

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn”

Alvin Toffler

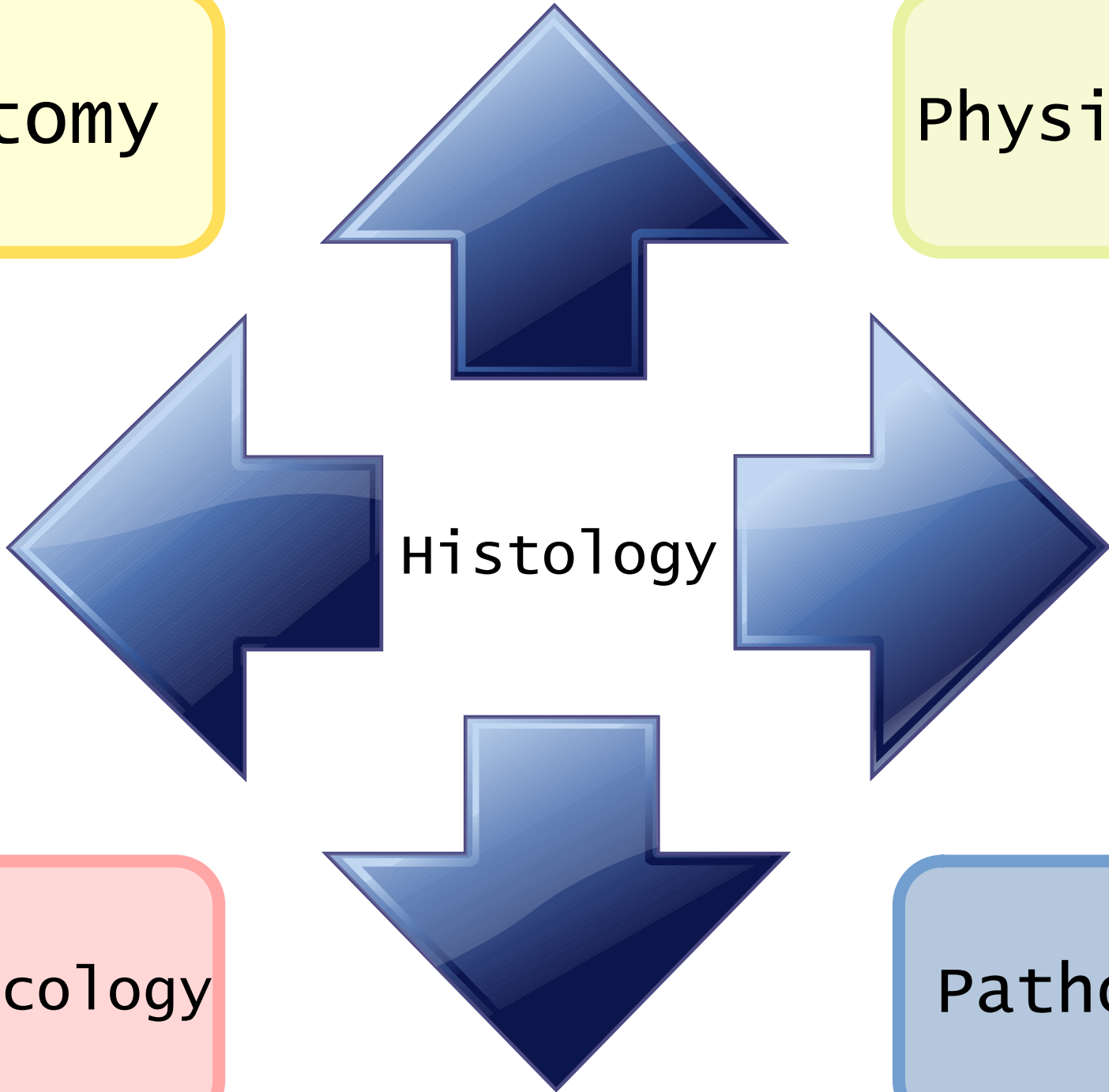
Anatomy

Physiology

Histology

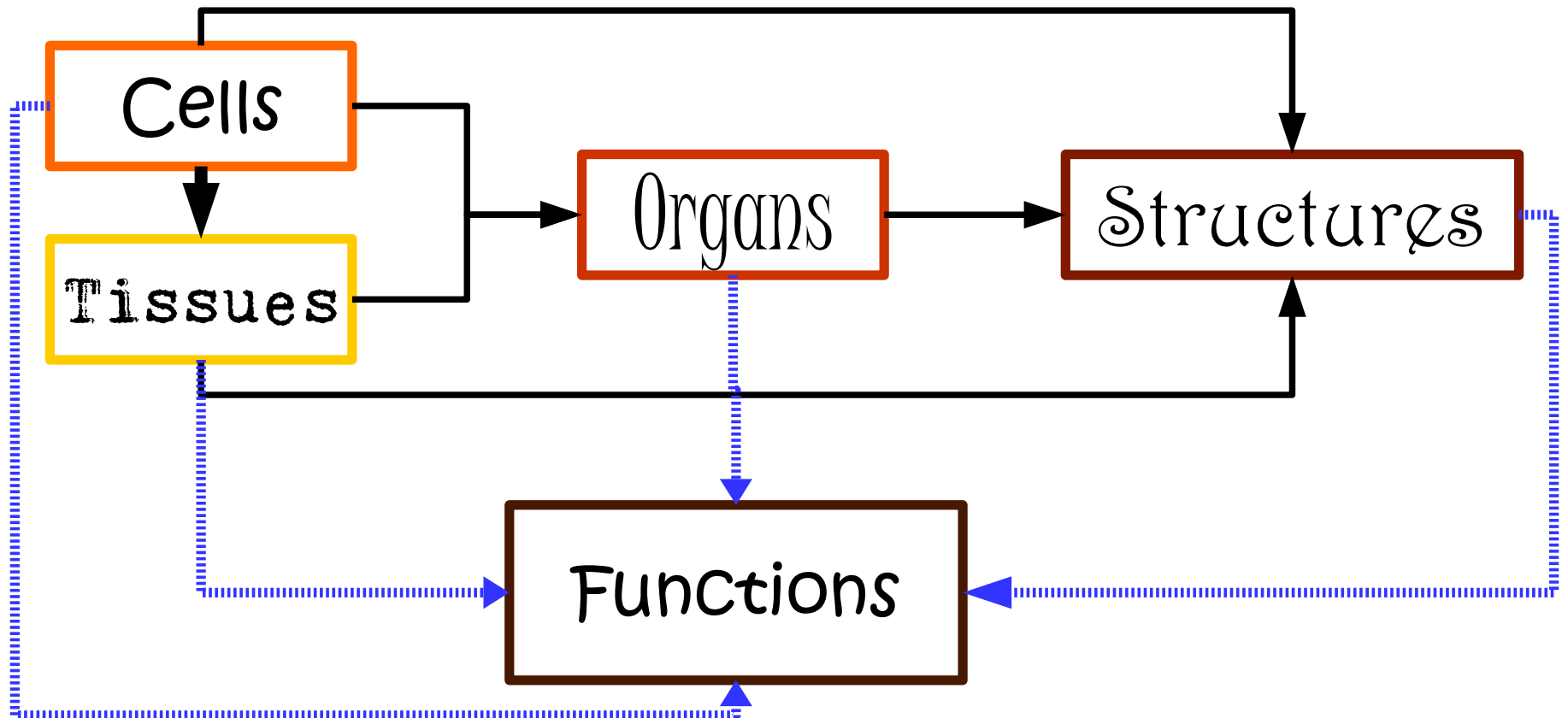
Pharmacology

Pathology



what in Histology

Basic framework to work from



Retrieval Practise

Because it is what works to make it like
cinnamon...



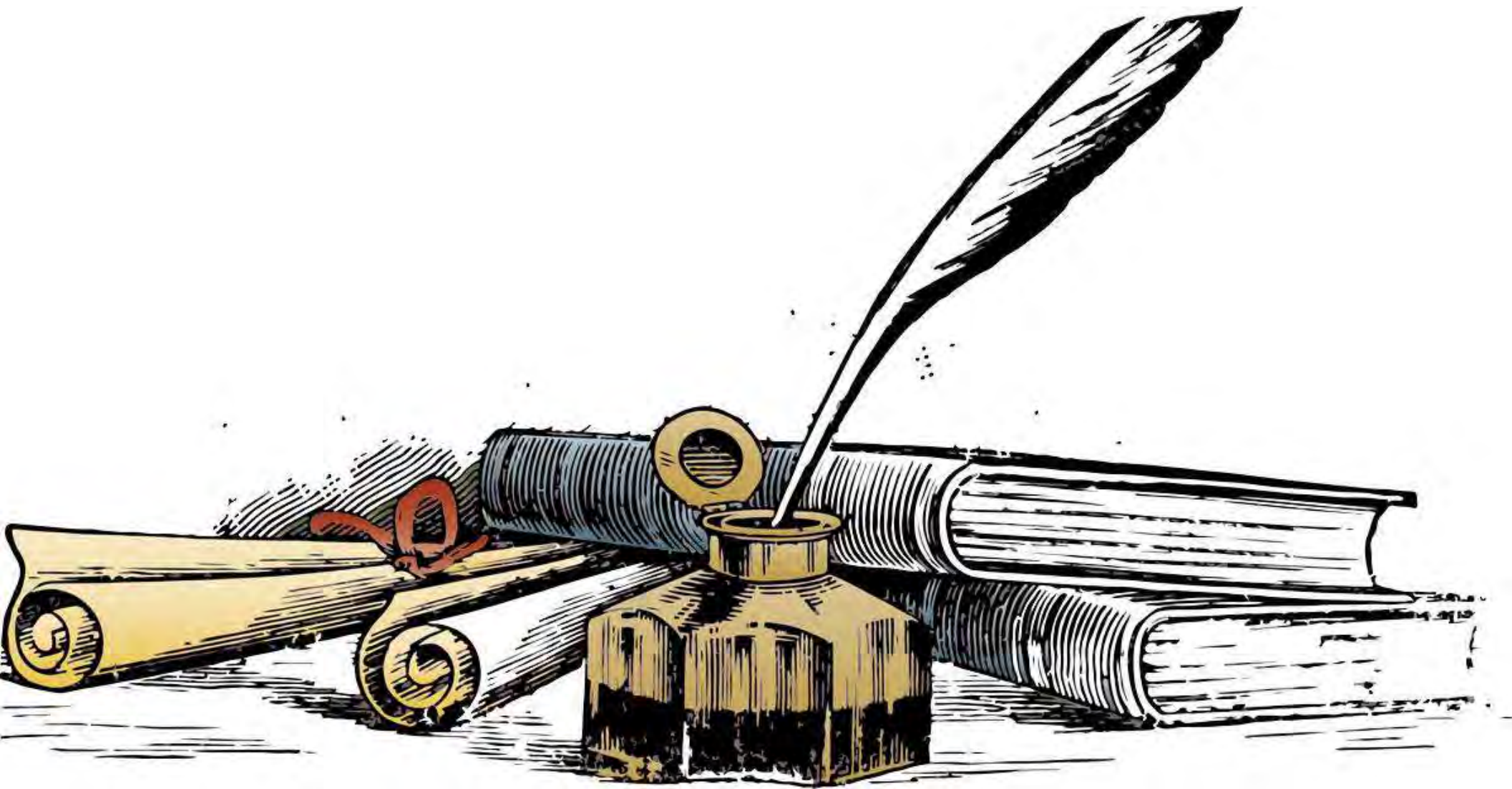
24 Questions



KNOW THE
RULES



Ink!!!



Best Effort!



No Consultation



Google

x

← → ↻ <https://www.google.com>

Search Images Maps Play YouTube News Gmail Drive Calendar More ▾

Google



Google Search

I'm Feeling Lucky

Score each answer

Nailed it



Not sure



Nailed it!

You are
confident about
your answer.



Not sure...

You do not know or
are uncertain.

Q01. what are the 3 main components
of all support tissues?

= 3

Q02. what is the main organic component in mineralized bone tissue?

= 1

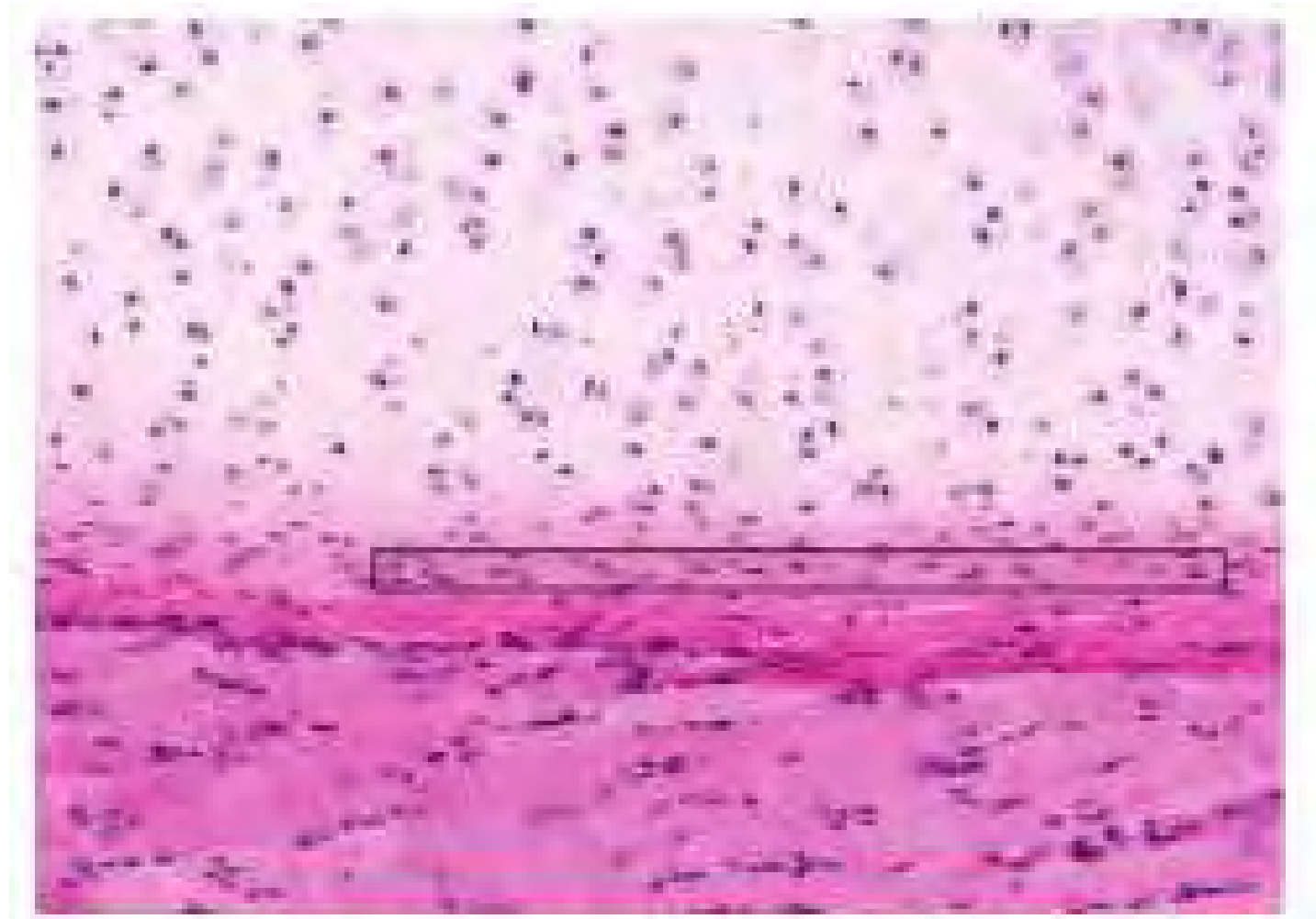
Q03. what is the origin of
osteoblasts and osteoprogenitor
cells in resting adult bone?

= 1

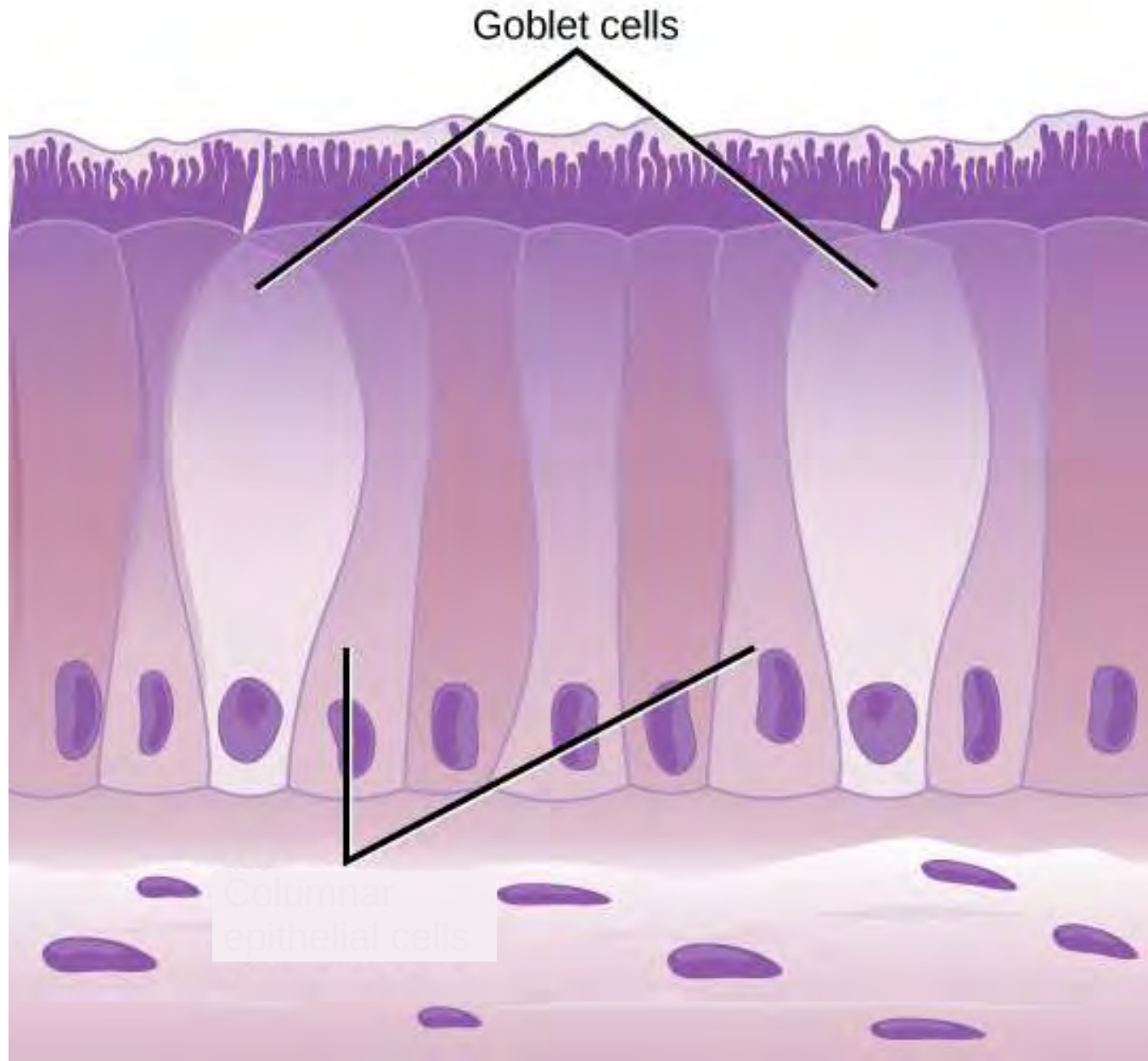
Q04. Howship's lacunae is associated
with which cells?

= 1

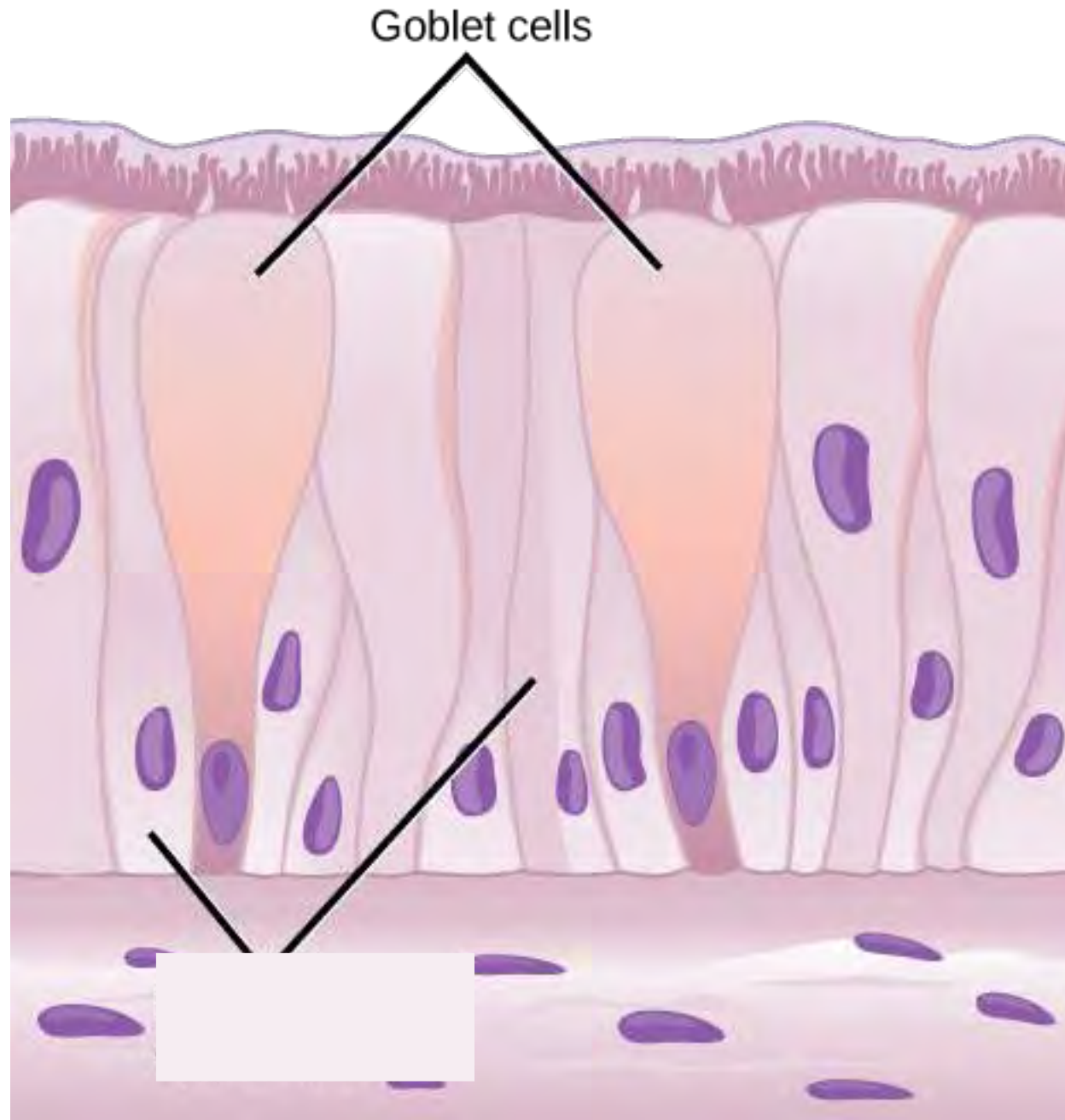
Q05. A surgical specimen containing normal cartilage is examined by light microscopy. The tissue/substance present within the rectangular box is best described as? = 1



