TEETH IN BIOANTHROPOLOGY

DEPARTMENT OF ANTHROPOLOGY

A Story of Teeth

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MUNI SCI

HR EXCELLENCE IN RESEARCH

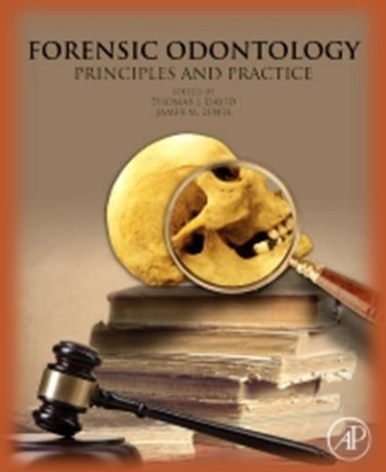
On the program today!

- EXCAVATION
- SAMPLING
- CLEANING
- RECORDING
- ANALYSING
- DOCUMENTING
- RESTORING
- ETHICS

The necessary areas of tooth identification

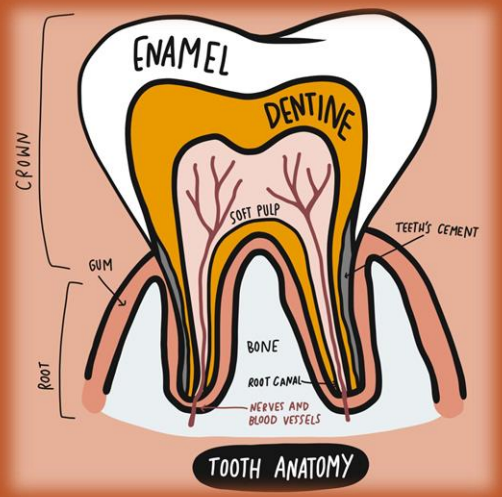
Clinical dentistry	Repair/prosthesis of parenchymal defects, understanding occlusion	✓ Diagnosis ✓ Treatment

The necessary areas of tooth identification



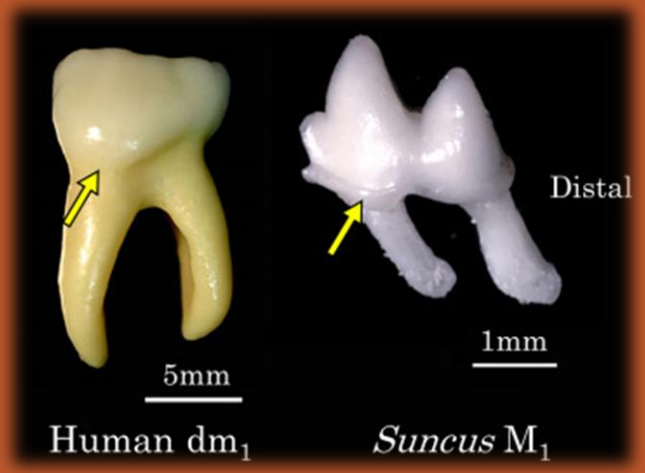
Forensic odontology (Forensic medicine)	Individual identification in the event of accident/incident/disaster	✓ Age ✓ Sex ✓ Population affinity

The necessary areas of tooth identification



Dental anatomy (Dental morphology)	Collecting and organizing (summarizing) morphological phenomena of teeth	✓ Fundamental principles and laws behind tooth morphology

The necessary areas of tooth identification



Comparative odontology (Zoology)	Examining species characteristics and differences in tooth morphology due to diet	✓ Estimate the evolutionary (phylogenetic) process

The necessary areas of tooth identification

Dental anthropology	Extracting the characteristics of human teeth and differences in tooth morphology among populations (differences in the frequency of crown and root traits)	✓ Population genetics ✓ Environmental factors

The necessary areas of tooth identification

Paleontology (Paleoanthropology)	Species identification and discovery of new species	✓ Estimate the evolutionary process (phylogenetic)

The necessary areas of tooth identification

Osteoarchaeology	Individual identification (calculating the minimum number of excavated human remains), an estimate of relatives	✓ Age ✓ Sex ✓ Diet ✓ Health ✓ Mobility

Why teeth?

Because they:

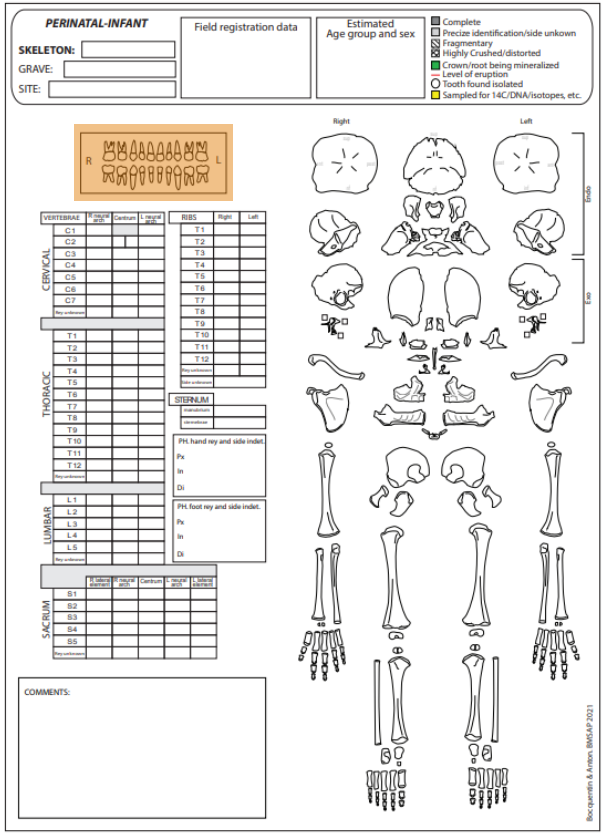
- Preserve well/resist decay
- Frequently outlast bones
- Best reservoir for biochemical analyses

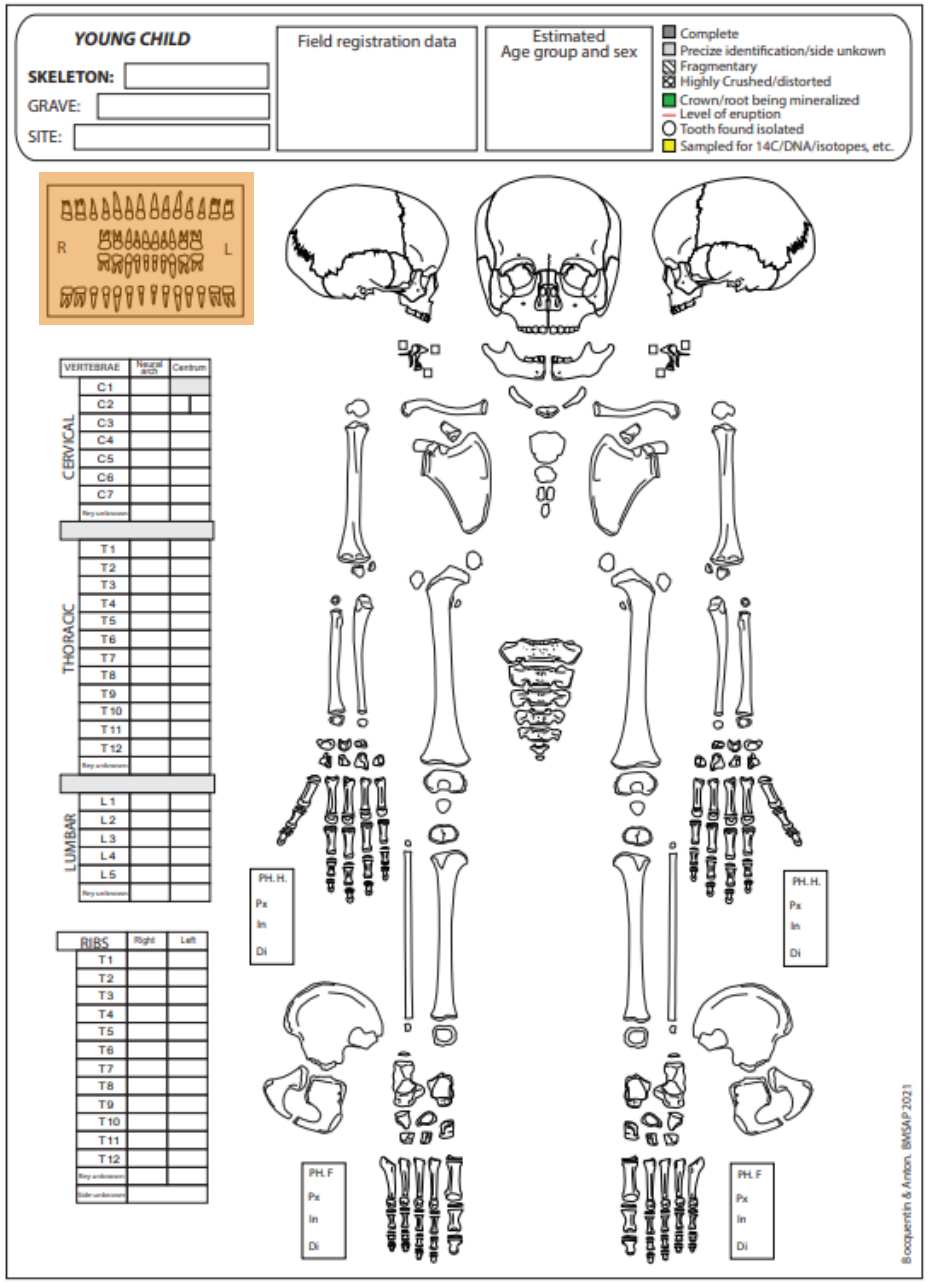
1. Excavation

- Use delicate tools (paintbrushes, teaspoons, dental instruments)
- Teeth should be shaded from strong sunlight so they do not dry out and crack (a light spray of water may help)

