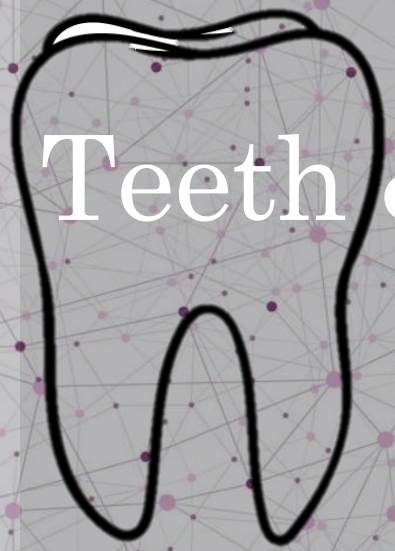


Teeth & Migration

Teeth in Bioanthropology

Arwa Kharobi, PhD, Assistant Professor

Migration, Mobility, Mouvement?

A basic distinction in evaluating human movement is scale, or time and distance travelled.

Many archaeologists differentiate between past practices of mobility & migration based on scope of movement:

Migration: a one-way, long-term or permanent relocation of one or more persons following travel across real or perceived political, environmental, or cultural borders

(Cabana and Clark 2011; Tsuda et al. 2015)

Mobility: involves individual or group movement across shorter distances that typically takes place within one's own cultural and/or political boundaries

(Tsuda et al. 2015)

Introduction

last decade:

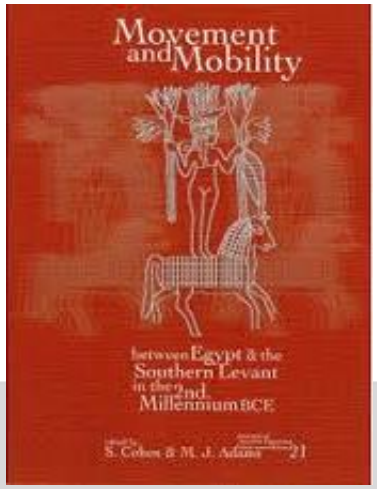
increase in migration studies focusing on the mobility of:

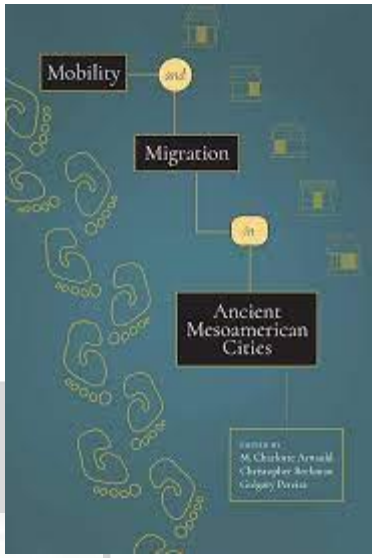
- groups
- single individuals

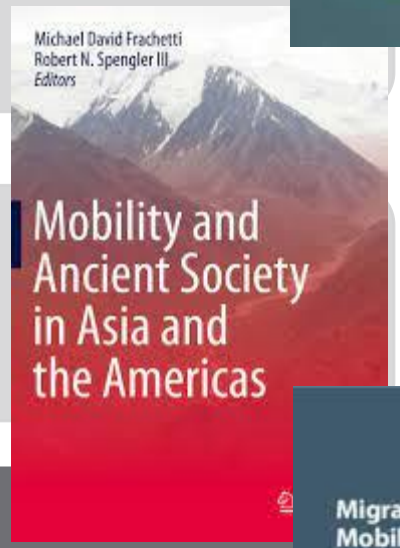
mostly based on:

- aDNA
- Strontium isotope analyses

provided important extra layer of data on past social dynamics







Introduction

current large quantity of data +

constant increase = opportunity to examine human mobility in unprecedented detail

academic dialogue is changing

from producing evidence for movement **to** examining differences or similarities in human mobilities across temporal & geographical barriers

Advantages of teeth

- Unlike bones, which regenerate through our lives,
- Teeth **do not produce new cells** when they form

forms & sets during infancy,

chemically "recording" a baby's diet

1st Molar

contains a diary of what an adult eats, and where their food originates

wisdom tooth

provide us with a map of where a person lived, between birth and burial

A mouthful of teeth

Dental calculus

Mineralized dental plaque or calculus

Tiny layers of food & bacteria

Contains 25 times more DNA than a bone

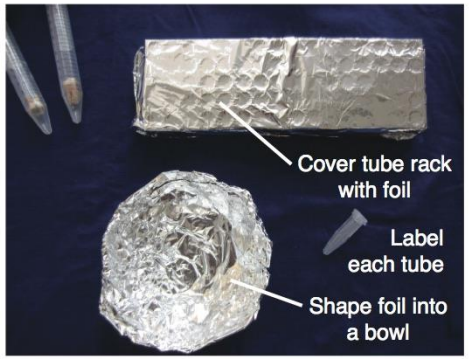
Anthropologists suggest that *researching dental calculus could unearth answers to the riddles of past migratory patterns.*

