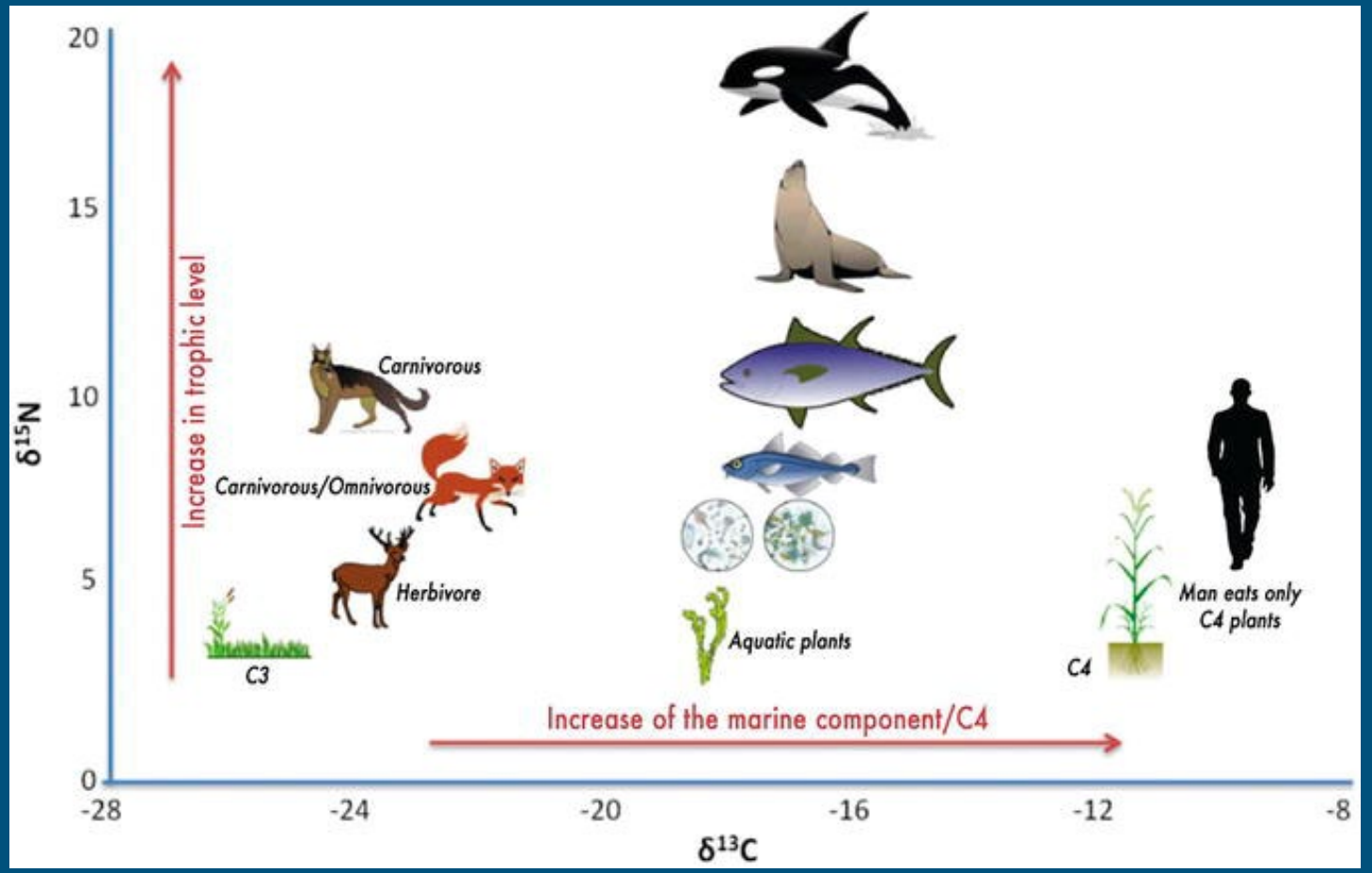





X12B
80°N
60°N
40°N
20°N
Latitude
160°W
140°W
120°W
100°W
80°W
60°W
Longitude
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.05
0.00
P-value


X18B
45°N
40°N
35°N
30°N
25°N
20°N
Latitude
80°E
90°E
100°E
110°E
120°E
Longitude
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.05
0.00
P-value

Carbon & Nitrogen: Diet



Variations of δ13 carbon and δ15 nitrogen (‰) isotopes in different organisms of the terrestrial and marine food chain. Image Credit to: Berto, Daniela, Federico Rampazzo, Claudia Gion, Seta Noventa, Malgorzata Formalewicz, Francesca Ronchi, Umberto Traldi, and Giordano Giorgi. "Elemental analyzer/isotope ratio mass spectrometry (EA/IRMS) as a tool to characterize plastic polymers in a marine environment." Plastics in the Environment (2019): 37-54.