1. Excavation

- Fill the teeth on the '**S**keleton **R**ecording **S**heet'

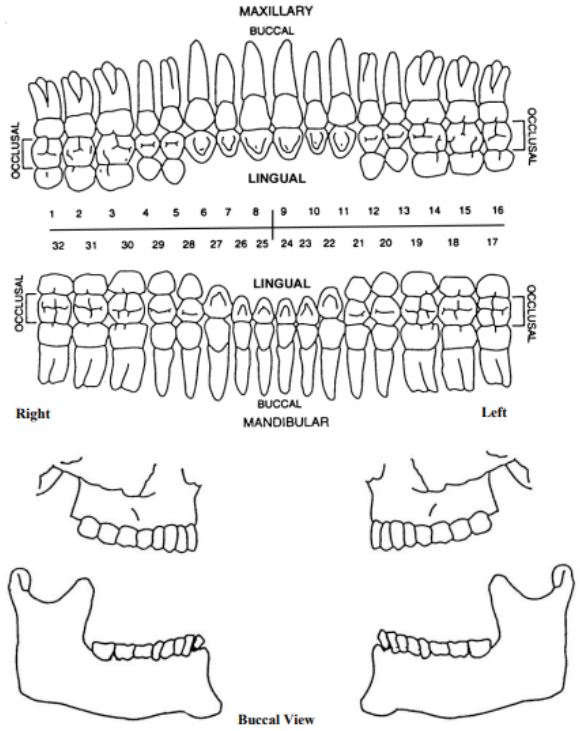




THE UNIVERSITY OF ARIZONA
ARIZONA STATE MUSEUM

DENTAL INVENTORY & PATHOLOGY
PERMANENT - RECORDING FORM (3a)

Note pathology locations and severity, wear, and any additional observations.



Buccal View

Additional observations:

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DENTAL MORPHOLOGY
ADULT - RECORDING FORM (4a)

Mark with a dash if not recordable or unobservable

Provenience: _____

Designation/ID: _____

	Right								Left							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Maxilla	M^3	M^2	M^1	PM^2	PM^1	C	I^2	I^1	I^1	I^2	C	PM^1	PM^2	M^1	M^2	M^3
Winging																
Labial curve																
Shovel																
Double shovel																
Interrupt groove																
Tuberculum dentale			Uto-Aztec PM:										Uto-Aztec PM			
Access. cusps																
Access. ridges																
Tricusped PM's																
Odontome																
Metacone																
Hypocone																
Cusp 5																
Carabelli																
C2 parastyle																
Enamel ext.																
Root number																
Radical number																
Peg/reduced																
Cong abscence																
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Mandible	M^3	M^2	M^1	PM^2	PM^1	C	I^2	I^1	I^1	I^2	C	PM^1	PM^2	M^1	M^2	M^3
Shovel																
Double shovel																
Distal access. ridge																
Lingual cusps																
Odontome																
Ant. fovea																
Groove pattern																
Cusp number																
Deflecting wrinkle																
Mid. trigonid crest																
Distal trigonid crest																
Protstylid																
Cusp 5																
Cusp 6																
Cusp 7					Tomes							Tomes				
Enamel ext.																
Root number																
Radical number																
Cong abscence																

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DENTAL MORPHOLOGY
DECIDUOUS - RECORDING FORM (4b)

Mark with a dash if not recordable or unobservable

Provenience: _____

Designation/ID: _____

	Right					Left				
	51	52	53	54	55	56	57	58	59	60
Maxilla	M^2	M^1	C	I^2	I^1	I^1	I^2	C	M^1	M^2
Winging										
Shovel										
Double shovel										
Double teeth										
Labial defect										
Canine form										
DAR										
Metacone										
Hypocone										
Cusp 5										
Carabelli										
C2 parastyle										
Root number										
Root sheath/groove										

	70	69	68	67	66	65	64	63	62	61
Mandible	M^2	M^1	C	I^2	I^1	I^1	I^2	C	M^1	M^2
Shovel										
Labial defect										
Double teeth										
DAR										
Delta										
Groove pattern										
Cusp number										
Deflecting wrinkle										
Distal trigon crest										
Protostylid										
Cusp 5										
Root number										
Root groove										

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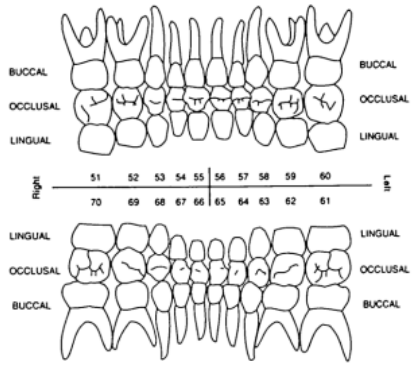
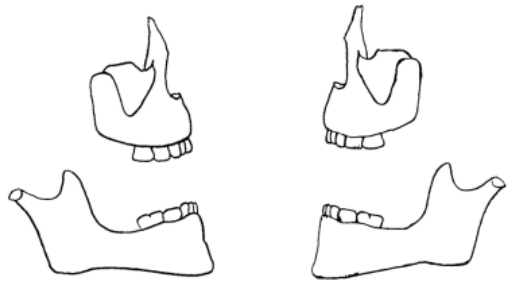
DENTAL INVENTORY & PATHOLOGY
DECIDUOUS - RECORDING FORM (3b)

Note pathology locations and severity, wear, and any additional observations.

MAXILLARY



MANDIBULAR



Buccal View

Additional observations:

1. Excavation

- Place the teeth in plastic bags
- Separate labelled bags should be used for : mandible, maxilla
- Waterproofs labels resistant to damage should be placed inside each bag

SNOMNH-Archaeology Division

Site/Cat#: 34Lf1/1.1-.6
Provenience: N1E2, L.1 (0-10cm)
Date: 1/1/2006
Excavator: John Doe
Specimen: 6 pottery body sherds (incised)

SNOMNH-Archaeology Division

Site/Cat#:
Provenience:
Date:
Excavator:
Specimen:

2. Sampling (Field)

- Consider it for future analysis so if future contamination occurs there is a sample for analysis (aDNA)

Destructive sampling (histological,, isotopes, aDNA, radiocarbon) **must be justified**

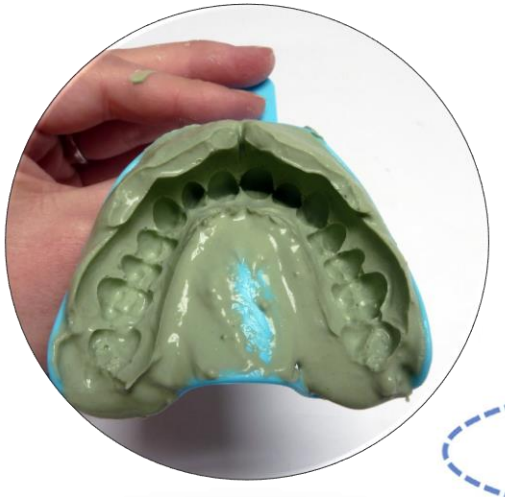
2. Sampling (lab)

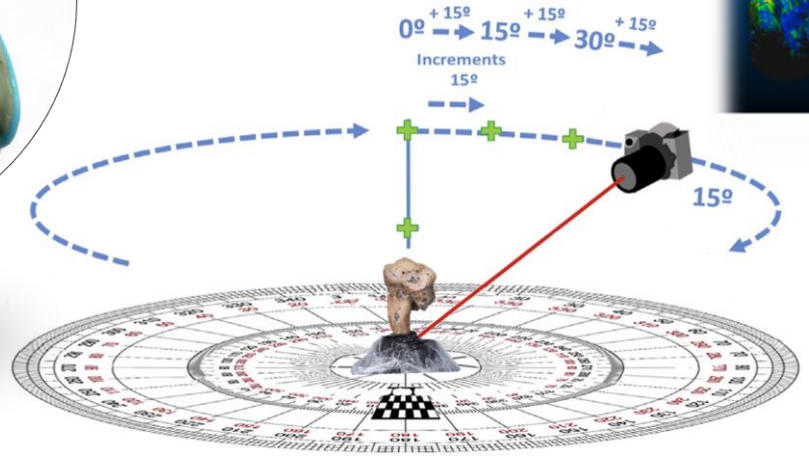
Before sending samples for destructive analysis: **analysis, make a double copy & document**!

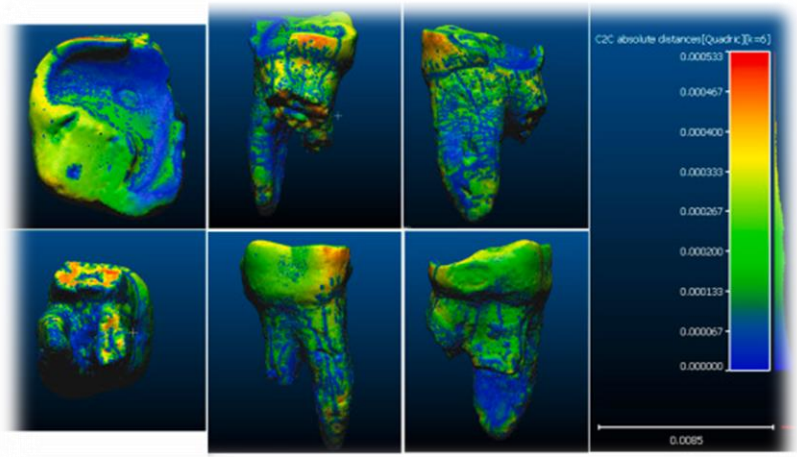
2. Sampling (lab)

Cast, Photo, Photogrammetry, Ct Scan… depending on **budget, access to materials & schedule**!