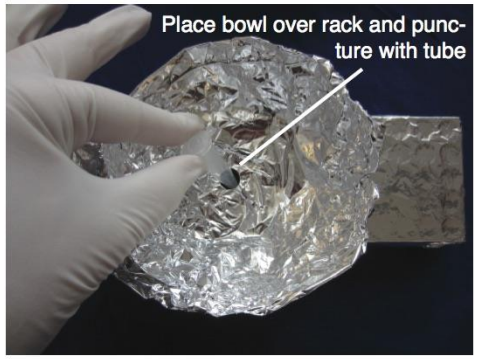
MAX-PLANCK-GESELLSCHAFT

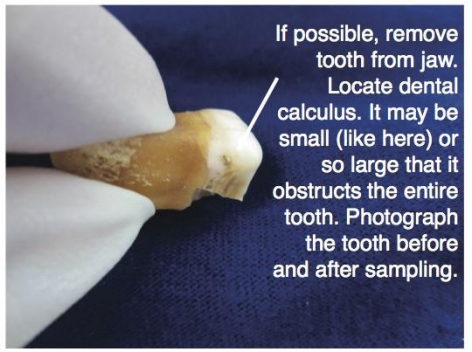
Dental Calculus

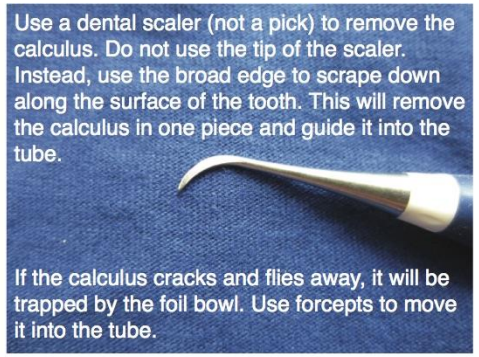
Sampling Protocol v.4, Nov. 29, 2016

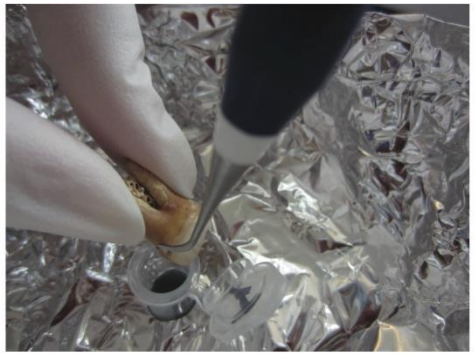
Christina Warinner, Max Planck Institute for the Science of Human History





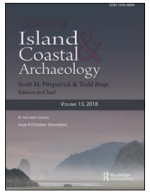






Additional Information: All dental calculus from one individual can be placed in the same tube. Use fresh foil for each individual and sterilize the scaler with an alcohol wipe between each individual. Also, change gloves or clean with alcohol wipes between individuals.

In 2019, researchers from the University of Adelaide, Australia, used calculus from the teeth of ancient Polynesians to decipher the timings and exact migration routes of prehistoric humans in the Pacific.



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Ancient Microbial DNA in Dental Calculus: A New method for Studying Rapid Human Migration Events

Raphael Eisenhofer, Atholl Anderson, Keith Dobney, Alan Cooper & Laura S. Weyrich

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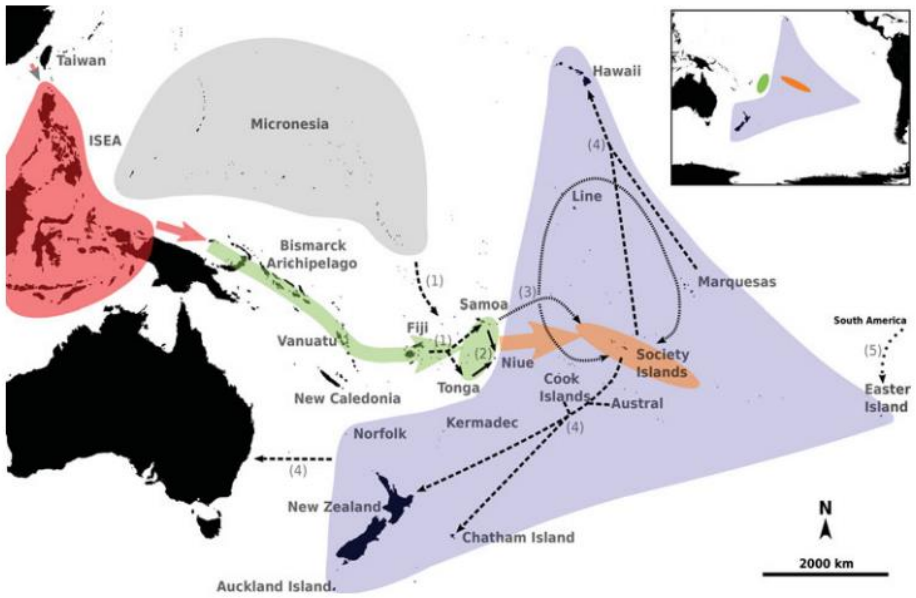
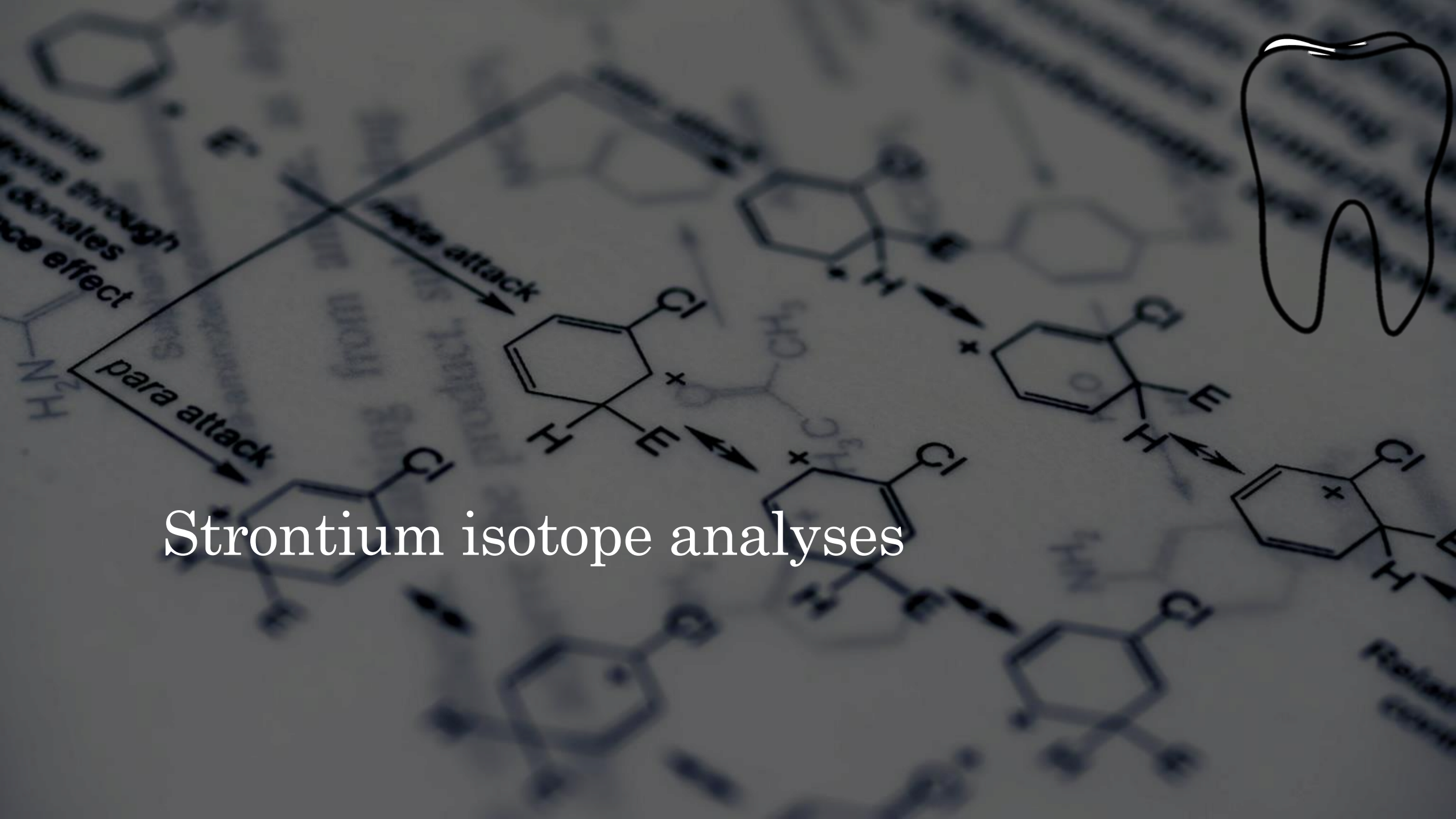
To link to this article: https://doi.org/10.1080/15564894.2017.1382620