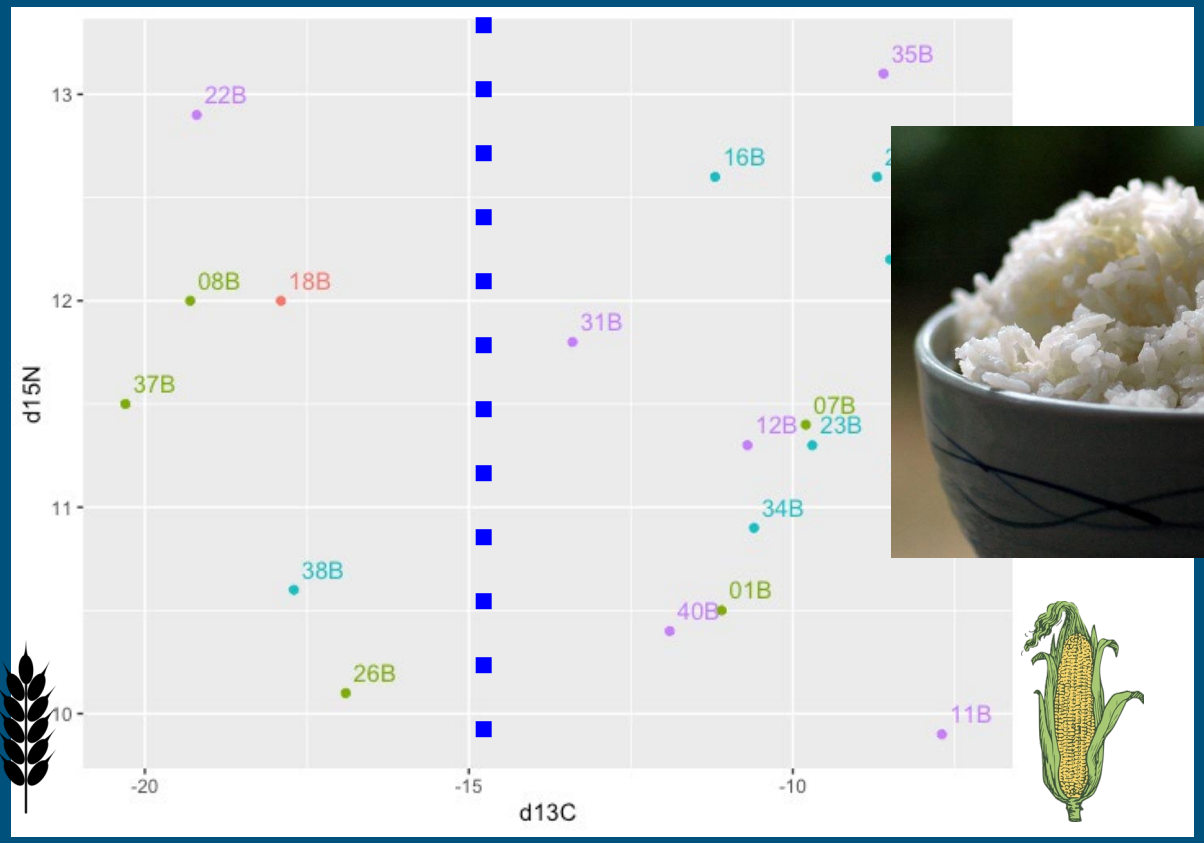
C_3 & C_4 Plants

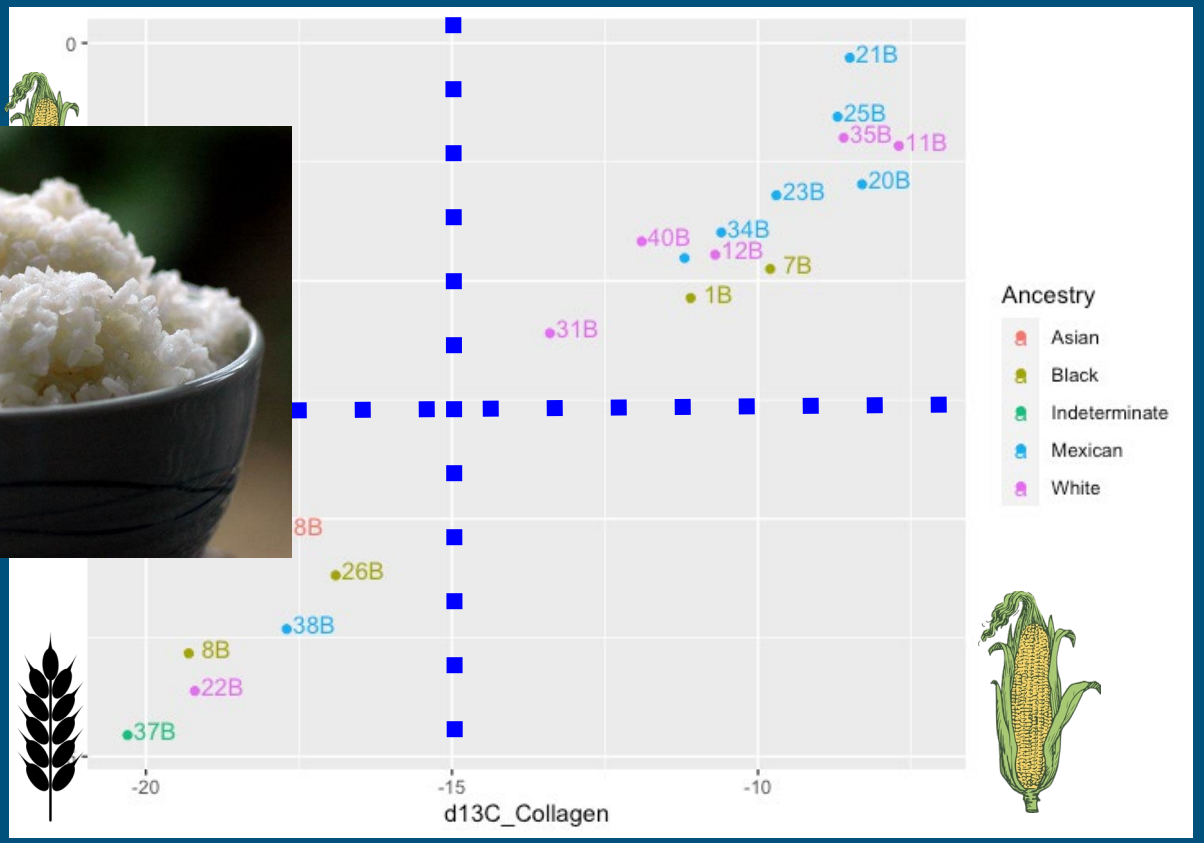
1% are C4 plants.

C3 plants	*CAM plants*	*C4 plants*
Barley, coconut, grape, palm, peanut, plum, potatoes, rice, rye, soy bean, sugar beet, sunflower, wheat	Agaves, pineapple, cactus, vanilla	Cane, corn, millet, sorghum
-30 to -23 ‰	-18 to -12 ‰	≈ -10 ‰
$\delta^{13}C$ (vs V-PDB)		

Examples of most common plants of the C_3, CAM, and C_4 plant groups and the variability of δ13 C values of their metabolites.Image credit to: Calderone, G., Holland, M., Reniero, F., & Guillou, C. (2005). An overview of isotopic analysis for the control of alcoholic drinks and spirits. European Commission, EUR Report N, 8, 21875.

Initial Patterns: Dentin





Next Steps

- Create more detailed isotope maps
- Analyse the carbon & nitrogen isotopes of local Texas produce and livestock
- Refine all findings alongside the DNA results

Recommended Sources for the Curious!

- YouTube Video
  - Paleodiet: Principles of Stable isotope Analysis. https://youtu.be/CN83D-ra4_o?si=yFms46-7Dsw3cnTg
- Web Article
  - Hirst, K. Kris. (2023, April 5). Stable Isotope Analysis in Archaeology. Retrieved from https://www.thoughtco.com/stable-isotope-analysis-in-archaeology-172694

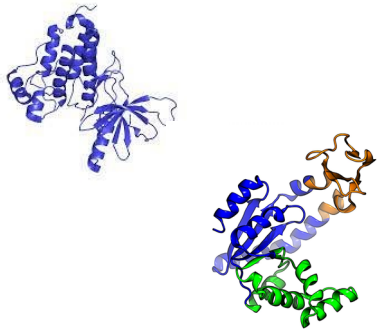
Oakwood Cemetery historical DNA project


KLEENGUARD
A30


TEXAS

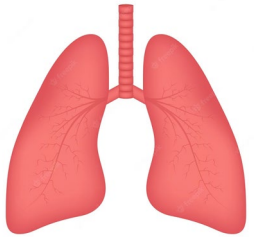
Human Genomics 101

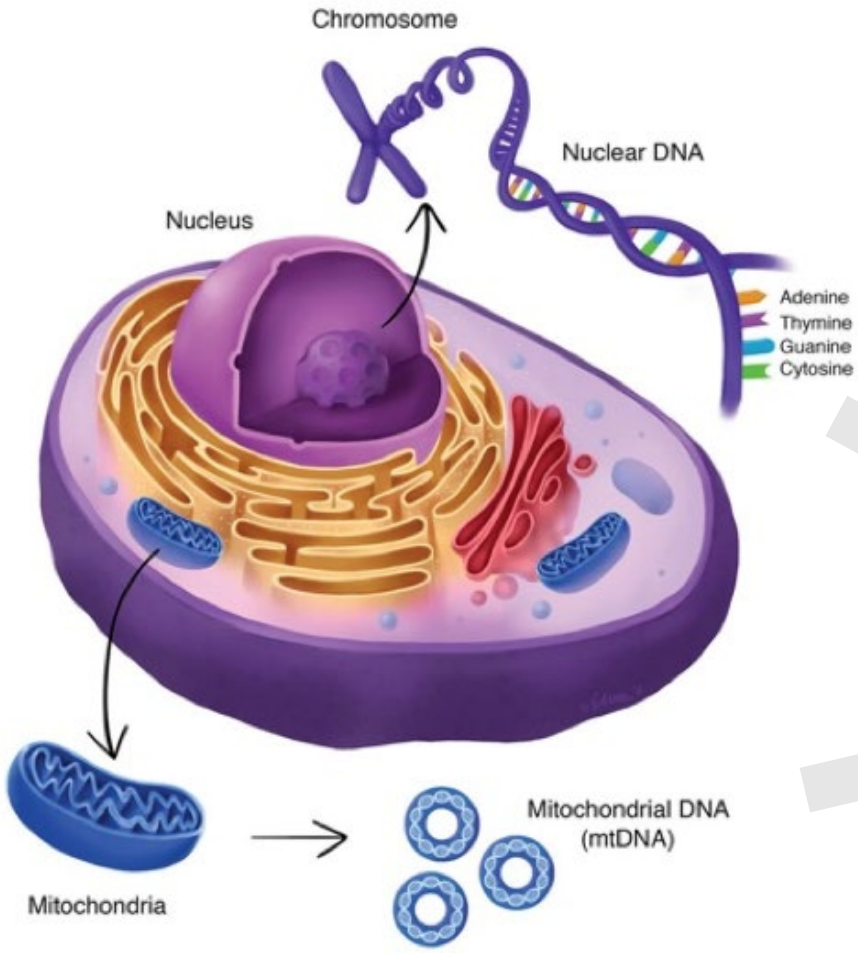
DNA → Proteins → Organs → You



Blood

Bones





DNA (deoxyribonucleic acid)

