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LABORATORI DI ANTROPOLOGIA

FERRARIAE UNIVERSITAS · 13 91 · EX LABORE FRUCTUS

UNIVERSITÄTSMEDIZIN GÖTTINGEN UMG

Department Of Biomedical And Specialty Surgical Sciences
Laboratory of Archeo-Anthropology & Forensic Anthropology

Microscopic Paleo-Pathology

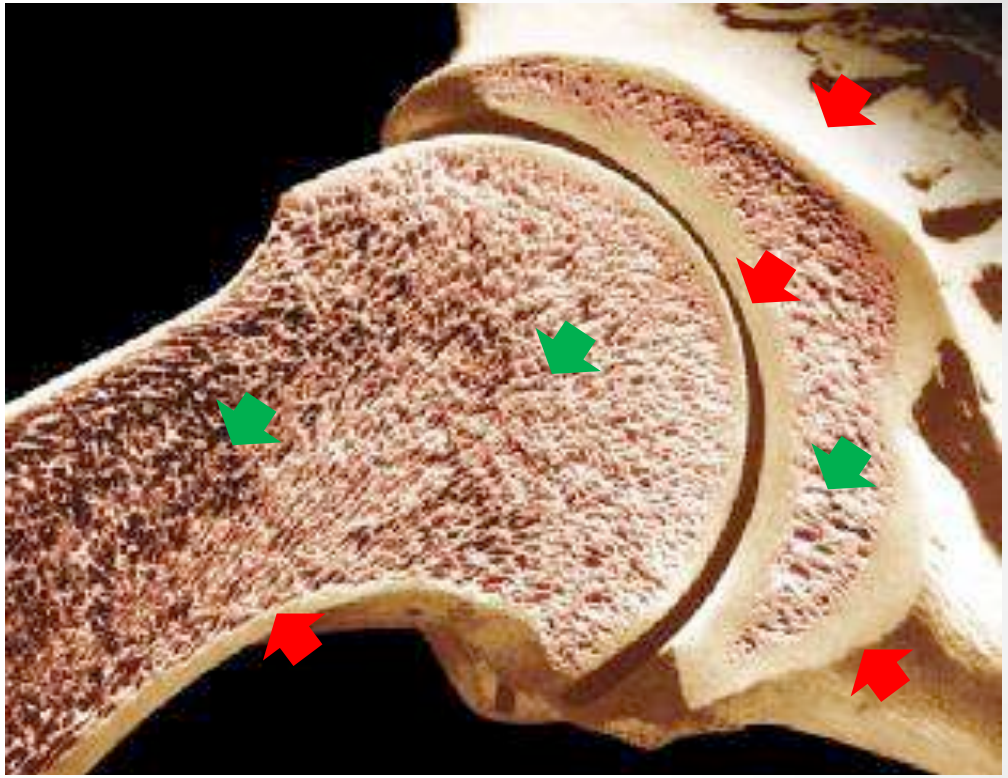
Collection, treatment and preparation of archaeological human remains for histopathological investigation

Ph.D. Student
Filippo Scianò

Introduction

Paleopathology: studies the pathological conditions found in ancient human and animal remains.

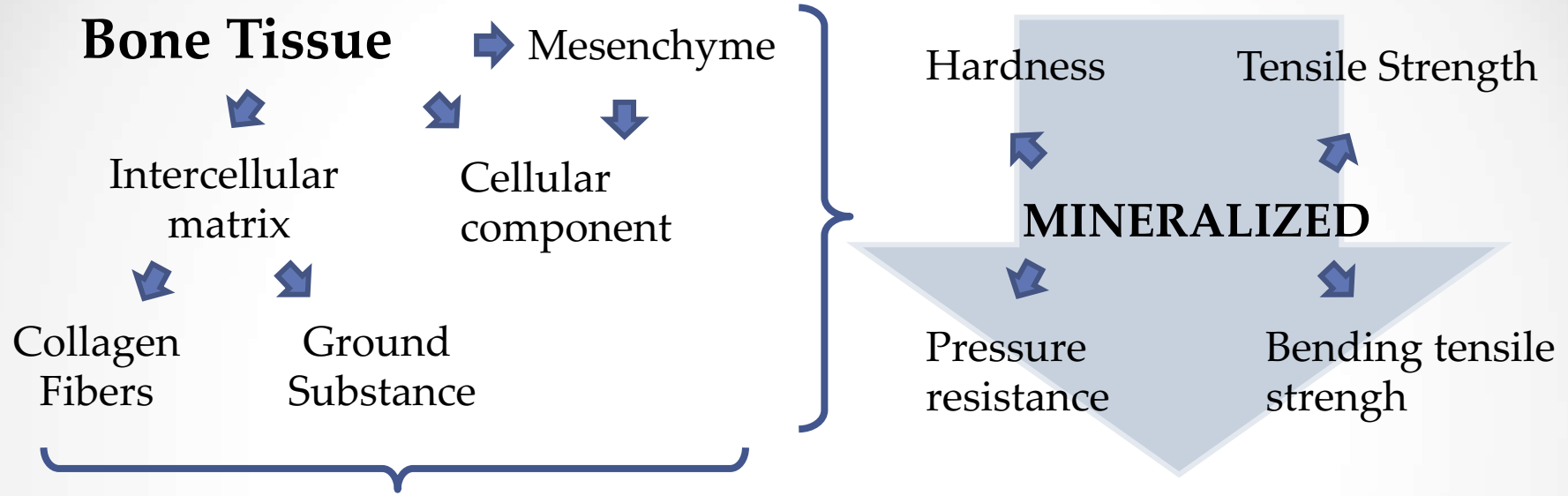
Hystology: studies the microscopic structure of animal and vegetal tissues.



Bone Tissue

Compact bone **Trabecular bone**

Bone Tissue



Spongy Bone + **Compact Bone**

- *Bone trabeculae* oriented and intersected each other.
- *Medullary cavity* hosts the hematopoietic bone marrow

- No macroscopic cavity.
- It coats the spongy bone.