No pathological teeth

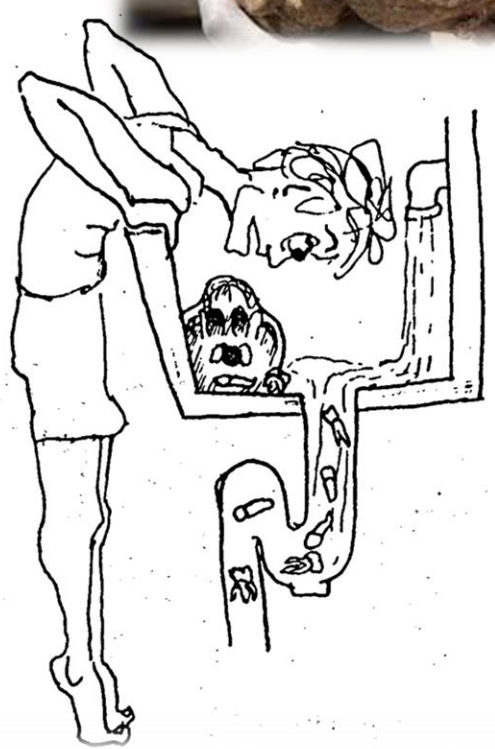




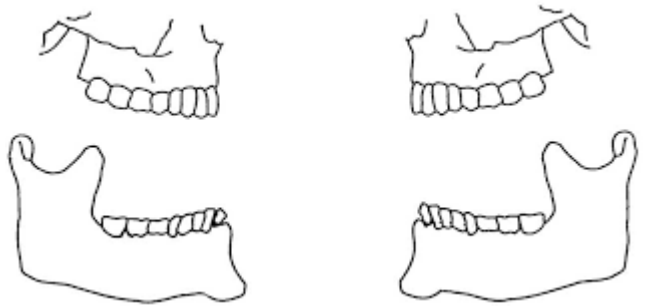


3. Cleaning

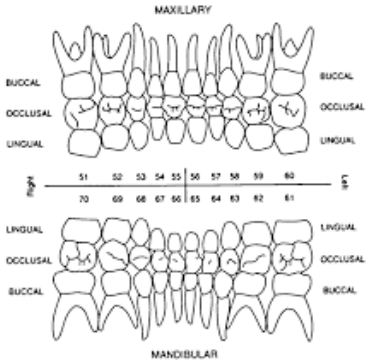
- Water only
- Change the water
- Use a 1mm mesh sieve to prevent loss
- Care with teeth that have plaque (calculus) deposi
- Allow to dry naturally away from direct sunlight
- Do not use artificial drying devices



4. Recording: Inventories

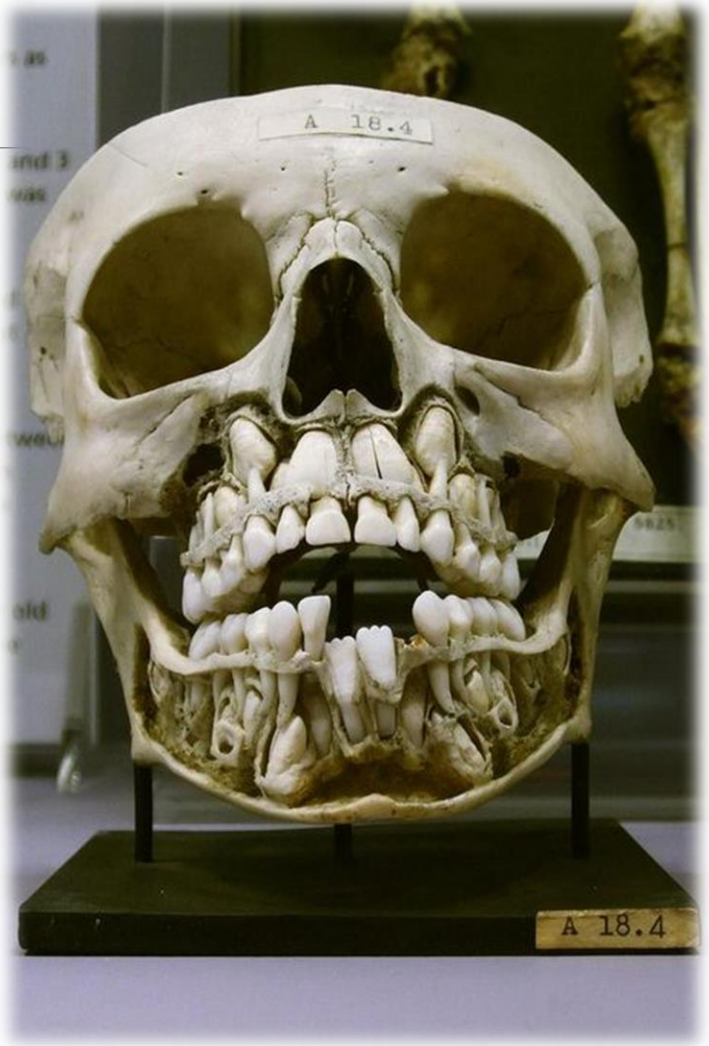


- Double check the ‘Skeleton Recording Sheet’
- If absent? Do it!



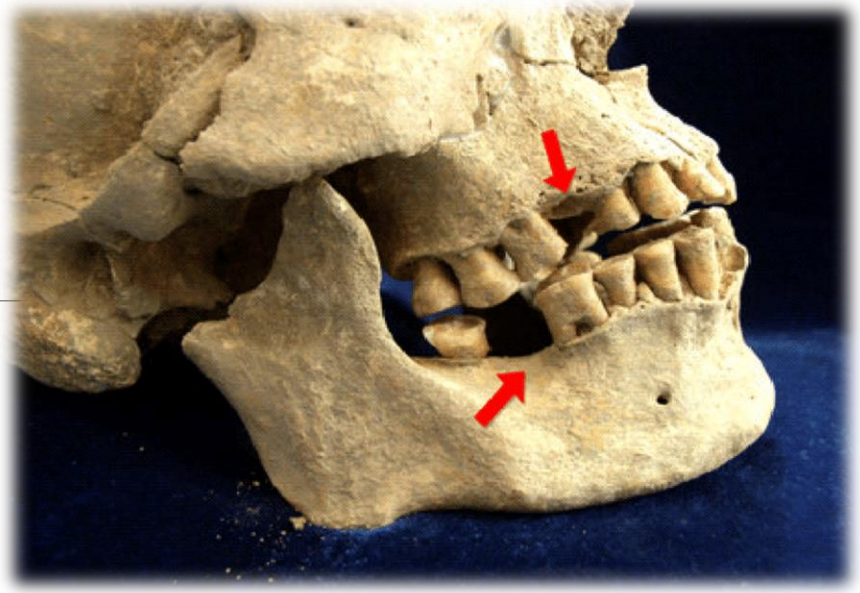
4. Recording: Inventories

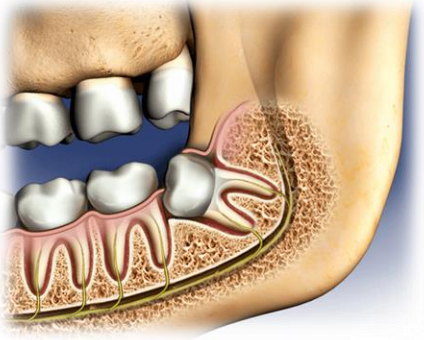
- Subtle morphological variations can be used to identify & side individual teeth (Hillson 1996; Lease 2016)
- **Human dentition** is usually comprised of **20 deciduous** (or milk) teeth gradually replaced with **32 permanent teeth**
- **Permanent dentition** starts to form just **before birth** and ends with the development and eruption of the **3rd molars**
- During long periods of a child's life, **both deciduous and permanent teeth are present** in various states of development



4. Recording: Inventories

- Number of teeth in an adult dentition can **occasionally vary**
- In some, teeth such as the 3rd permanent molars **congenitally absent**
- Disease, trauma or cultural practices -> **loss of teeth during life**
- Some are **lost post-mortem**
- **Extra** (supernumerary) teeth: less common & highly irregular form (Nelson 2016)

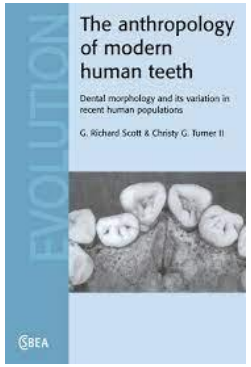


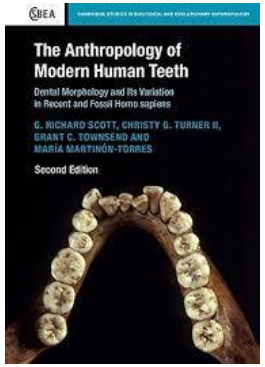


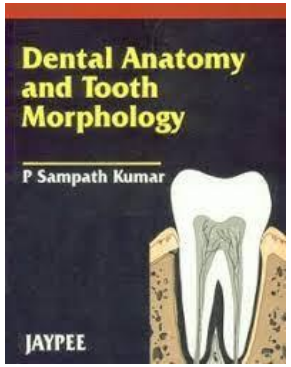
4. Recording: Inventories

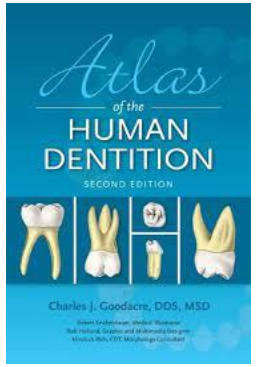
Methods employed to identify & label teeth:

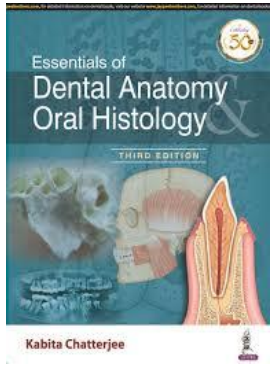
- Most remained the same since the last edition
- Some have been re-evaluated & improved upon (e.g., Irish & Scott 2016)

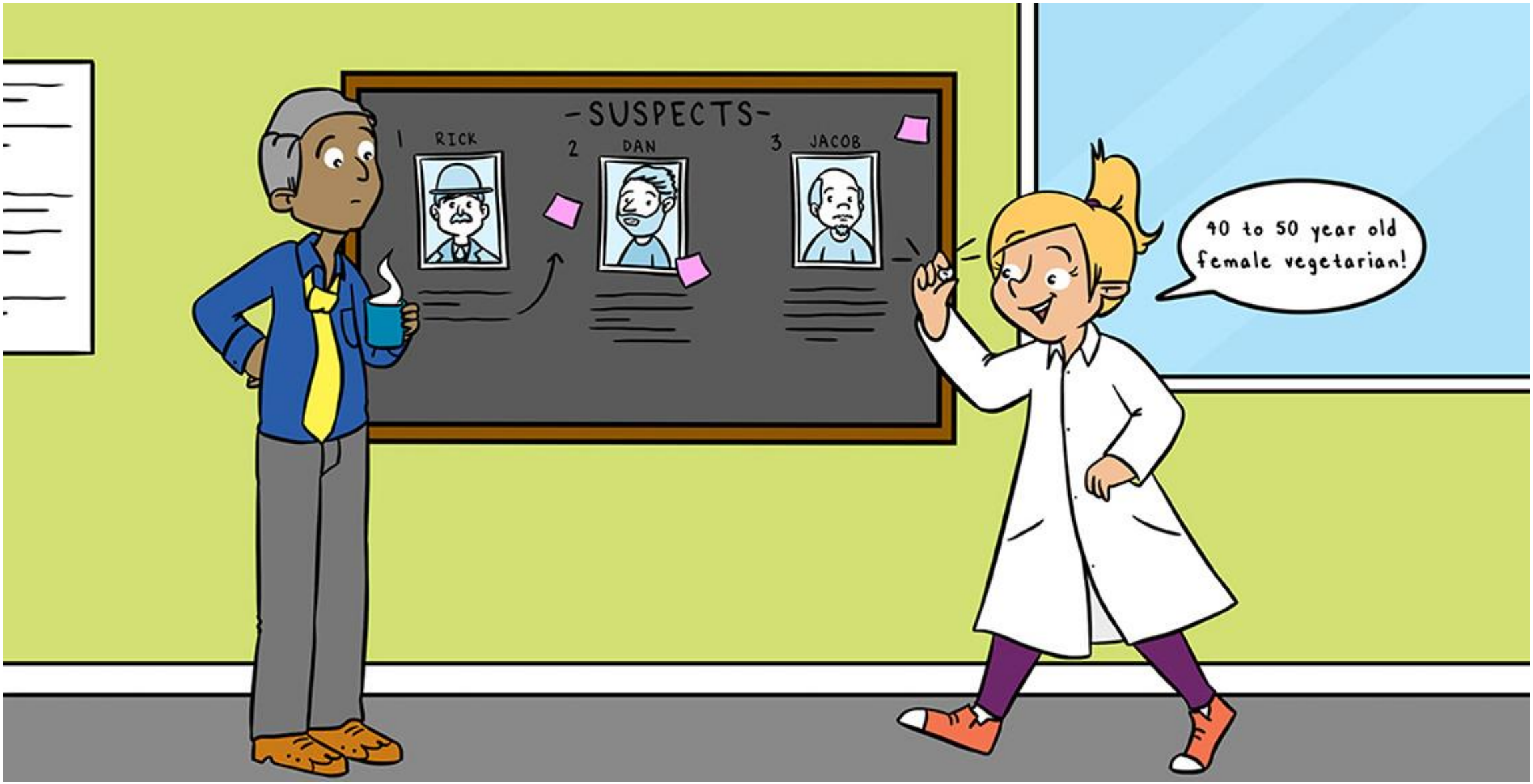








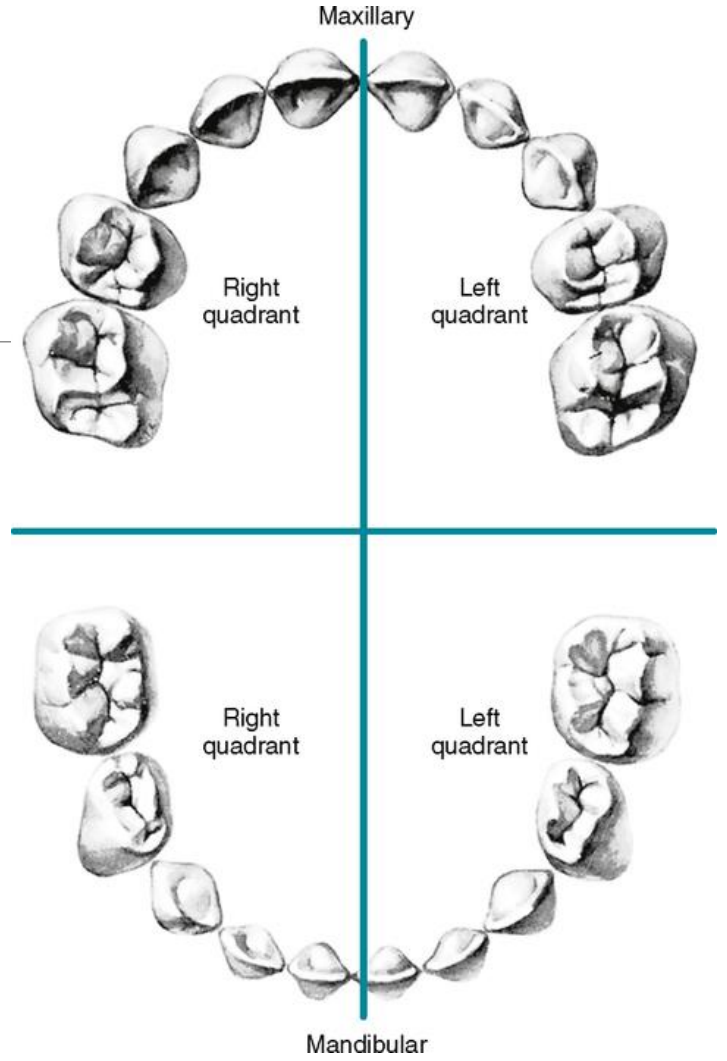



-SUSPECTS-
1 RICK
2 DAN
3 JACOB
40 to 50 year old female vegetarian!

4. Recording: Inventories

- Dental inventories used to record presence of individual teeth
- As teeth can be **lost pre- or post-mortem**, the presence of their supporting structures (ie, tooth positions or the root sockets into which they may have once fitted) should also be recorded when observable
- Most systems divide teeth into **four quadrants** that mirror each other:

1. the maxillary right,
2. maxillary left,
3. mandibular left
4. mandibular right



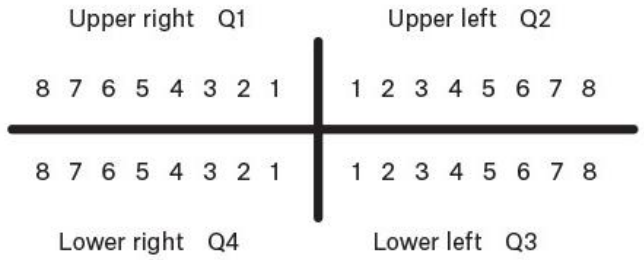
(Beek 1983; Hillson 1996)

4. Recording: Recording system

Each quadrant of the **permanent dentition** is made up of

1. two incisors
2. one canine
3. two premolars
4. three molars

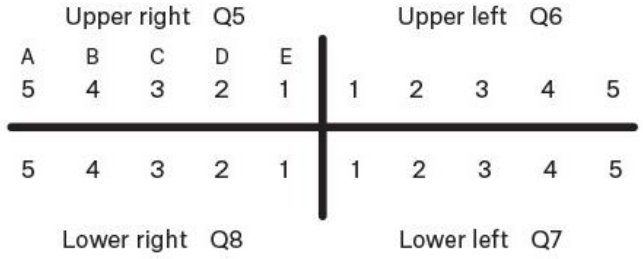
numbered in each quadrant from 1 to 8 respectively from the central incisor to the 3rd molar.



In the **deciduous dentition**, each quadrant is made up of

1. two incisors
2. one canine
3. two molars

labelled from 'a' to 'e' or 1 to 5 respectively from the central incisor to the 2nd molar.