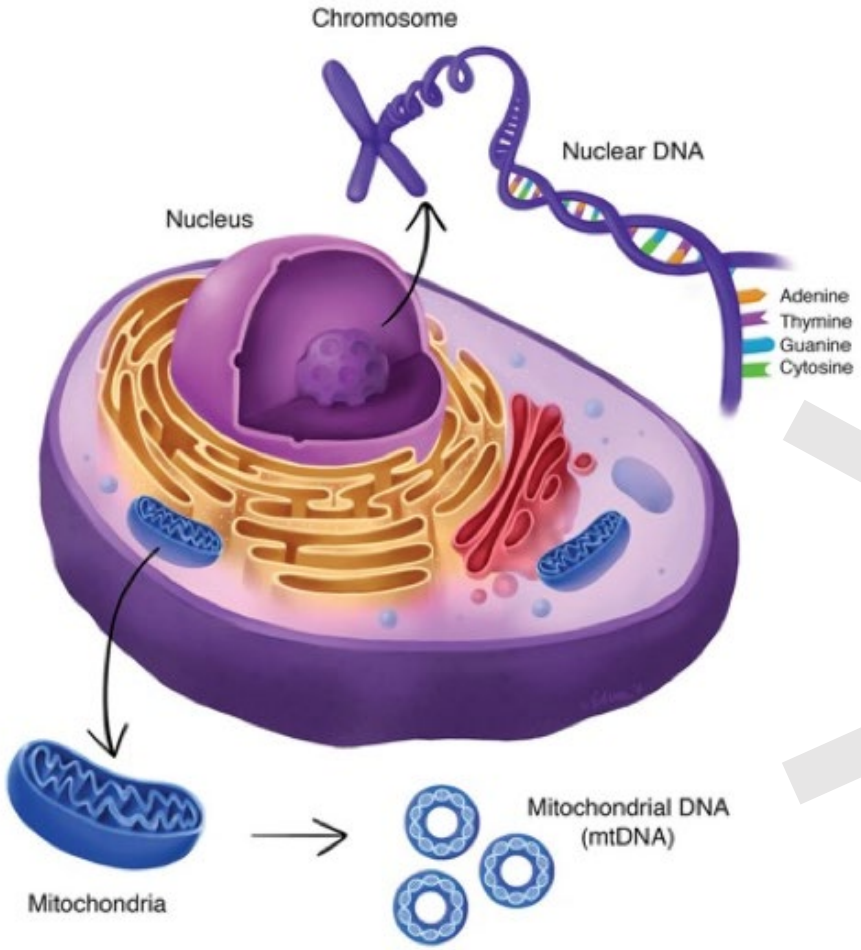
Nucleotides

Adenine

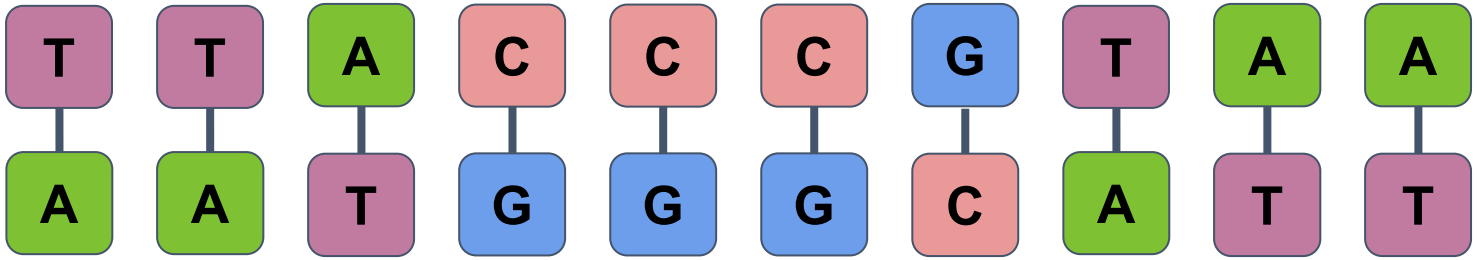
Thymine

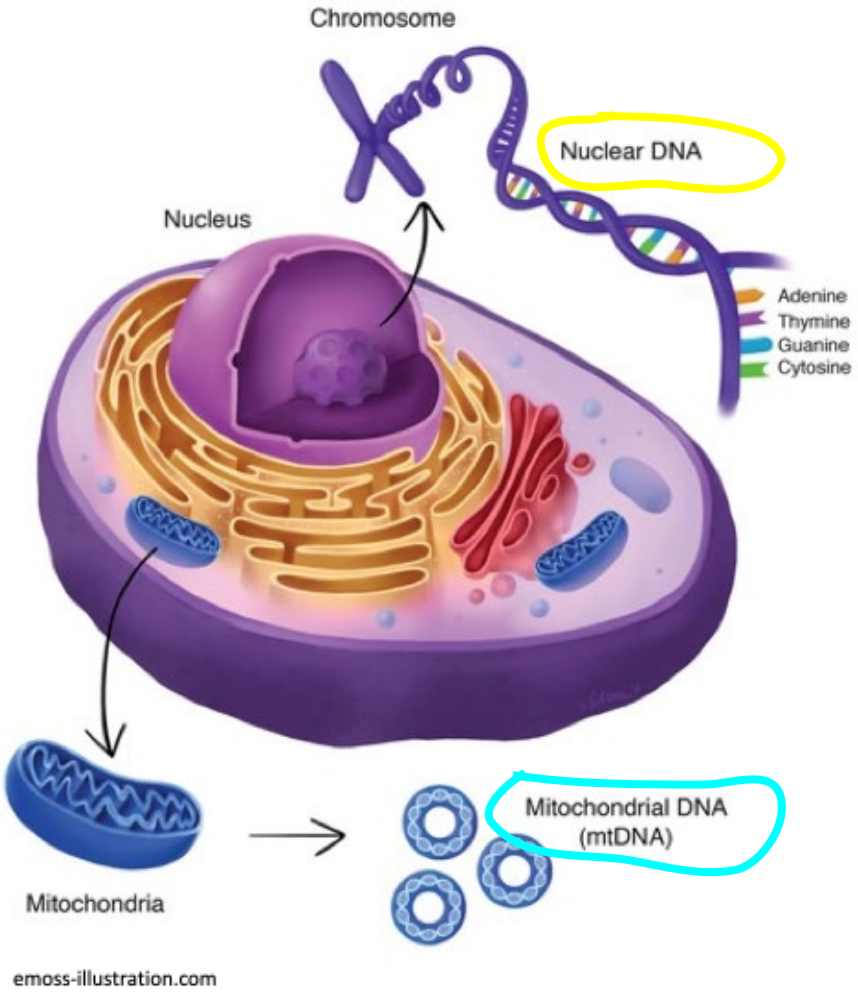
Guanine

Cytosine



DNA sequence

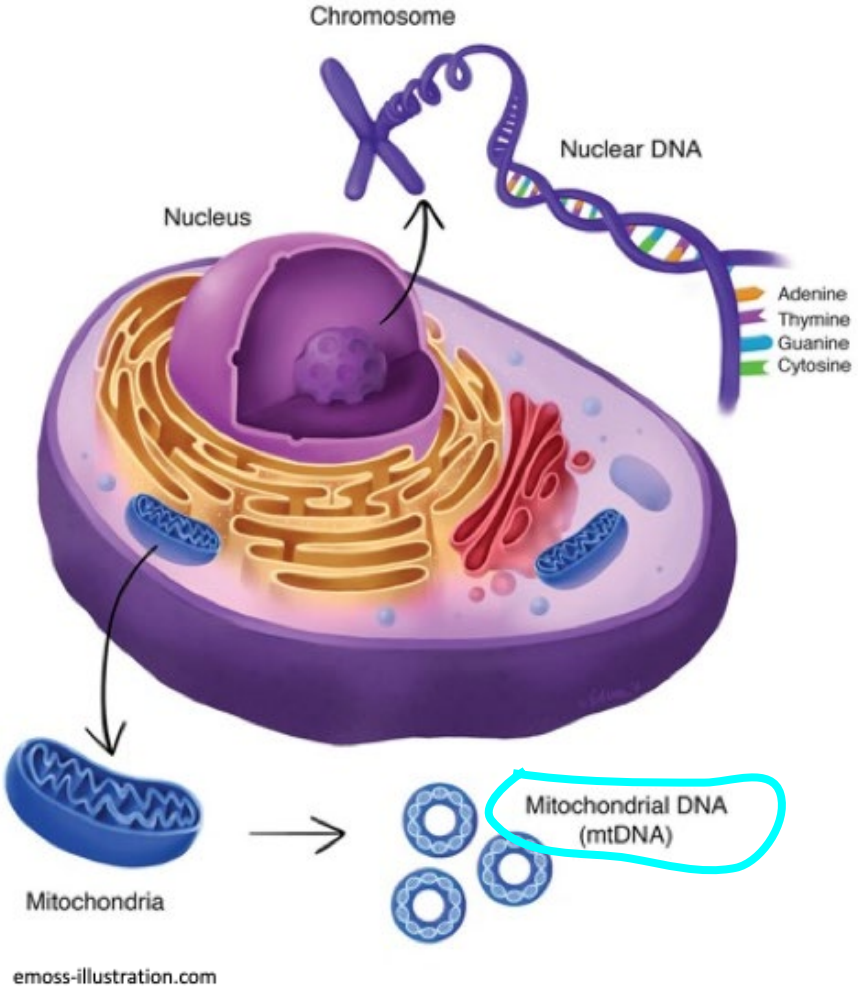




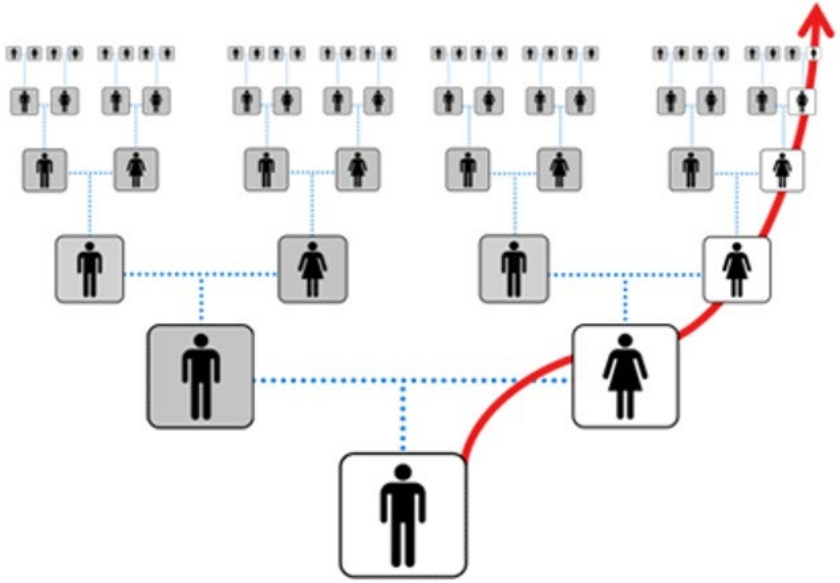