Raphael Eisenhofer et al.

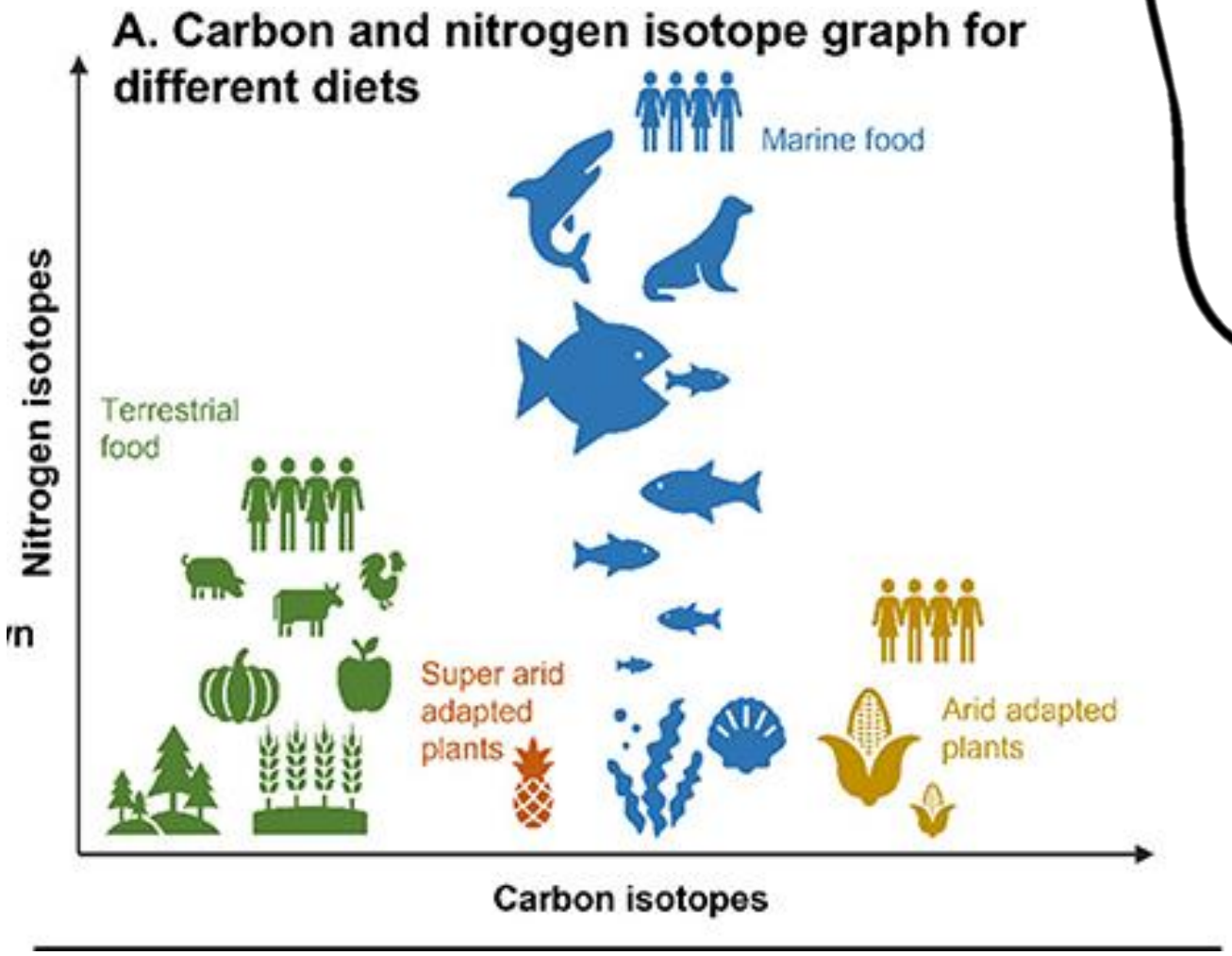




Strontium isotope analyses

For diet

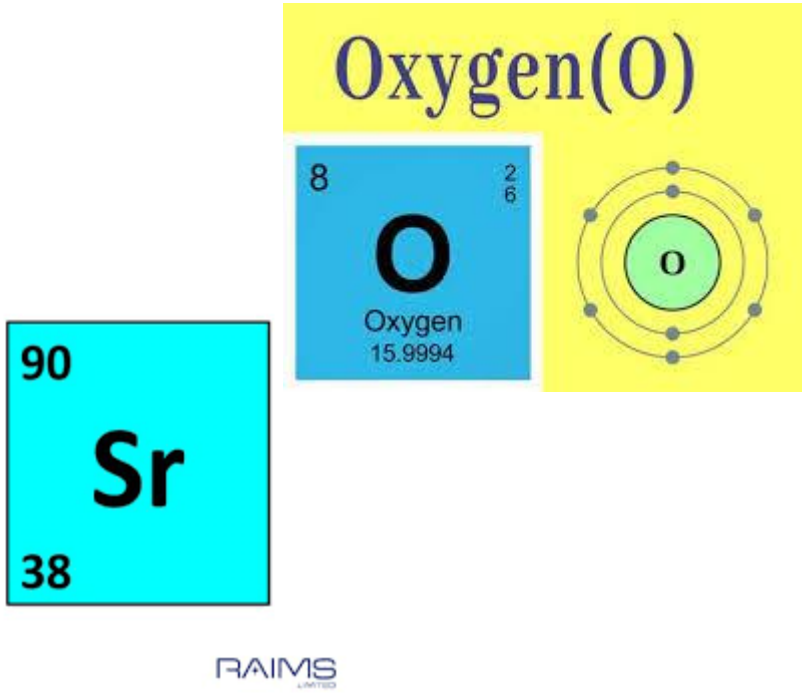
Tell me what you eat, Ill tell you who you are!