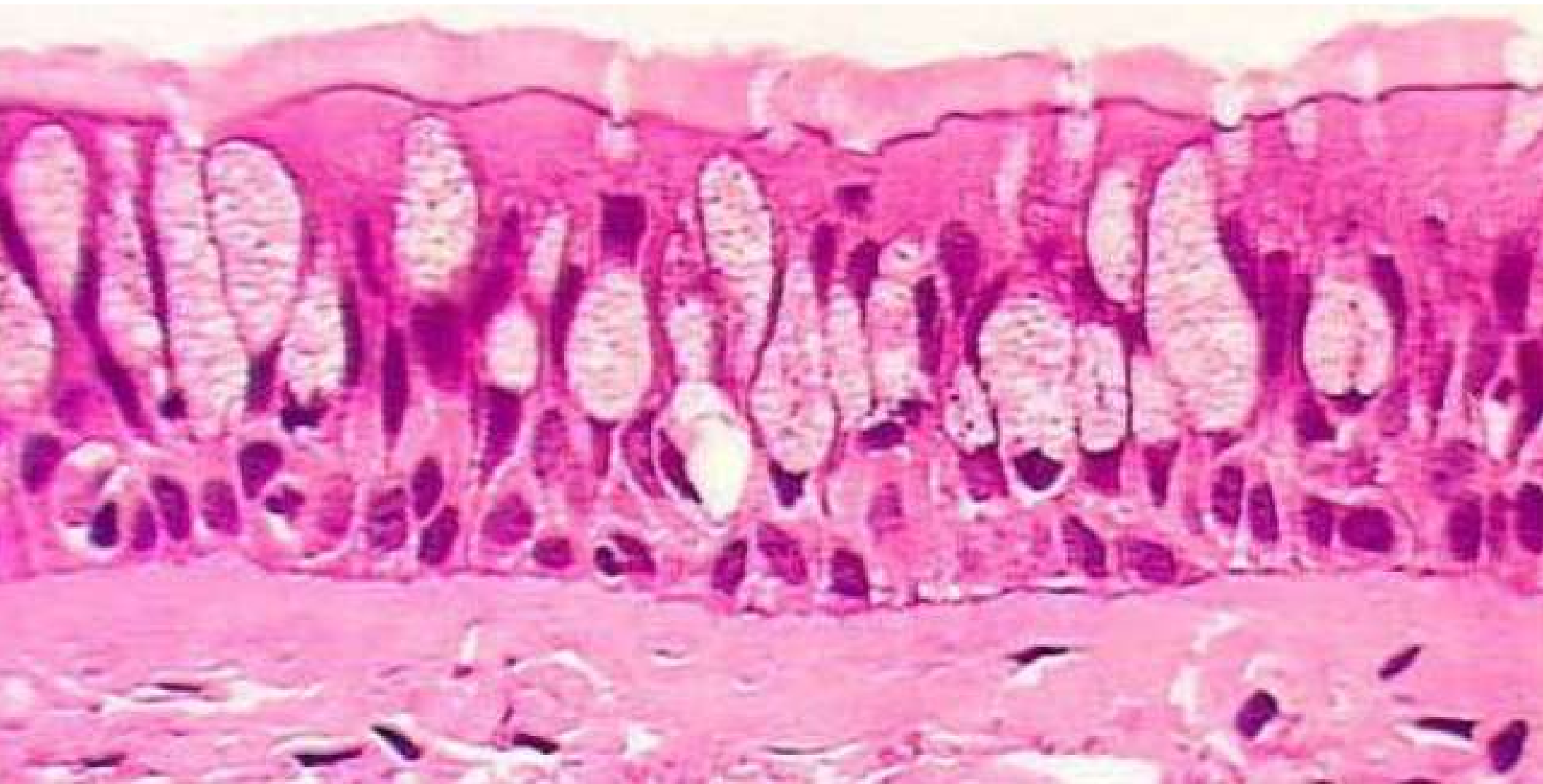
Q06: Identify the epithelium



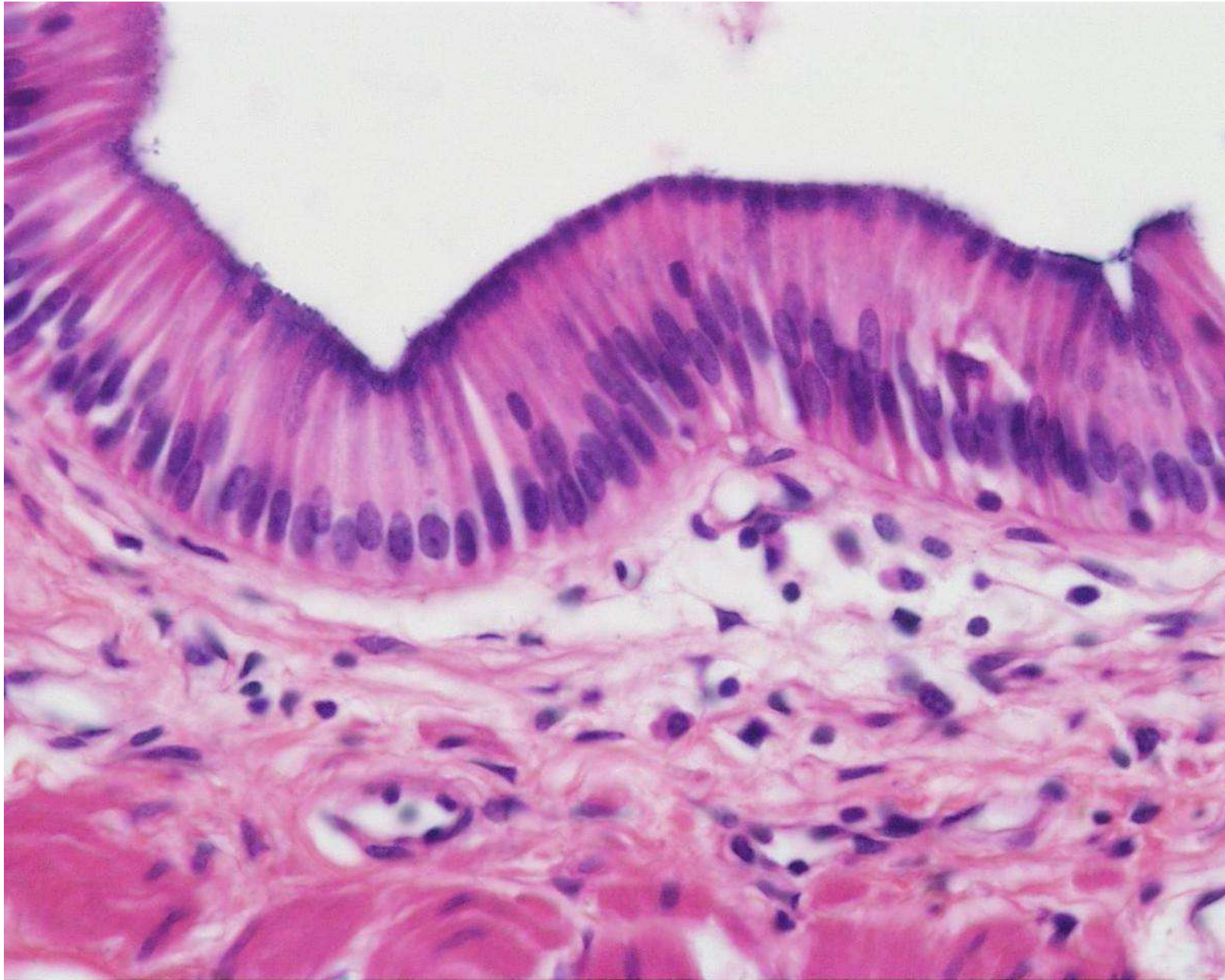
Q07: Identify the epithelium



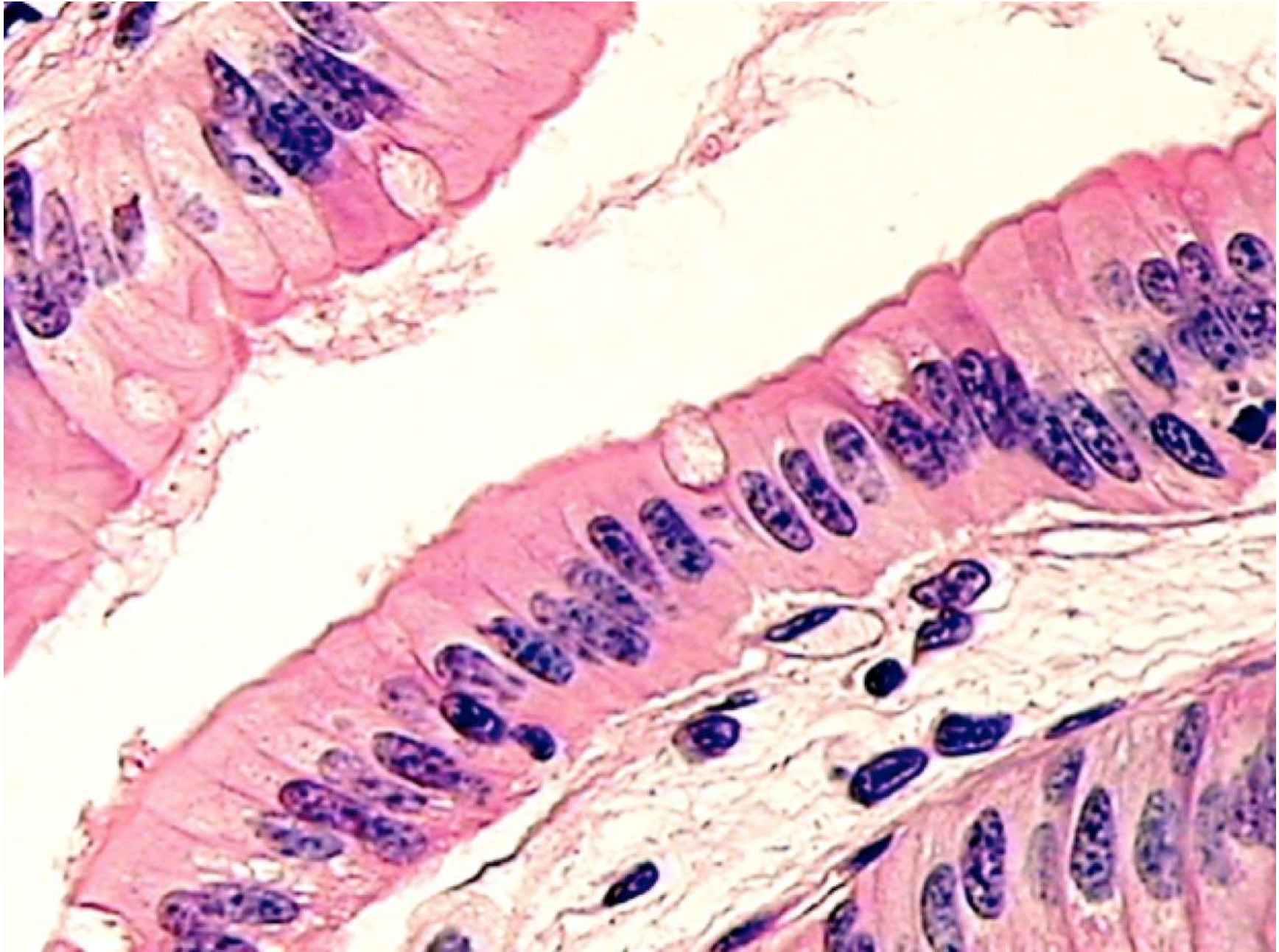
Q08: Identify the epithelium



Q09: Identify the epithelium



Q10: Identify the epithelium



Q11: Name the
main cell found
in cartilage.

Q12:

Name the main
cell found in
developing bone.

Q13: Name the
main cell found
in mature bone.

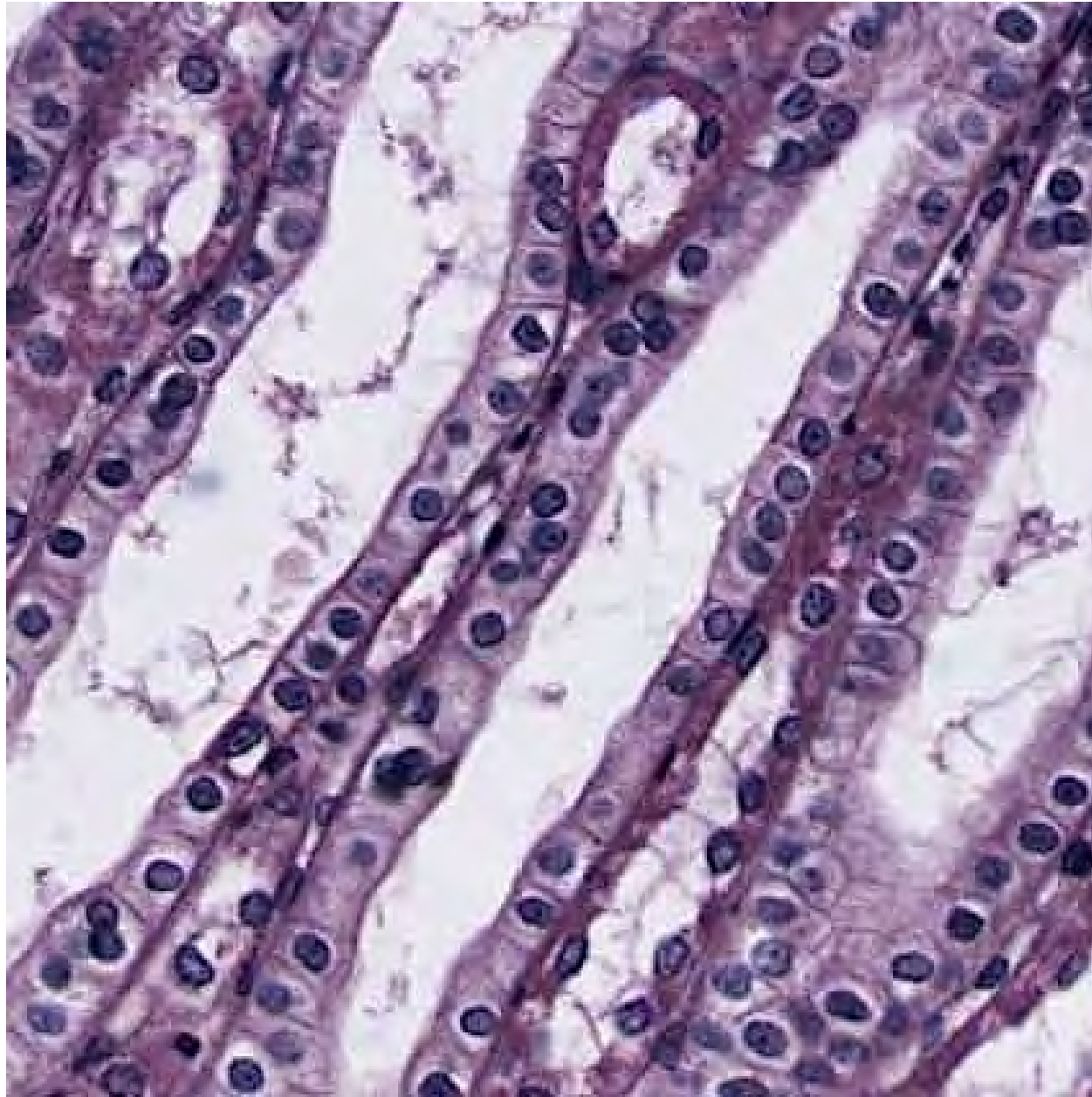
Q14: what is the name of the elongated processes?



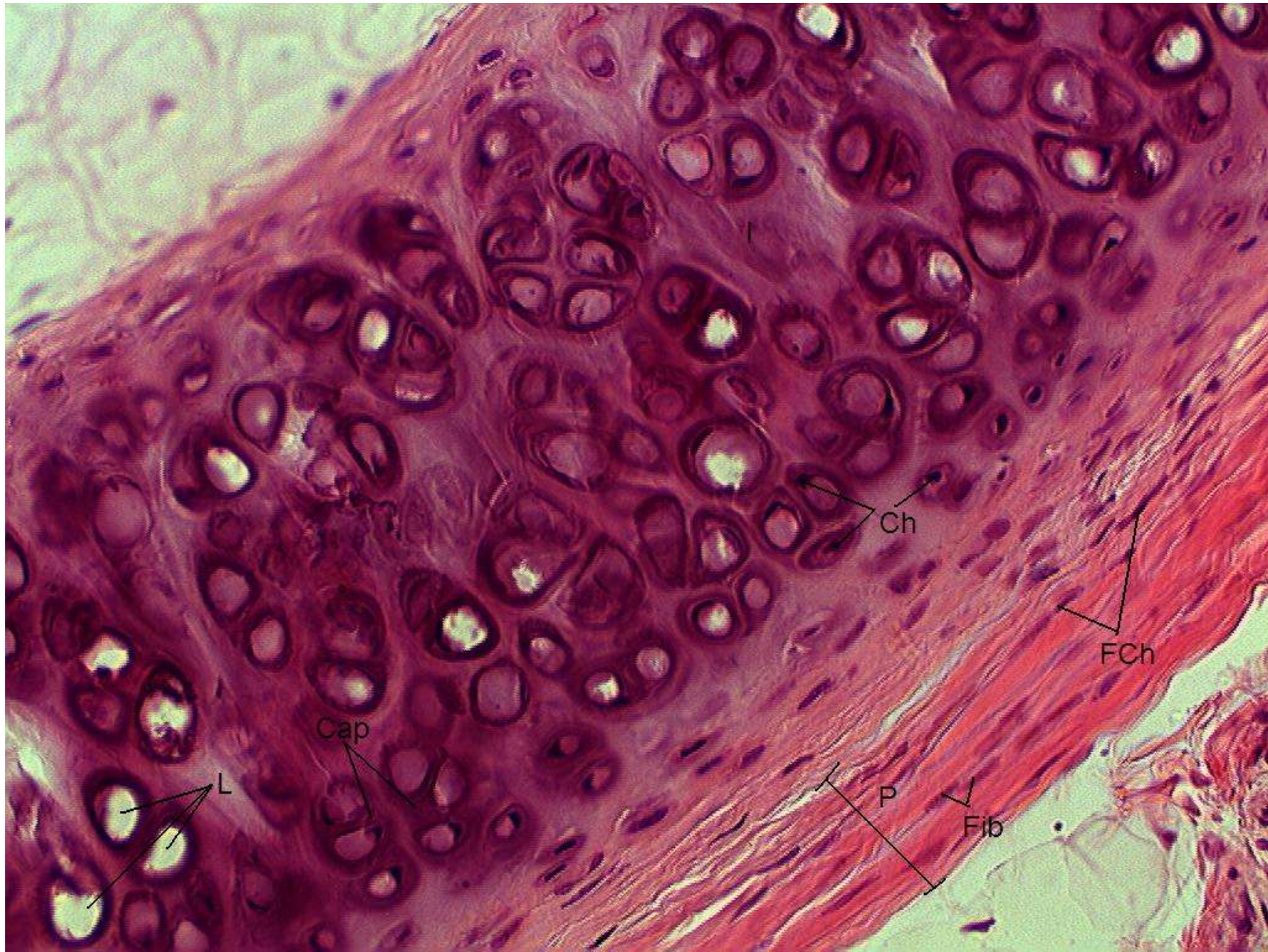
Q15: what is the function of the elongated processes?



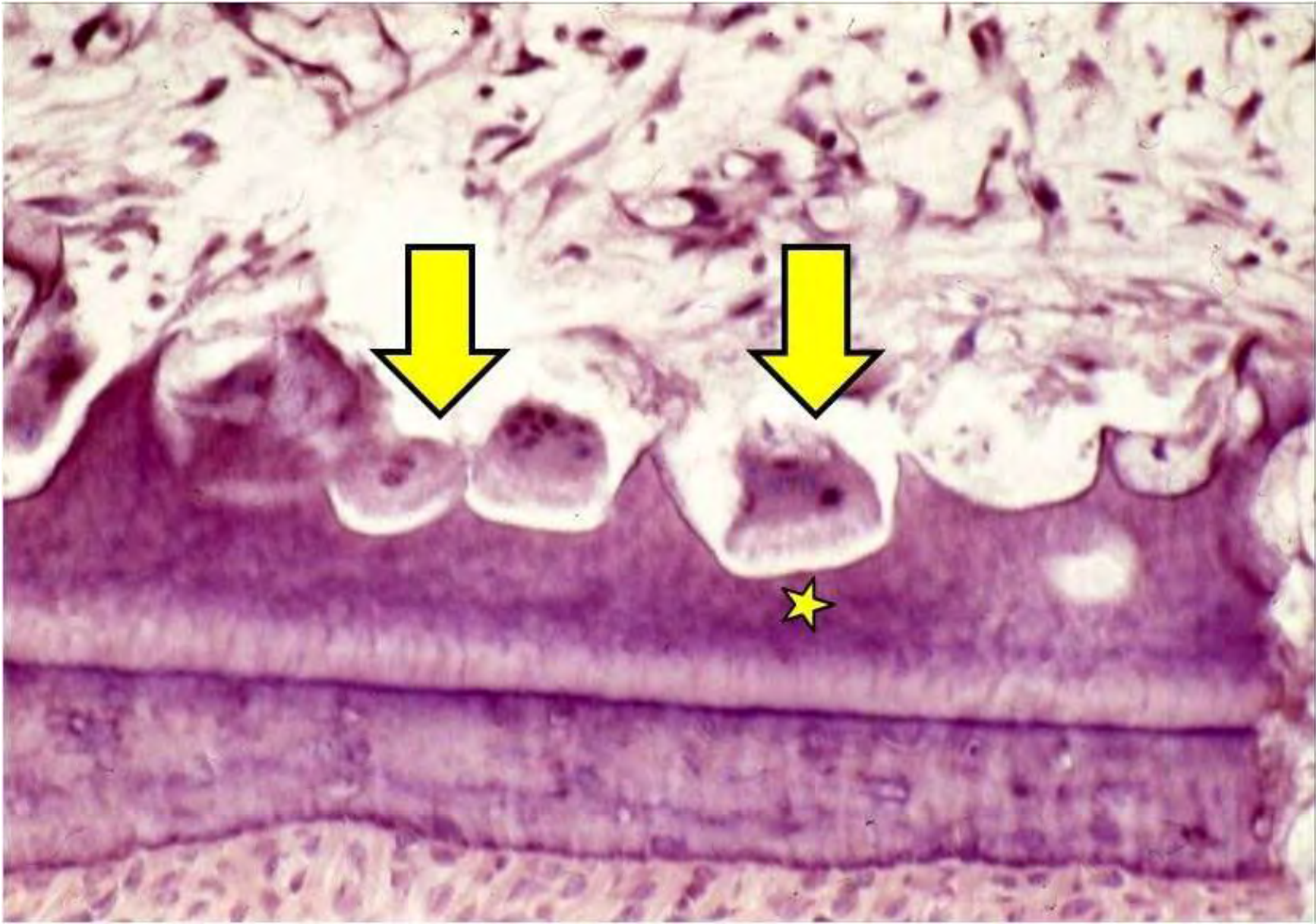
Q16: Give an organ where this epithelium occurs.



Q17: Identify the cartilage.



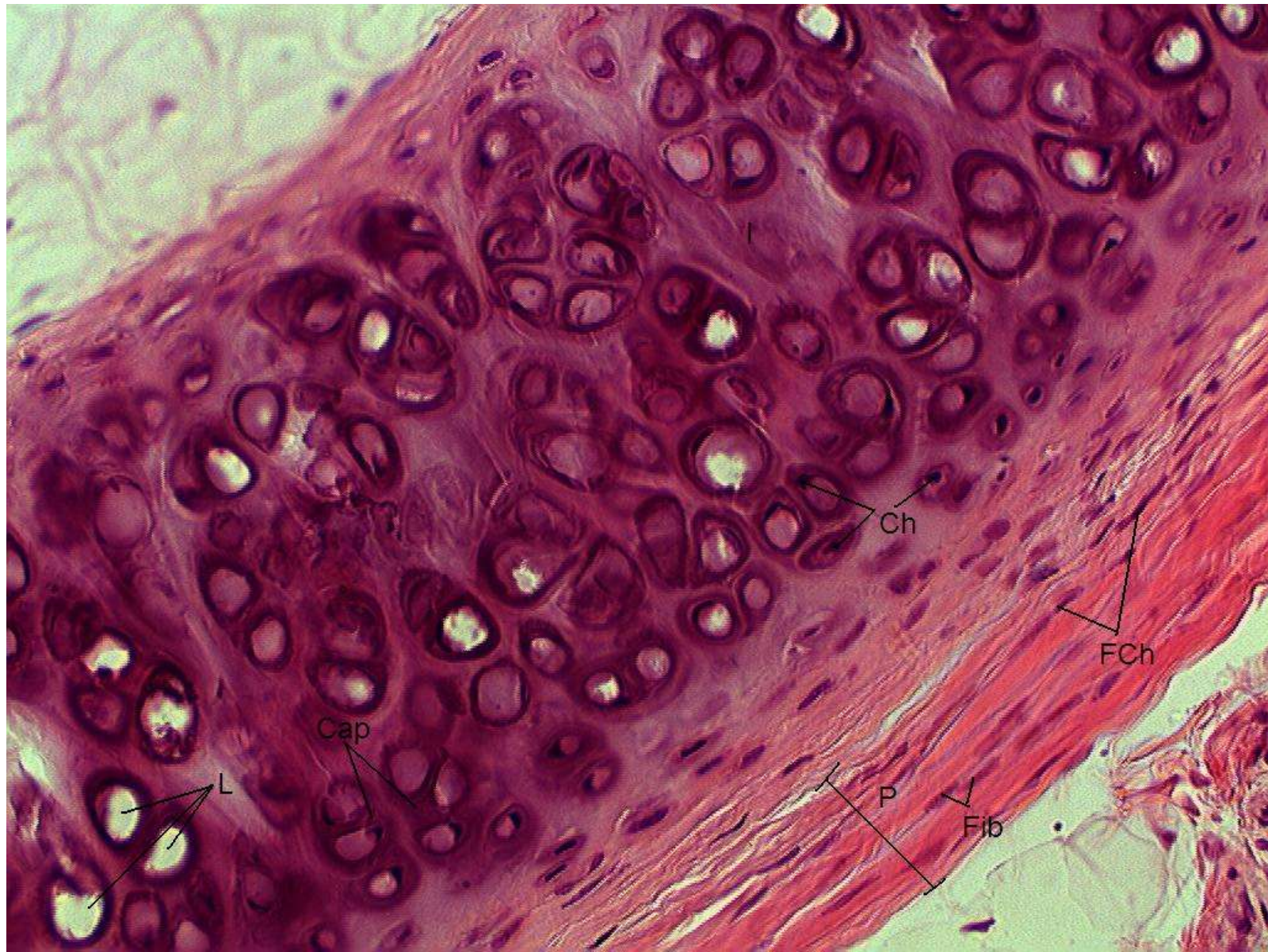
Q18: Identify the cells indicated with the yellow arrows.