DNA is found in **two** places in our cells

Mitochondrial DNA (mtDNA)

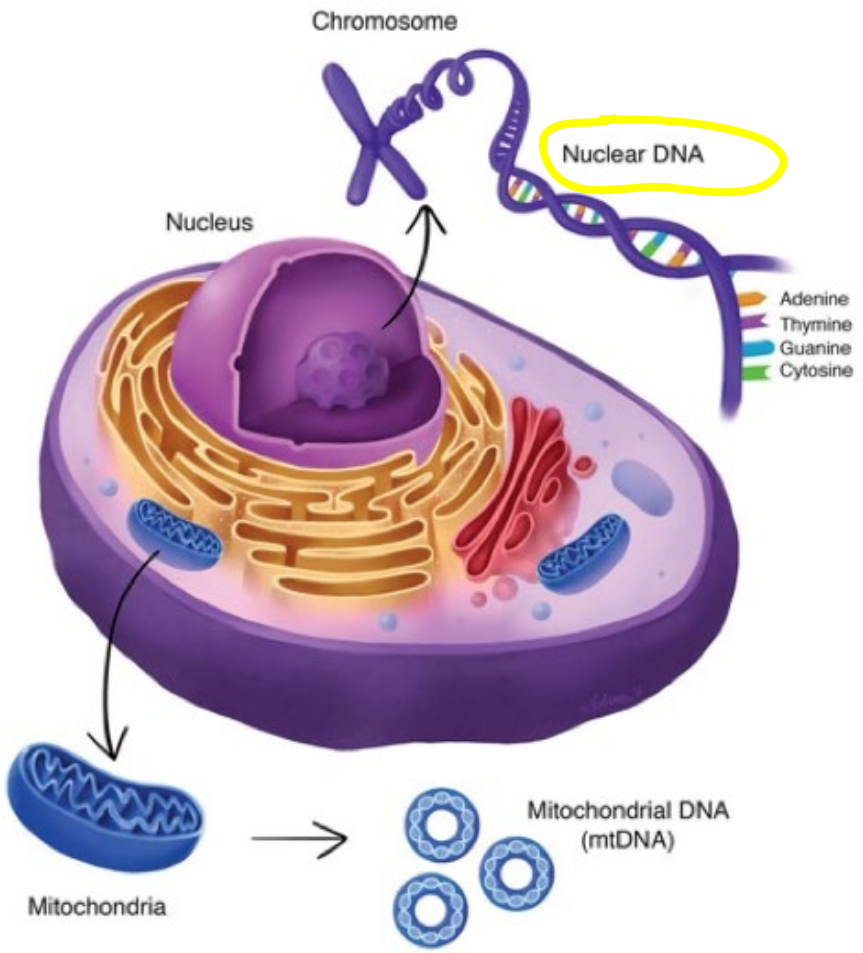
Nuclear DNA



Mitochondrial DNA (mtDNA)



Maternal lineage



Nuclear DNA

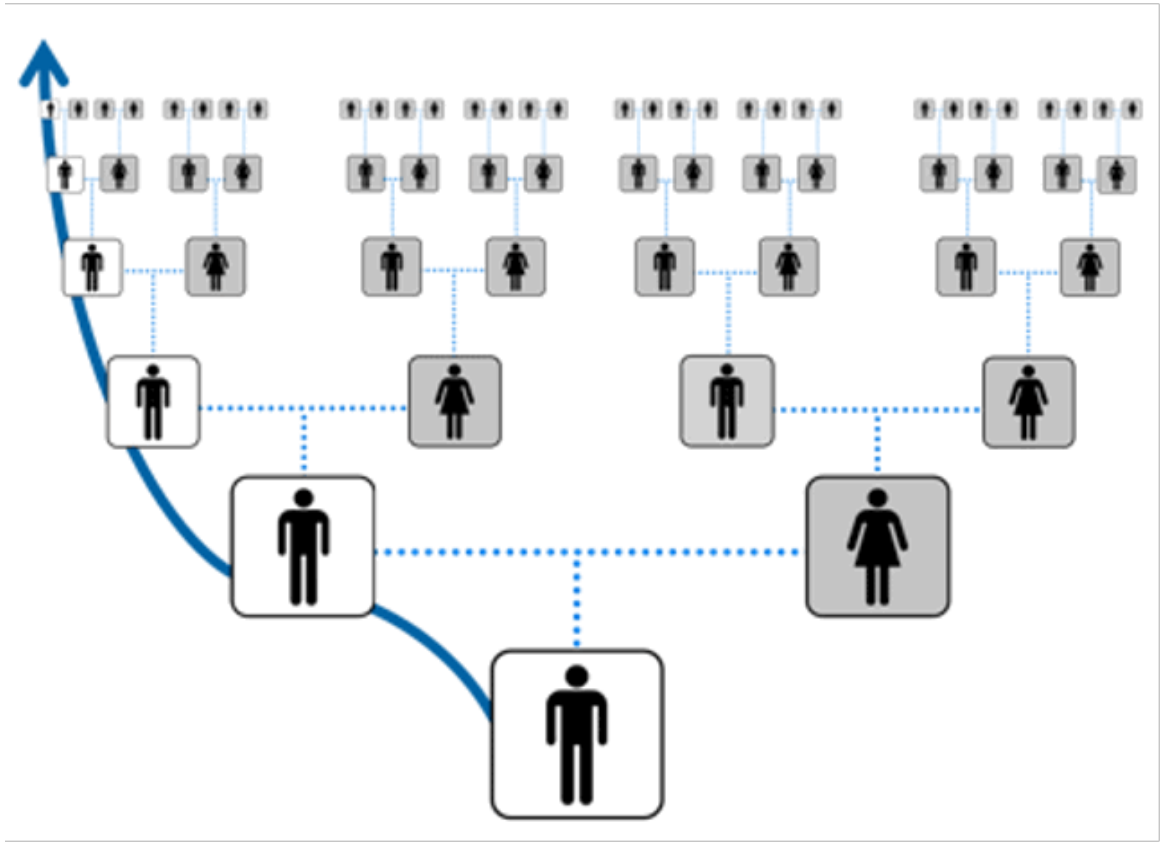
Sex chromosomes (XX, XY, XXY, X0)