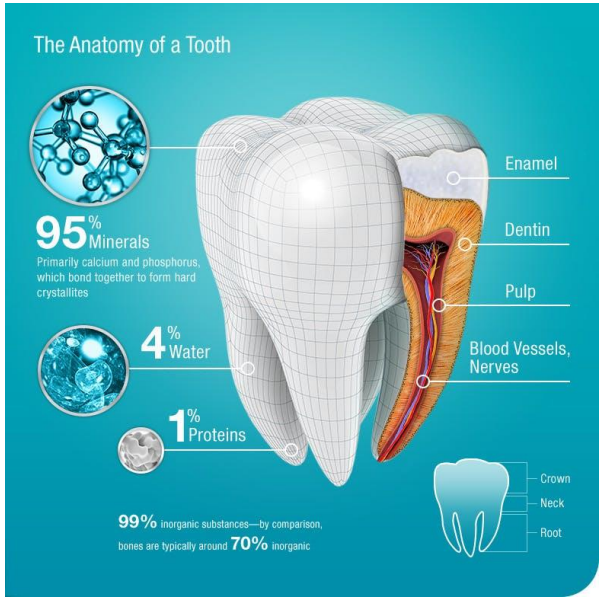


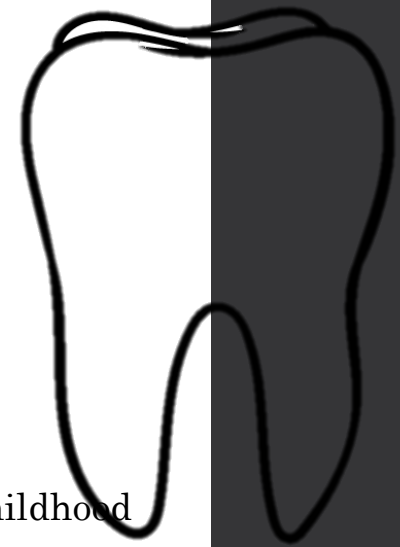
Understanding How People Moved Around From Teeth

To uncover where people were living in the past, we can use two isotope systems:

1. oxygen
2. strontium





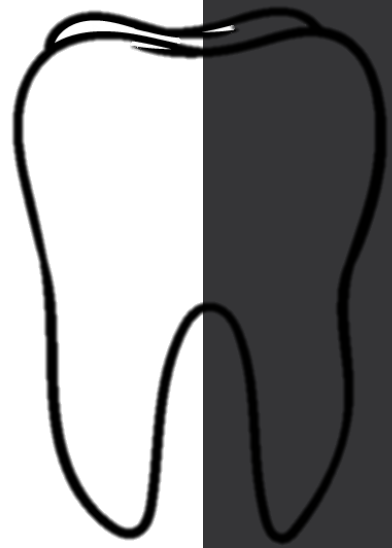


Local or not?

1. **Tooth** enamel forms during early childhood and does not change
2. **Bone** changes continually through life
3. **Difference** in Sr isotope ratio between bone & enamel in the same individual →

change in residence or not?