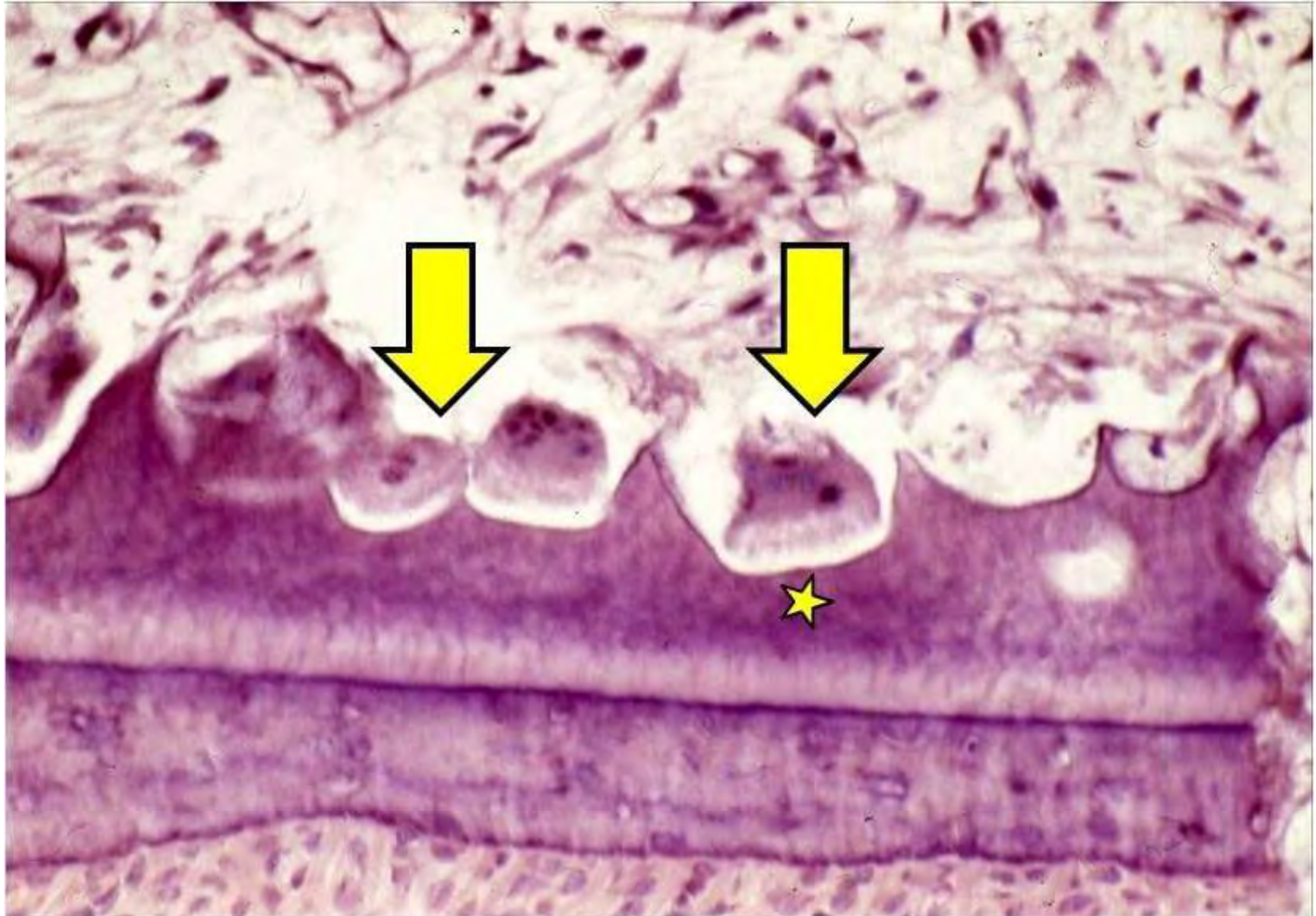
Q19: Identify the cell.



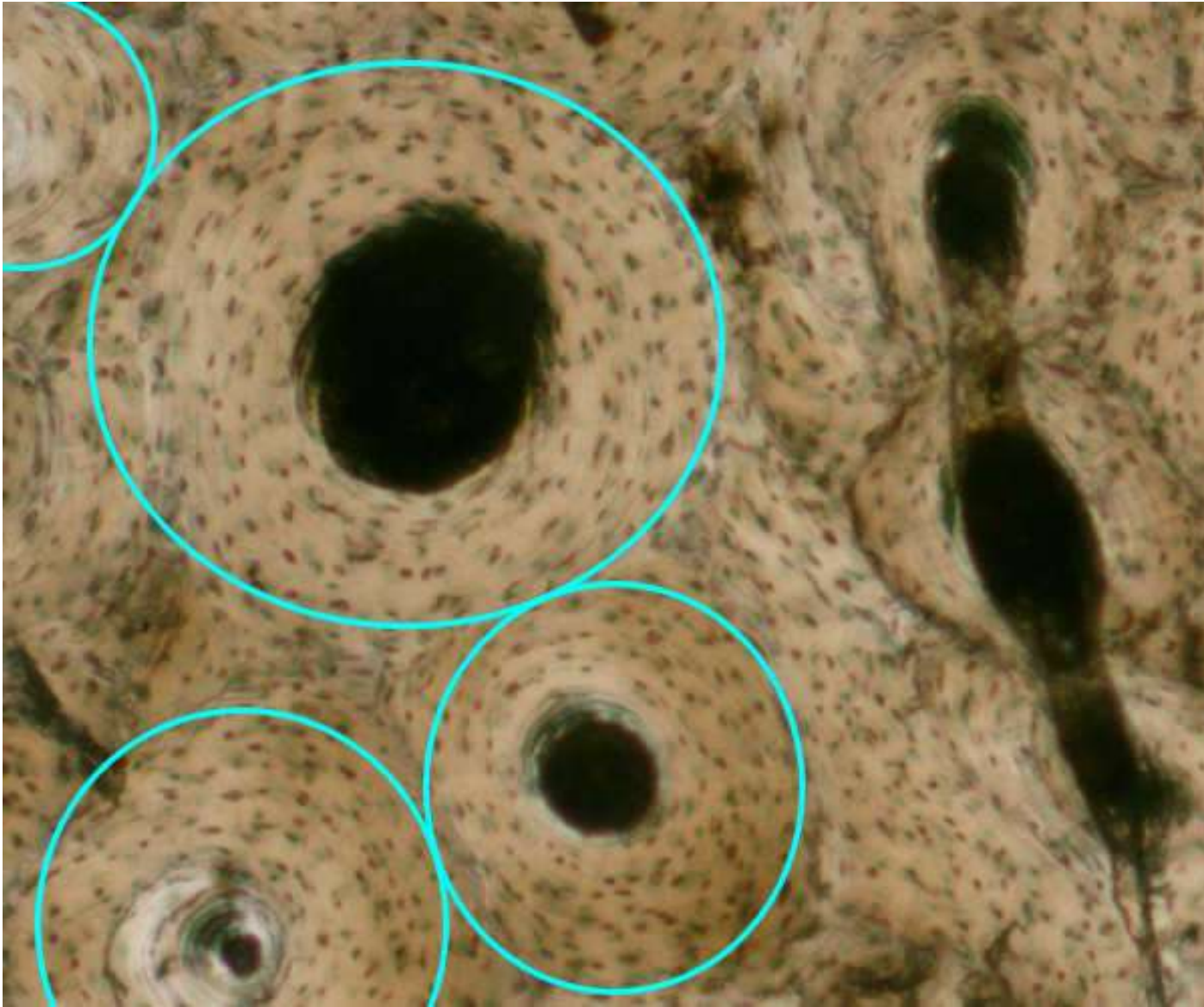
Q20: what is the name of the layer surrounding this structure?



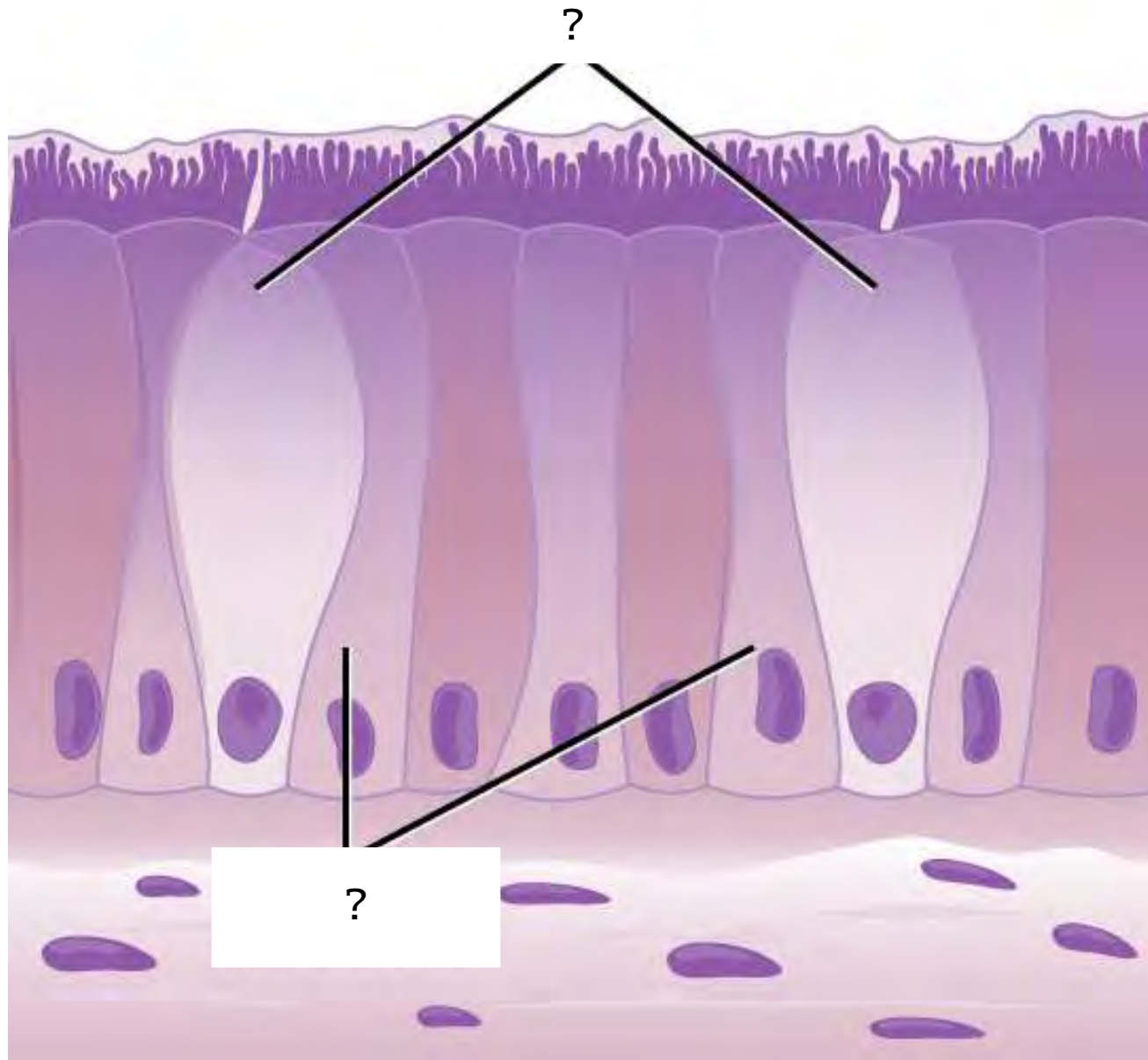
Q21: what is the function of the cells indicated with the yellow arrows?



Q22: what structures are present in the dark areas on the slide?



Q23: Name the 2 cells present in this epithelium.



Q24: I exercise -

1. Not enough
2. I don't have time to exercise
3. At least once a week
4. Enough
5. 5 times a week
6. Most days

Q24: I exercise -

1. If you don't exercise - why not?
2. If you do - what do you do?

Grade your answers



Community of Truth

what is my answer?

what is the correct answer?

I am am wrong, what was my error?

THUS: Find the truth

Score each answer

Nailed it



Not sure



Q01: what are the 3 main components
of all support tissues?

= 3

1. cells

2. Fibers

3. Ground substance

Dense vs Loose CT

Q02: what is the main organic component in mineralized bone tissue?

= 1

= collagen

Calcium = inorganic

Q03: what is the origin of
osteoblasts and osteoprogenitor
cells in resting adult bone?

= 1

= Periosteum

Surrounds bone

Cartilage equivalent = perichondrium

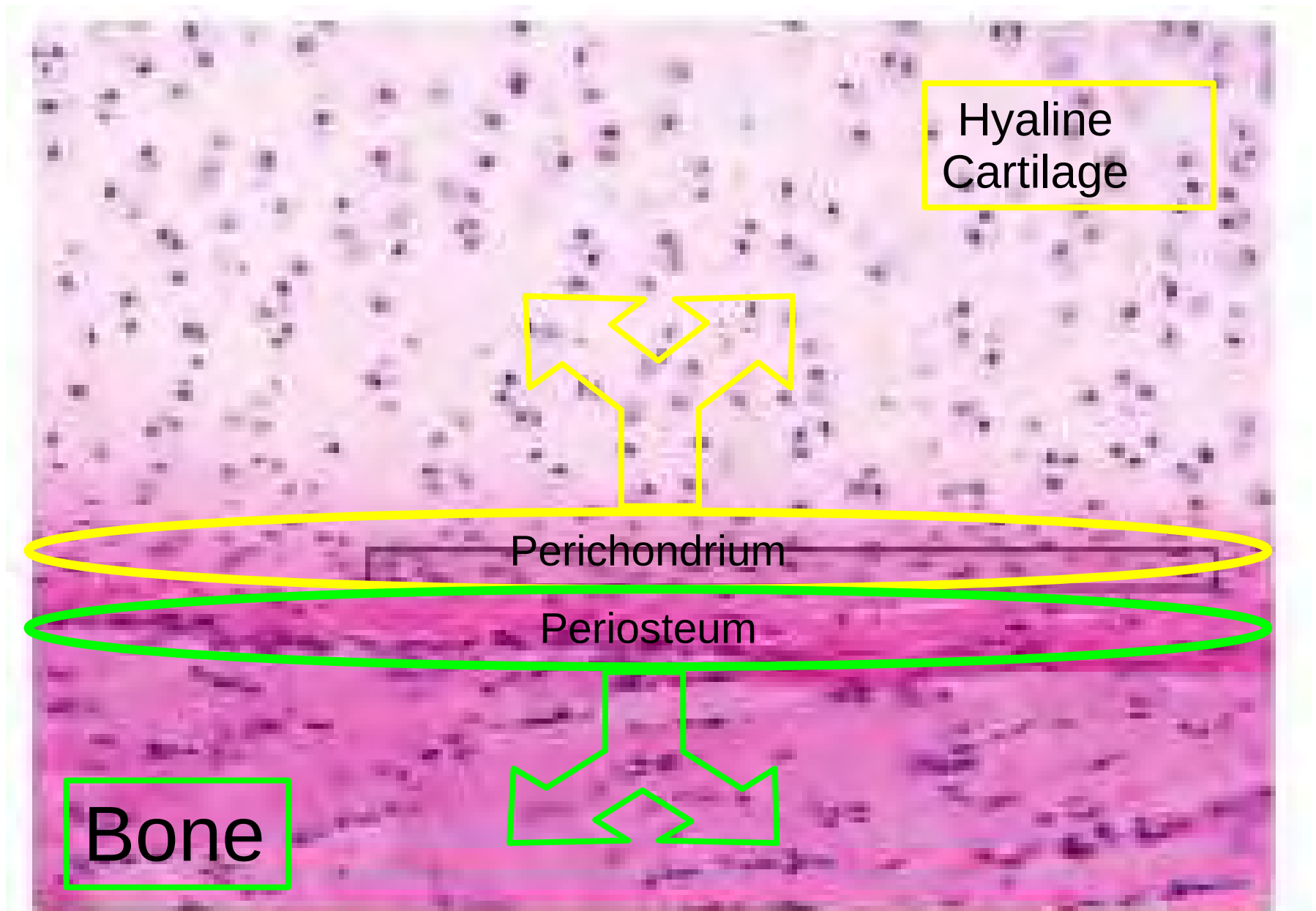
Q04: Howship's lacunae is associated
with which cells?

= 1

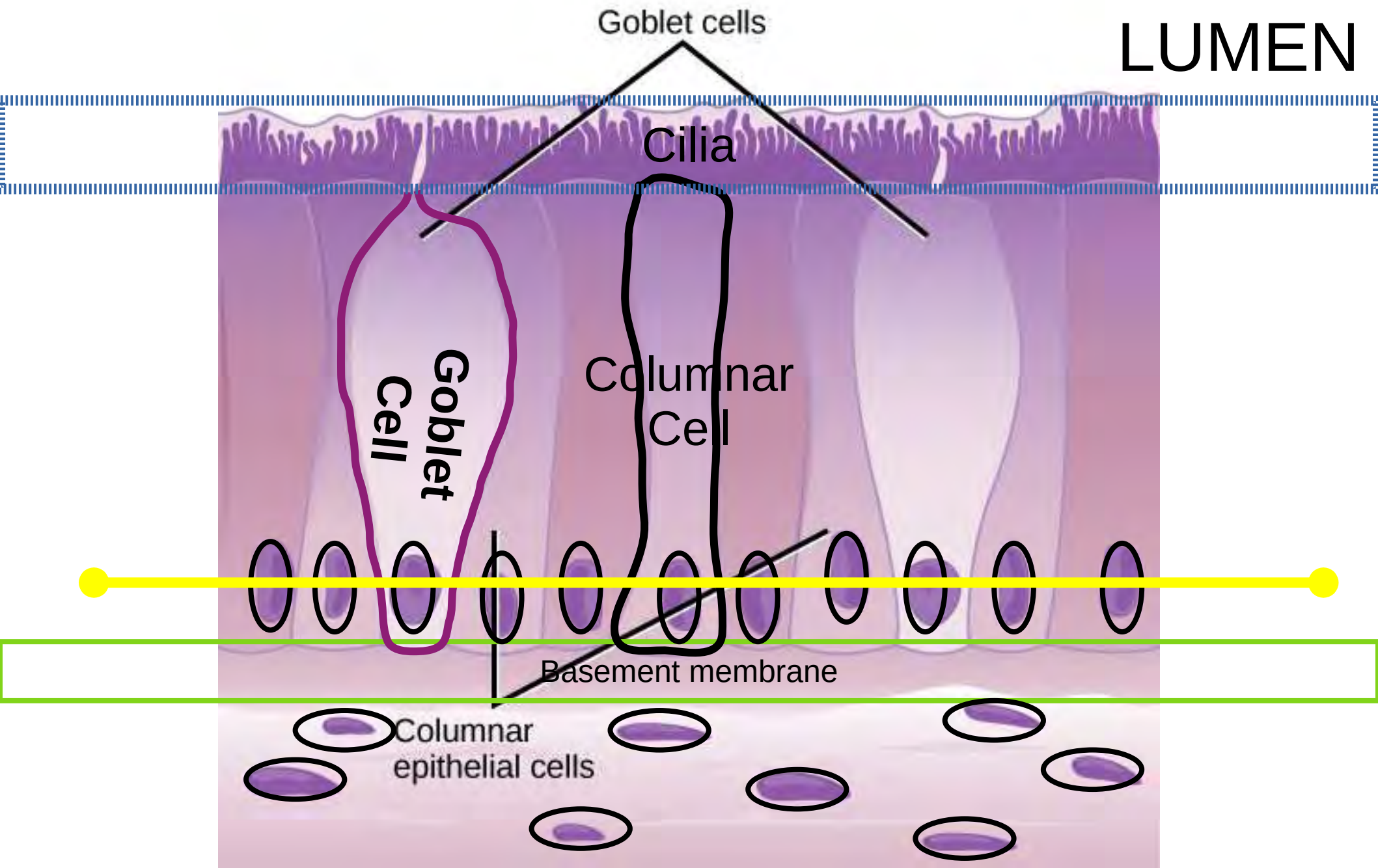
= Osteoclasts

Resorbs (eat) bone

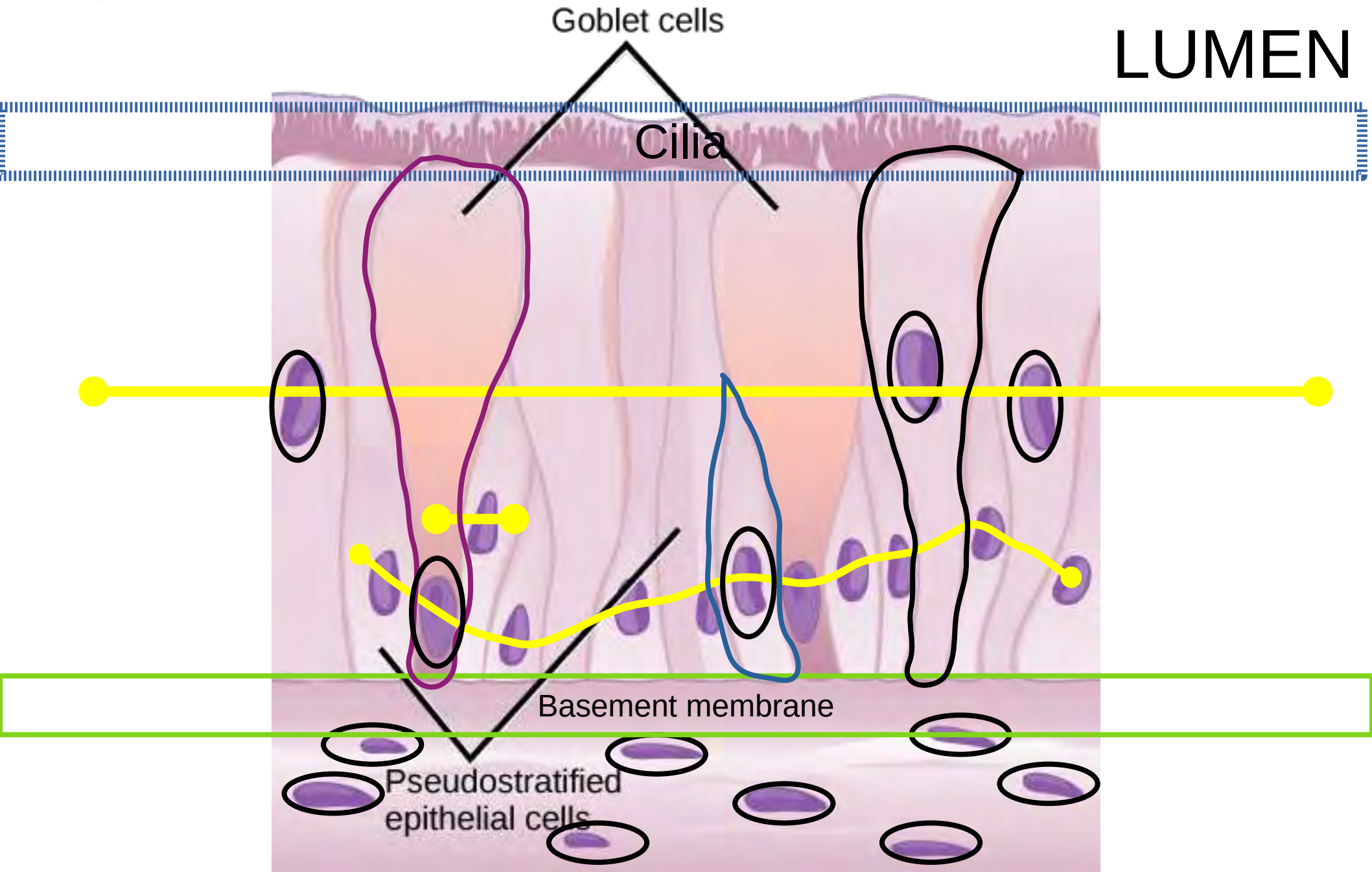
Q05: The tissue/substance present within the rectangular box the perichondrium