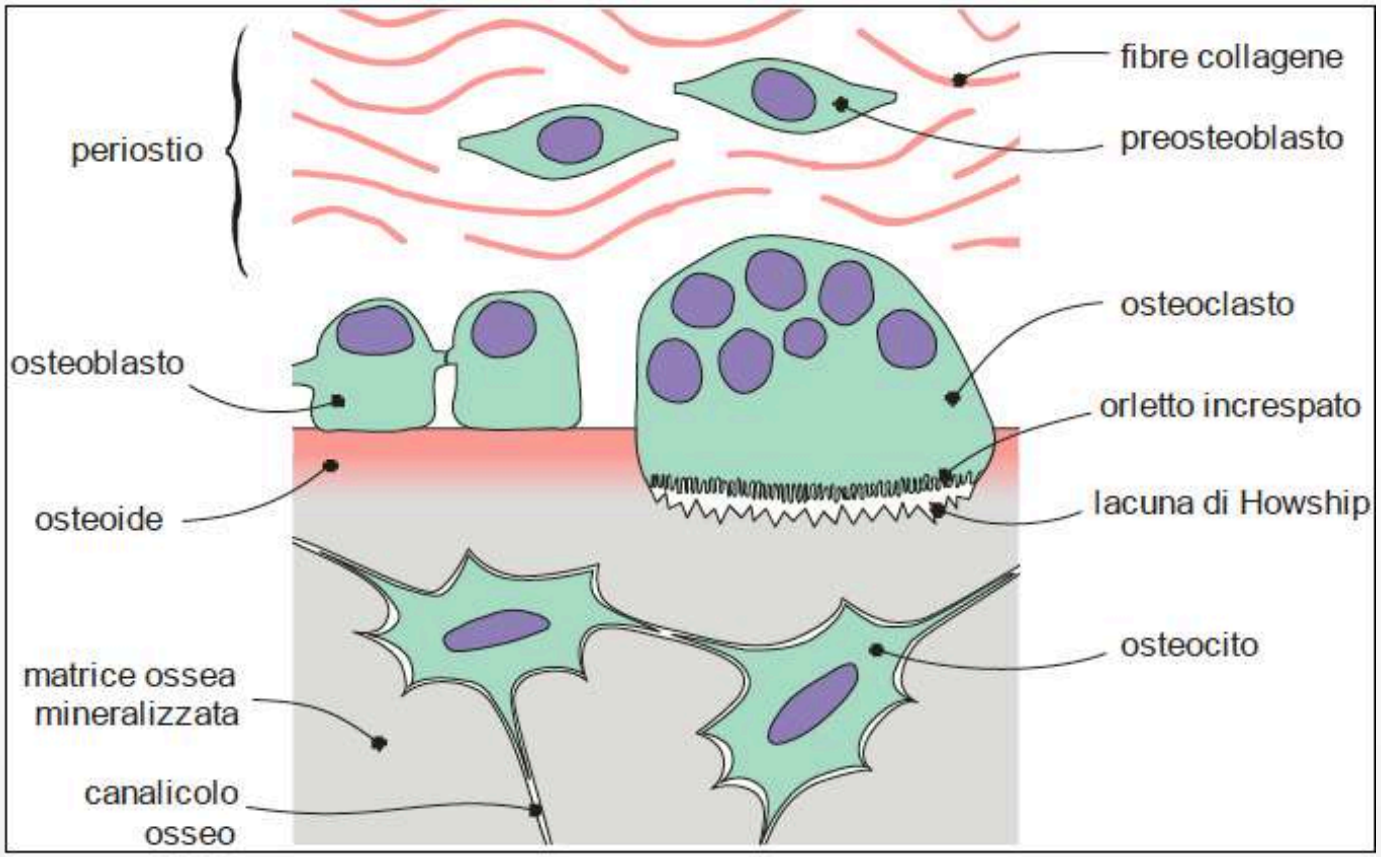
LIGHTNESS

Mineral component

- Calcium phosphate (Hydroxyapatite)
- Calcium carbonate
- Calcium floride
- Magnesium phosphate

Cellular components

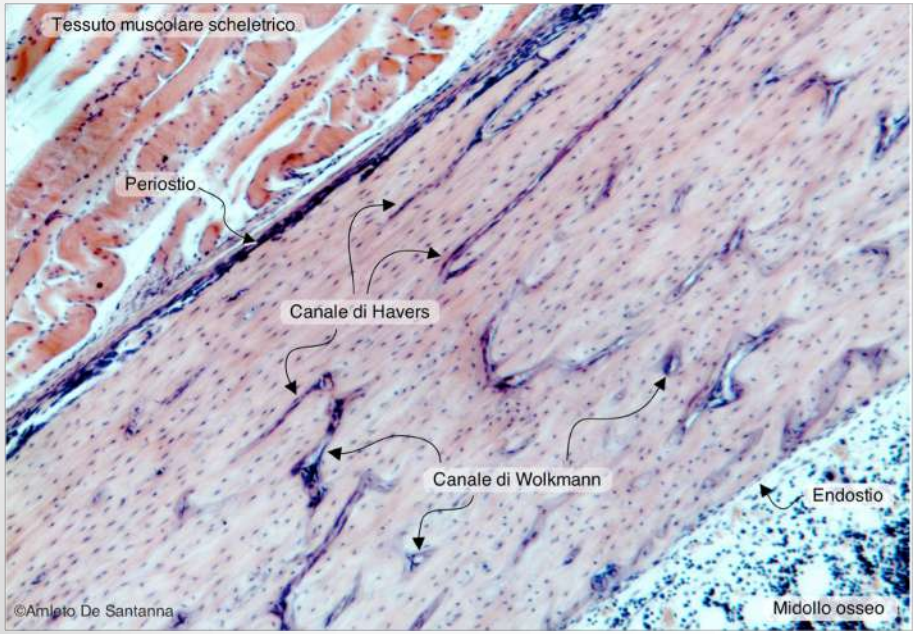
- Pre-Osteoblasts ➔ Osteoblasts
- Osteocytes
- Osteoclasts