Understanding How People Moved Around From Teeth

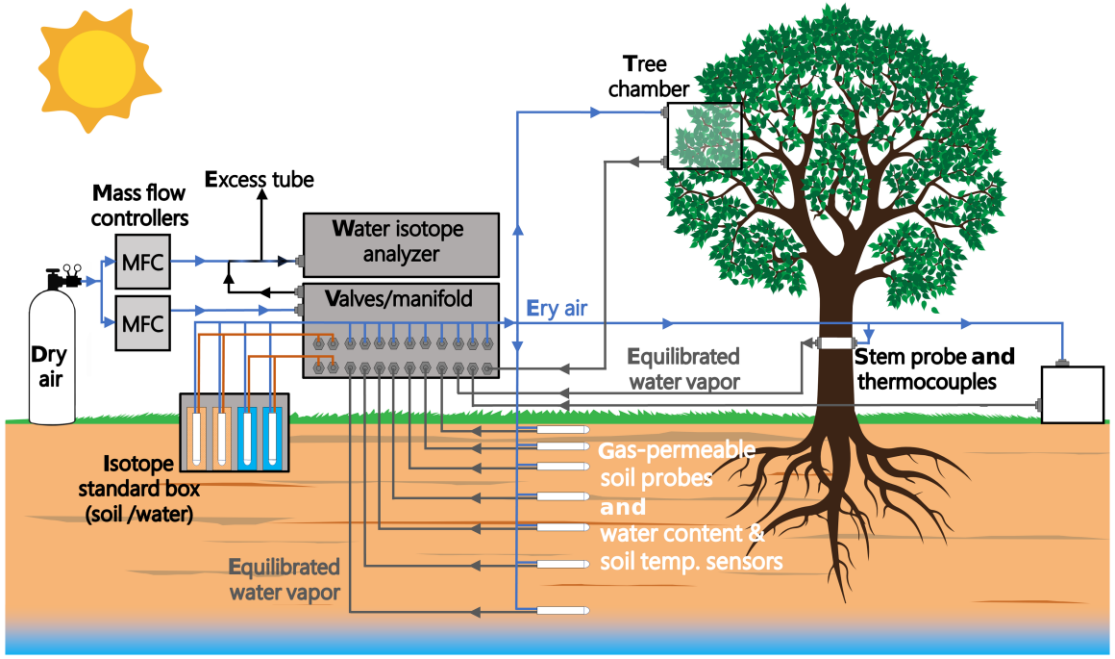


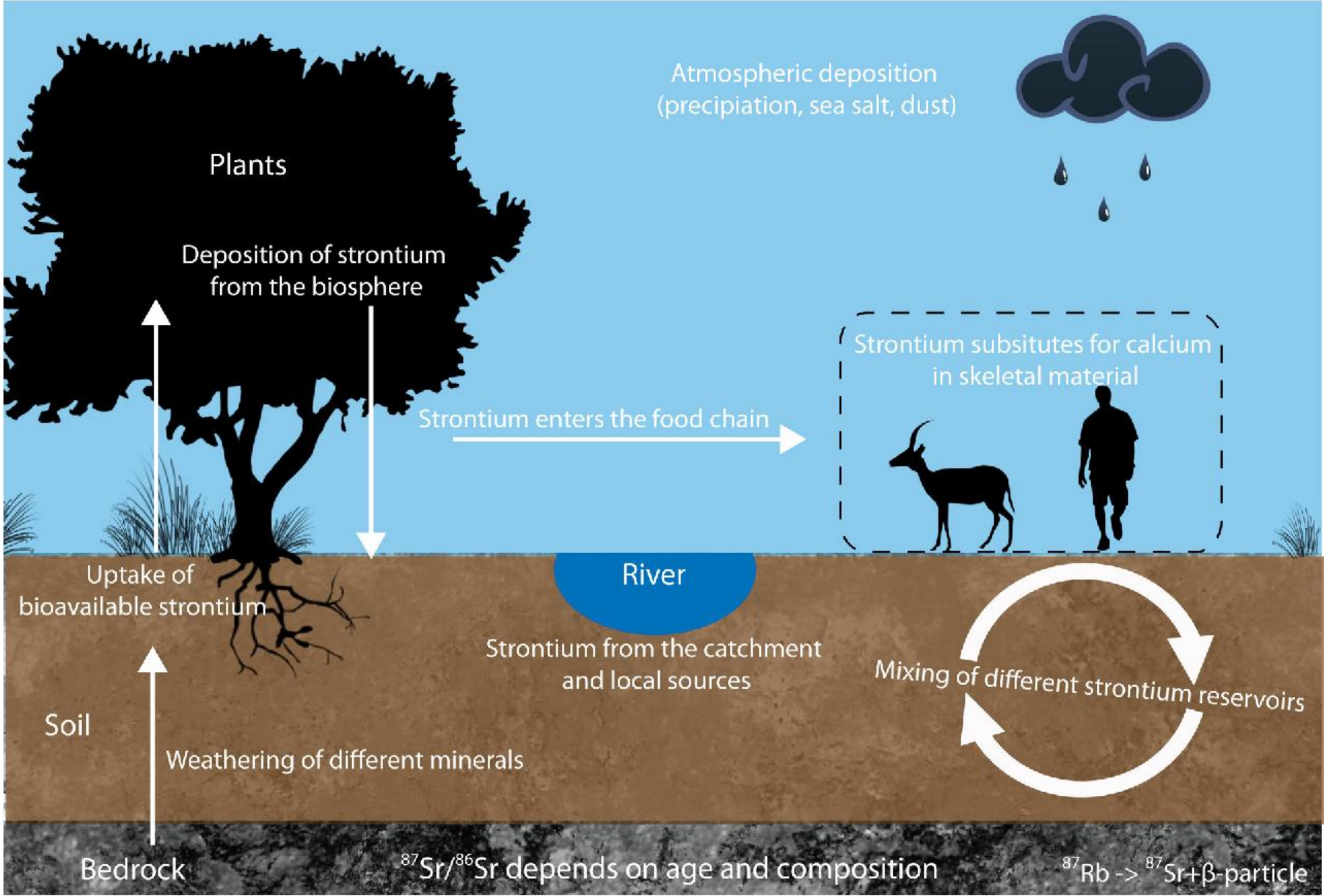
δ16O & δ18O ratios in rain change with climate

As drinking water often comes from rain, O ratios in teeth reflect the region that people were living in

87Sr & 86Sr are found in different amounts in different types and ages of bedrock

As the bedrock erodes, these isotopes get into the soil and into plants, so when humans or animals eat, the environment's Sr isotope ratio is incorporated into their teeth




Plants
Deposition of strontium
from the biosphere
Atmospheric deposition
(precipiation, sea salt, dust)
Strontium enters the food chain
Strontium subsitutes for calcium
in skeletal material
Uptake of
bioavailable strontium
River
Strontium from the catchment
and local sources
Mixing of different strontium reservoirs
Soil
Weathering of different minerals
Bedrock
$^{87}Sr/^{86}Sr$ depends on age and composition
^{87}Rb -> ^{87}Sr+β-particle

Understanding How People Moved Around From Teeth

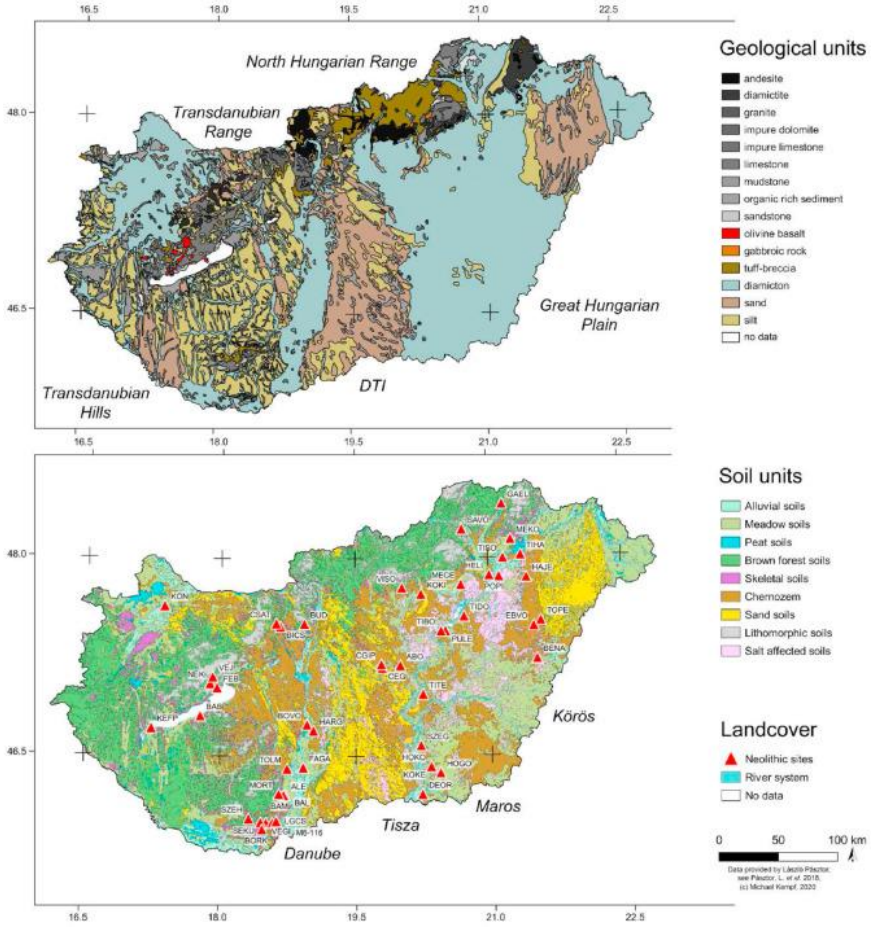
Before we can make sense of the O or Sr isotope ratios measured in a human tooth