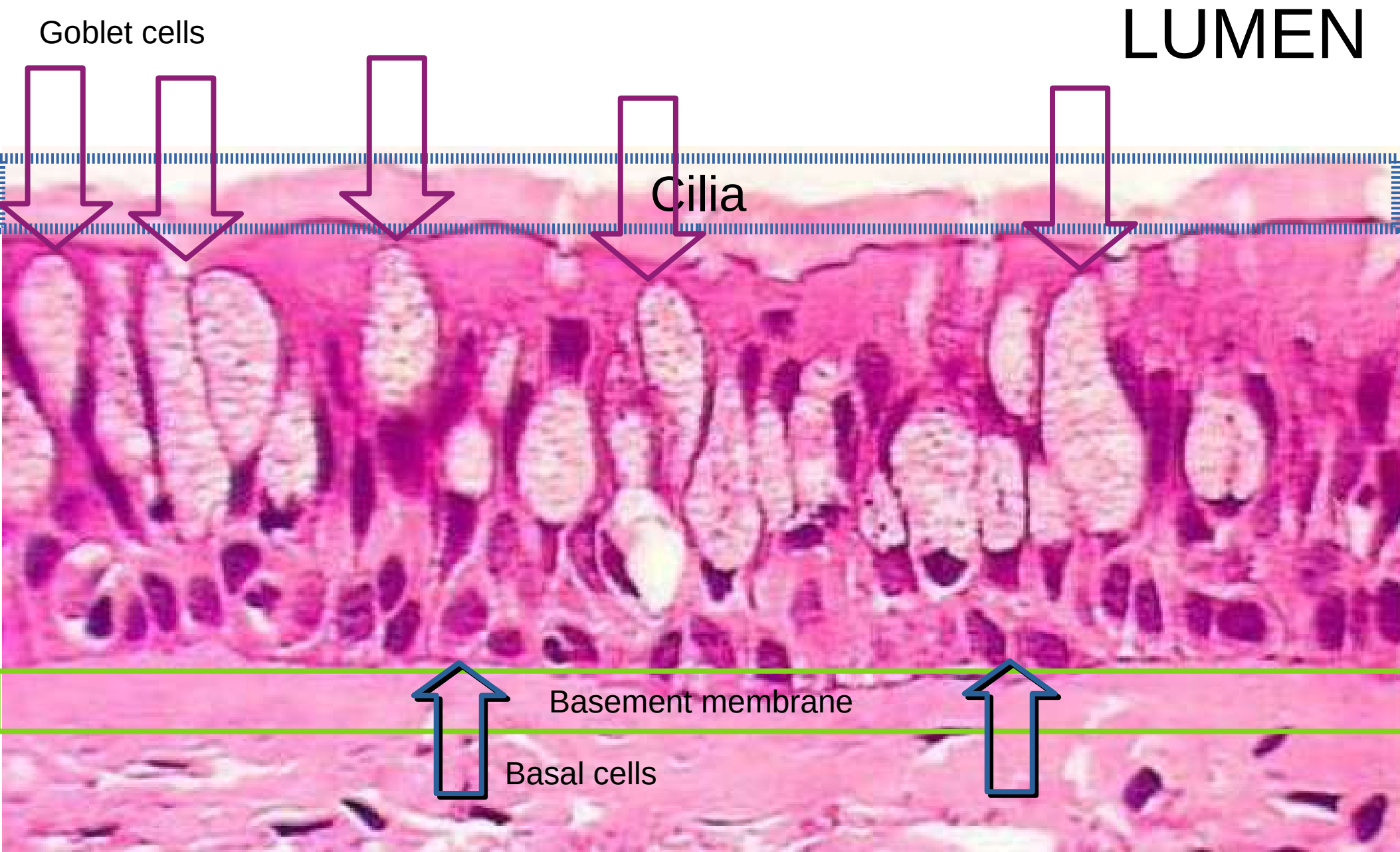
Q06: columnar epithelium



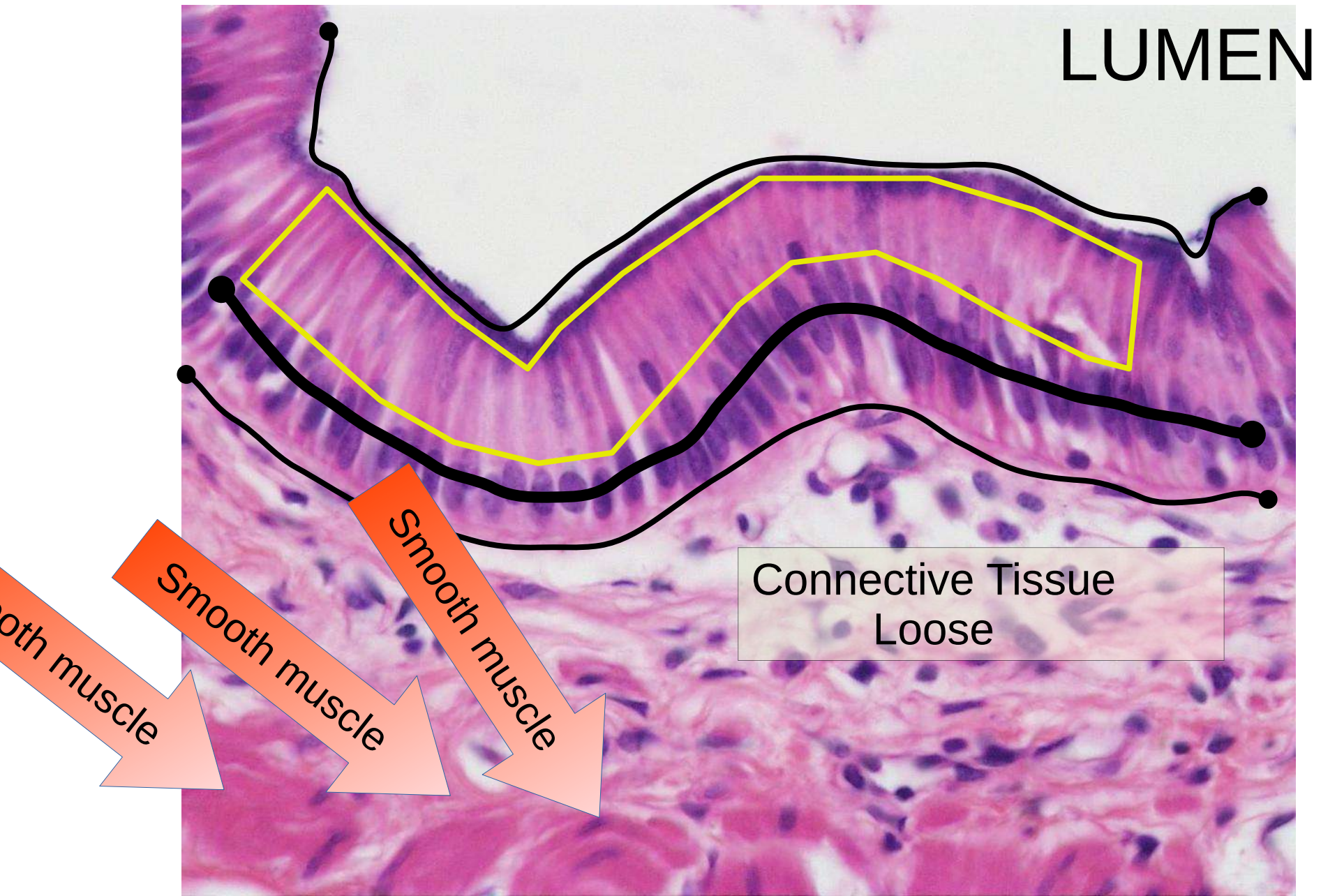
Q07: Pseudostratified columnar



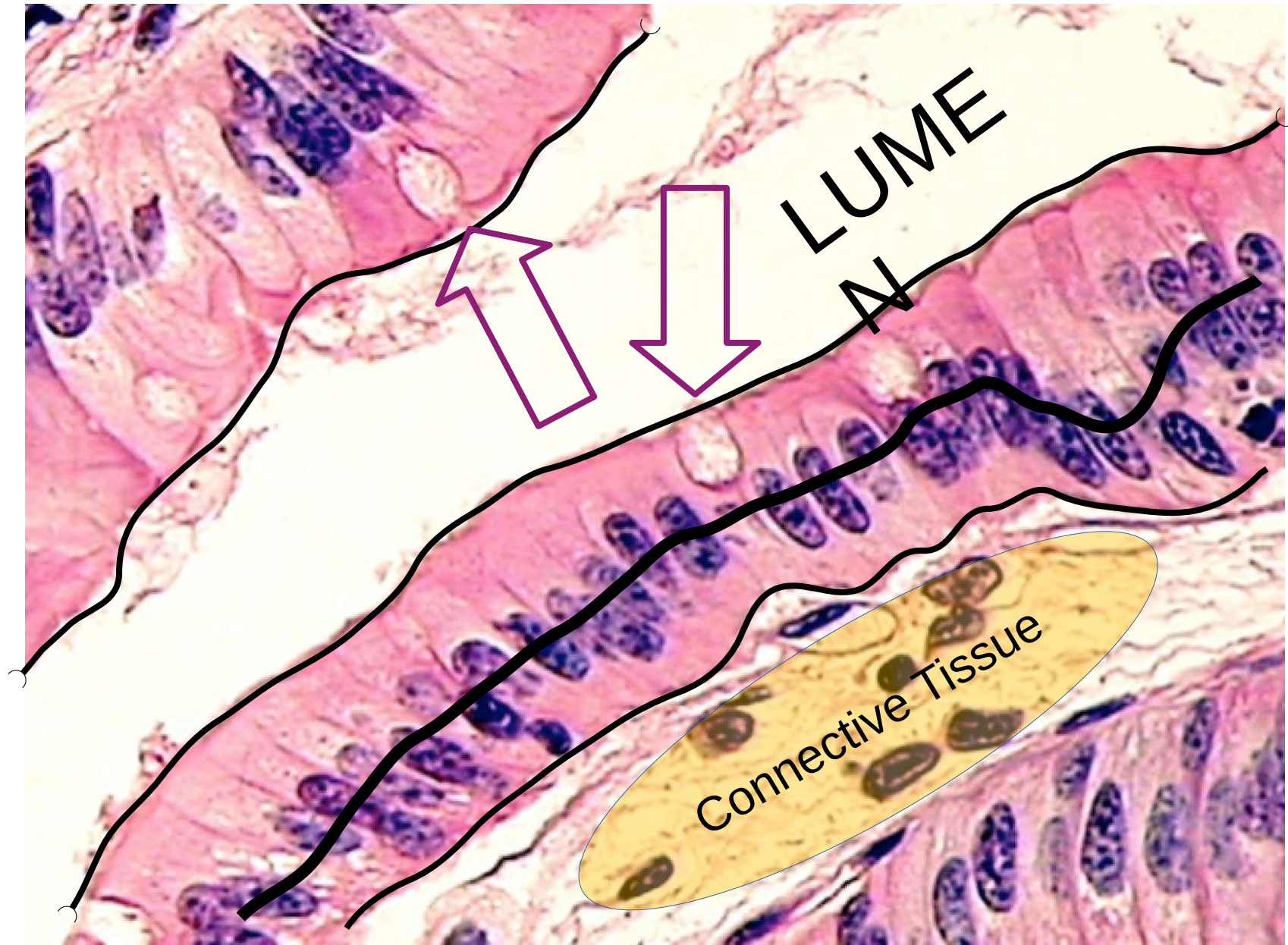
Q08: Pseudostratified columnar



Q09: columnar epithelium



Q10: columnar epithelium



Q11: Main cell
found in
cartilage
=
Chondrocyte

Q12:
Main cell found
in developing
bone
=
Osteoblast

Q13: Main cell
found in mature
bone

=

Osteocyte

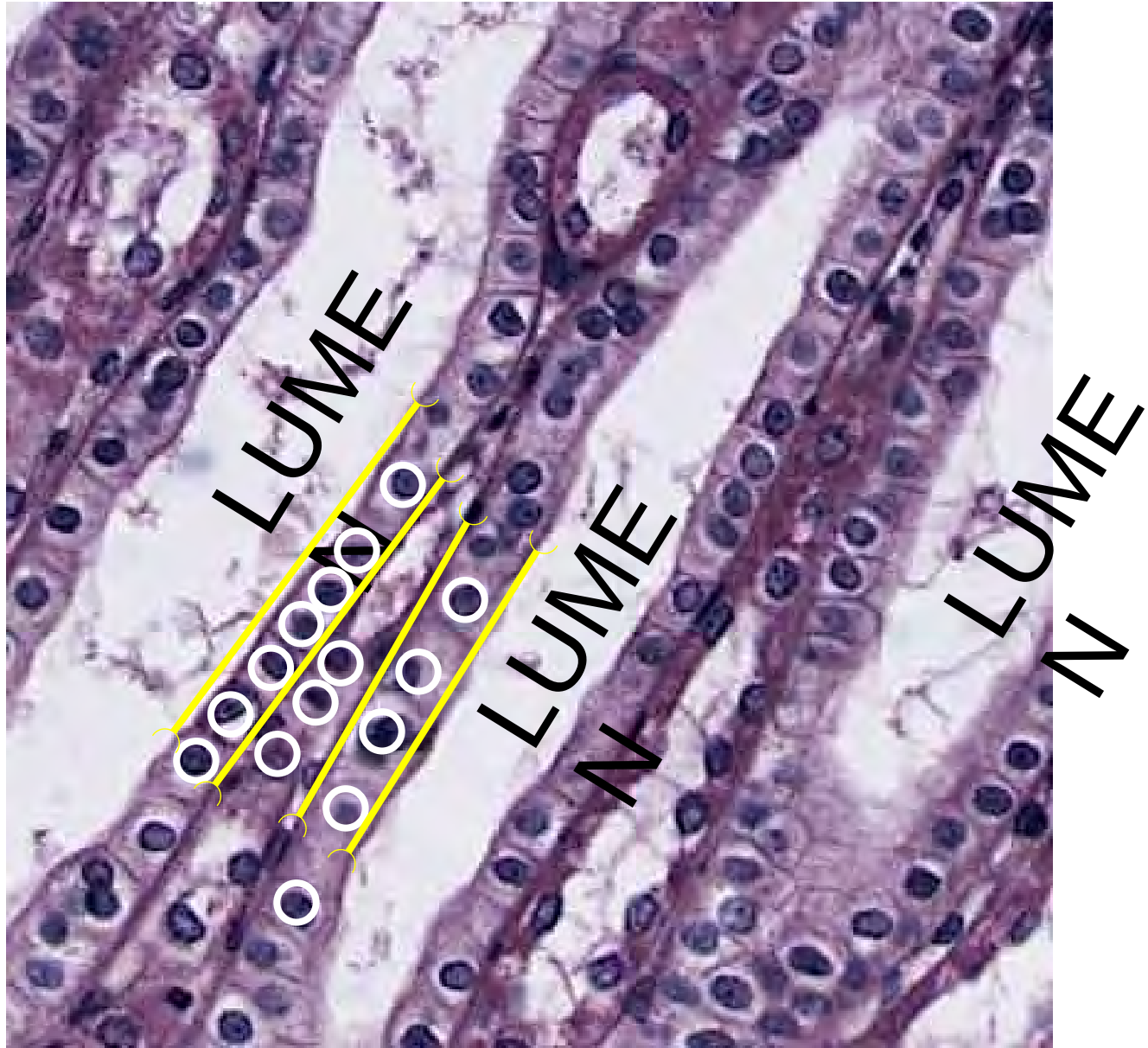
Q14: The elongated processes =
Canaliculi



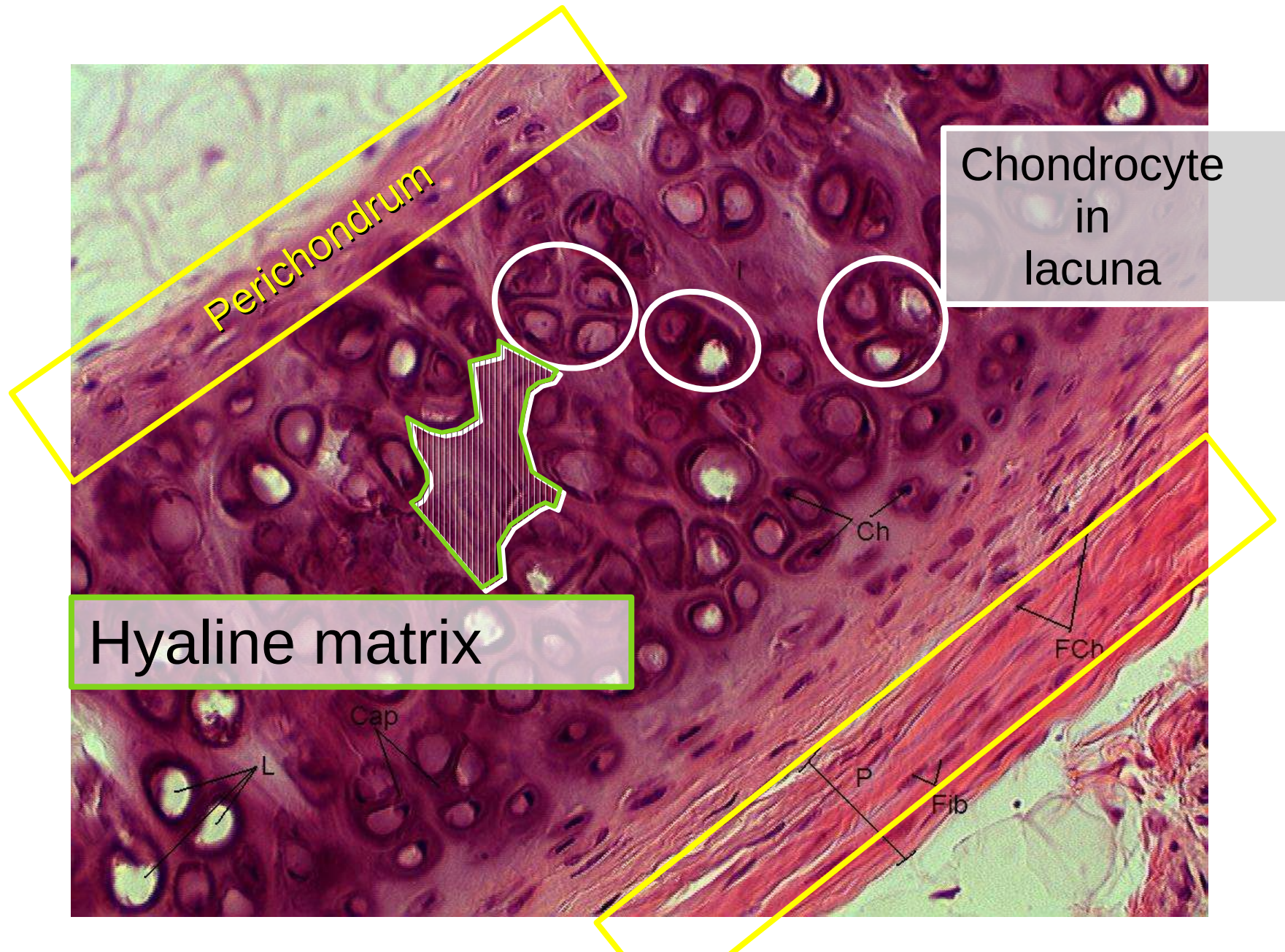
Q15: Function of canaliculi? Nutrients, Sensors, Communication