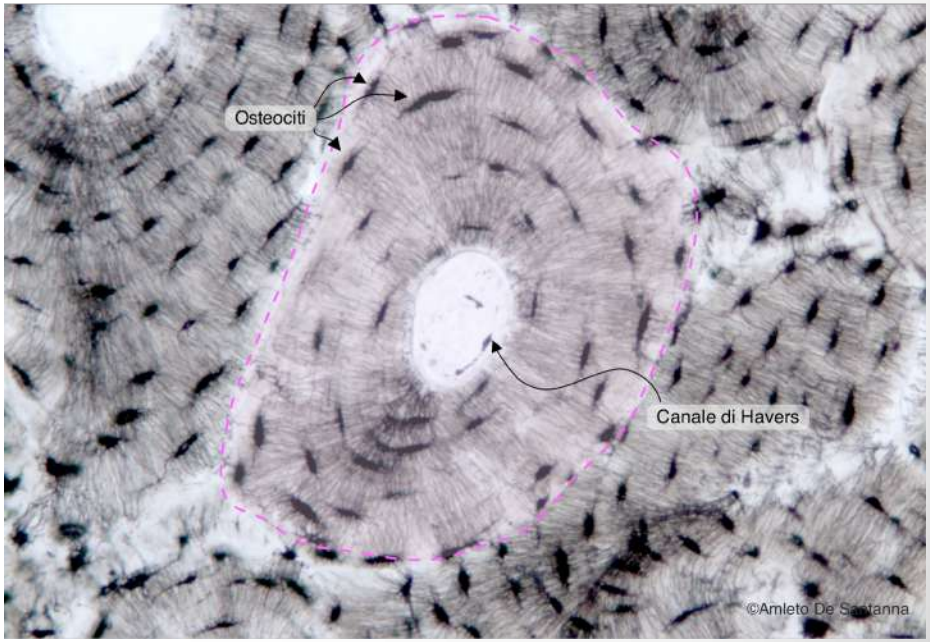


Structure

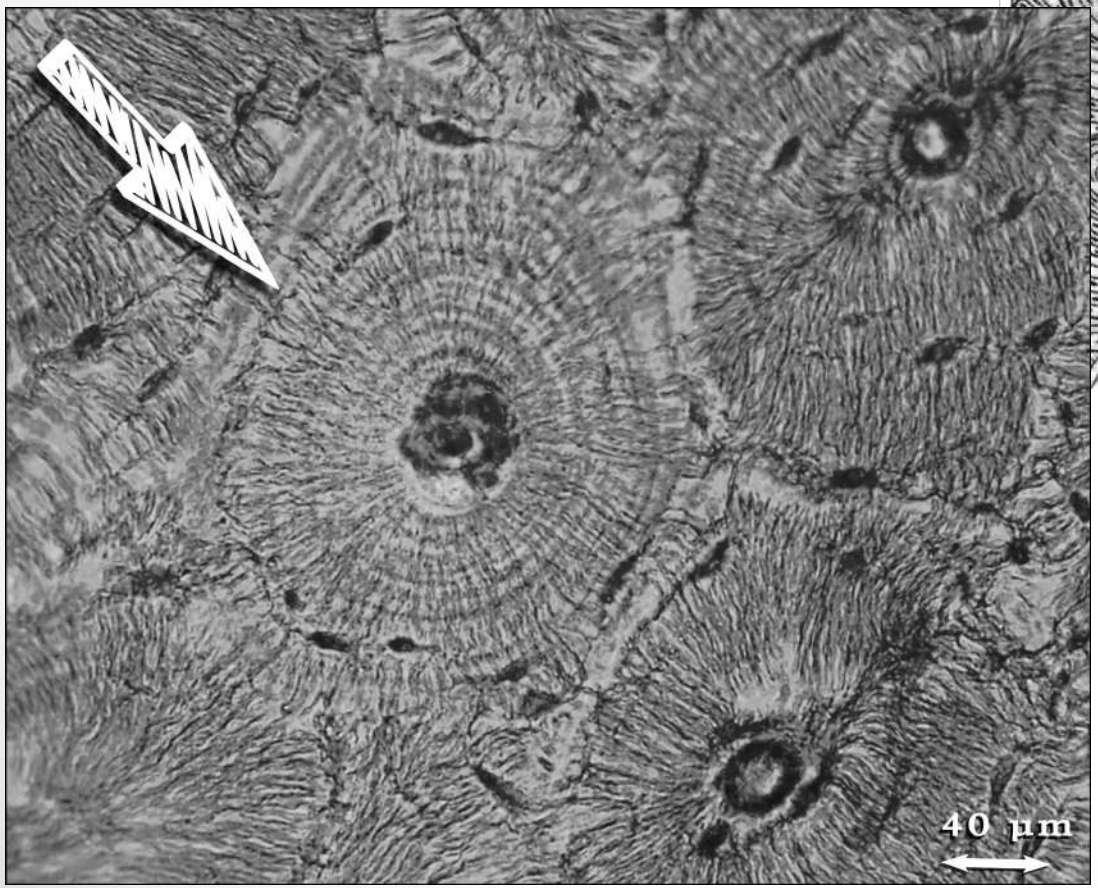
Lamellar bone

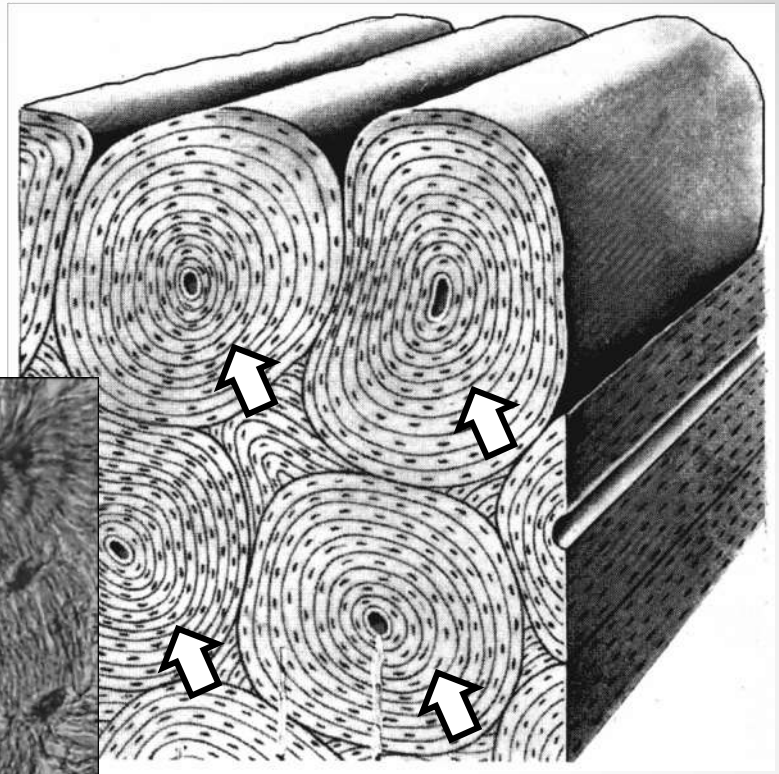
Compact bone Spongy bone



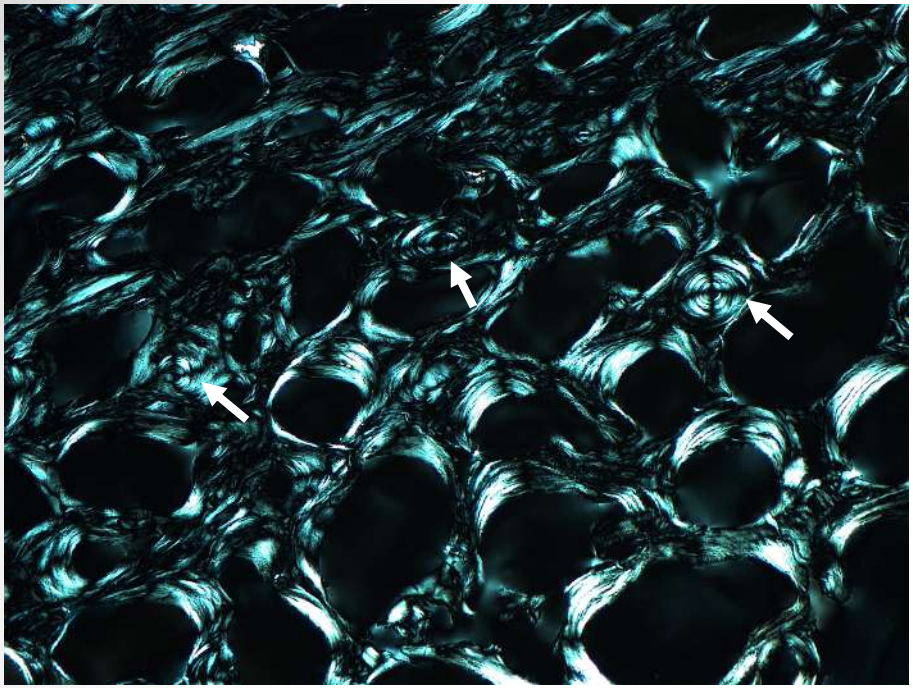


Haversian System

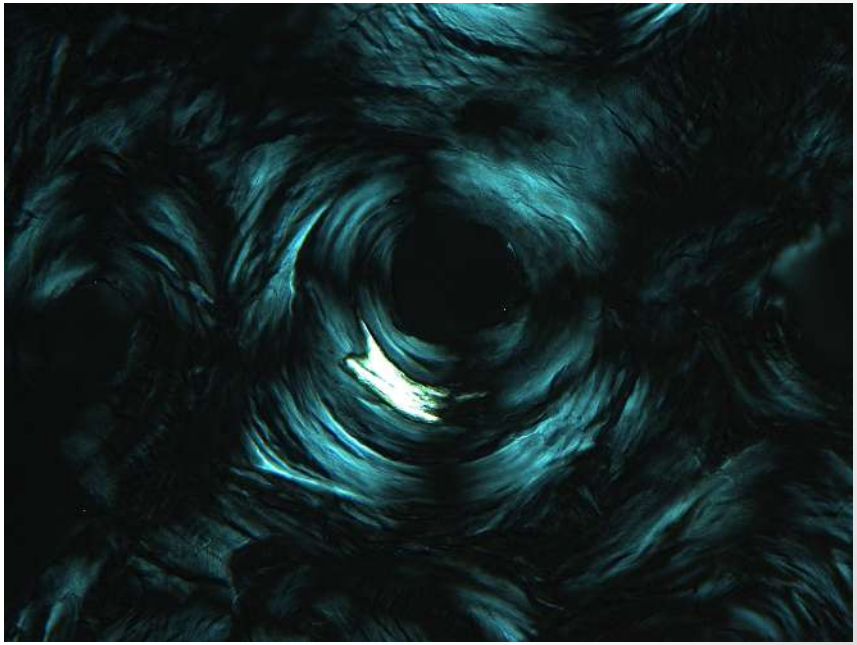




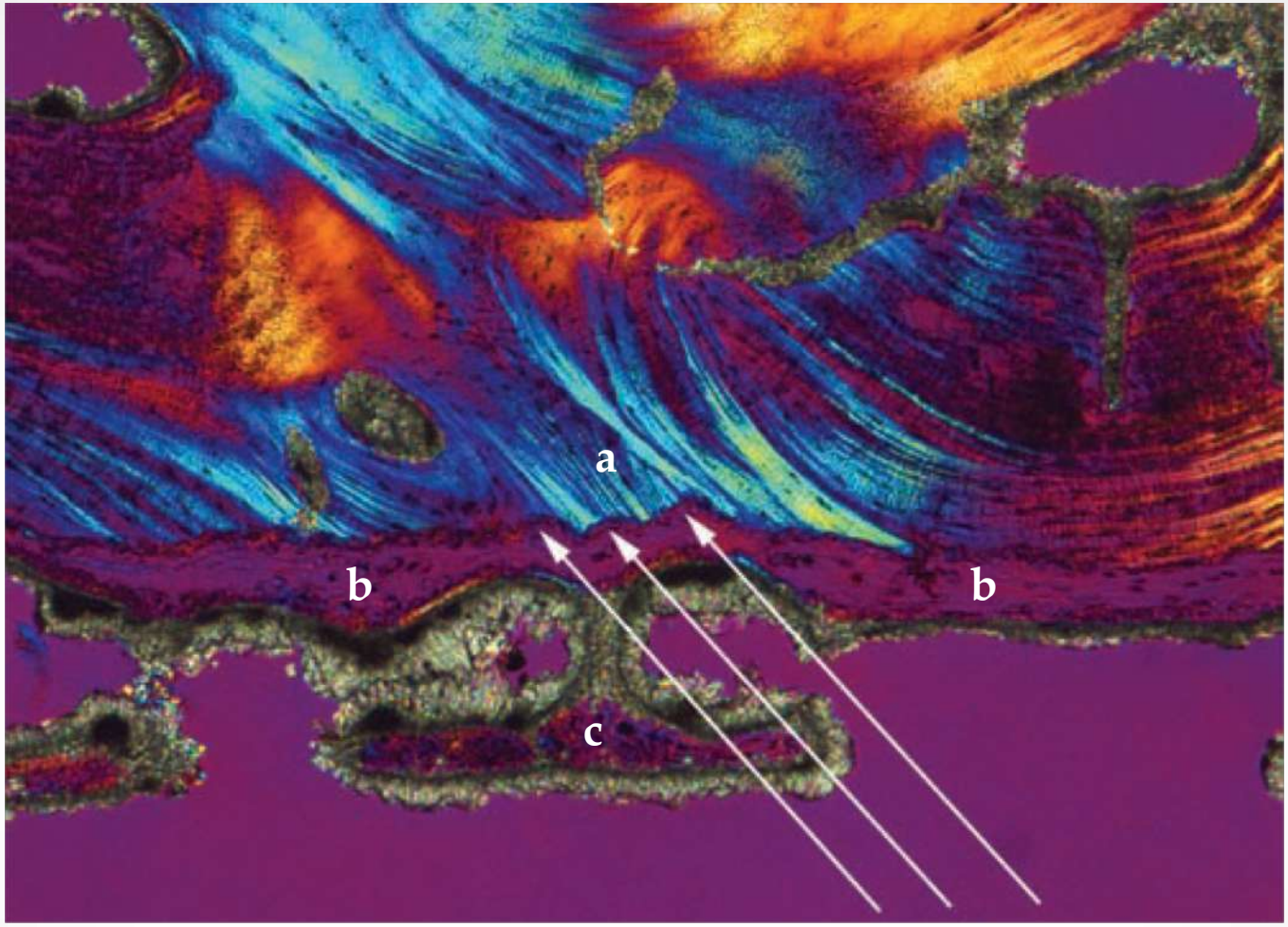
Tridimensional drawing of Haversian Systems:
Frecce = Haversian System



SSM (Italy), US 81, Middle Adult.
Pariet dx.
Fig. 1) Trabecular bone,
Arrows = Osteons. 25x magnification.



SSM (Italy), US 81, Middle Adult.