we need to understand how these isotope ratios vary in a region

measure the isotopes in

1. soils
2. plants
3. water
4. animals

to create a baseline map

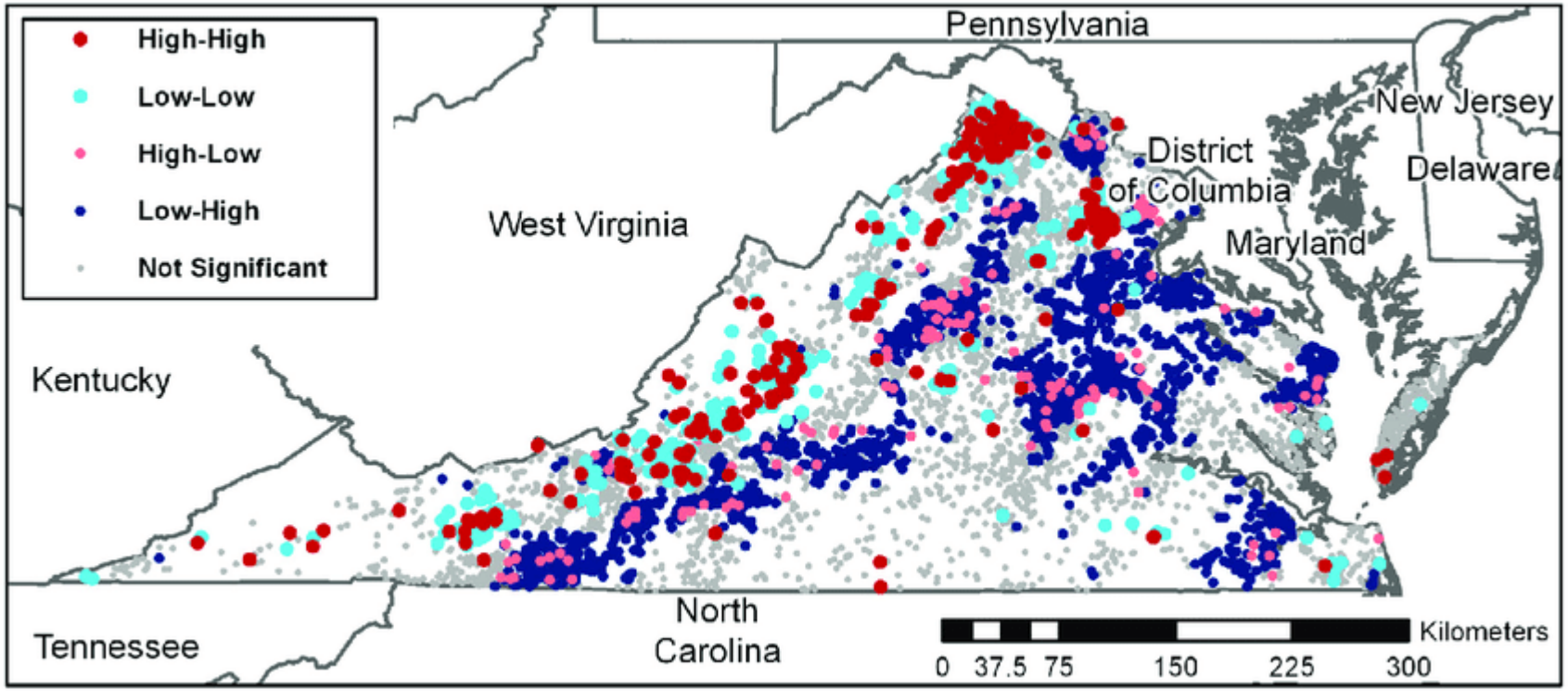


A baseline map

shows how O & Sr isotopes vary across landscape

we can then compare isotope ratio in teeth to these maps

Local vs non-local

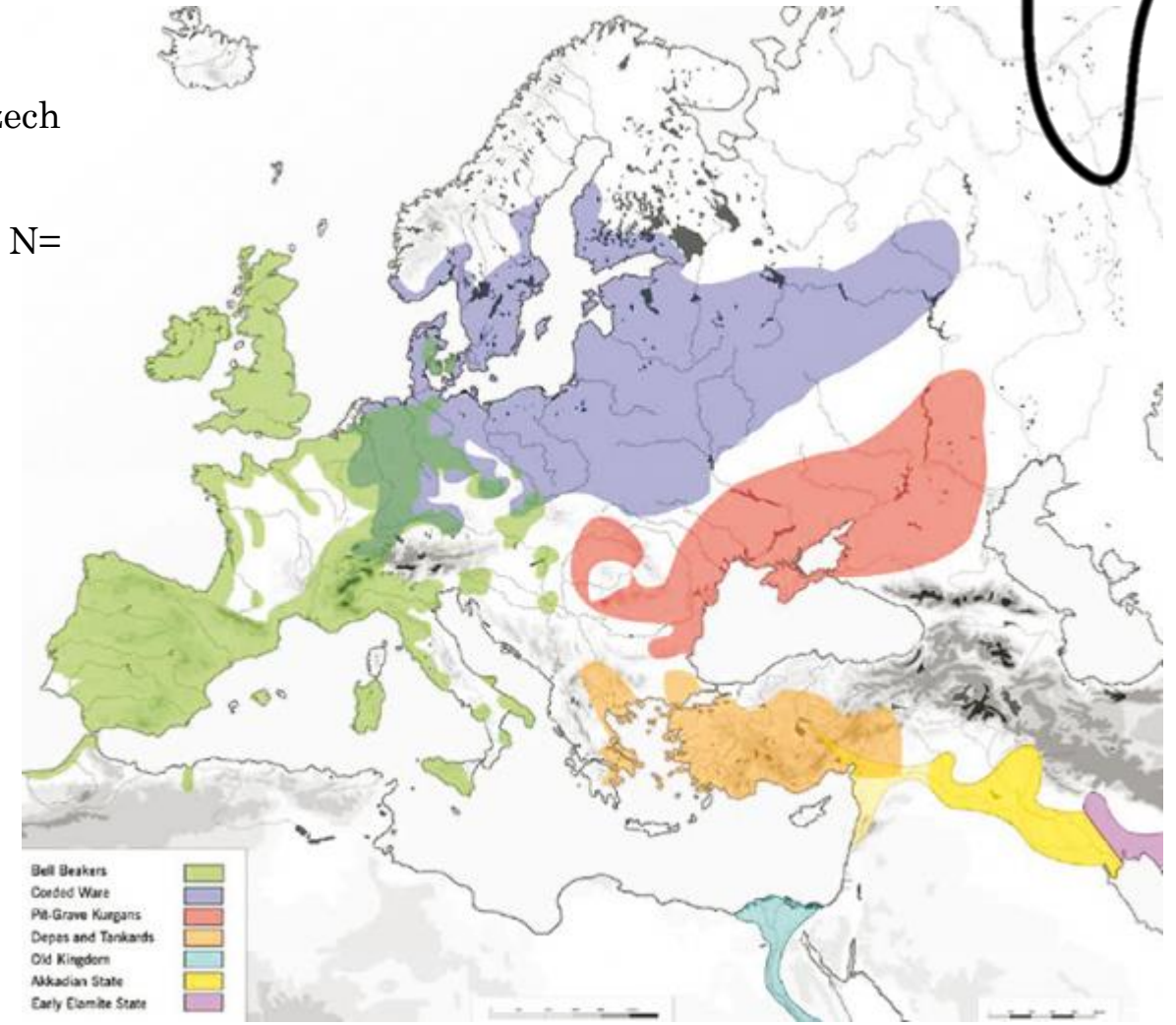


Sr & Prehistoric Human Migration:
The Bell Beaker Period in Central Europe

Context: southern Germany, Austria, Czech Republic, & Hungary