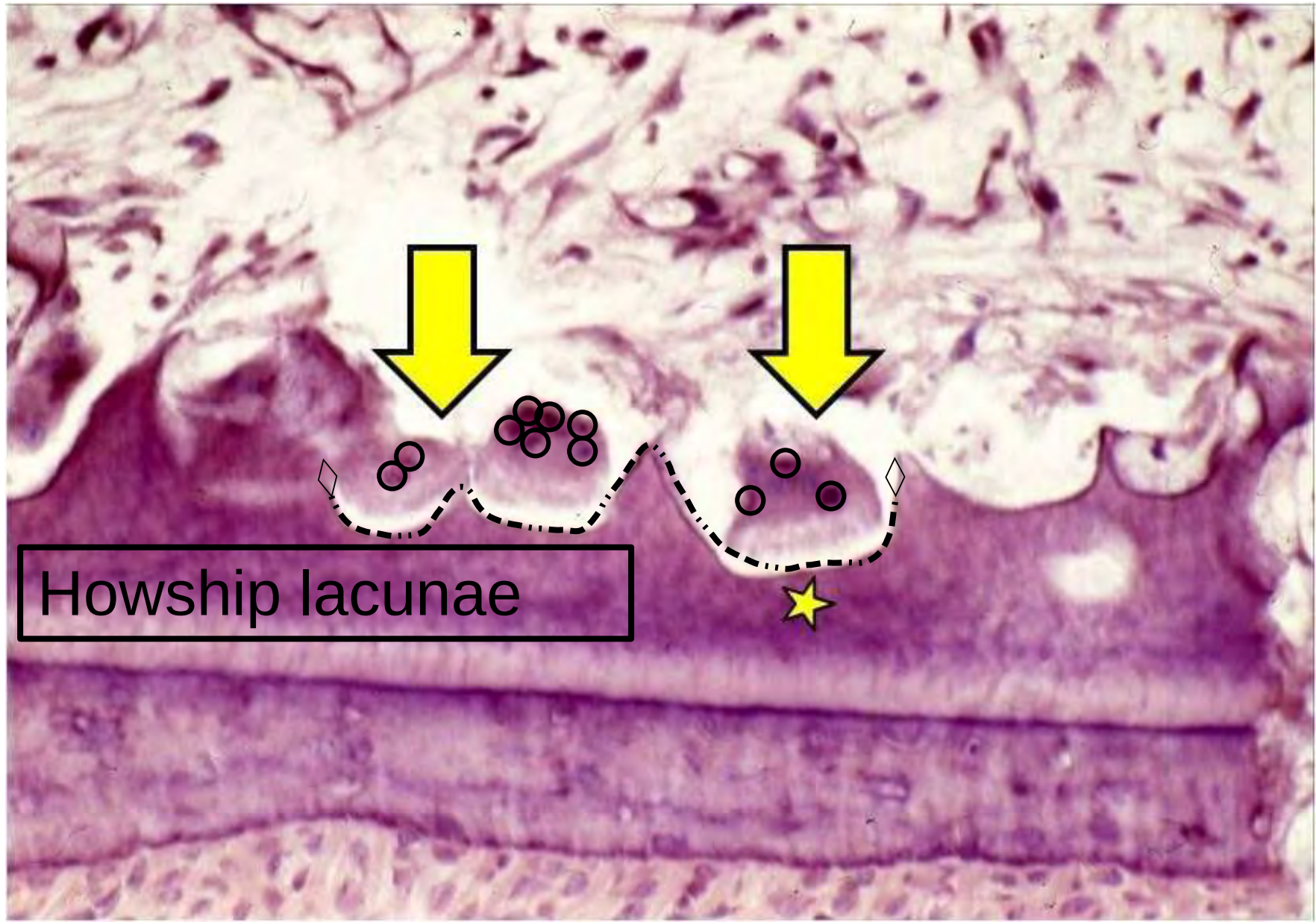
Q16: Cuboidal - kidney



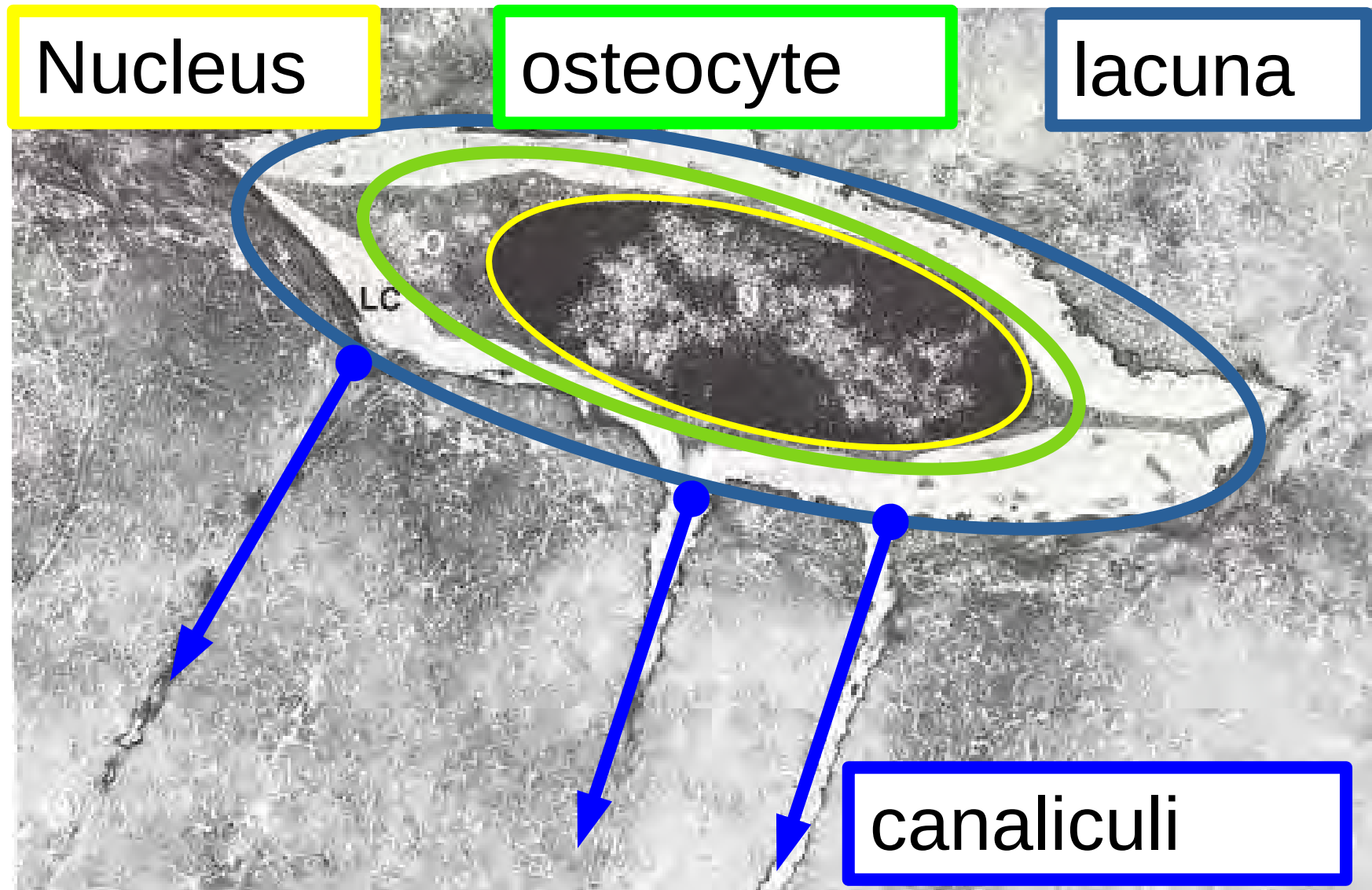
Q17: Cartilage = hyaline



Q18: cells = osteoclasts

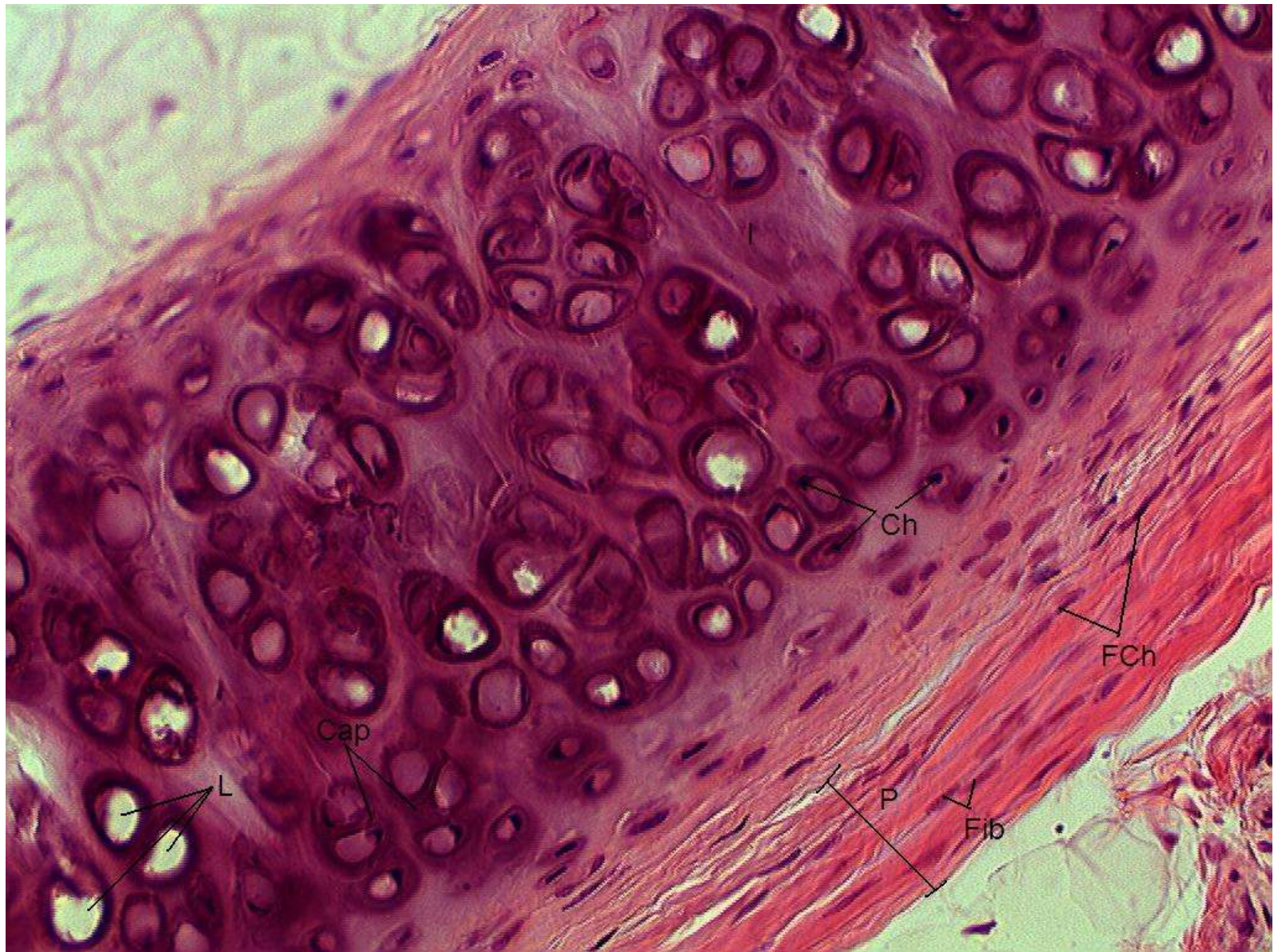


q19: cell = osteocyte





Q20: Surrounding hyaline cartilage =
perichondrium



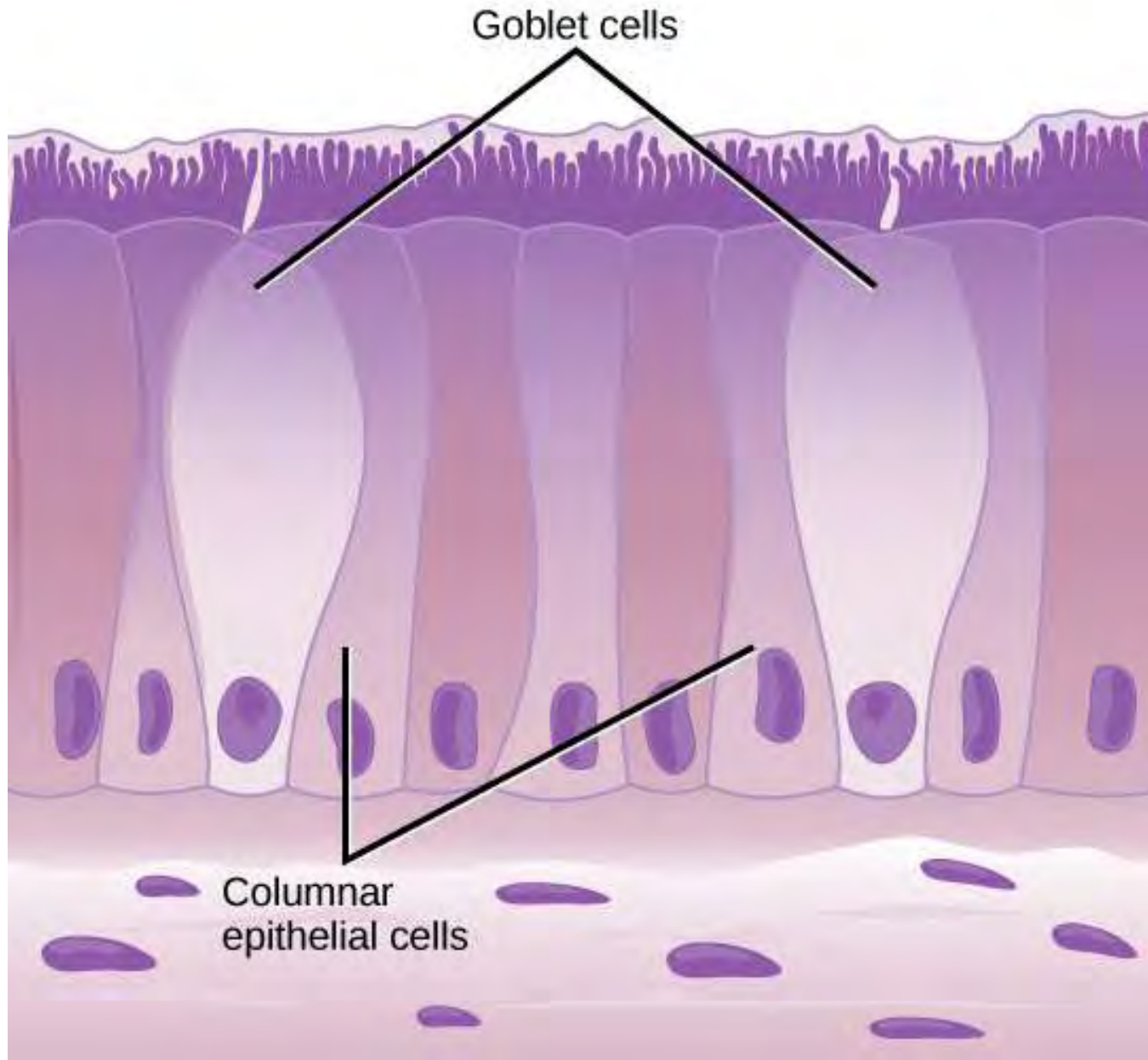
Q21: osteoclasts = resorption of bone



Q22: Structures in Haversian canal
artery, vein, nerve, lymph vessel



Q23: 2 cells = goblet, ciliated columnar.



Q24: I exercise -

Something is better than nothing

More is better

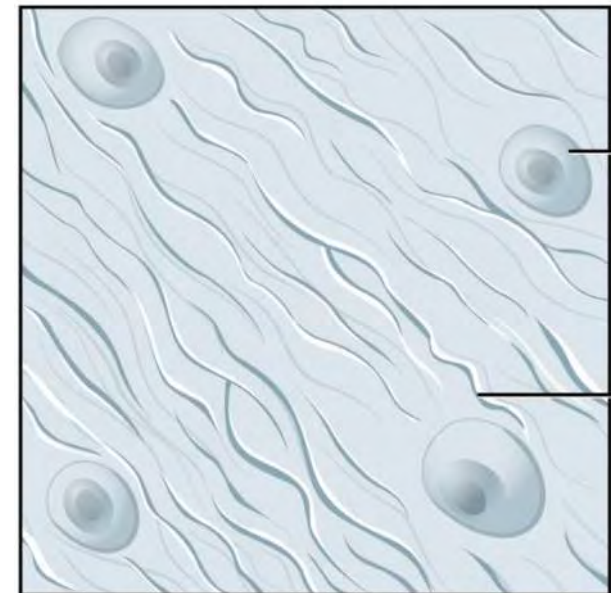
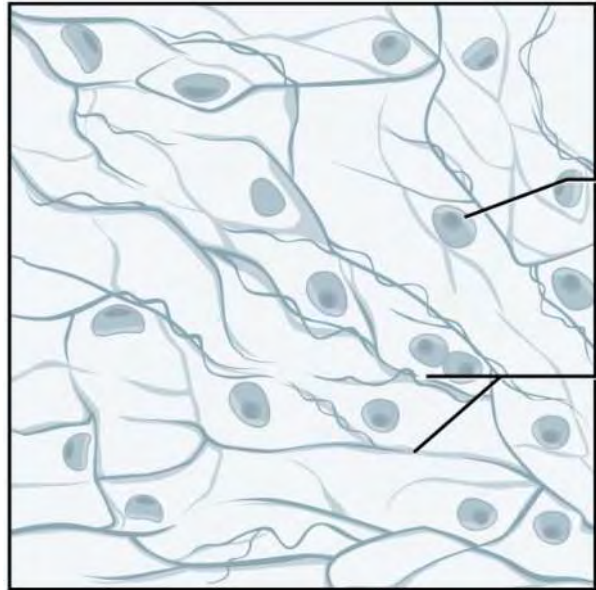
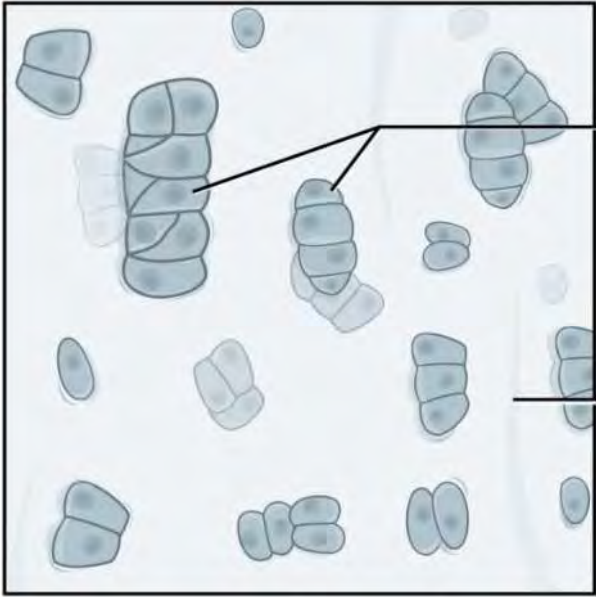
Reflection

Final step:
Are you happy with progress?

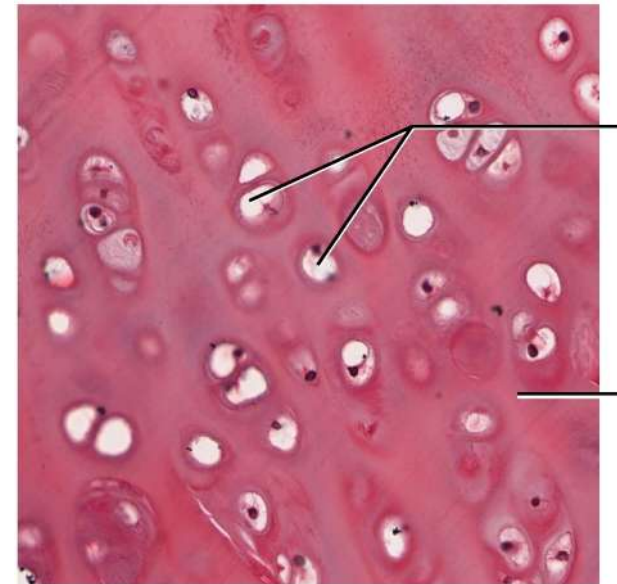
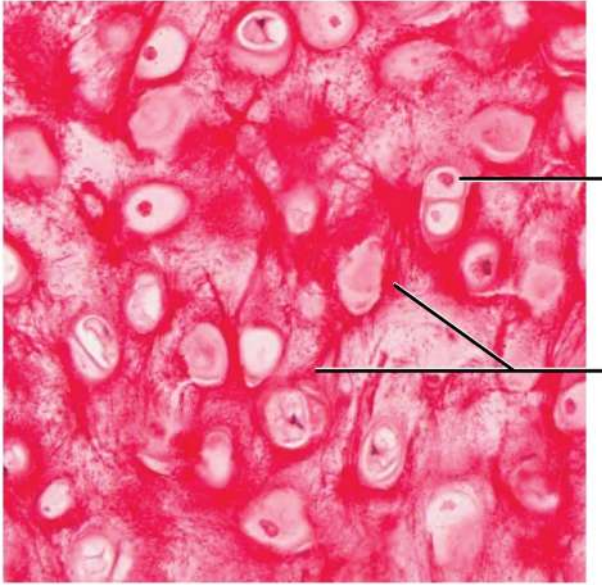


Cartilage and Bone

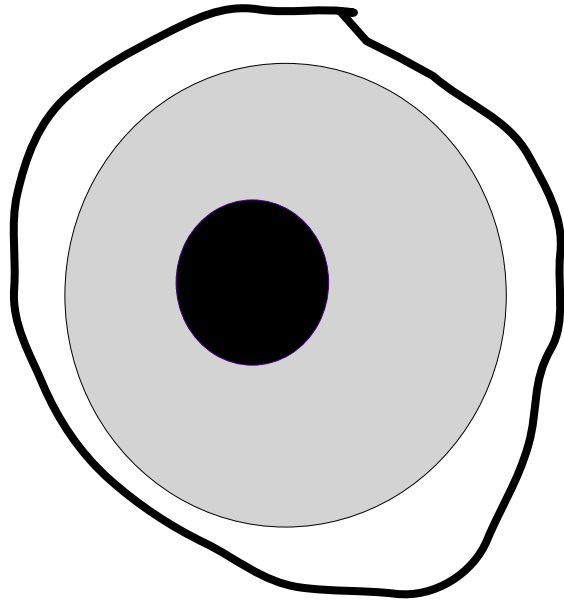
Identify & Annotate



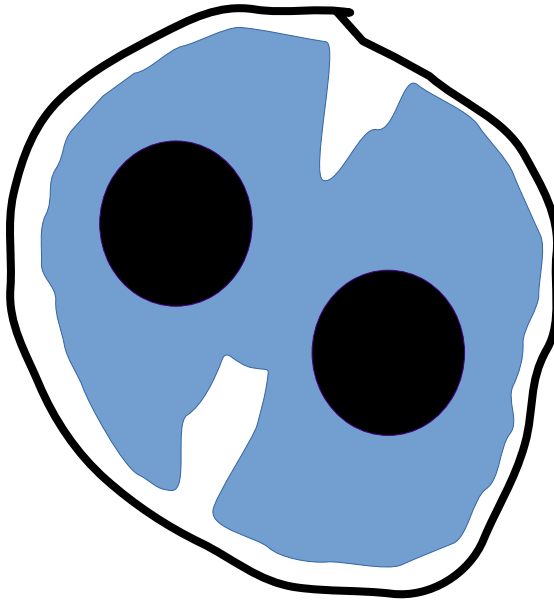
Identify & Annotate



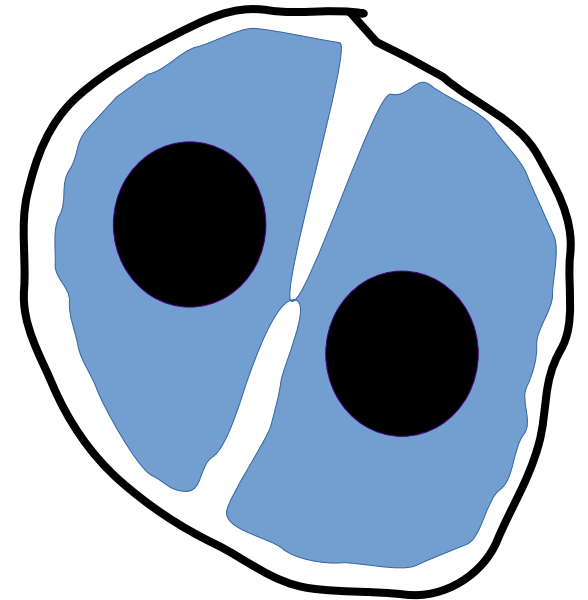
Chondrocyte/s



Chondrocyte
in
lacuna



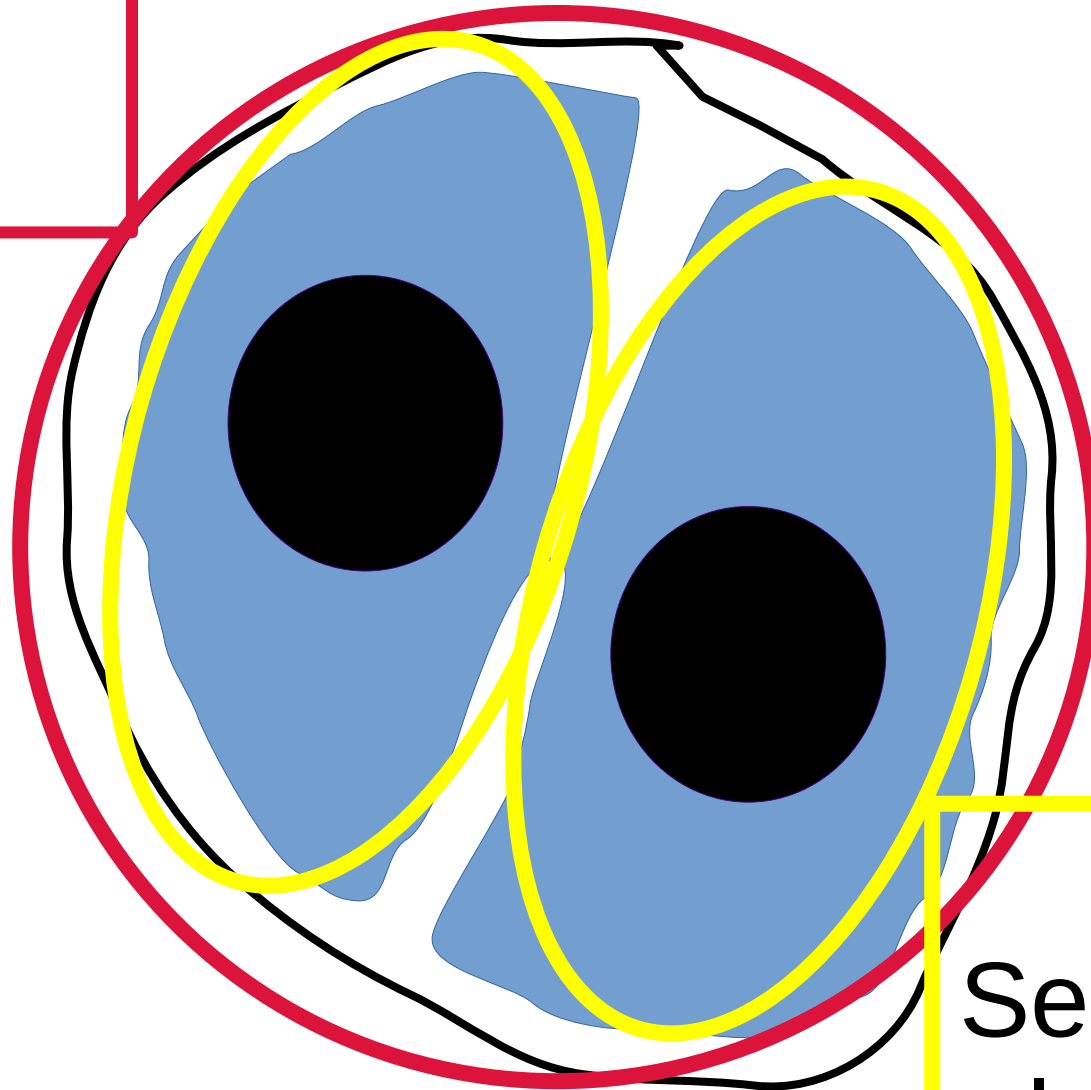
Divide
Mitosis



Two
Chondrocytes
in
lacuna

Chondrocyte/s

Primary
lacuna



Two
Secondary
lacunae

Trachea

slide 73

For hyaline cartilage

Hyaline cartilage

- Perichondrium except articular surfaces
 - Outer fibrous layer – fibroblasts & blood vessels
 - Inner cellular layer – chondrogenic cells
 - Chondrogenic cells differentiate – chondroblasts
- Chondrocytes
- Mature chondroblasts
 - Inside lacunae surrounded by matrix
 - Oval (superficially) to spherical (deep)
 - Multiple cells in lacunae = growth
 - Degeneration – hypertrophy → die → calcify
- Most common
 - Articular ends, nose, larynx, trachea, bronchi