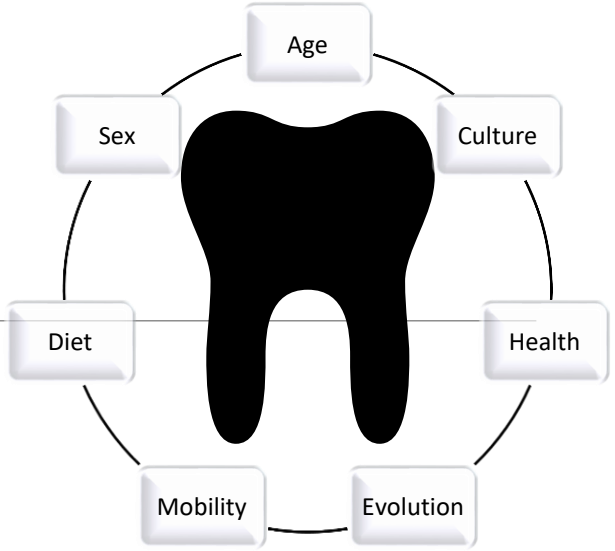


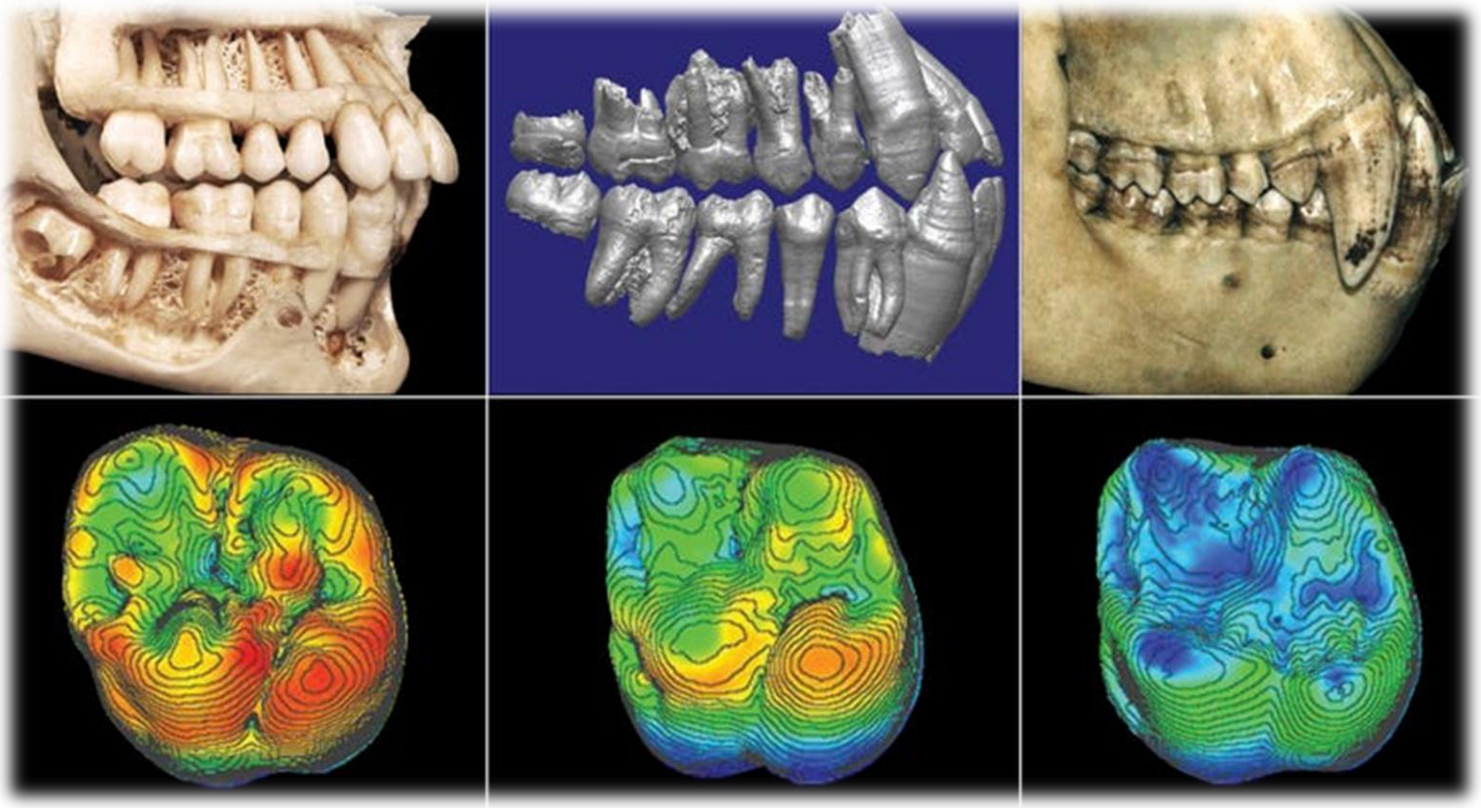
Do not!

Glue a tooth into a socket because this will prevents access to check the tooth roots for disease