M & M: Sr isotope ratios in bone & tooth enamel, N= 81

Results: 51 had moved during their lifetime



2017

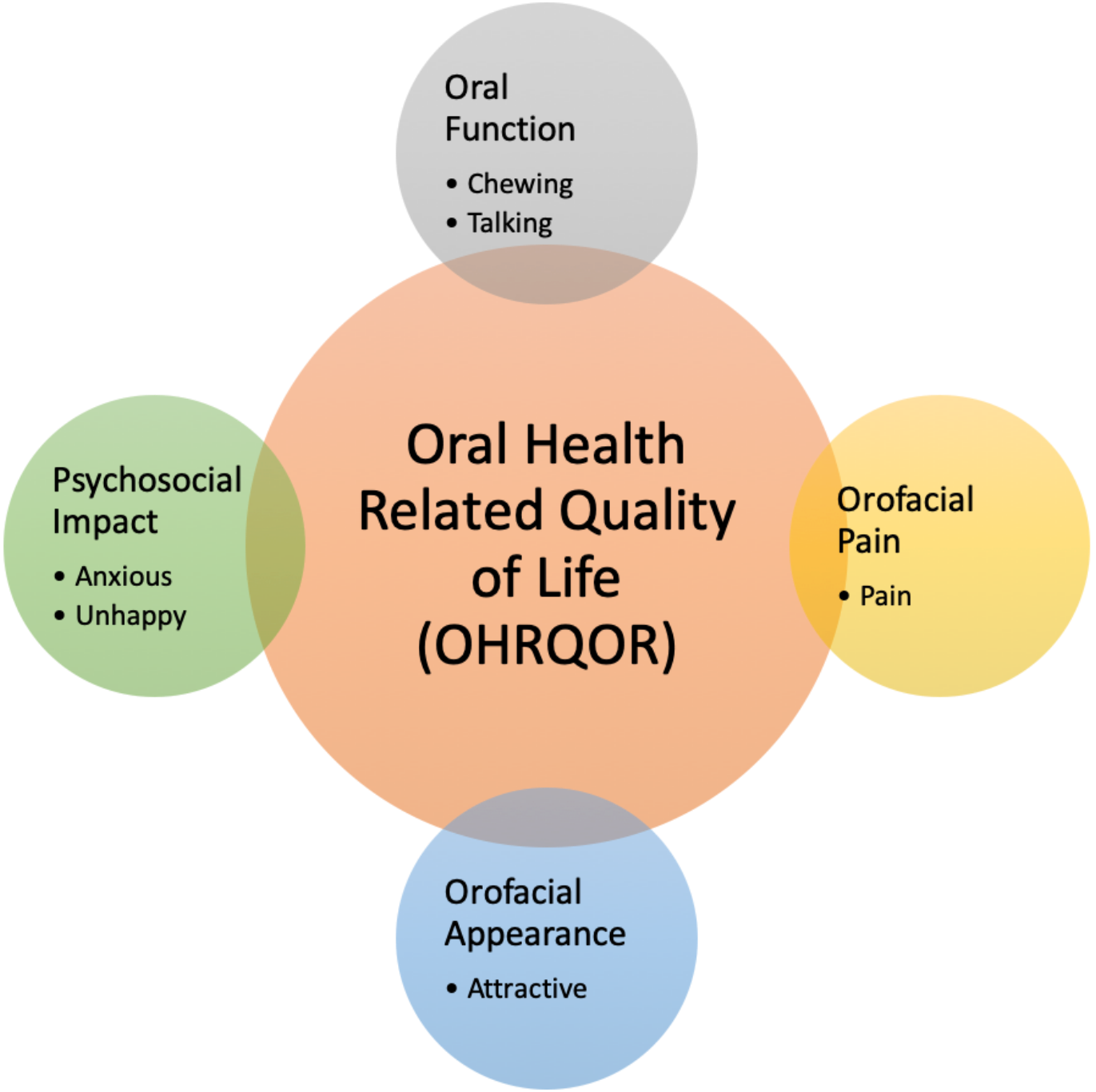
Association between migration & oral health-related quality of life:

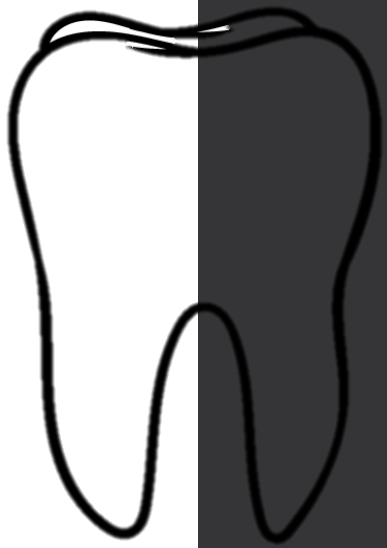
Aarabi et al. 2022

Data taken from a nationally representative online survey

- ✓ (n = 3,075; 18–70 years; living in Germany)
- ✓ from August to September 2021

Purpose: To analyze the link between individuals with and without migration background and oral health-related quality of life (also stratified by sex).