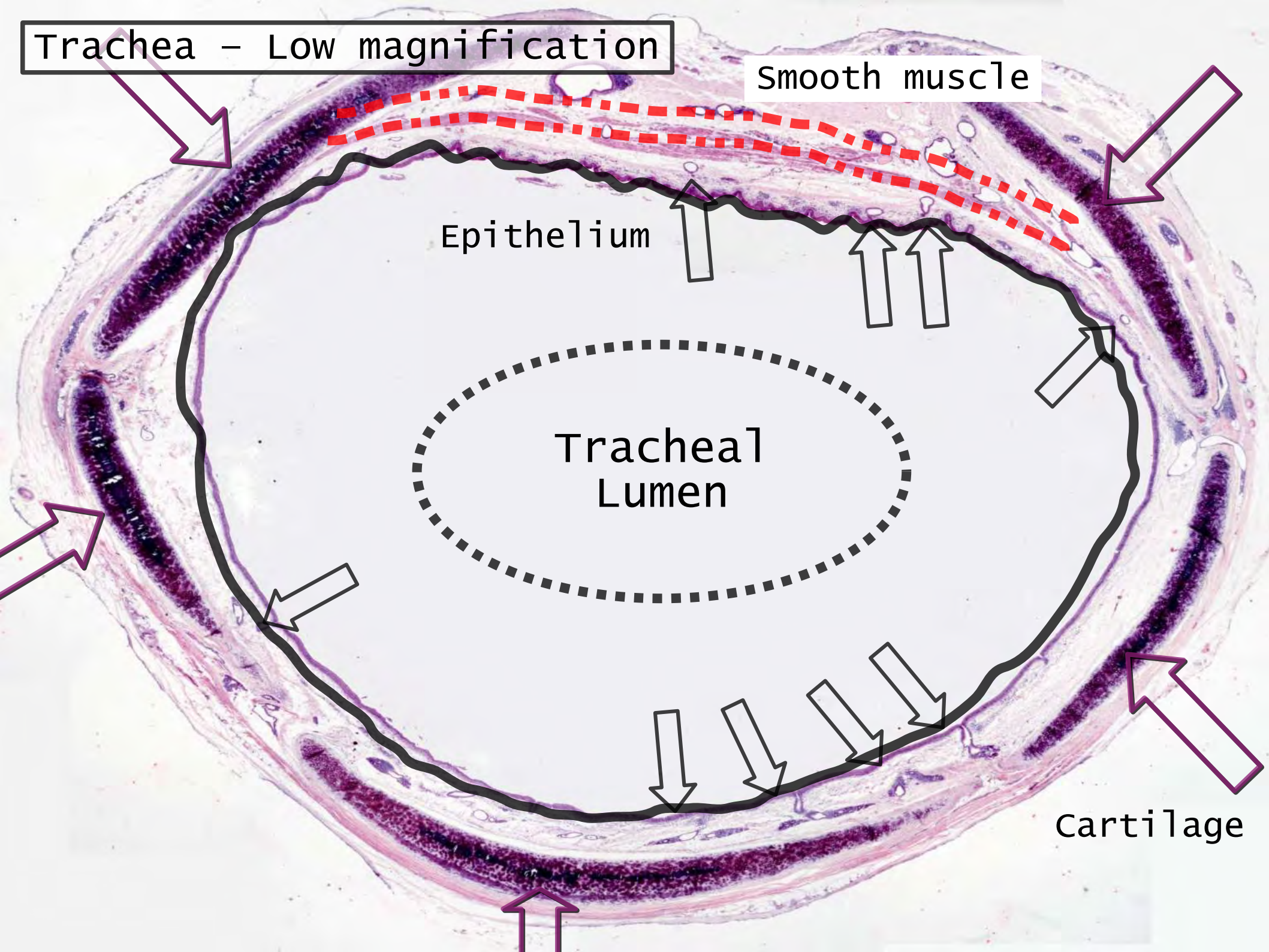
Trachea – Low magnification

Smooth muscle

Epithelium

Tracheal
Lumen

Cartilage



wall of the trachea

PCCE

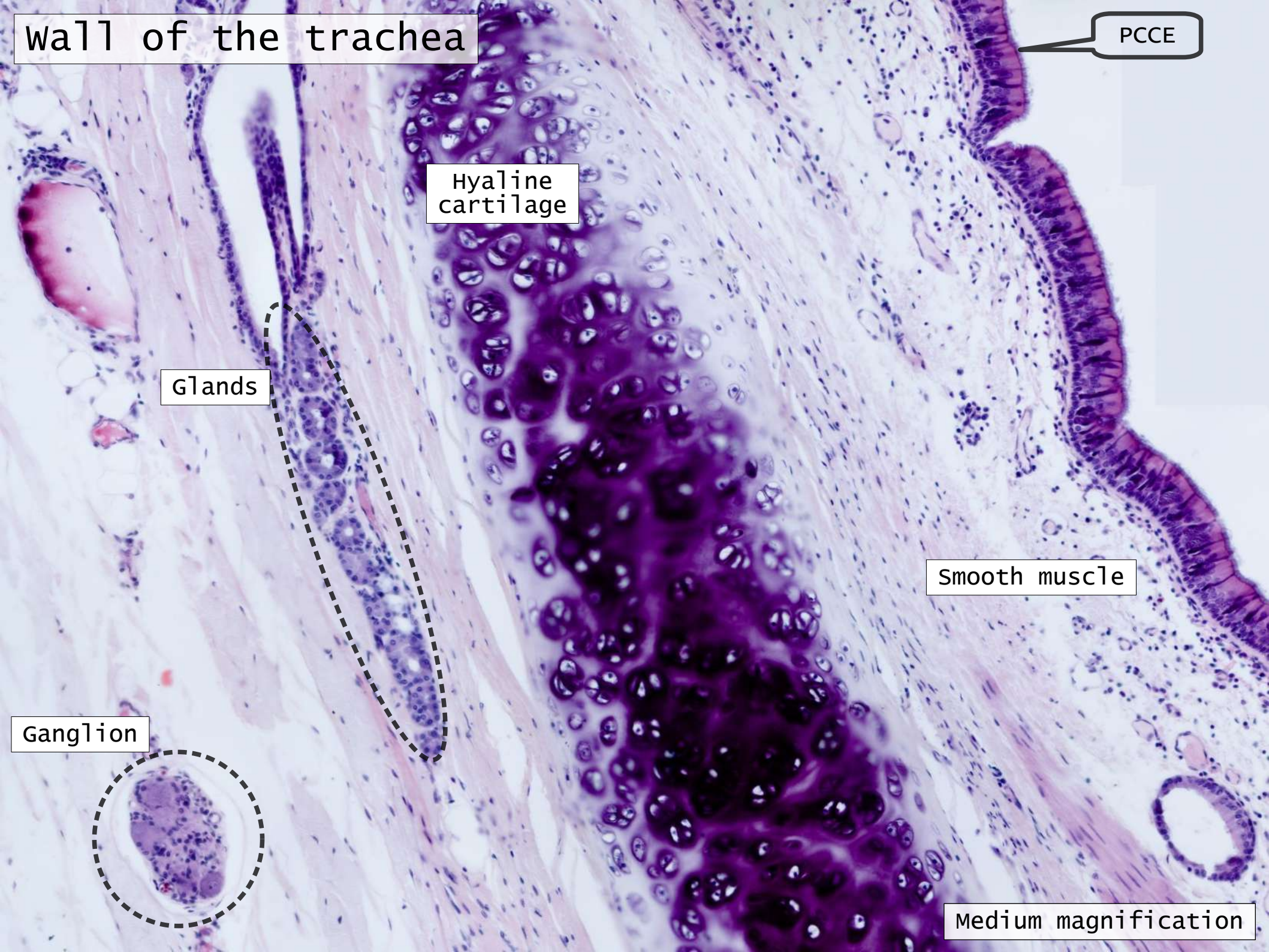
Hyaline cartilage

Glands

Smooth muscle

Ganglion

Medium magnification



Hyaline cartilage

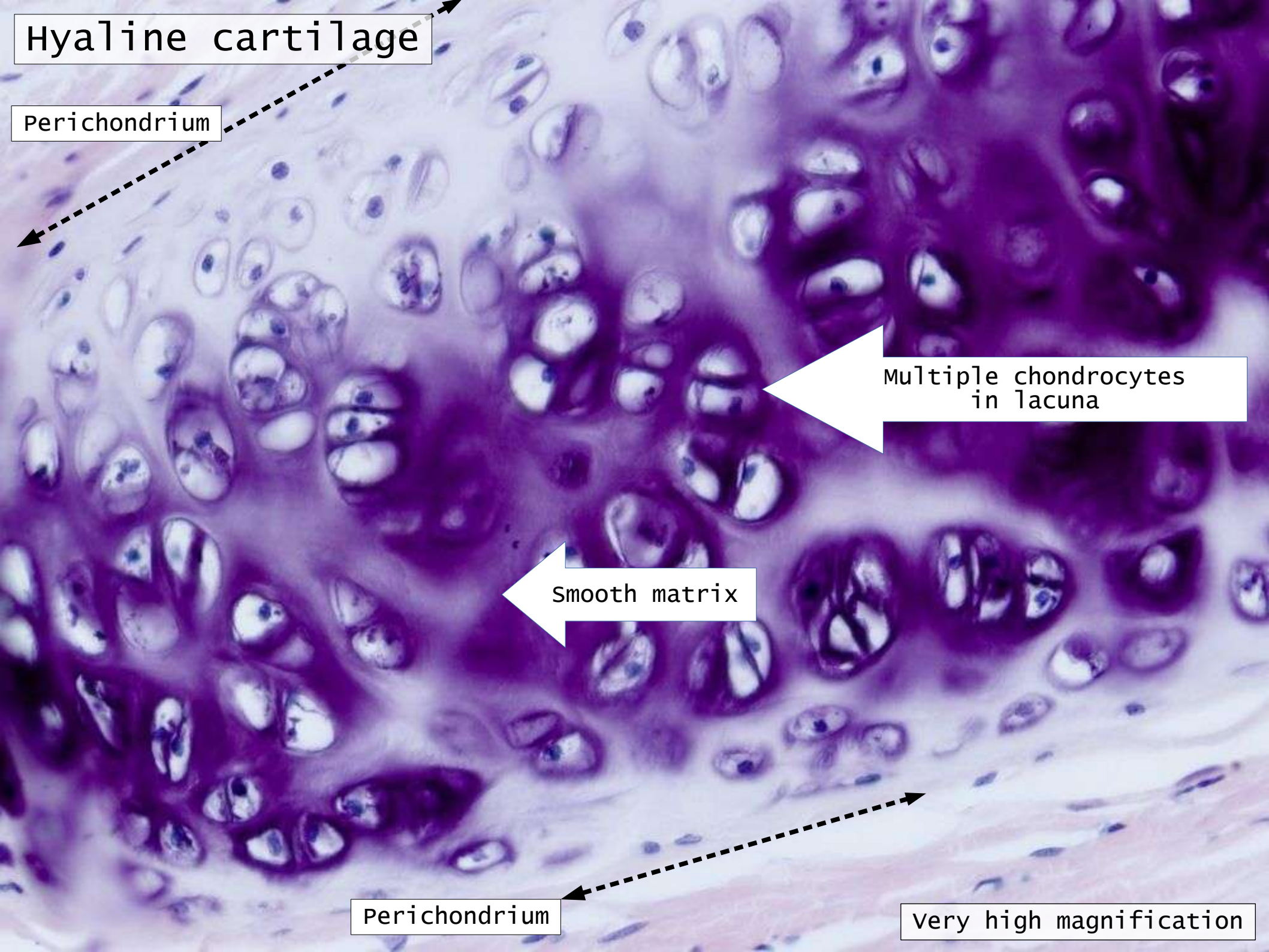
Perichondrium

Multiple chondrocytes
in lacuna

Smooth matrix

Perichondrium

very high magnification



Elastic

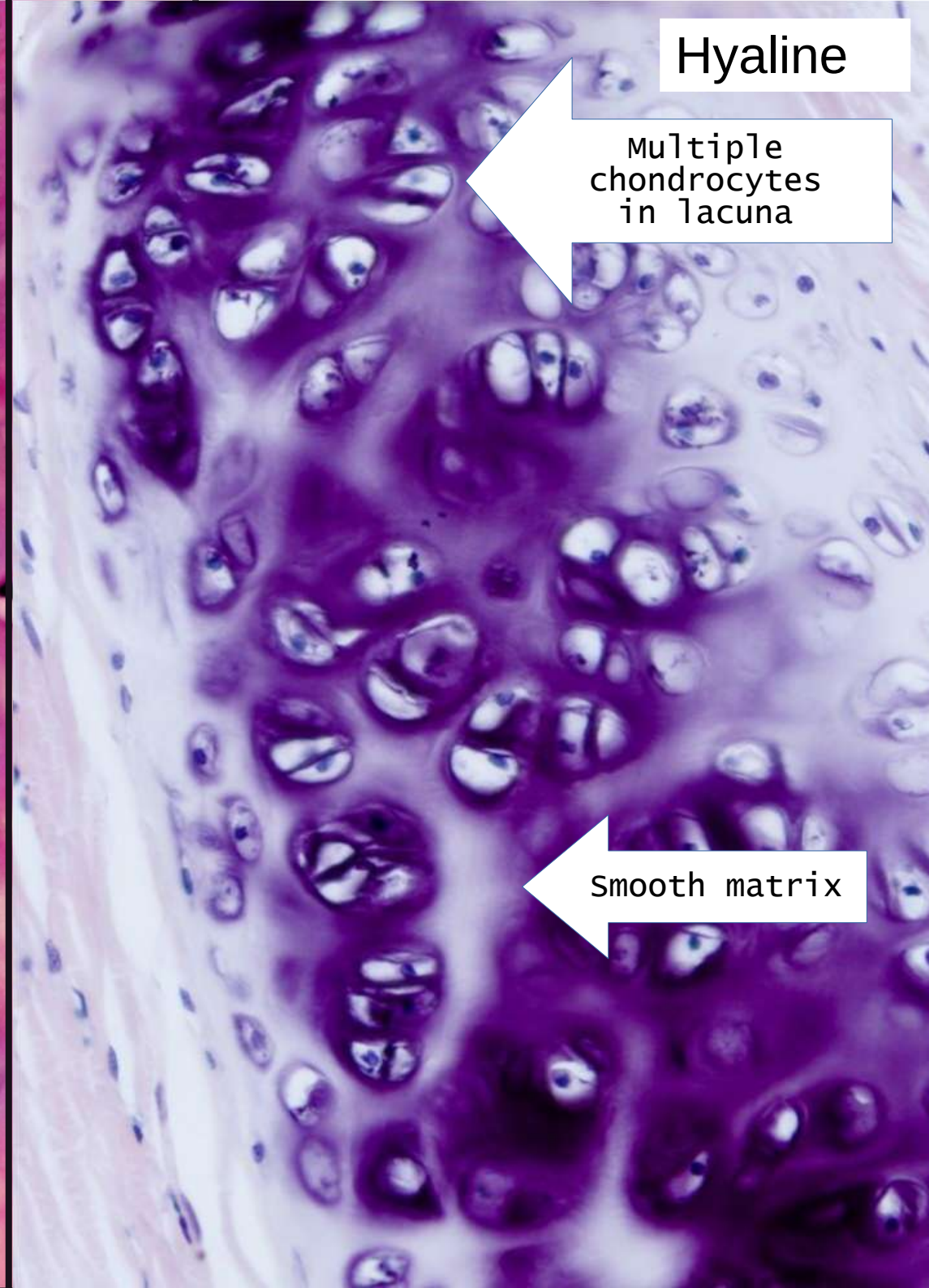
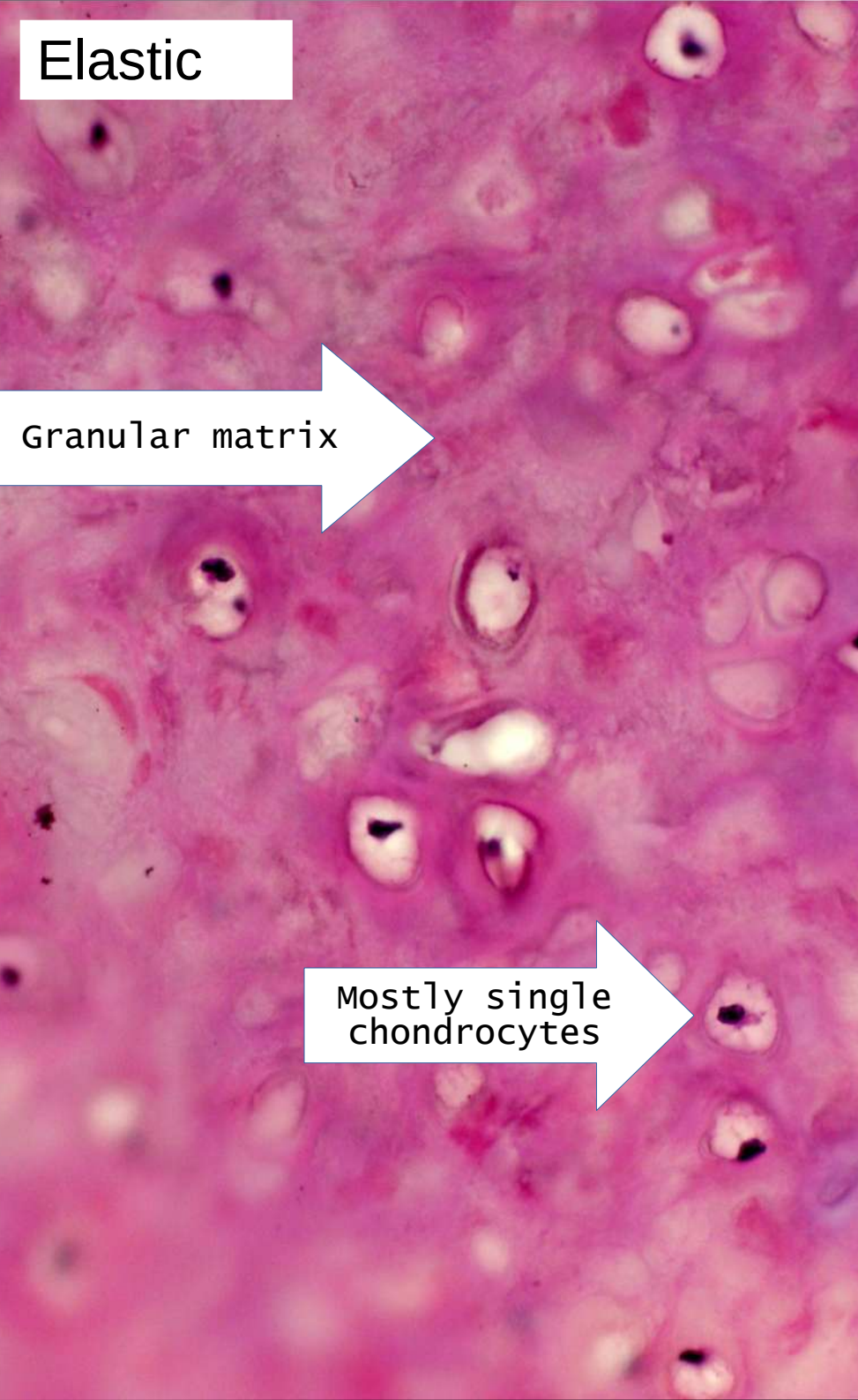
Hyaline

Multiple
chondrocytes
in lacuna

Granular matrix

Mostly single
chondrocytes

Smooth matrix



Ear

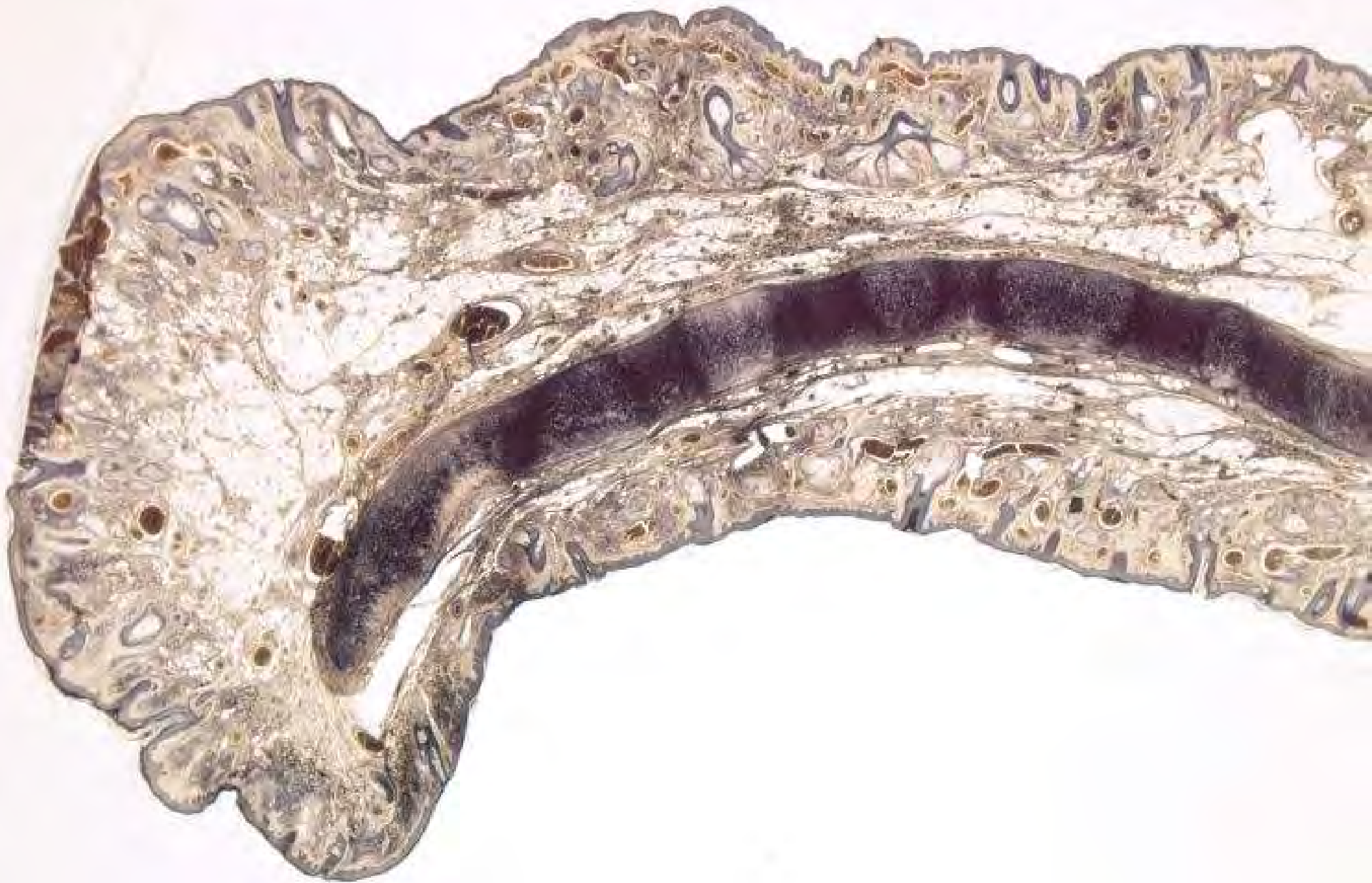
Slide 9

For elastic cartilage

Elastic cartilage

- Perichondrium
- Appositional growth
- Flexible
 - Ear
 - Auditory canal
 - Epiglottis
- Network elastic fibres in matrix