Autosomal DNA (atDNA)

Nuclear DNA

Sex chromosomes (XX, XY, XXY, X0)

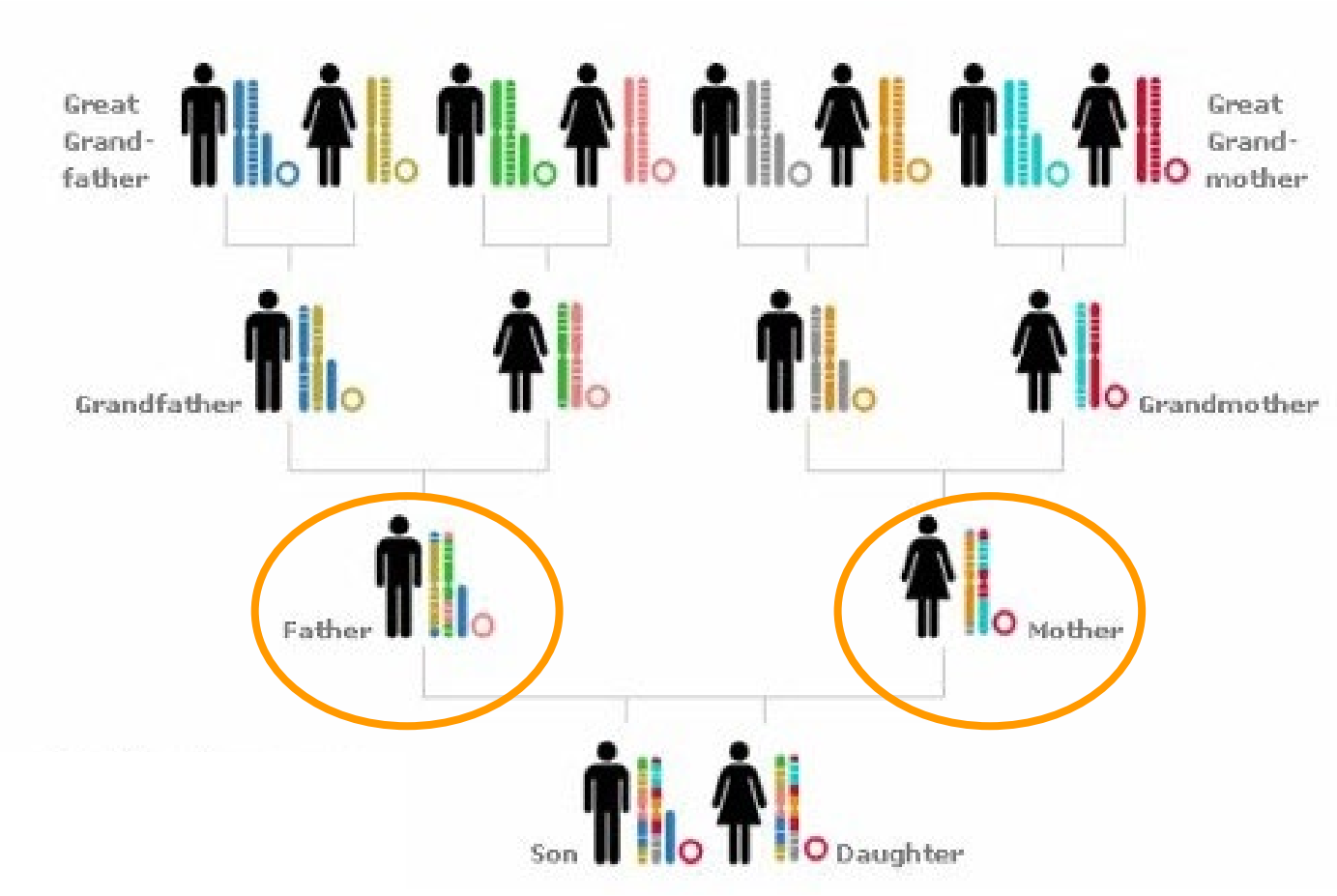
Y-Chromosome DNA



Paternal lineage

Nuclear DNA

Autosomal DNA (atDNA)



Biparental lineage

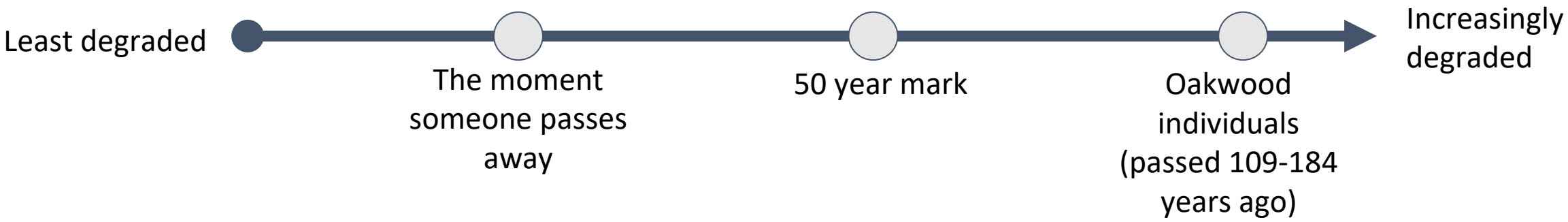
Position 15

Reference:
AGTACCCTAGATCATGACAAA
Individual 1: AGTACCCTAGATCATGACAAA
Individual 2: AGTACCCTAGATCACGACAAA
Individual 3: AGTACCCTAGATCACGACAAA
Individual 4: AGTACCCTAGATCATGACAAA

SINGLE
NUCLEOTIDE
POLYMORPHISM
(SNPs)

Ancient DNA (aDNA)

What is ‘ancient’ about ancient DNA? How ancient are we talking?