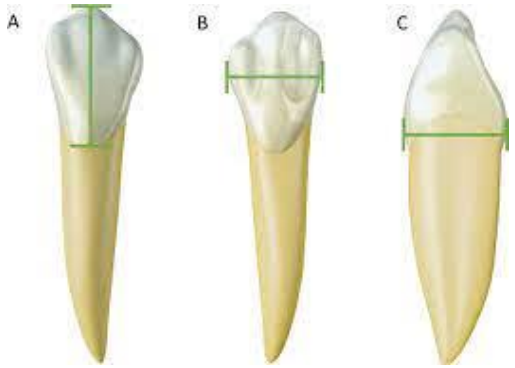

ARCHAEOLOGY
I DIG DEAD PEOPLE

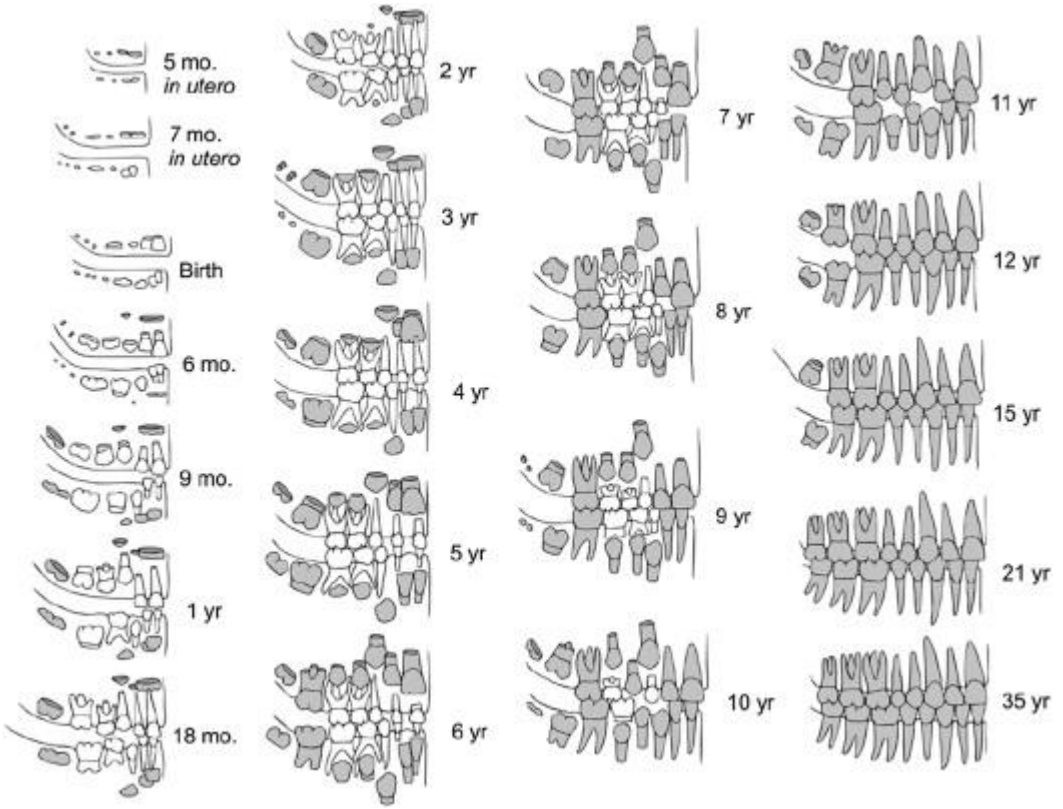
5. Analysing

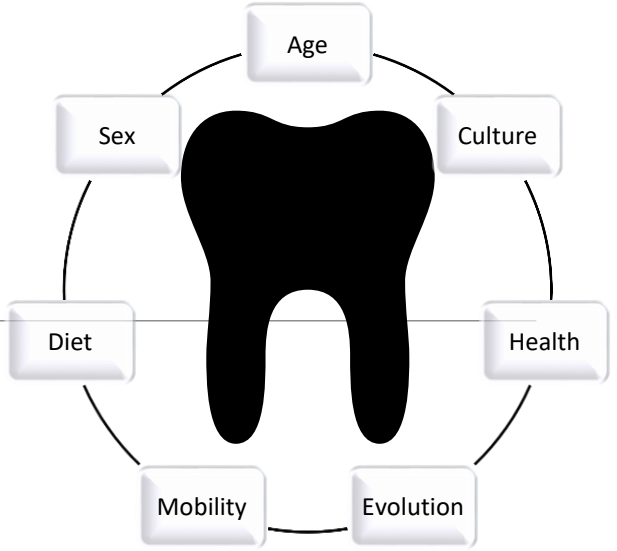


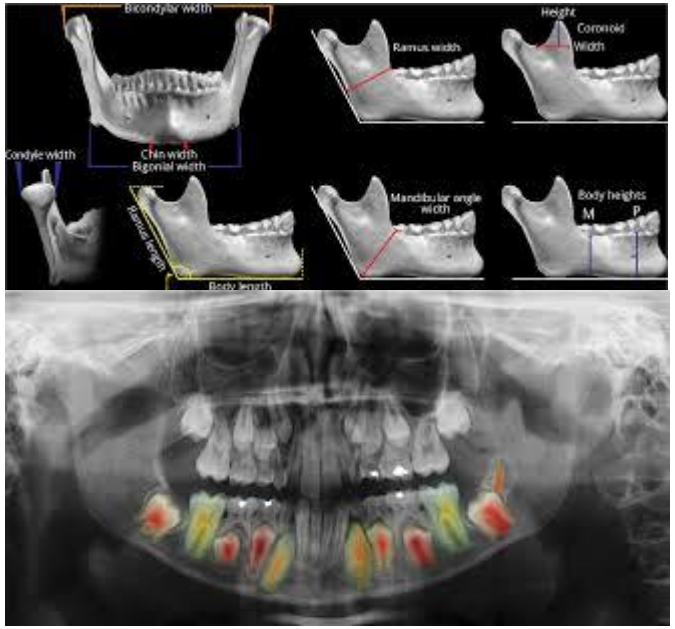


5. Analysing

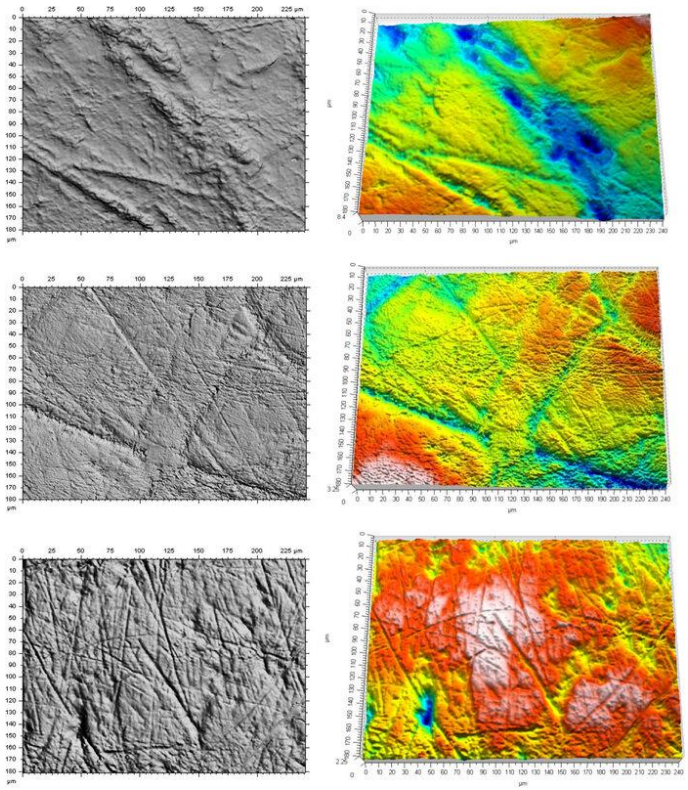

A
B
C

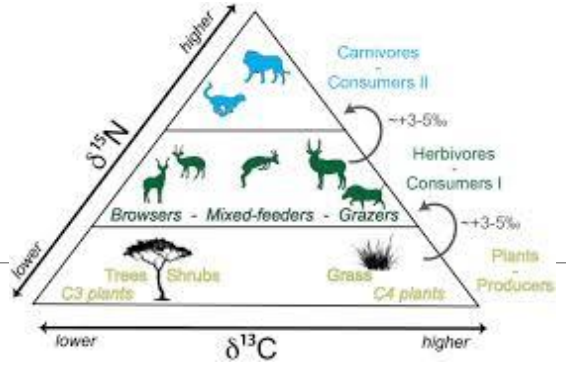

5 mo. in utero
7 mo. in utero
Birth
6 mo.
9 mo.
1 yr
18 mo.
2 yr
3 yr
4 yr
5 yr
6 yr
7 yr
8 yr
9 yr
10 yr
11 yr
12 yr
15 yr
21 yr
35 yr

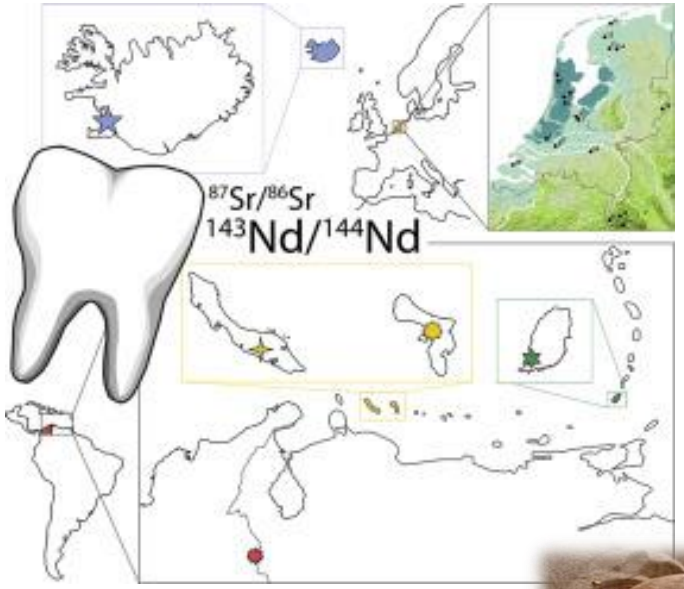

Age
Culture
Health
Evolution
Mobility
Diet
Sex

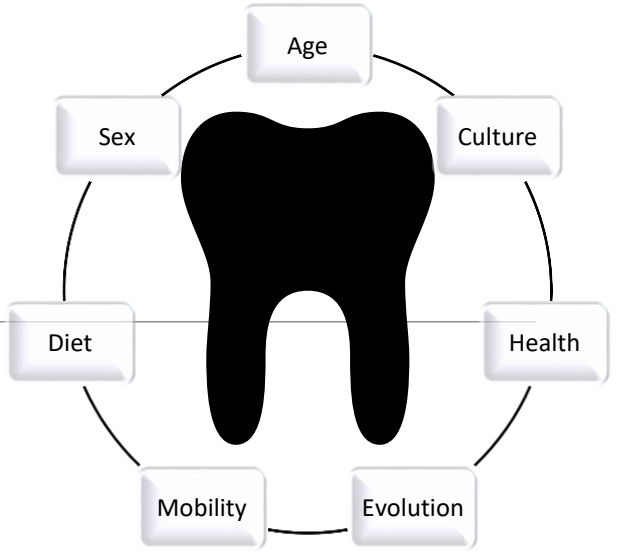

Bicondylar width
Ramus width
Height
Coronoid Width
Condyle width
Chin width
Bigonial width
Mandibular angle width
Body heights
M
P
Ramus length
Body length

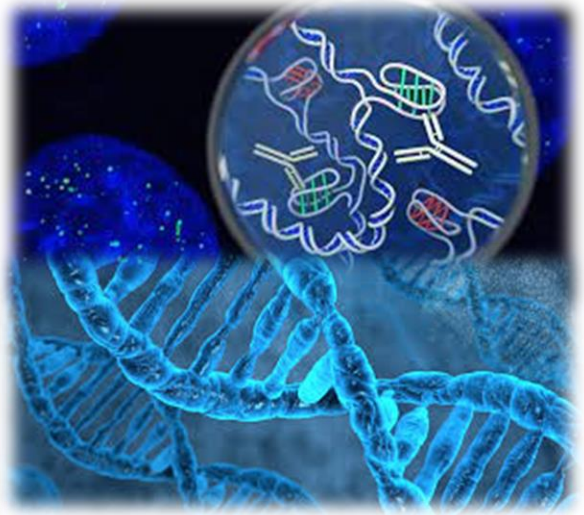
5. Analysing



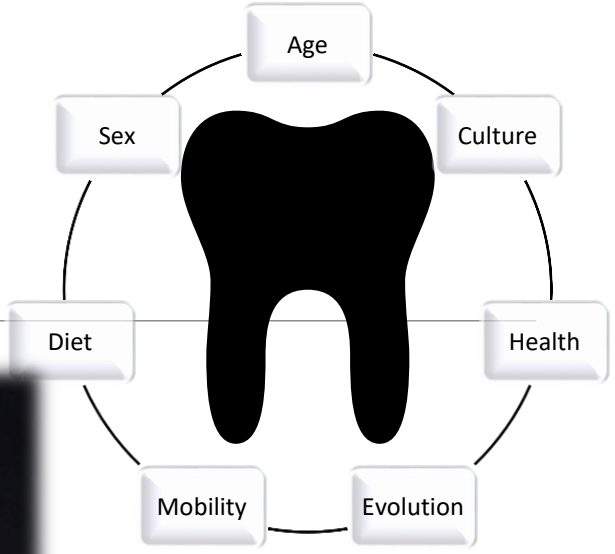

higher
lower
$\delta^{15}N$
Carnivores
Consumers II
~+3-5‰
Herbivores
Consumers I
~+3-5‰
Browsers - Mixed-feeders - Grazers
Trees Shrubs
C3 plants
Grass
C4 plants
Plants
Producers
lower
$\delta^{13}C$
higher