External ear



very low magnification

External ear



very low magnification

External ear

Stratified keratinized
squamous epithelium

Hair follicles

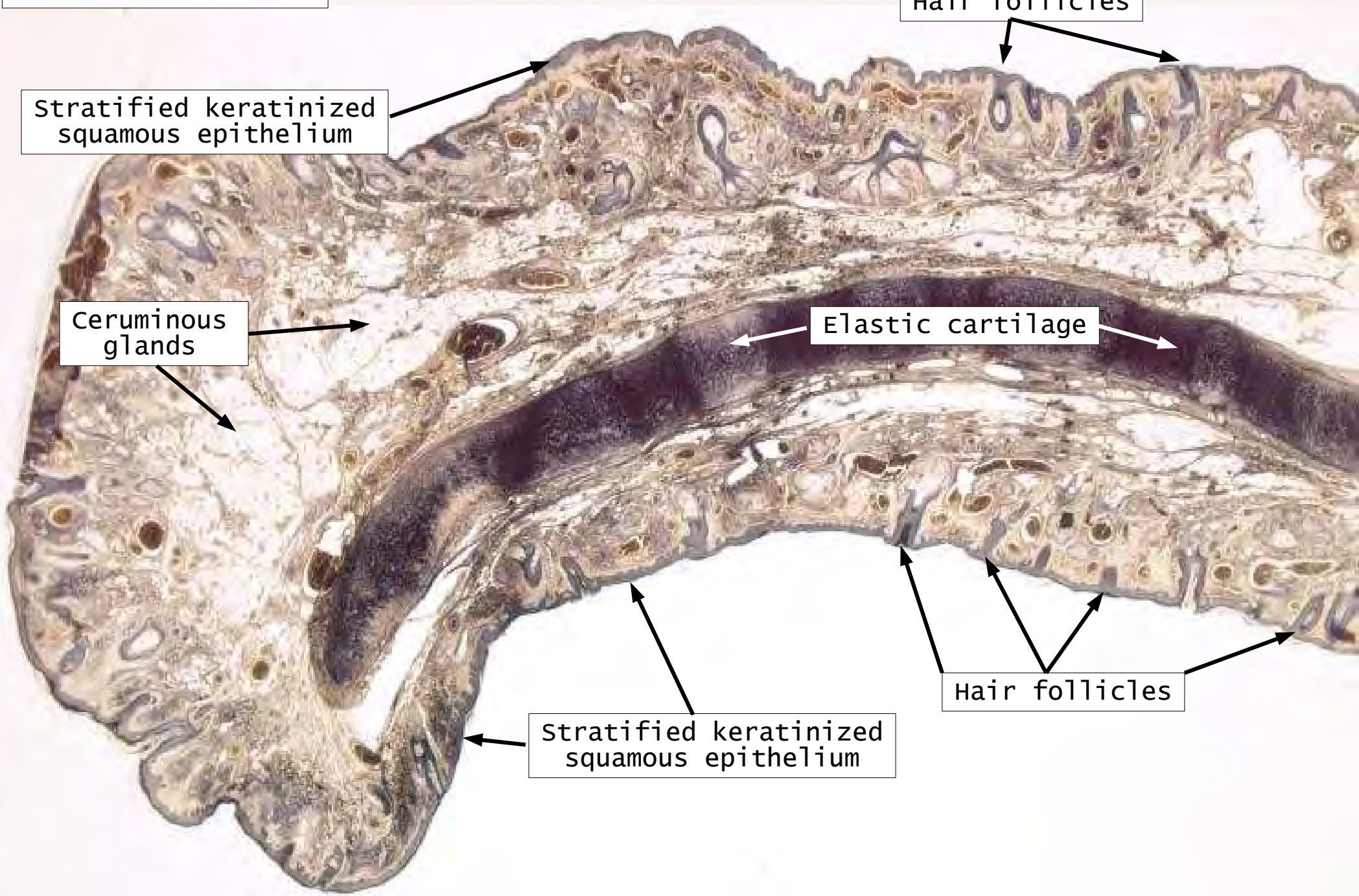
Ceruminous
glands

Elastic cartilage

Hair follicles

Stratified keratinized
squamous epithelium

very low magnification



External ear

Hair follicles

Ceruminous glands

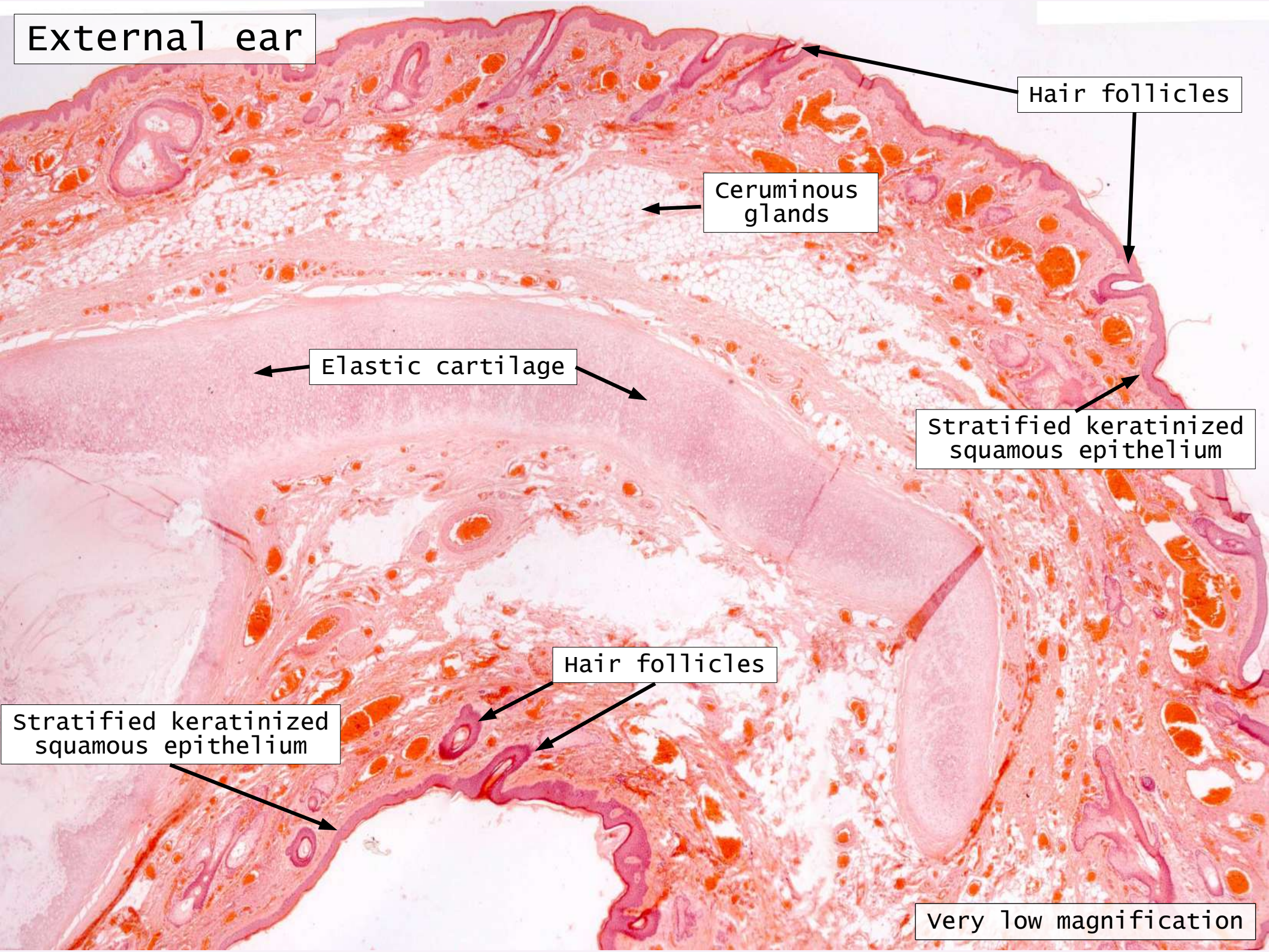
Elastic cartilage

Stratified keratinized squamous epithelium

Hair follicles

Stratified keratinized squamous epithelium

Very low magnification



External ear

Stratified keratinized
squamous epithelium

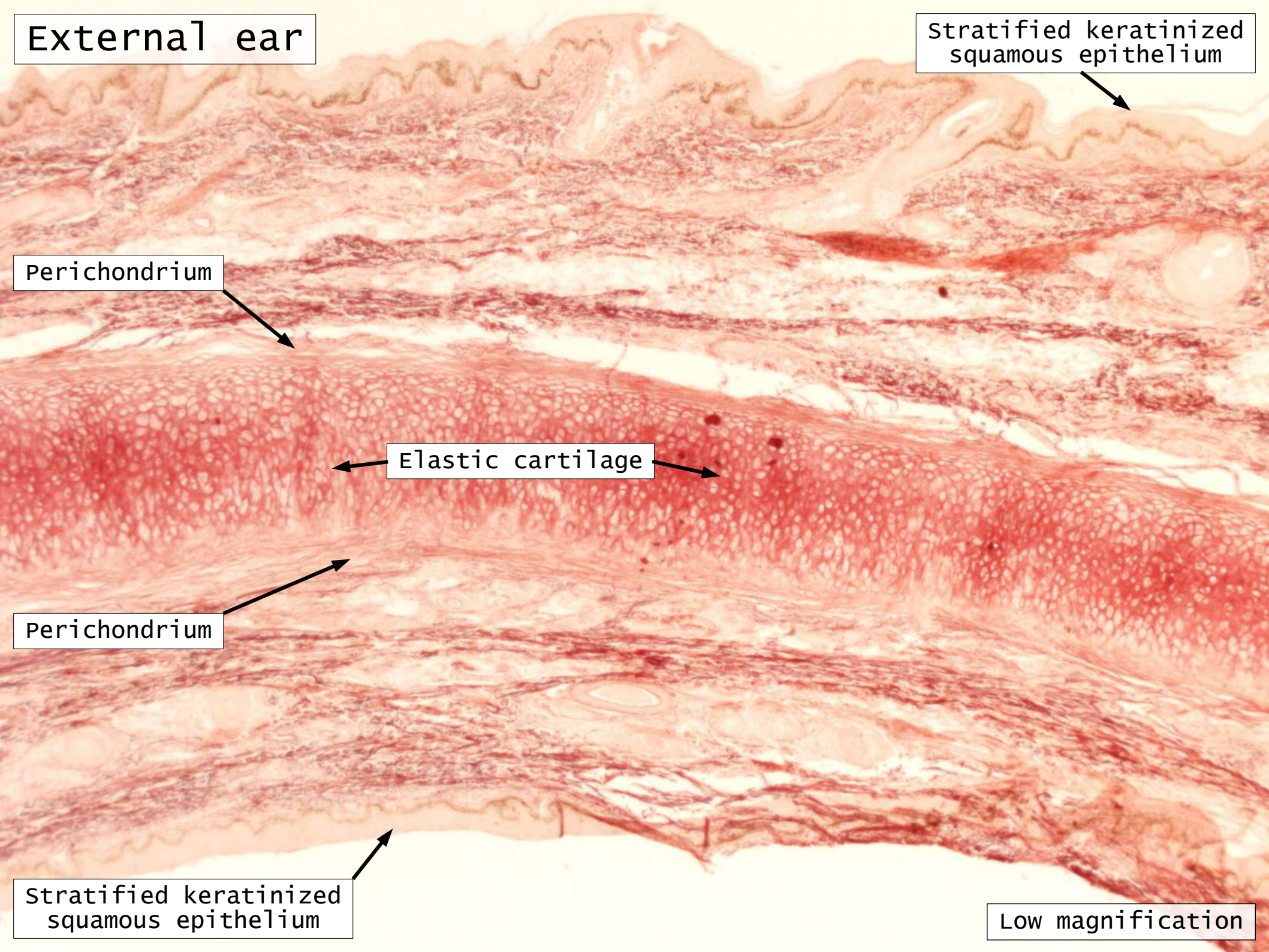
Perichondrium

Elastic cartilage

Perichondrium

Stratified keratinized
squamous epithelium

Low magnification



Elastic cartilage

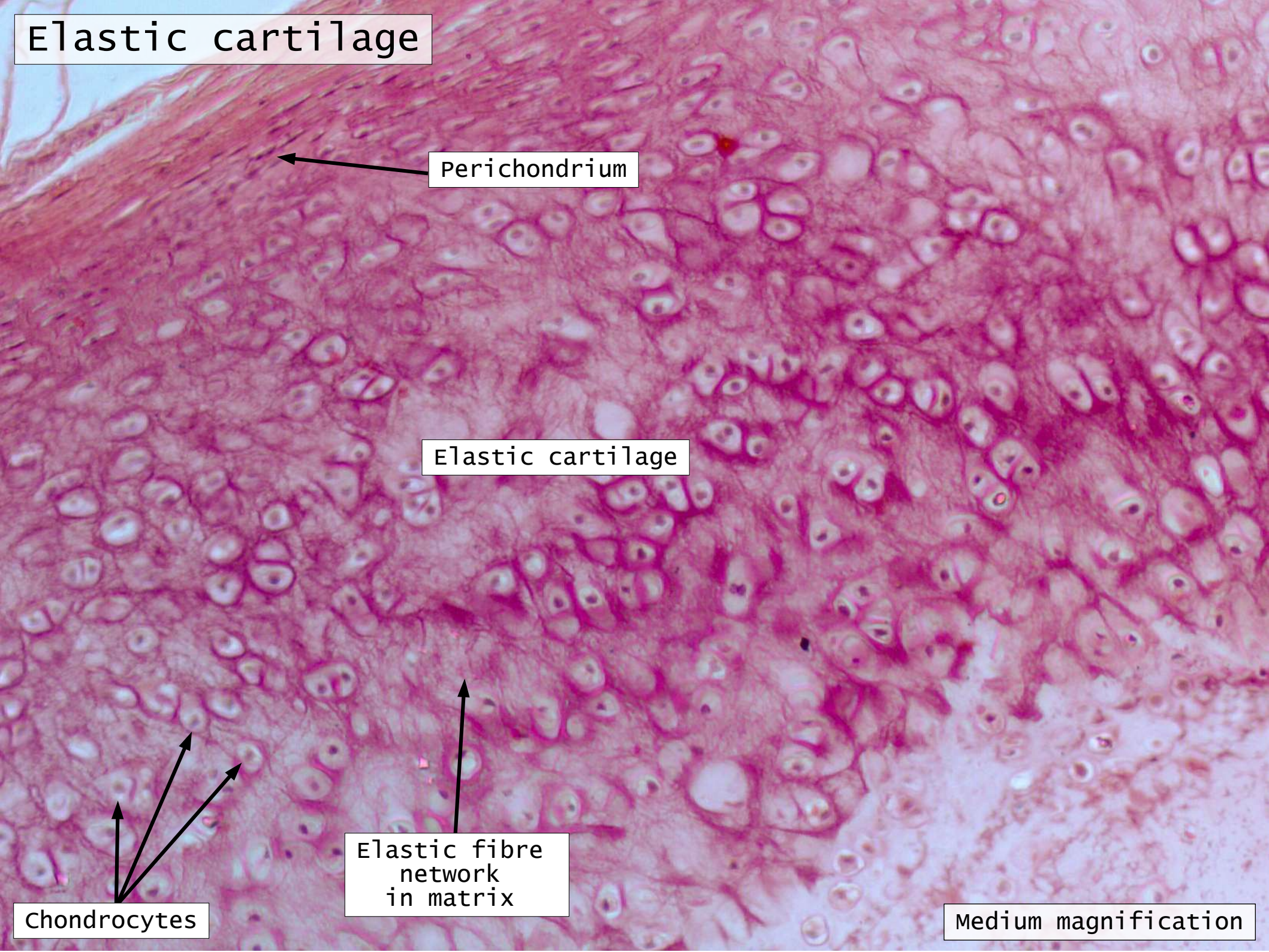
Perichondrium

Elastic cartilage

Chondrocytes

Elastic fibre
network
in matrix

Medium magnification

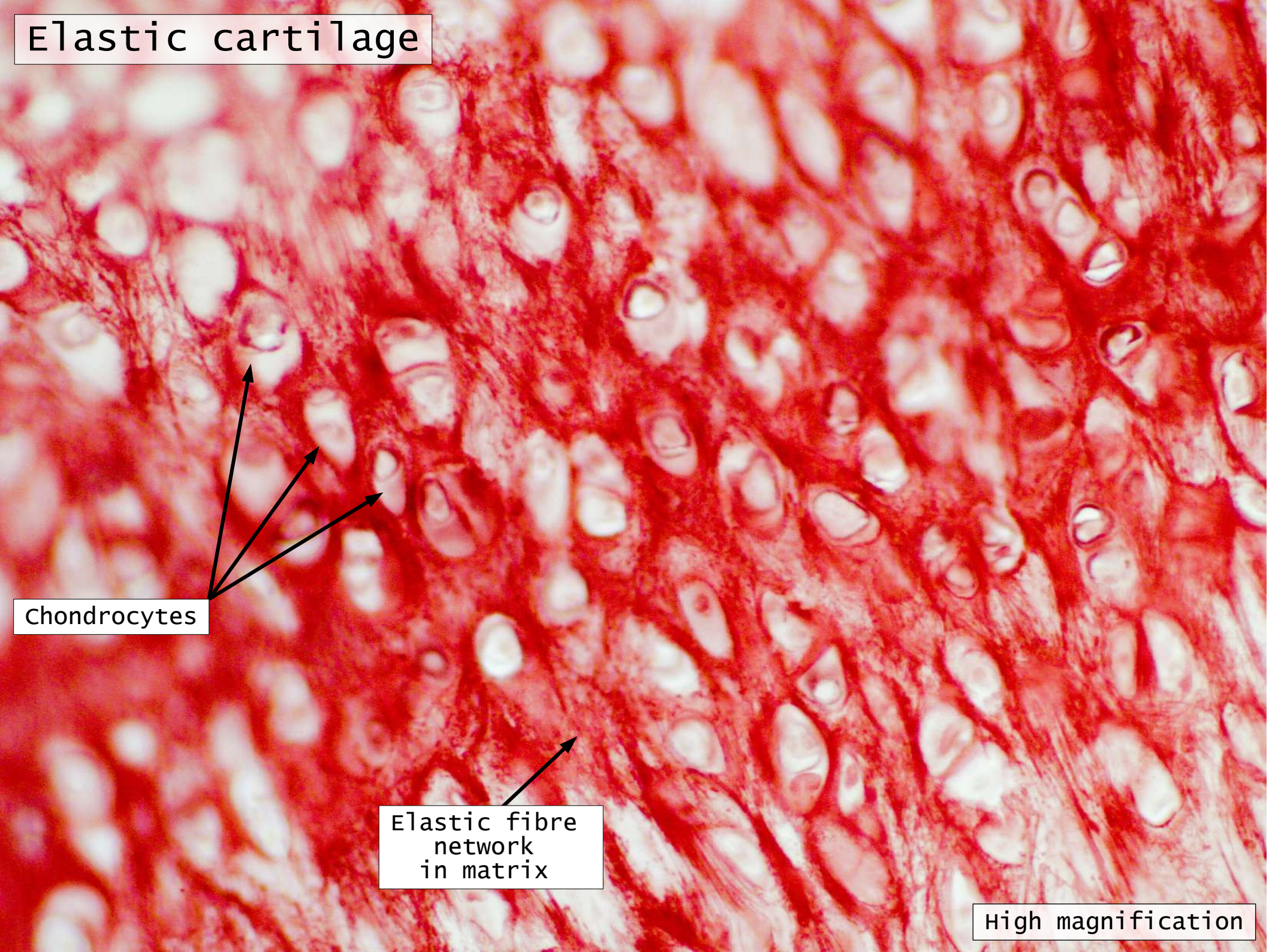


Elastic cartilage

Chondrocytes

Elastic fibre
network
in matrix

High magnification



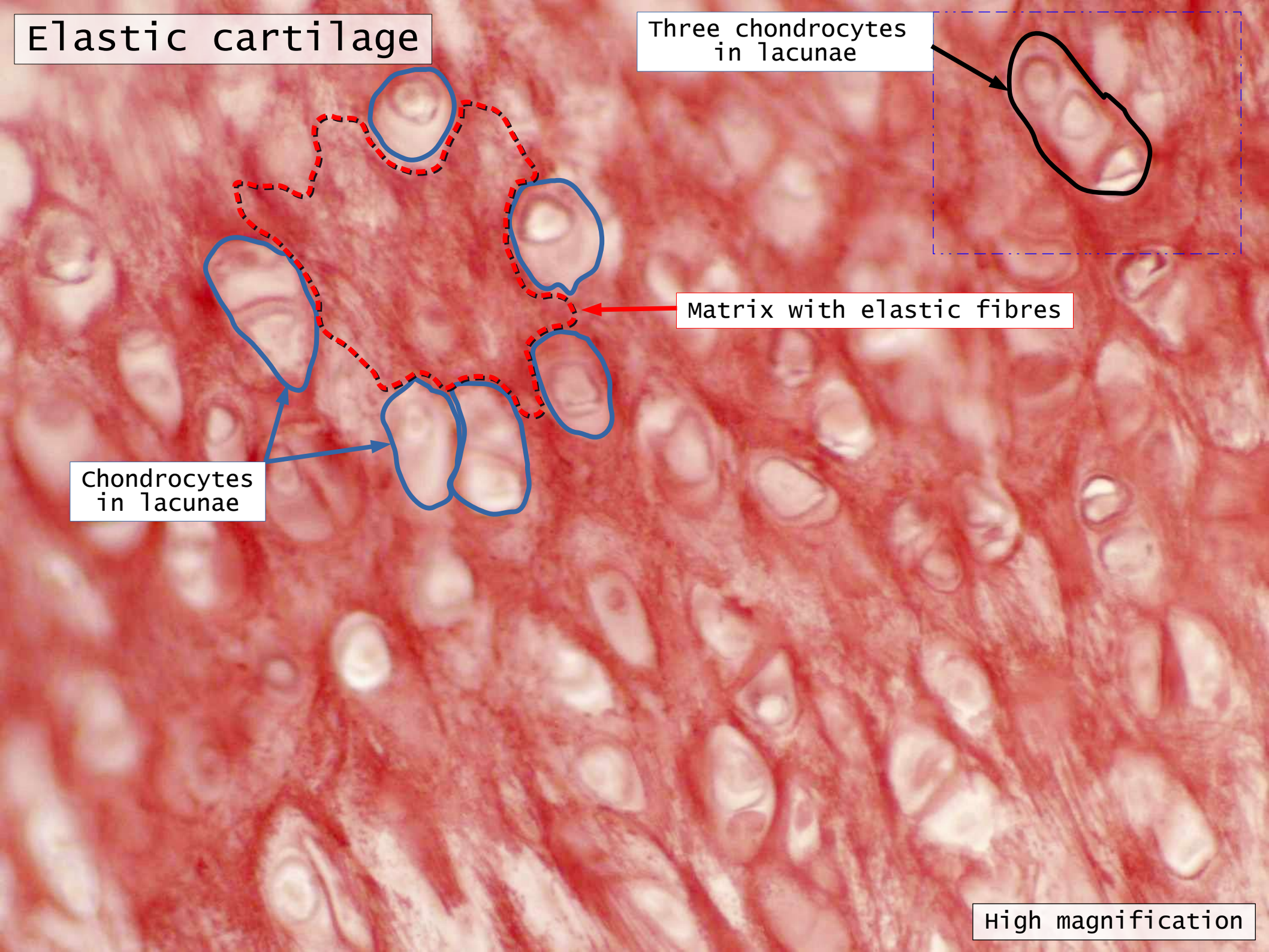
Elastic cartilage

Three chondrocytes
in lacunae

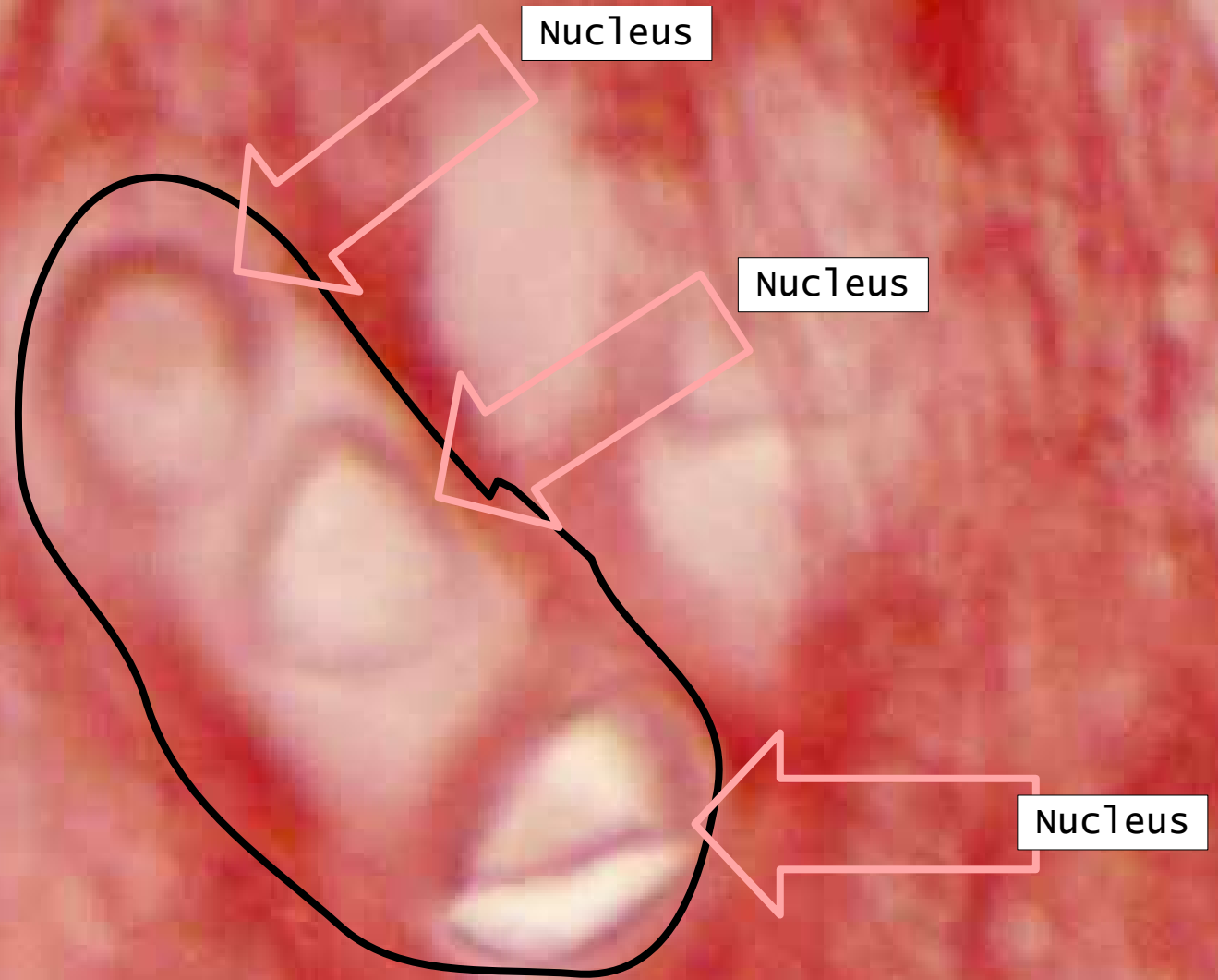
Matrix with elastic fibres

Chondrocytes
in lacunae

High magnification



Elastic cartilage



very high magnification

Tendon

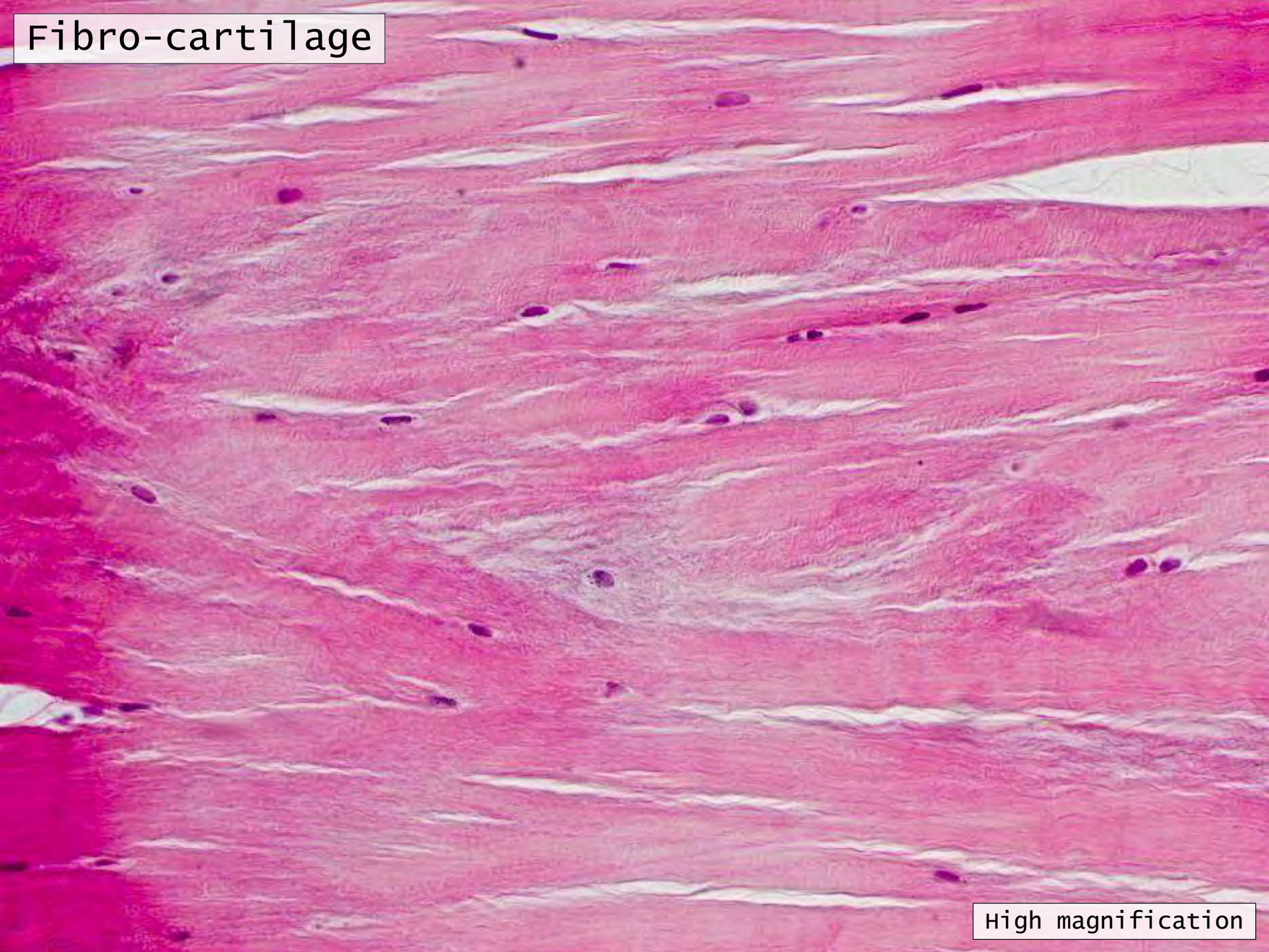
Slide 10

For fibro-cartilage

Fibrocartilage

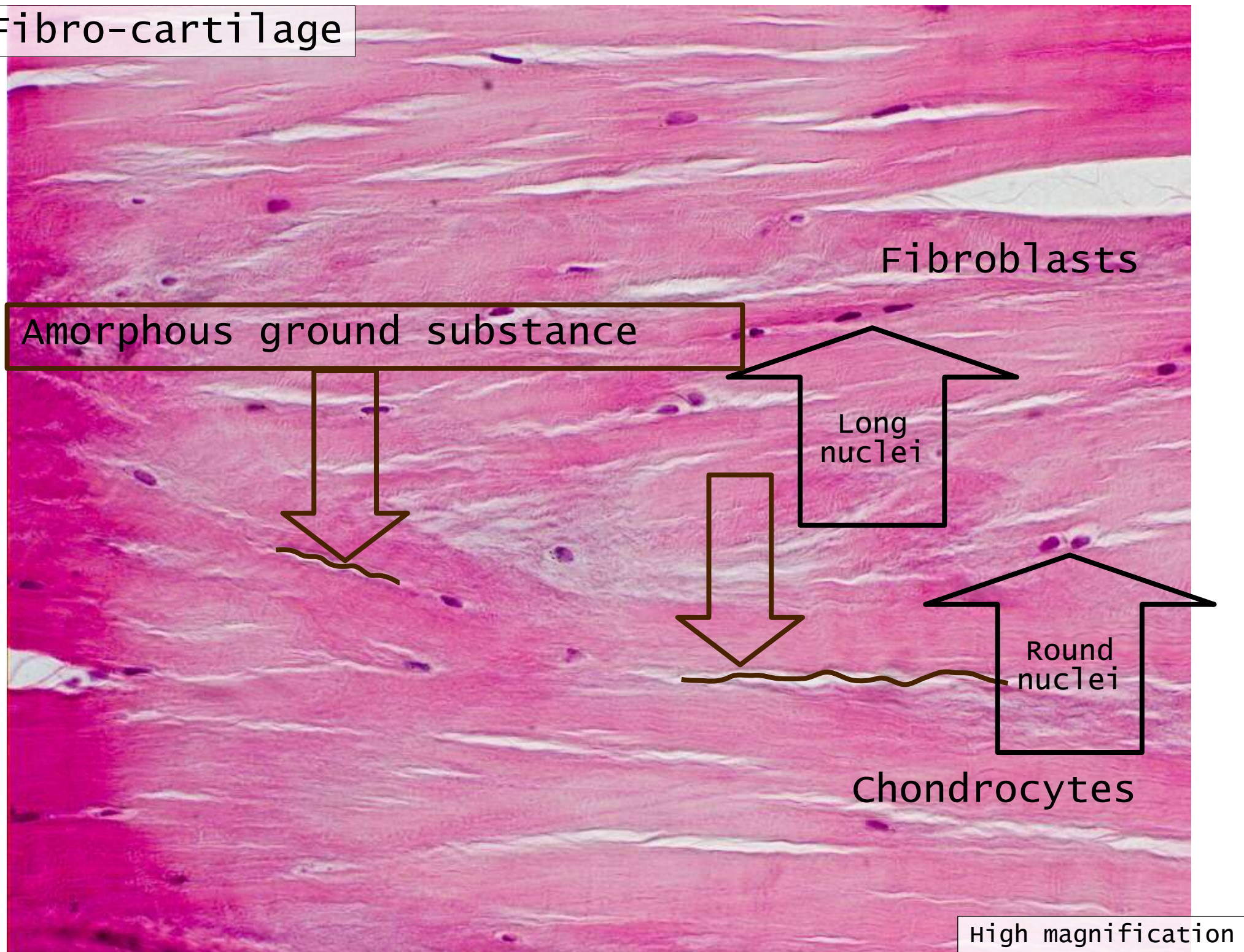
- No perichondrium
- Associated with hyaline cartilage & CT
- Transition between cartilage and CT
 - Annulus fibrosis of intervertebral disks
- Support and tensile strength
 - Capsules & ligaments of joints
 - Articular disks
 - Pubic symphysis
 - Insertion of some tendons and ligaments
- Collagen fibre bundles parallel to stress
- Chondrocytes longitudinal columns
- Stress - CT fibroblasts differentiate into chondrocytes
- Transform tissue into fibrocartilage