Pariet dx..
Fig. 2) Osteons. 100x magnification
Thin-ground section (50 μm) polarized light microscope.

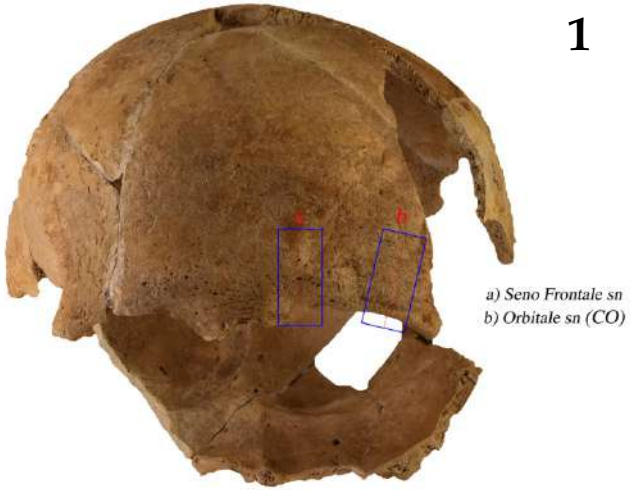


İkiztepe (Turkey), IT-Türk-145, subadult, III millennium BC. Parietal left.
CC internal lamina, probable meningeal reaction; **a** = lamellar bone **b** = new bone formation, **c** = conglomerate made by new bone formation,
Arrows = Howship's lacunae (Thin-ground section (70 µm) Polarized light microscope with polarizing filter and quartz compensator 100 X magnification. © Schultz M.