$^{87}Sr/^{86}Sr$
$^{143}Nd/^{144}Nd$


Age
Culture
Health
Evolution
Mobility
Diet
Sex

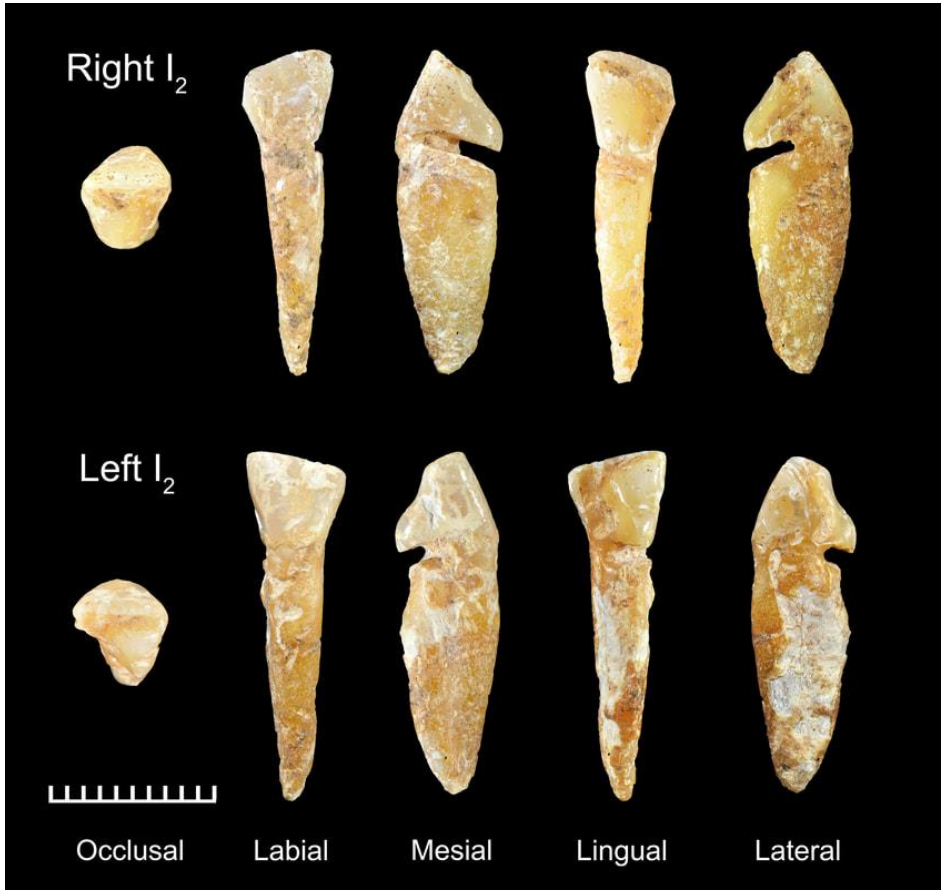


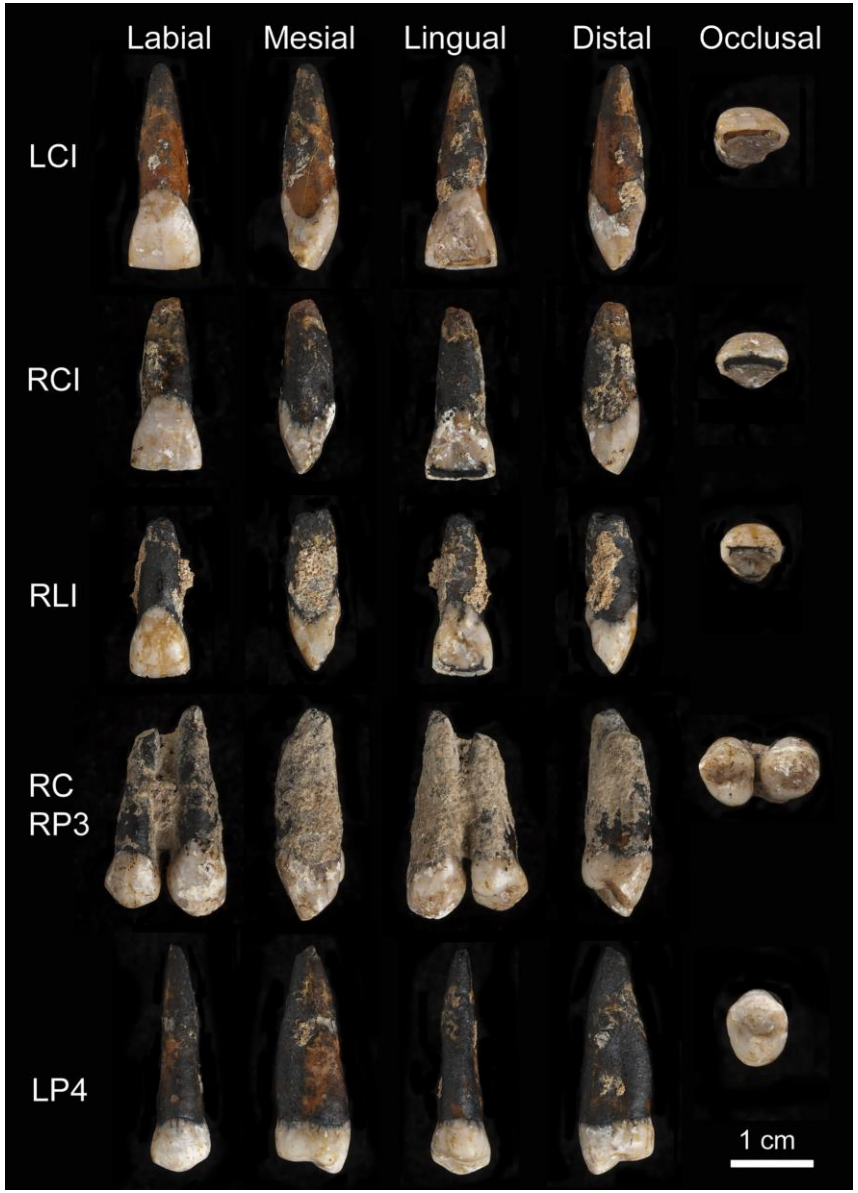
5. Analysing



6. Documenting

6. Documenting

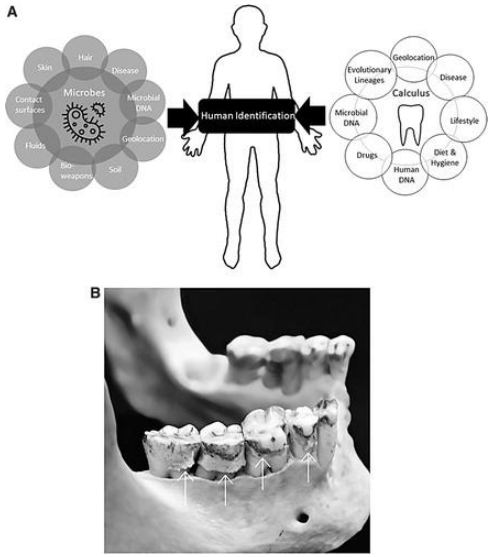



Labial
Mesial
Lingual
Distal
Occlusal
LCI
RCI
RLI
RC
RP3
LP4
1 cm

6. Documenting

~~1. Photos~~

2. **Publications**



European Journal of Dental and Oral Health
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RESEARCH ARTICLE

Introduction of New Tooth Notation Systems in Comparison with Currently In-Use Systems

Ozair Erfan, Elham Qasemian, Manizha Khan, Aziz-ur-Rahman Niazi

ABSTRACT

Dental charting, referral notes, and dental financial claims are integral parts of dental practices for their smooth and effective usage. Currently, dental charting is proceeded by one of the three commonly used tooth notation systems, The Zsigmondy-Palmer, Federation Dentaire International, and American Dental Association. Although these systems have been used and adopted internationally, in practice, there is much confusion in referring to a tooth, which leads to mismanagement and eventually leads to confusion affecting the clinician-patient relationship. Hence, a growing need for a new system to make dental charting simple, secure, and void of confusion is always felt. In this experiment, we evaluated currently in use tooth notation systems and introduced three tooth numbering systems named based on the place of origin as the Herat Dentistry Faculty 1, Herat Dentistry Faculty 2, and Herat Dentistry Faculty 3 tooth notation systems. A questionnaire containing 17 questions was designed, a meeting was held with the participants where both systems were introduced, and the questionnaire was explained to them. The questionnaire was filled by a population of 481, among which 213 were randomly selected, and data were entered into SPSS. The results proved that the three newly suggested systems are more efficient in terms of learning and entering into patient files compared to traditionally in-use systems.

Keywords: Tooth notation, Zsigmondy-Palmer, FDI, Universal, New methods.