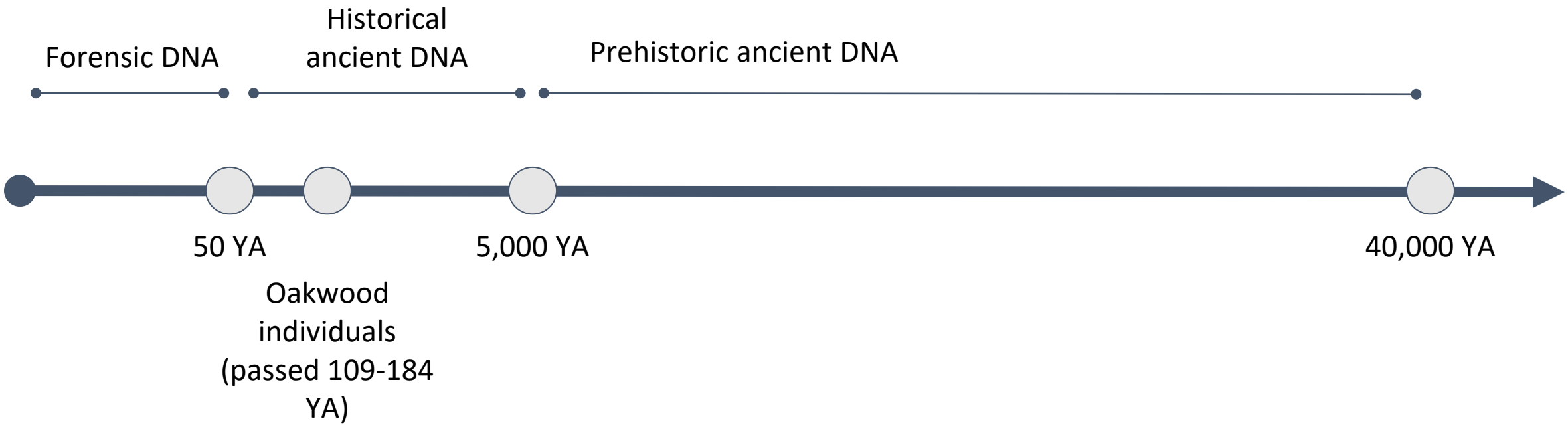


Living (contemporary) DNA

Forensic DNA

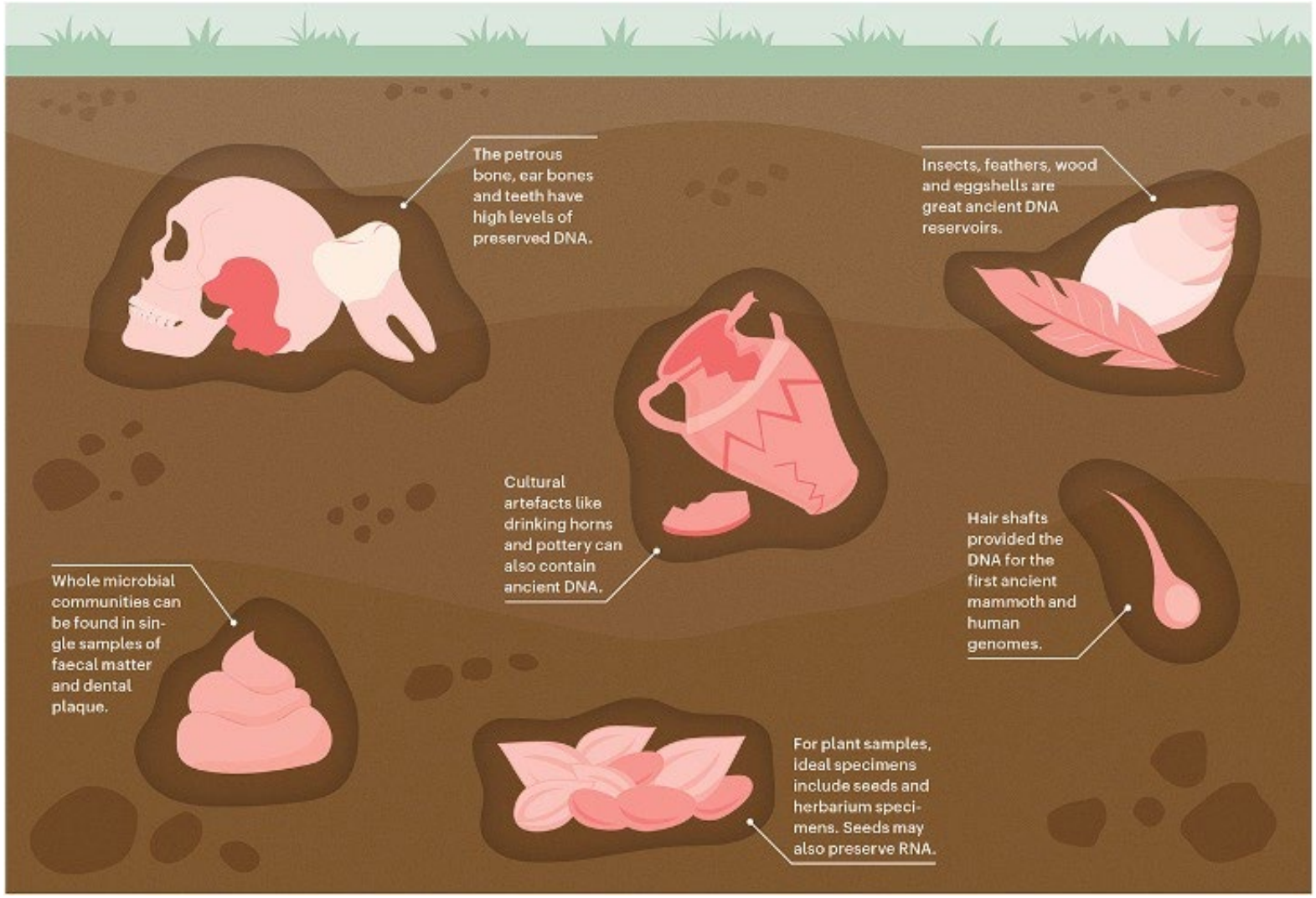
Ancient DNA

Historical ancient DNA



Where does aDNA come from?

- Human aDNA
- Botanical aDNA
- Microbial aDNA
- Non-human animal aDNA



Orlando et al., 2021. Nature Primer

NEWS | 17 February 2021

Million-year-old mammoth genomes shatter record for oldest ancient DNA

Permafrost-preserved teeth, up to 1.6 million years old, identify a new kind of mammoth in Siberia.

AUSTIN PARKS & RECREATION

CITY OF AUSTIN

CAPRA ACCREDITED

What can we learn?*

* Everything we might learn with aDNA is **completely** dependent on preservation and what types of material are available for extraction

What can we learn?

One.
Basic genetic ancestry via maternal (mtDNA) and paternal (Y-DNA) lines

Two.
Genetic ancestry via autosomal DNA (atDNA)