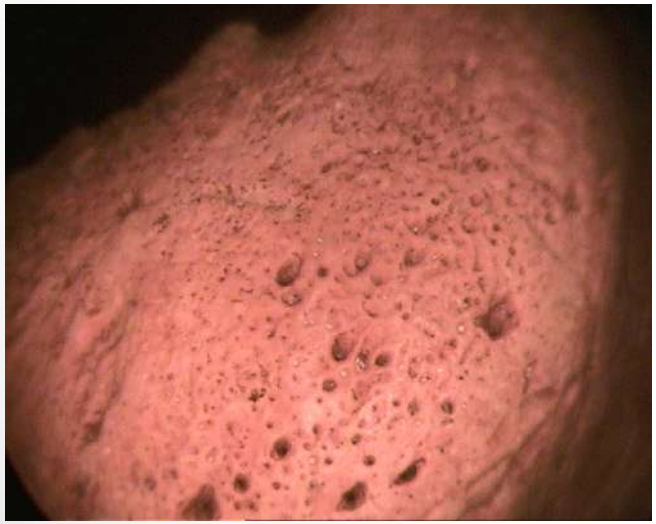
Microscopic Pathology:

Collection, Treatment & Preparation of the archaeological human bones.

1. Photographic documentation
2. Endoscopic/Microscopic documentation
3. Radiologic Documentation



1



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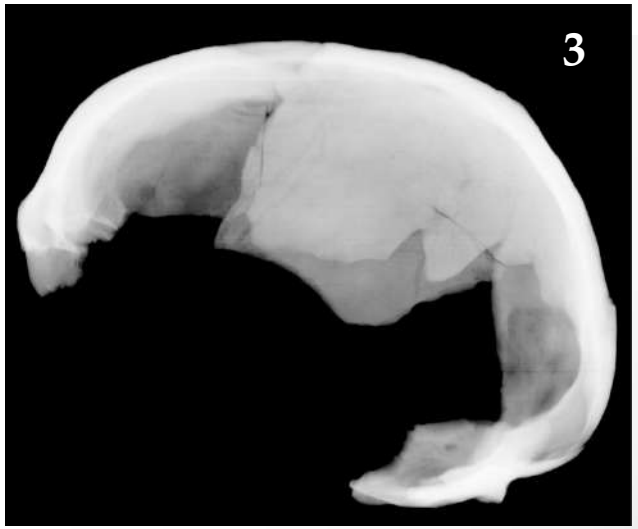


3

Sampling methods

Using:

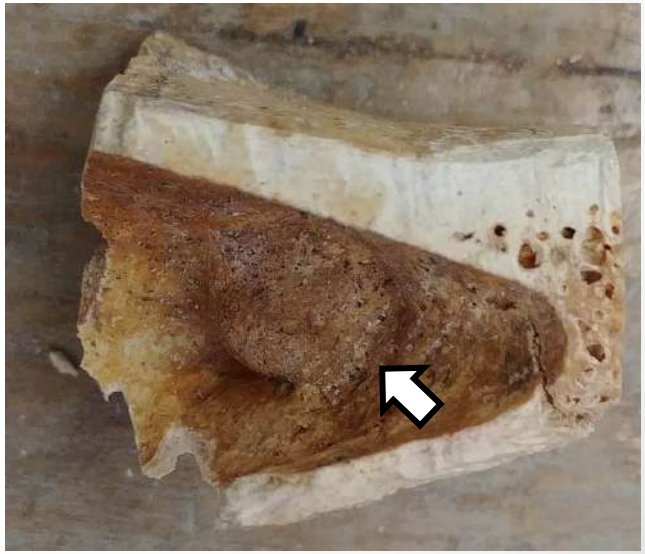
- Manual cutting
- Diamond rotary saw / surgical saw
- Drilling
- Erosion

Measuring and labelling

Sample's requirement:

- Presence-absence of the lesion
- Possibly cross-cutting
- Minimum sizes: 1 cm^2
- Maximum sizes: 5 x 7 cm

SSM 81 (Italia) – Sampling steps.



Microscopic Pathology:

Collection, Treatment & Preparation of the archaeological human bones.

The bones treatment involves some careful steps before the final inclusion in Biodur©

1. Sediment removal with soft bristle brush
2. Removing traces of adhesives with undiluted acetone
3. Immersion in Methylene Chloride or in increasing alcoholic solutions

Microscopic Pathology:

Collection, Treatment & Preparation of the archaeological human bones.

The last step of the treatment consists in the inclusion in resin:

1. Immersion of the samples in Epoxy Resin
2. Drying of samples in vacuum impregnation system
3. Creation of resin discs/cubes with included samples
4. Drying of samples in an oven at 25-30°C

Microscopic Pathology:

Collection, Treatment & **Preparation of the archaeological human bones.**

The drying phase is followed by two simultaneous phases :

Shaping

Creation of a polyhedral block with dimensions not exceeding those of the supporting glass.

Preparation of the blocks for longitudinal cutting

Creation of two mirror blocks (50µm and 70µm)

Regularisation and Polishing of the surface in contact with the supporting glass.

Arrangement on supporting glass

Thin-ground sections:

How to obtain the thin sections.

After the consolidation subsequent to the previous steps , the final procedure shall be followed:

1. Reducing block volume
2. Thinning to the proper size
3. Sanding and Polishing with leather
4. Cover with cover glass (max thickness 10µm)
5. Labelling of the sample on the slide side

Sample collection table: Different stages of creating thin sections.

Microscopy and Paleohistology:

Analysis and possible diagnoses: Some examples

Entire process of creating a batch of Thin-ground sections: 3/4 weeks.

Histological preparations ready for microstructural analysis

Recognition of microscopic structures

Comparison with benckmark collection

Polarized light microscope Leica DMRXP,
Camera Leica DFC 500.
Infraview© for digital rendering on PC.

Reconstruction work:

How to repair damage from sampling activities

Tissue collection for histological analysis

Intrusive operation

Destructive action

Total or partial restoration with plaster reproduction

Sculpting a block of plaster (single)

Creation of a silicone negative (multiple)