Oral Function
• Chewing
• Talking
Psychosocial Impact
• Anxious
• Unhappy
Oral Health Related Quality of Life (OHRQOR)
Orofacial Pain
• Pain
Orofacial Appearance
• Attractive



Protocol

1. Have you had difficulty chewing any foods because of problems with your teeth, mouth, dentures or jaw?
2. Have you felt that there has been less flavor in your food because of problems with your teeth, mouth, dentures or jaws?
3. Have you had painful aching in your mouth?
4. Have you felt uncomfortable about the appearance of your teeth, mouth dentures or jaws?
5. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth, dentures or jaws?

(in each case: 0-never, 1-hardly ever, 2-occasionally, 3-fairly often, and 4-very often)

A sum score was computed.

Thus, the OHIP-G5 ranges from 0 to 20 (higher scores reflect lower oral health-related quality of life).

Cronbach's alpha was 0.85 in our current study.

Independent variables

The key independent variable was self-rated migration background

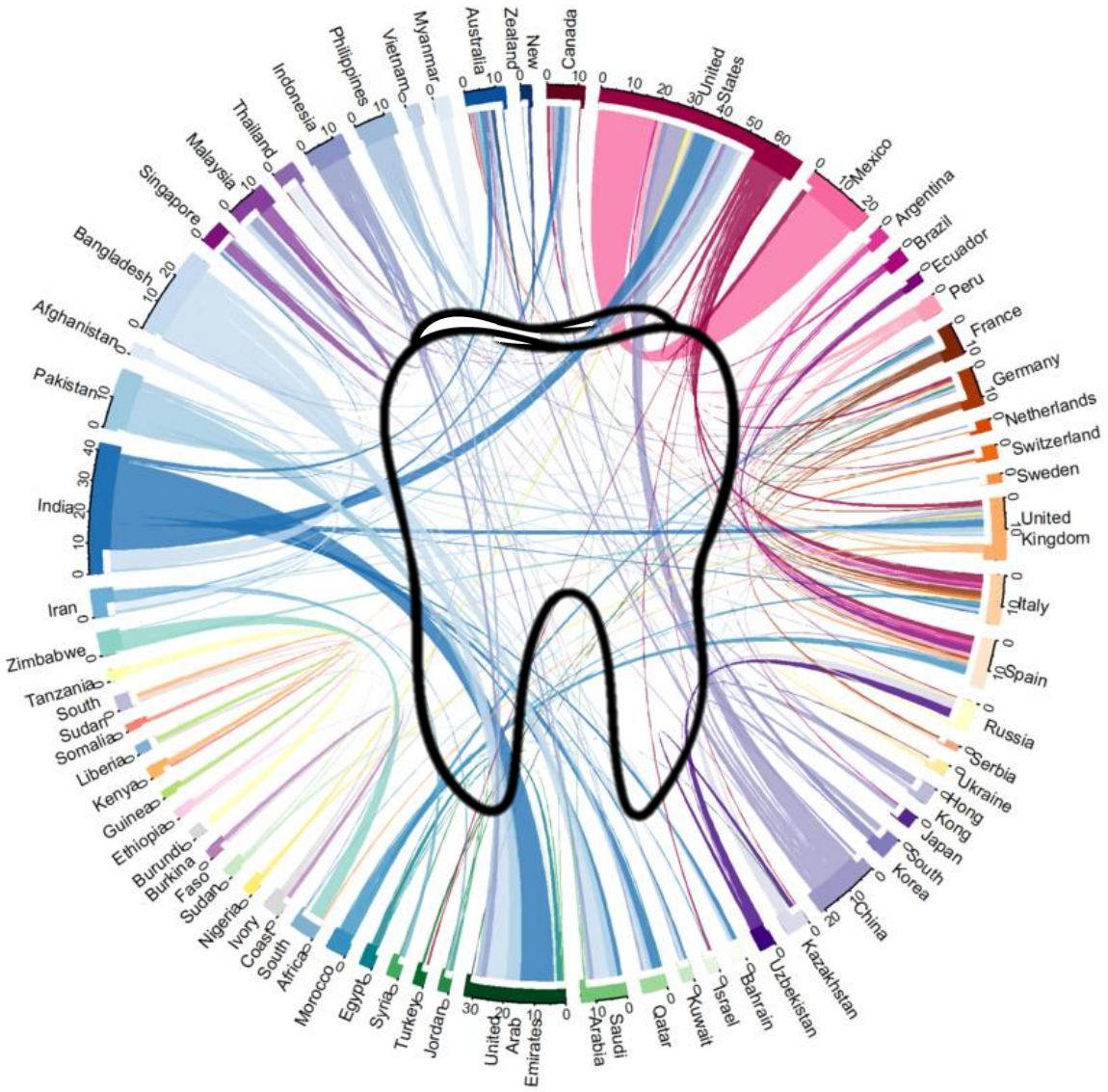
- no
- yes

explained as follows

“A person has a migration background if he or she or at least one parent was not born with German citizenship”.

Results

- ✓ Small (women) to medium (men) differences in oral health-related quality of life (in terms of effect size) between individuals with migration background and their counterparts.
- ✓ Two-part models revealed that the migration background was associated with a higher likelihood of OHIP-G5 scores of one or higher total sample and in both sexes.
- ✓ Migration background was positively associated with the extent of oral health-related quality of life (total sample and in men).
- ✓ Migration background was associated with lower oral health-related quality of life (total sample and in both sexes)



Conclusions

- ✓ This study emphasized the **link between having a migration background** & **lower oral health-related quality of life** among both women and men.
- ✓ Maintaining oral health among individuals with a migration background is a **key challenge**.
- ✓ Culturally & socially sensitive actions should provide easy accessible oral health information & preventive measures in order to lower access barriers in dental care for individuals with migration background

Conclusions on oral health, teeth & mouvements

1. Local vs nonlocal
2. Movements trajectory
3. links between oral health and cultural, social & geographical background
4. Identity (forensic and archaeological) contexts

Today, forensic scientists apply techniques of isotopes (diet/migration) to identify people who die during perilous journeys…..

"It's a bit harder, since modern people eat food from so many different places, but if our combined work in this area can bring a person home to their family, it's worth the effort."


Thank you!