Three.
Genetic sex

Four.
Kinship between ancestors

Five.
Kinship between ancestors and living people

Six.
Trace patterns of population migration

Seven.
Identify the presence of certain foods and pathogens

Eight.
Stress and trauma

Nine.
Microbiome reconstruction

Ten.
Local adaptation through natural selection

Lab work

STEP 1. EXTRACT

STEP 2. CONSTRUCT DNA LIBRARY

STEP 3. PREPARE AND SEND DNA LIBRARY FOR SEQUENCING

STEP 4. SEQUENCE DNA

STEP 5. ANALYZE SEQUENCE DATA COMPUTATIONALLY

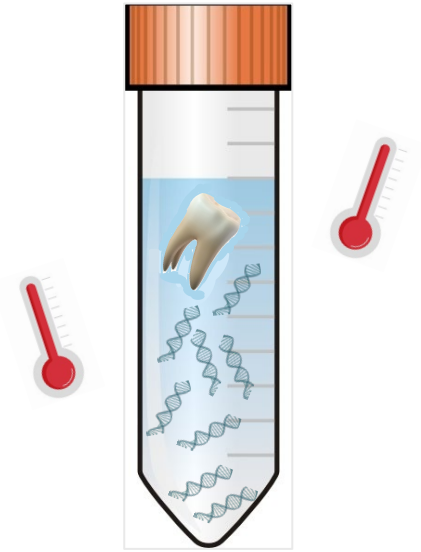
STEP 1. EXTRACT

BONE → DNA

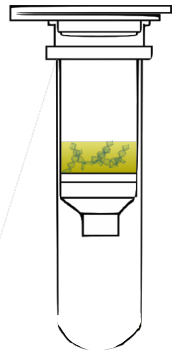
INDIVIDUAL 1

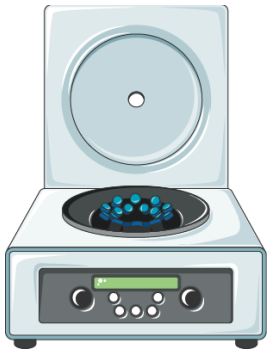
DAY 1

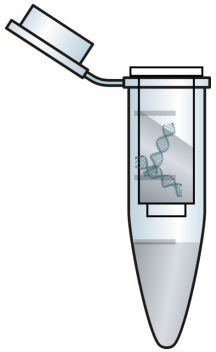
DAY 2

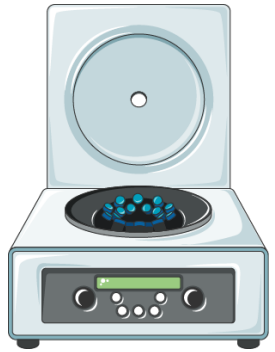


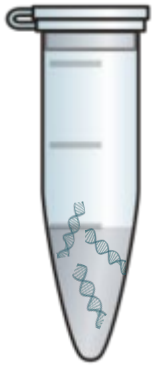
DAY 3





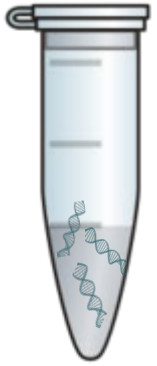




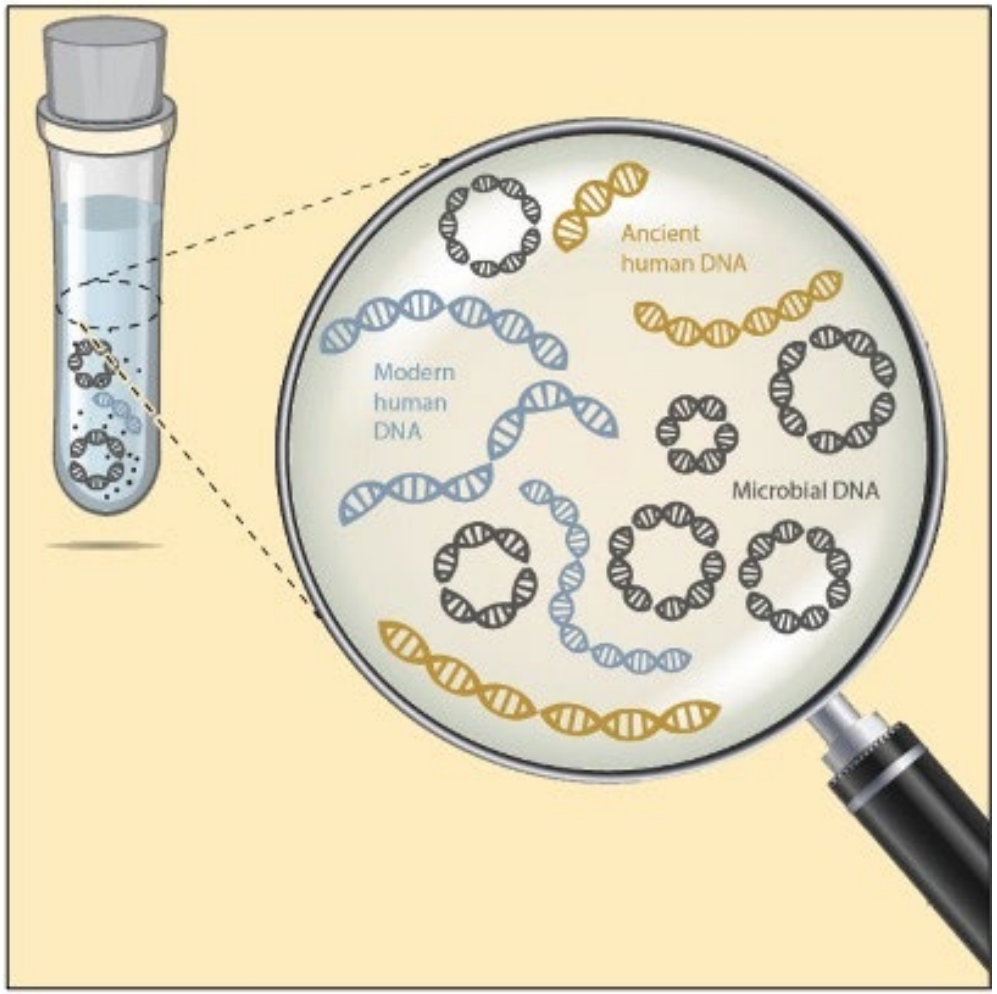


FINAL DNA EXTRACT

STEP 1. EXTRACT



FINAL DNA EXTRACT



Discovermagazine.com

STEP 1. EXTRACT

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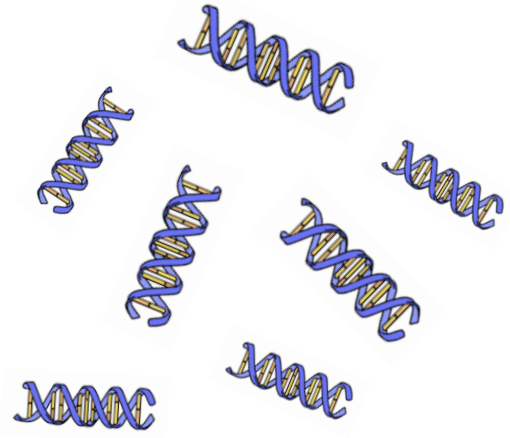
STEP 2. CONSTRUCT DNA LIBRARY

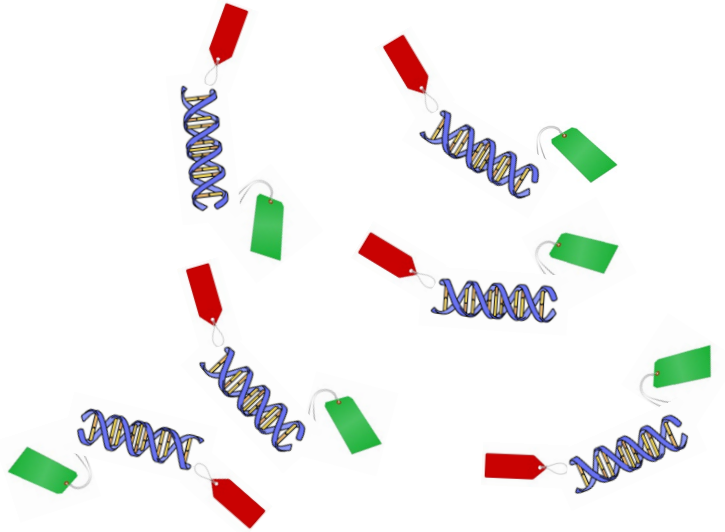
TOOTH

INDIVIDUAL 1

DNA EXTRACT



DNA LIBRARY



STEP 1. EXTRACT

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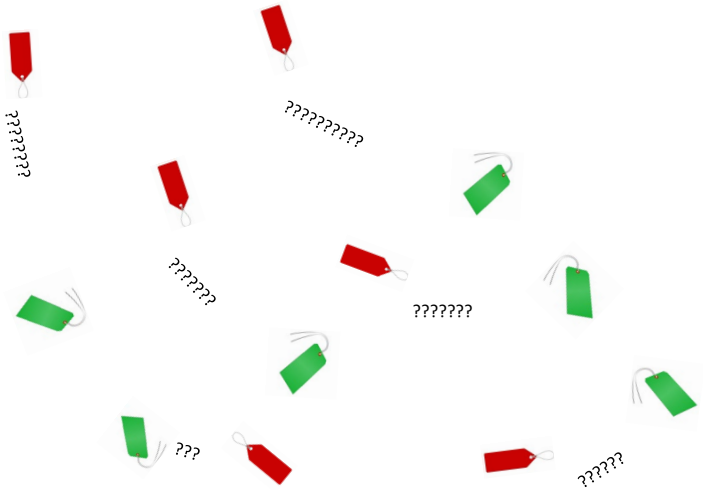
STEP 3. PREPARE AND SEND DNA LIBRARY FOR SEQUENCING