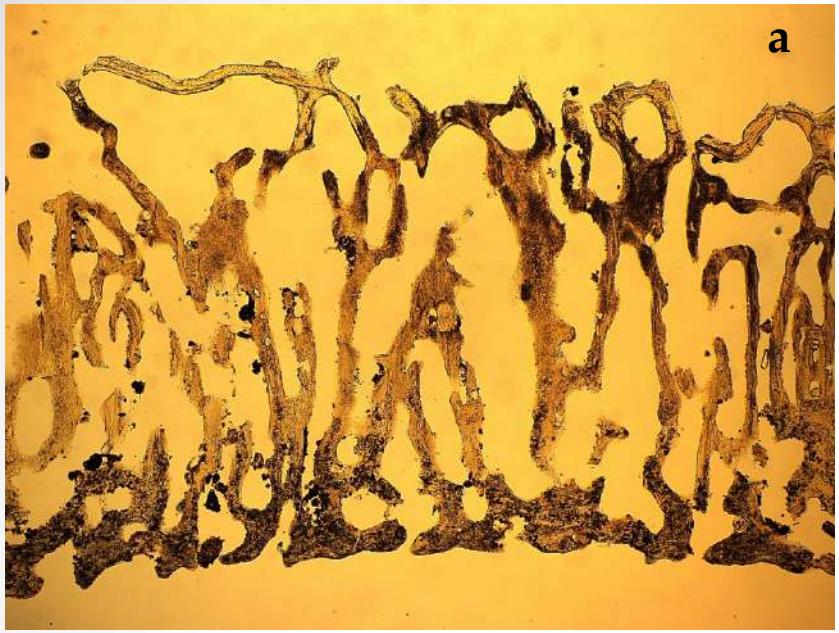
Coloring with natural pigments or water-based colors

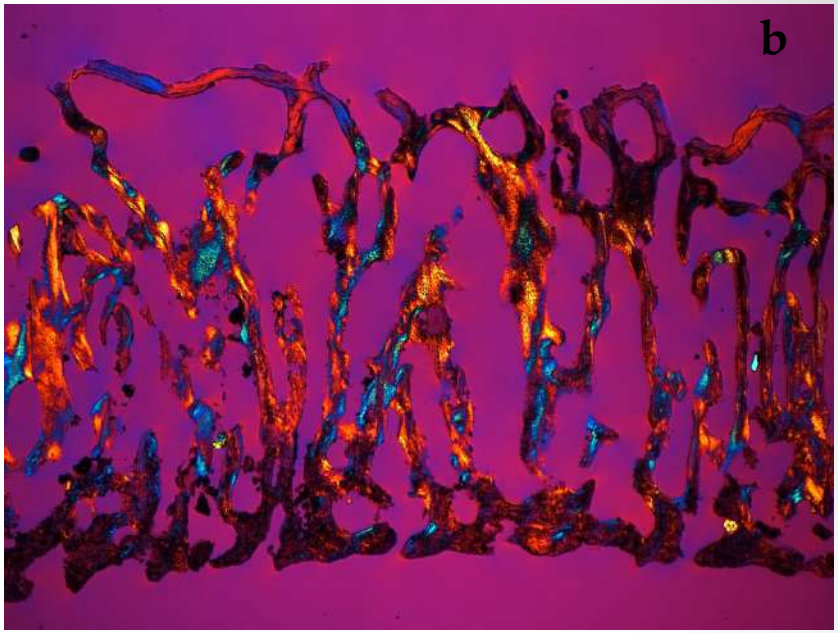
SSM 42 (Italy) – Reconstruction phase.

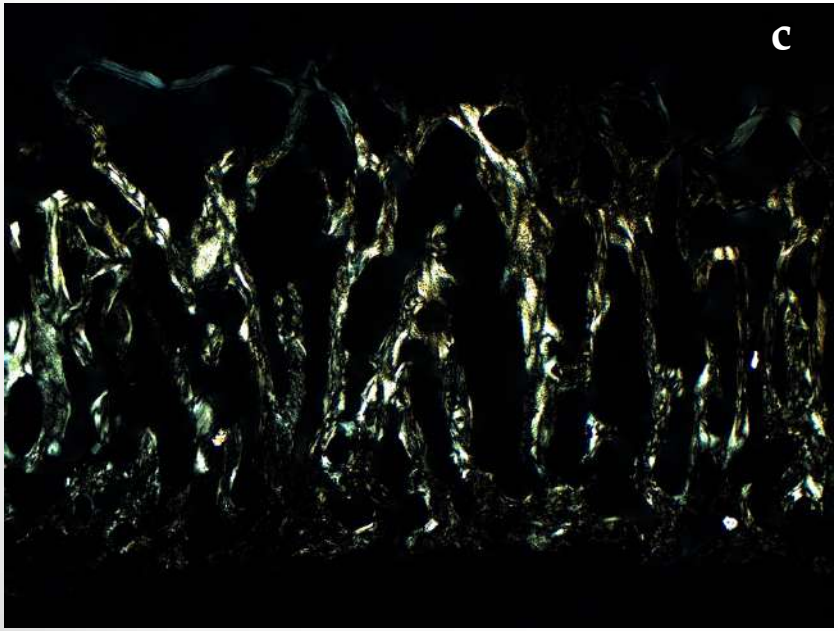
Case 1:

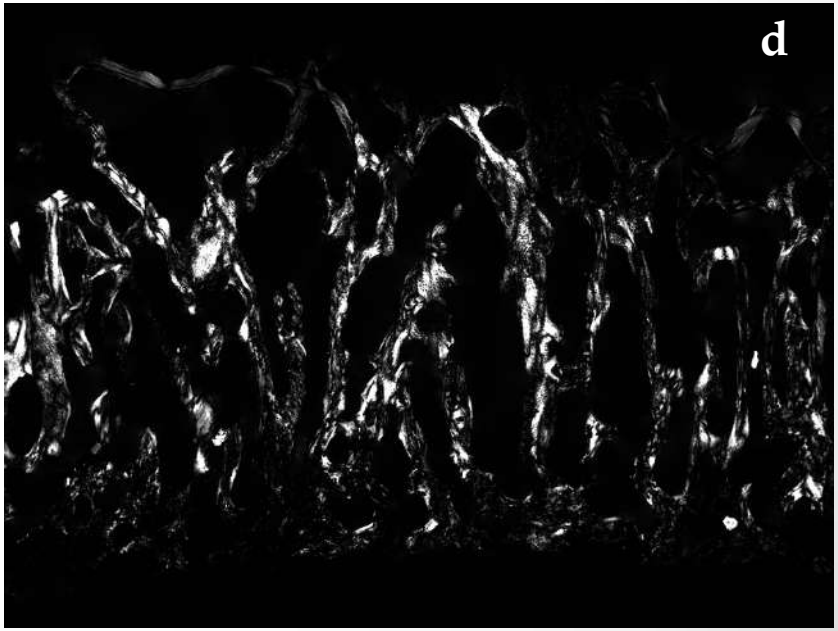
SSM 4IIa – Subadult Orbital roof

SSM 4IIa- LT Orbital Roof





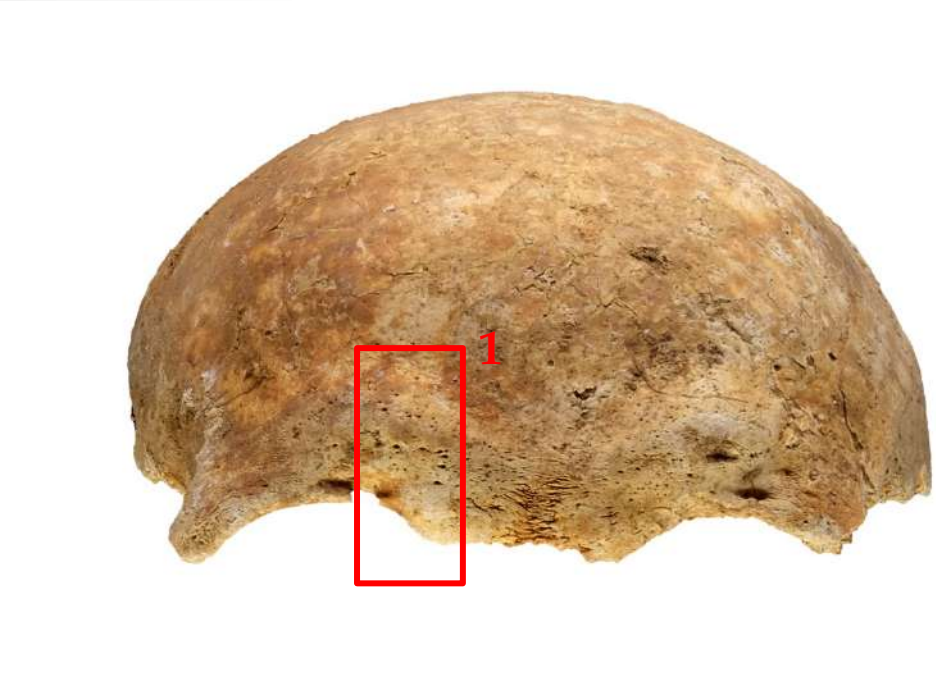


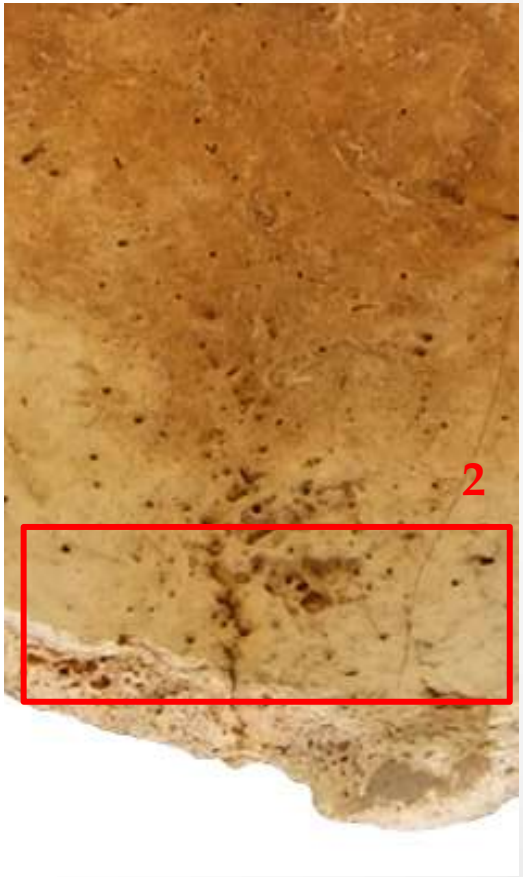


Thin-ground section (50 µm): polarized light microscope using **a)** transmission light; **b)** polarizing filter; **c)** polarizing filter & quartz as compensator; **d)** polarizing filter (de saturated image. 16X magnification

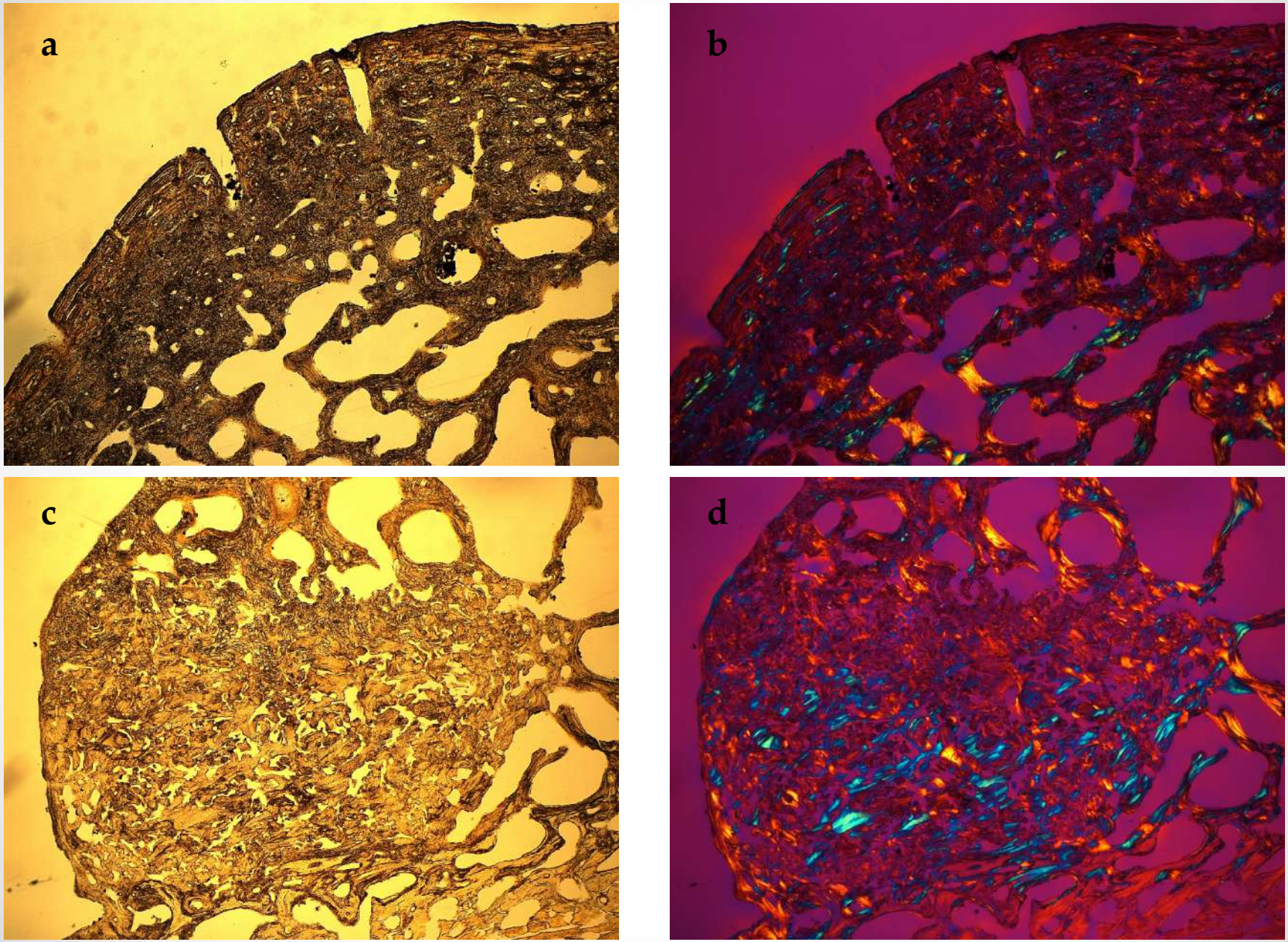
Case 2:

SSM 92 – RT Frontal Sinus + RT Parietal



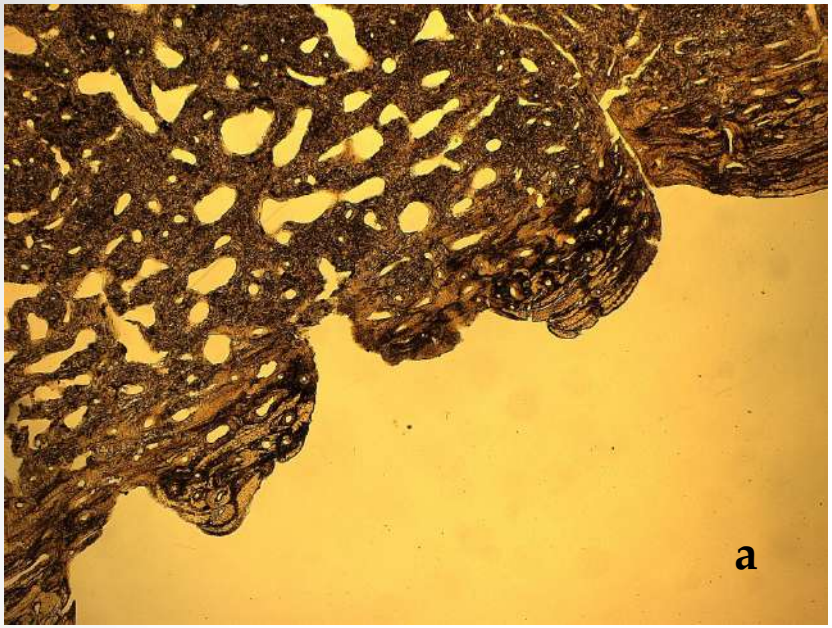


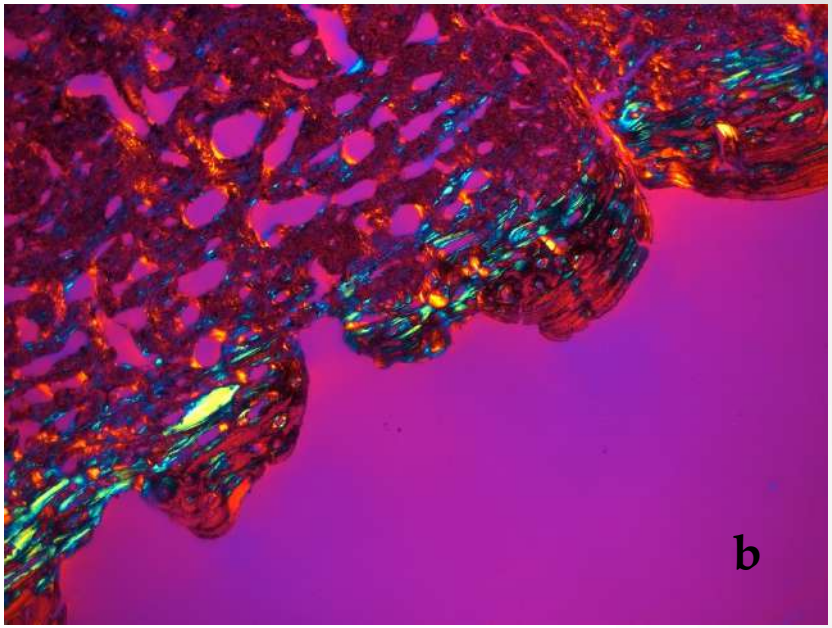
SSM 92- RT Frontal Sinus

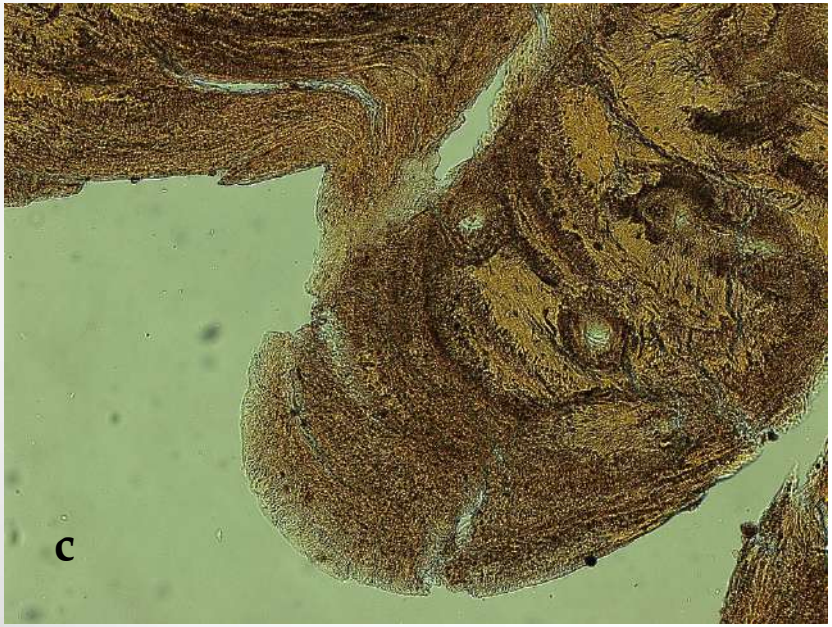


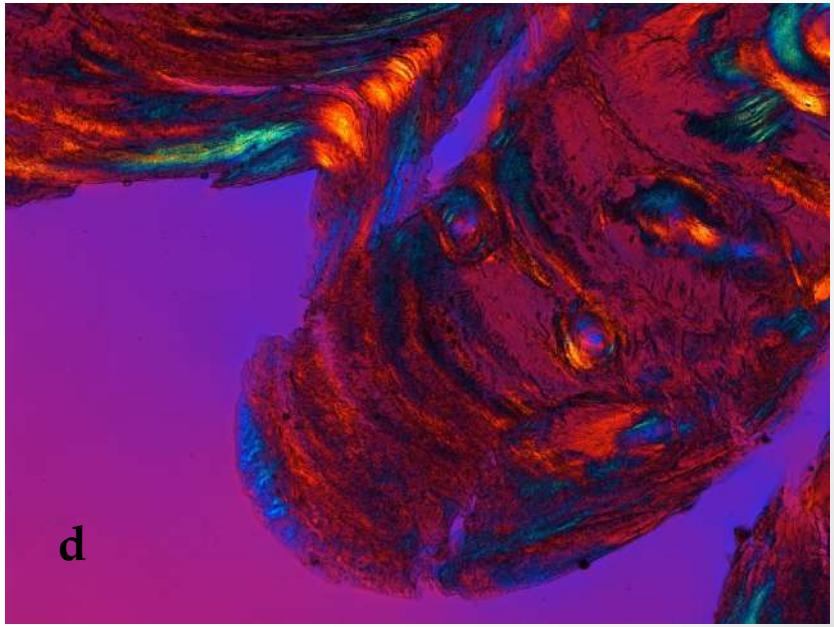
Thin-ground section (70 µm): polarized light microscope using **a - c)** transmission light; **b - d)** polarizing filter and quartz as compensator. 16X magnification

SSM 92- RT Parietal









Thin-ground section (70 µm): polarized light microscope using **a)** transmission light; **b)** polarizing filter & quartz as compensator. 16X magnification; **c)** transmission light; **d)** polarizing filter and quartz compensator. Magnification 100X

Thanks for your attention!