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CHAPTER 2 A Brief History of Dental Anthropology

G. Richard Scott

PNAS RESEARCH ARTICLE | ANTHROPOLOGY

Dental data challenge the ubiquitous presence of *Homo* in the Cradle of Humankind

Clément Zanolli[a,1], Thomas W. Davies[b,c], Renaud Joannes-Boyau[d,e], Amélie Beaudet[f,g,h], Laurent Bruxelles[g,i,j], Frikkie de Beer[k,l], Jakobus Hoffman[k], Jean-Jacques Hublin[b], Kudakwashe Jakata[m], Lazarus Kgasi[n,o], Ottmar Kullmer[o,p], Roberto Macchiarelli[q,r], Lei Pan[s,t,2], Friedemann Schrenk[o,p], Frédéric Santos[u], Dominic Stratford[g], Mirriam Tawane[n], Francis Thackeray[m], Song Xing[s,t], Bernhard Zipfel[m], and Matthew M. Skinner[b,c,v]

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Homo
J. Comp. Hum. Biol.
Published online October 2022

PrePub Open Access Article

Teeth macroabrasion for determination of dental age and diet in the Illyrian population from the Kopila necropolis on the Island of Korčula, Croatia

Marina Marić[1,*], Dinko Radić[2], Jelena Dumančić[1], Marin Vodanović[1], Minja Birimiša[1], Davorka Radovčić[3], Hrvoje Brkić[1,*]

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6. Documenting

1. ~~Photos~~
2. ~~Publications~~
3. **Database**

https://newro.co/osteology-recording-system/

6. Documenting

~~1. Photos~~

~~2. Publications~~

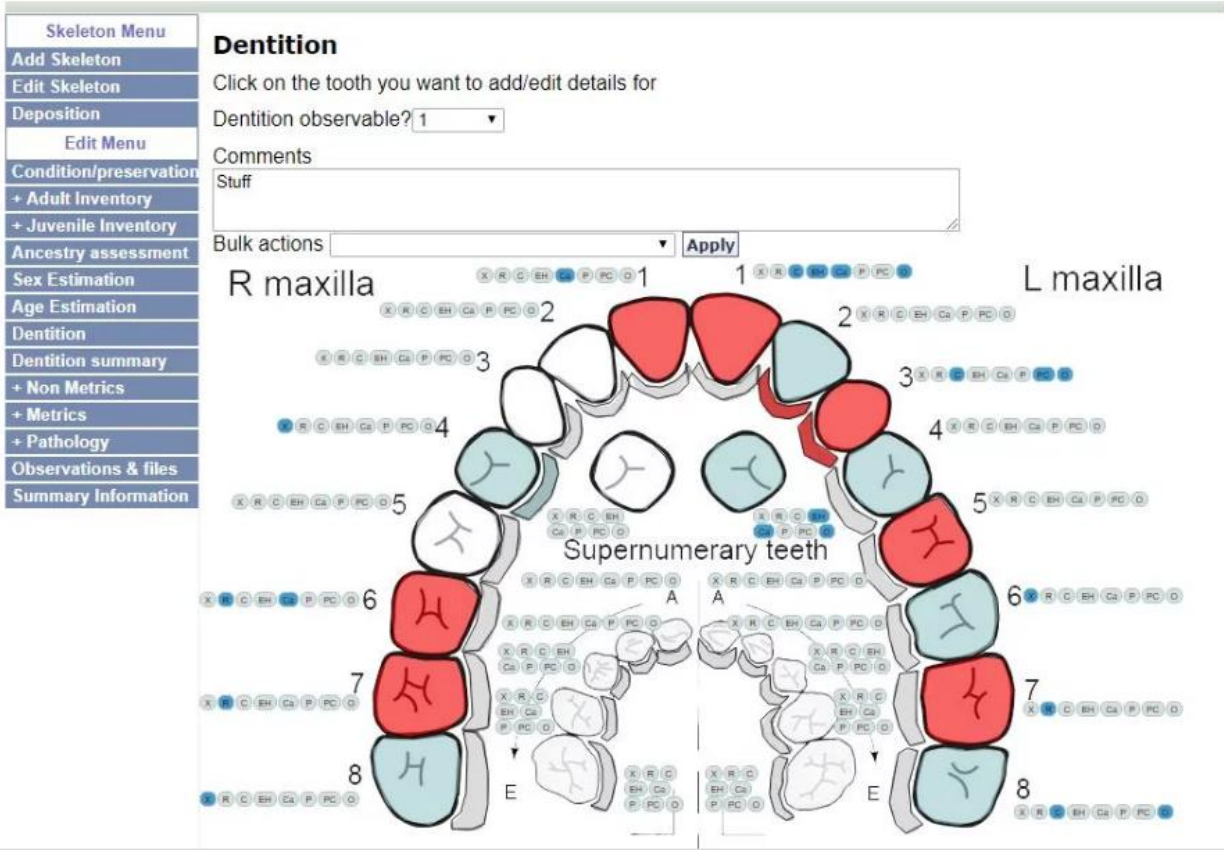
3. **Database**

https://newro.co/osteology-recording-system/

Dentition data entry

Dentition data entry is very complex. Each tooth allows for detailed data entry by clicking on them and adding the data in the form that pops up. Easier data can be added for each tooth by using the quick buttons which add or remove certain data for a tooth. e.g caries, present or absent, etc.

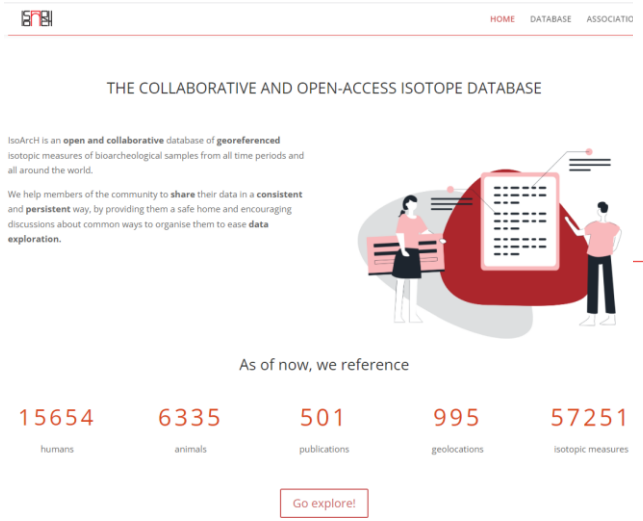
This same section allows data entry for deciduous teeth, supernumerary teeth and even about the tooth sockets.



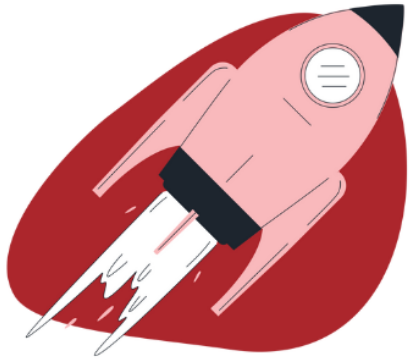
6. Documenting

1. ~~Photos~~
2. ~~Publications~~
3. **Database**

https://isoarch.eu/



THE ISOARCH INITIATIVE



Welcome to IsoArcH – the premier community-driven platform for isotope research in bioarchaeology and forensic sciences.

More than just a database, IsoArcH embodies a collaborative spirit and an unwavering commitment to open data culture. By fostering knowledge-sharing, IsoArcH offers researchers an unparalleled opportunity to connect and collaborate.

Join forces with like-minded individuals, harness the power of pooled knowledge, and take your research to the next level with IsoArcH.

More than

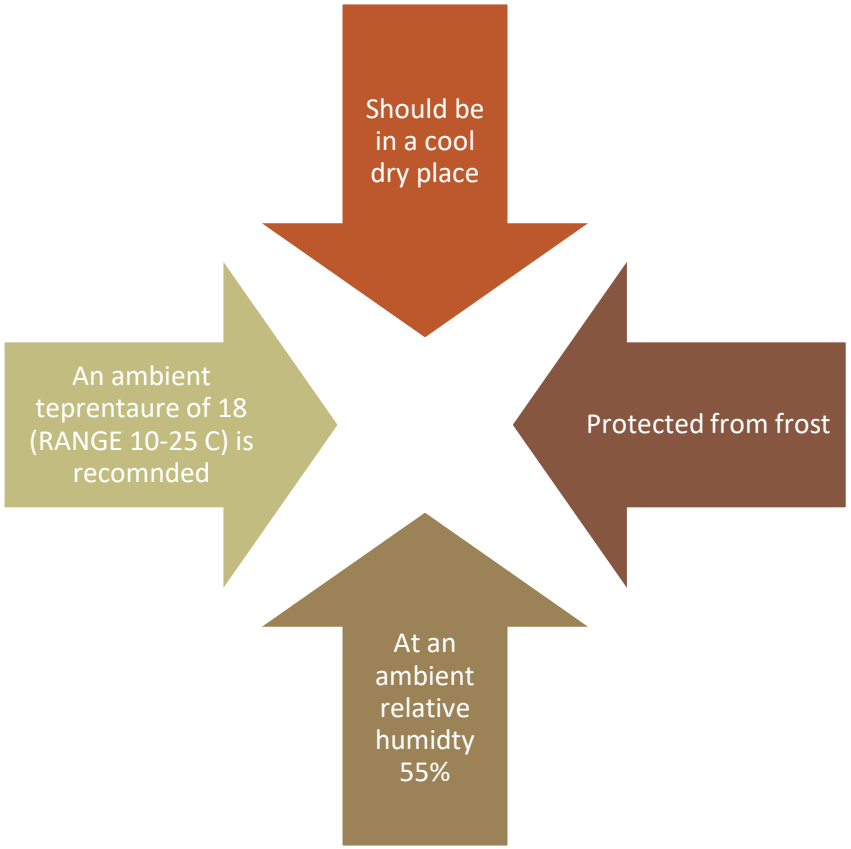
50000

georeferenced isotopic measurements

Welcome to the Dental Anthropology Association!

The Dental Anthropology Association (DAA) is a non-profit 501(c)(3) organization which seeks to stimulate interest in dental anthropology, a subfield of biological anthropology. Dental anthropology utilizes the dentitions of humans and other non-human primates—both past and present—to answer questions of anthropological interest. These questions can include (but are by no means limited to): How are individuals and populations related? What did their diet look like? How healthy were they?

7. Restoring


Should be in a cool dry place
An ambient teprentaure of 18 (RANGE 10-25 C) is recomnded
Protected from frost
At an ambient relative humidty 55%


Box 1
18CV317
Lots 17-25
Boxes can be marked directly in the bottom right corner in the area that will later be covered by the 3" x 4" permanent label.
Temporary labels can be made with a piece of paper folded over the edge.
Post-its work as temporary labels.
Do not use adhesive label holders, as these are often difficult to remove.

8. Ethics

NOW, ITS YOUR TURN