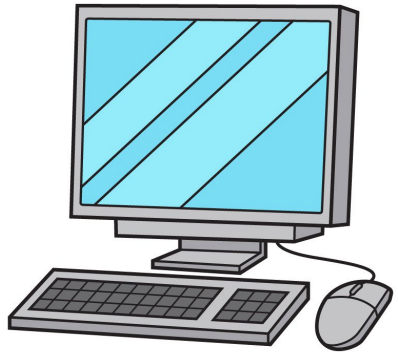
DNA LIBRARY



STEP 4. SEQUENCE DNA

DNA SEQUENCER

COMPUTER



SEQUENCED DNA MOLECULES

STEP 1. EXTRACT

STEP 2. CONSTRUCT DNA LIBRARY

STEP 3. PREPARE AND SEND DNA LIBRARY FOR SEQUENCING

STEP 4. SEQUENCE DNA

STEP 5. ANALYZE SEQUENCE DATA COMPUTATIONALLY

STEP 5. ANALYZE SEQUENCE DATA COMPUTATIONALLY

REFERENCE GENOME:

TACAGATCGGTCAGTTTCAGATAGTTTAGGAACCCT
A
GGAATTCCTACAGCTCGGATCGATC
GGAATTCCCTCGGTCAGGATCGATC
GGAATTCCTCAG GATCGATC
GGAATTCCTCAGTTTCAGATGATCGATC
GGAATTCCGATAATTTAGATCGATC
GGAATTCCTTAGGAGATCGATC
GGAATTCCGAACCTT GATCGATC
A

INDIVIDUAL 1'S GENOME:

TACAGCTCGGTCAGTTTCAGATAATTTAGGAACCCT

REFERENCE GENOME:

TACAGATCGGTCAGTTTCAGATAGTTTAGGAACCCT
A
A

Position 6 Position 24 Position 35

Applying ancient DNA methods to historical contexts

Why is this study unique?

Texas historical ancient DNA

Genetic genealogy and ancient DNA

Phase I of the project: Collection of bone material to reinterment

What happened once we partnered with the Oakwood Cemetery Chapel team?

May 2020
Established partnership with PARD

September 2020
"All Together Here" symposium

January 2021
Bone material chosen for sampling arrives in Connecticut

February 2021
DNA, dentin, enamel, and dental calculus extracted

September 2021
All bone material sent to Connecticut is returned to FACTS in San Marcos

October 2021

November 2021
All remains were reunited with each individual and all individuals were reinterred next to the Chapel

35

Individuals in the Oakwood cemetery population

27/35

Extracts completed

2/35

Genomic libraries constructed

8/35

Dental calculus samples collected for future study

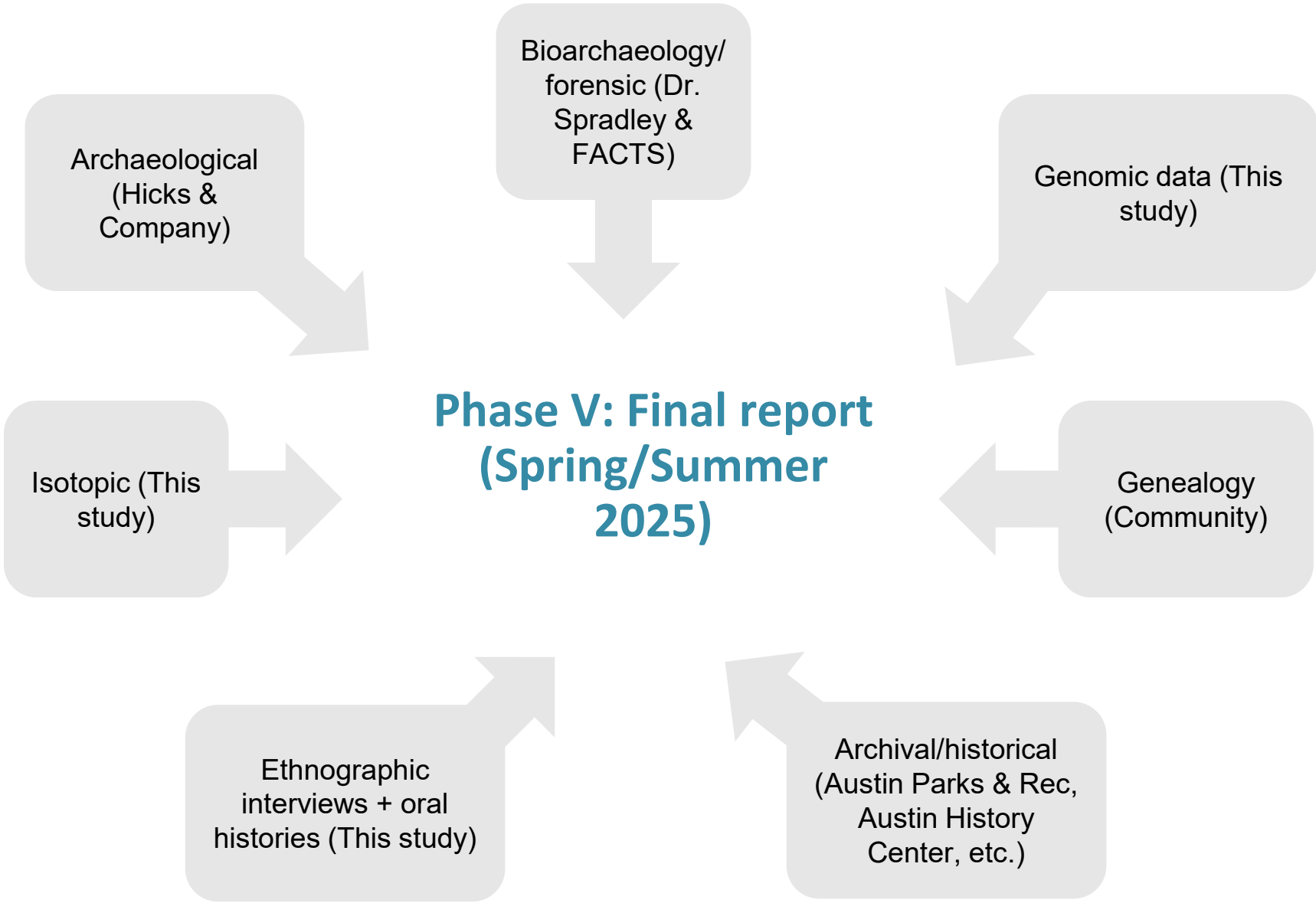
Dr. Lauren Springs

Phases of the project

2020 2021 2022 2023 2024 2025

Phase I [Completed]	Phase II [Current]	Phase III	Phase IV	Phase V
	Community collaboration	Community collaboration	Community collaboration	
Lab work	Lab work	Lab work	Lab work	
		Bioinformatic analyses	Bioinformatic analyses	Final report
			Ethnographic interviews + oral histories	
			Archival + genealogical research	

Assessing relatedness: Target date Fall 2024


Bioarchaeology/ forensic (Dr. Spradley & FACTS)
Archaeological (Hicks & Company)
Genomic data (This study)
Phase V: Final report (Spring/Summer 2025)
Isotopic (This study)
Genealogy (Community)
Ethnographic interviews + oral histories (This study)
Archival/historical (Austin Parks & Rec, Austin History Center, etc.)

Why can’t I just give you my [23andMe, AncestryDNA, etc.] results to compare?

We need to ensure that the genomes that we are using for living individuals is properly comparable to the ancient genomes.

When can I spit in a tube?

Soon! Once the Institutional Review Board at UConn approves the research.

Questions &
Links to more information

City of Austin

https://www.austintexas.gov/OakwoodProject

https://www.austintexas.gov/department/oakwood-cemetery-chapel

https://www.austintexas.gov/department/cemeteries

University of Connecticut

s.uconn.edu/OakwoodDNA