Fibro-cartilage

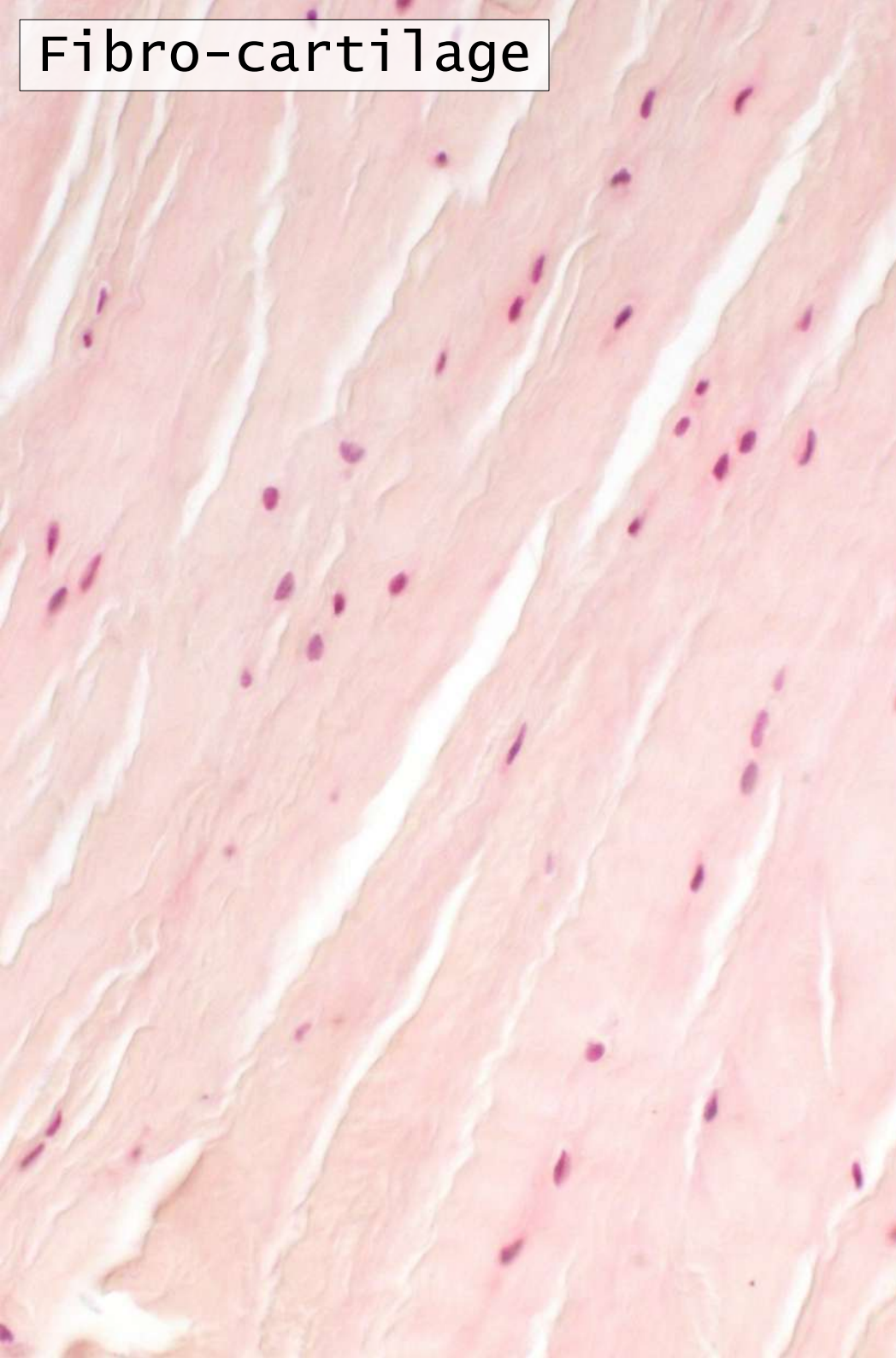


High magnification

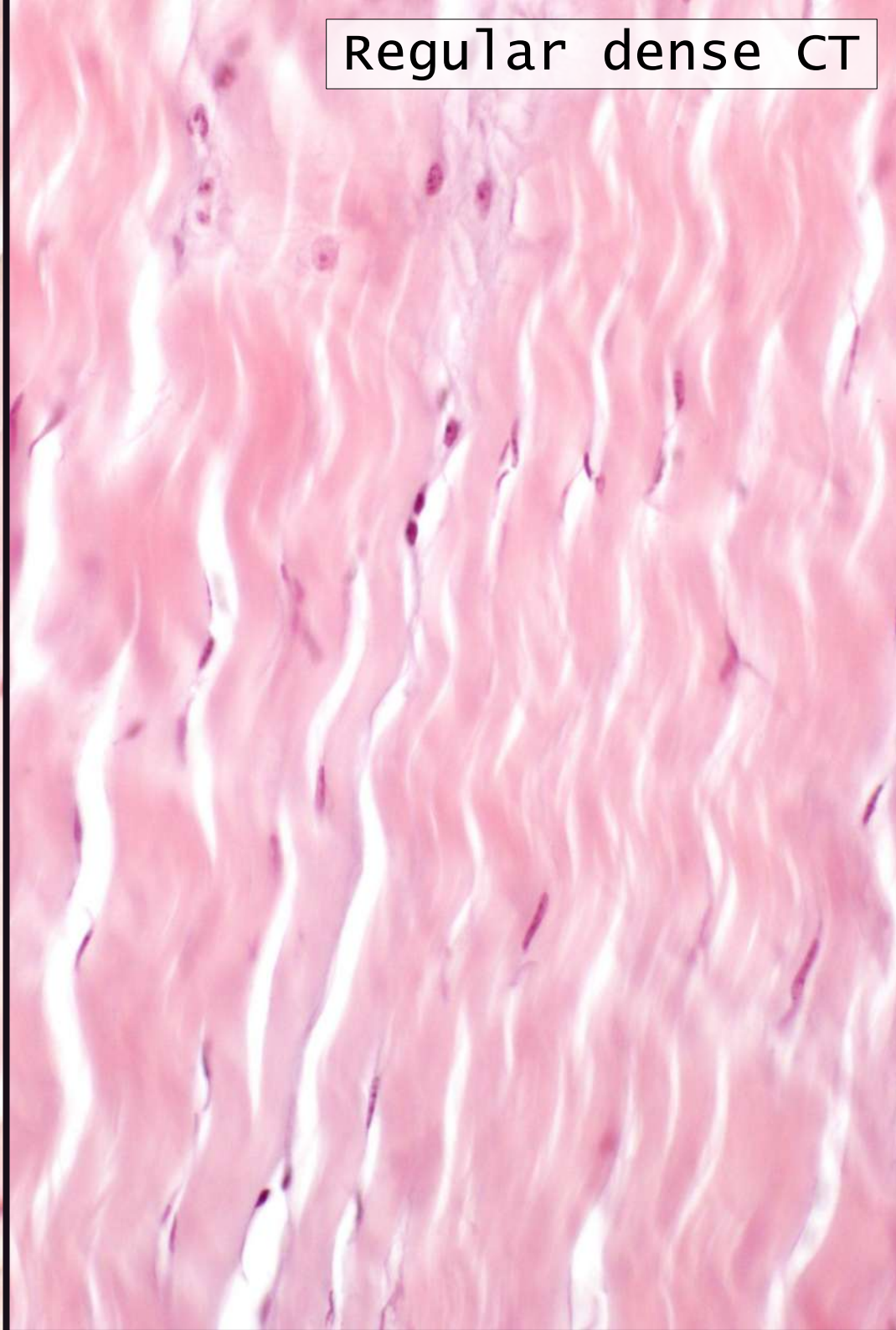
Fibro-cartilage



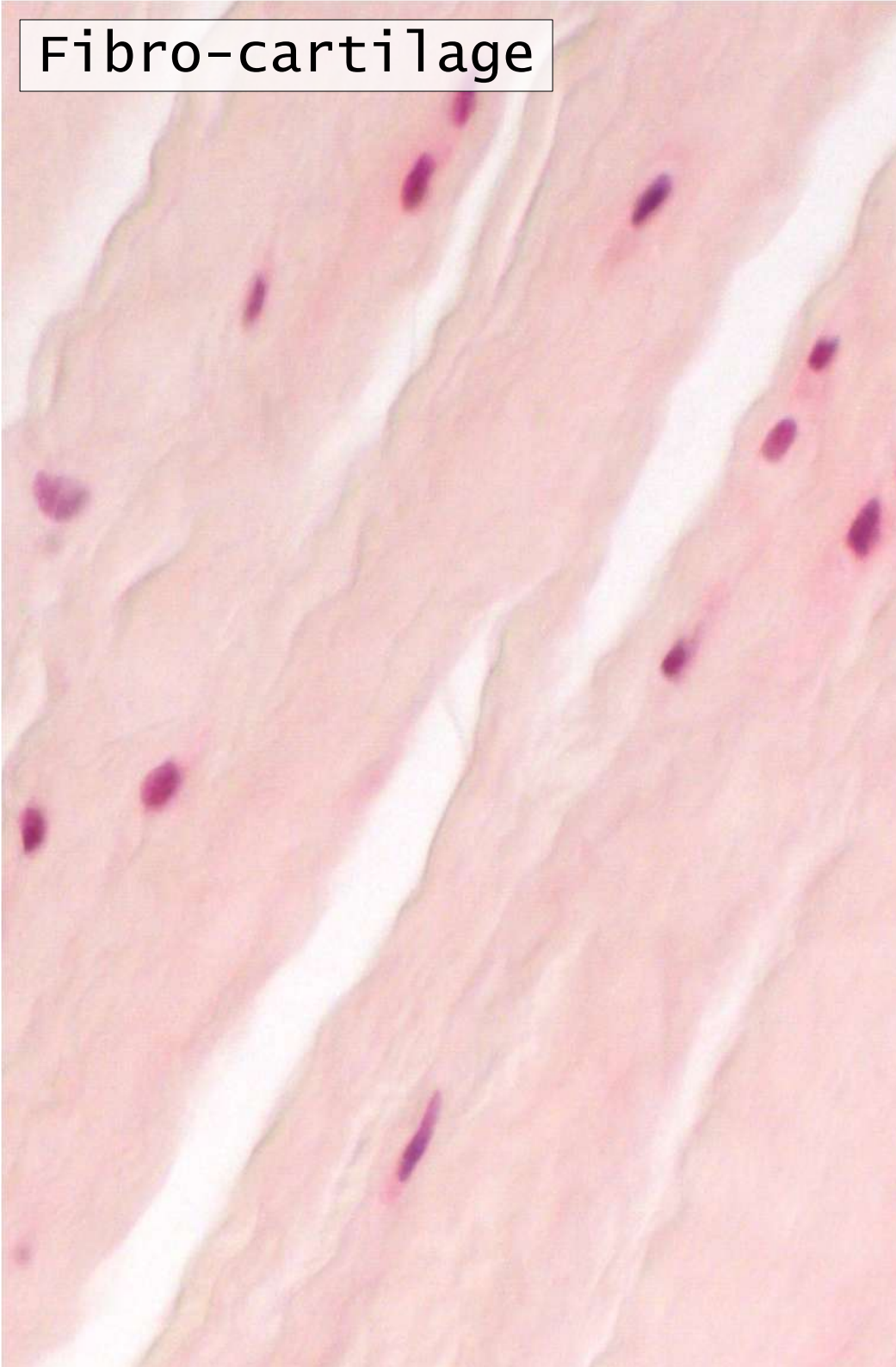
Fibro-cartilage



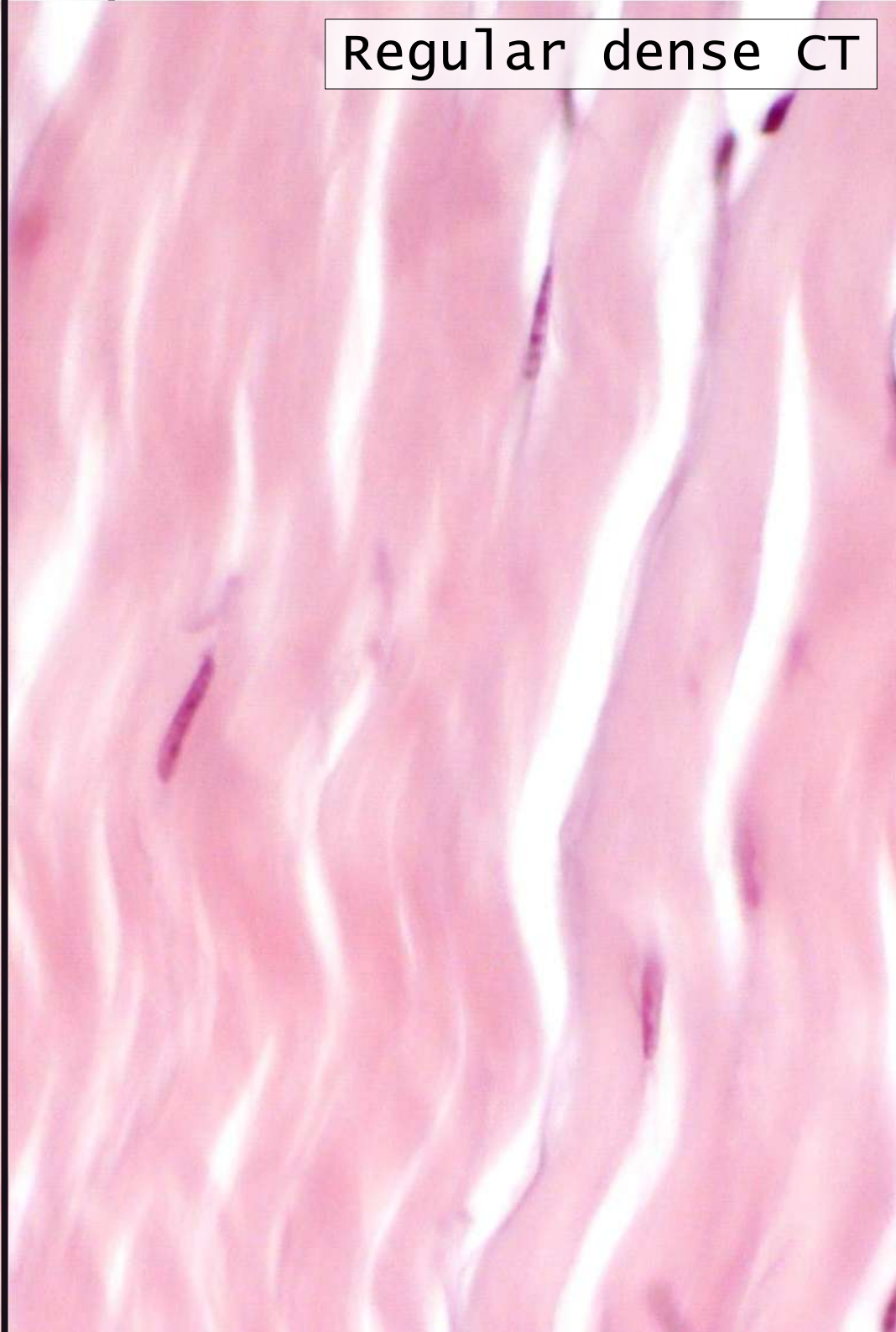
Regular dense CT



Fibro-cartilage



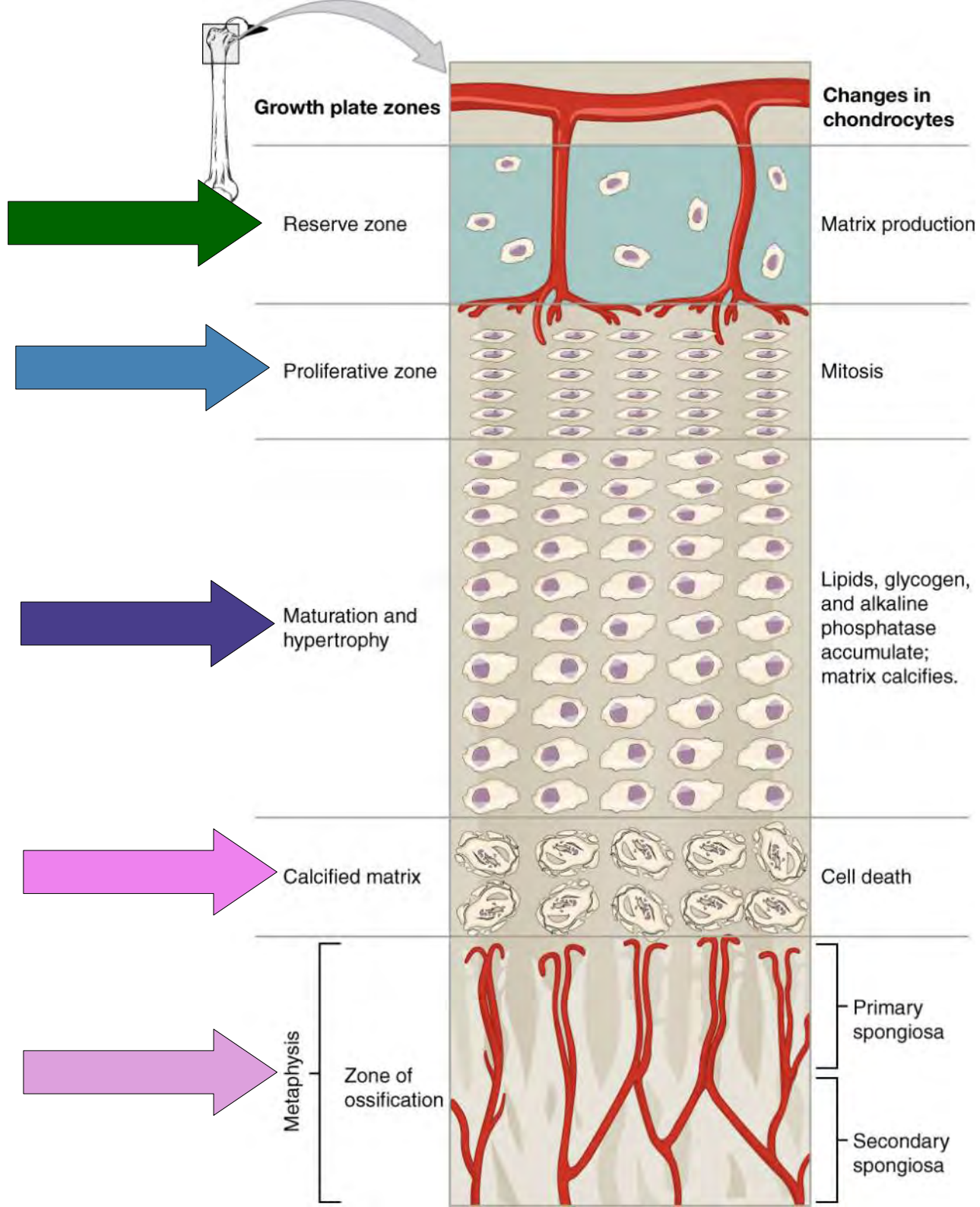
Regular dense CT



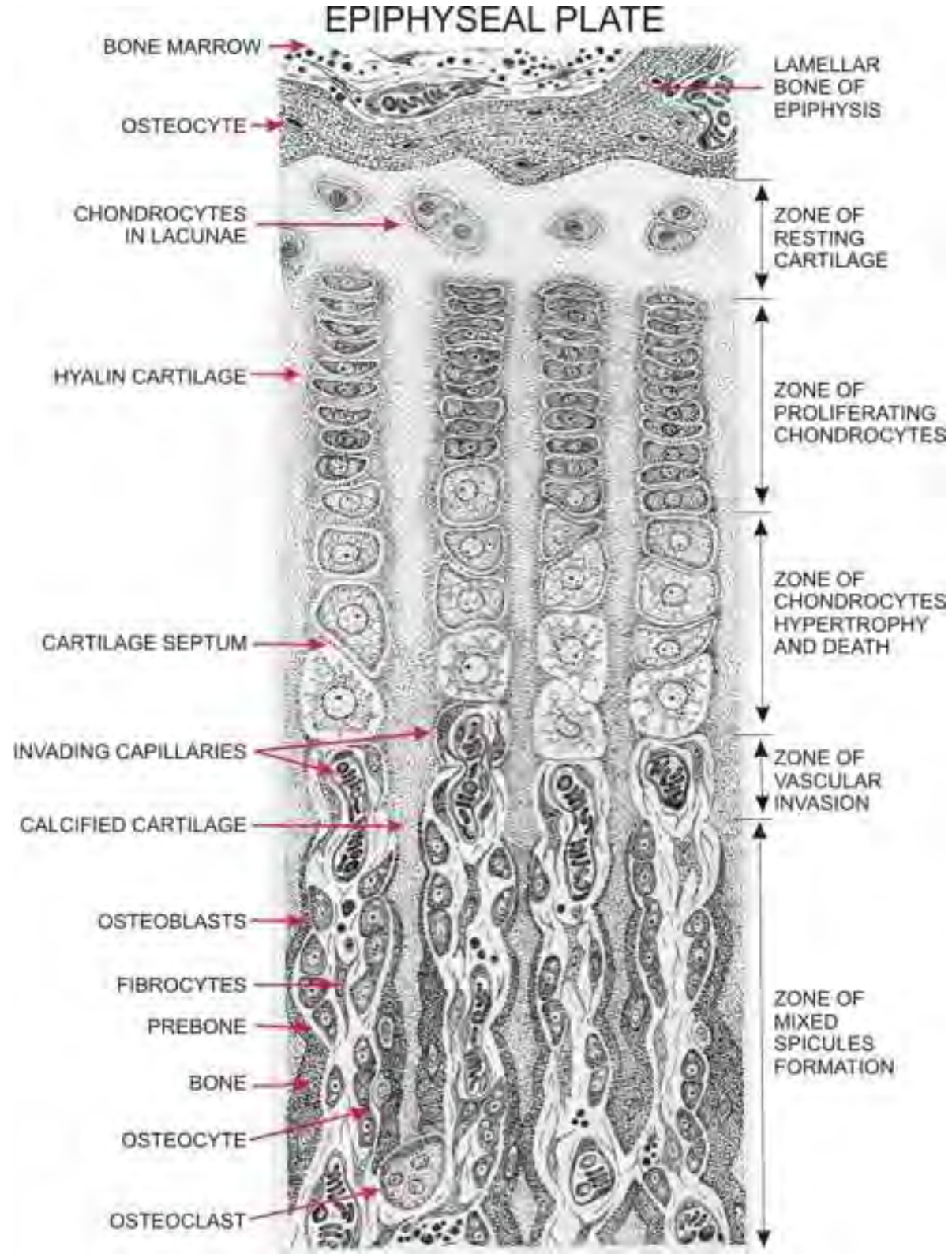
Bone Development

Slide 11

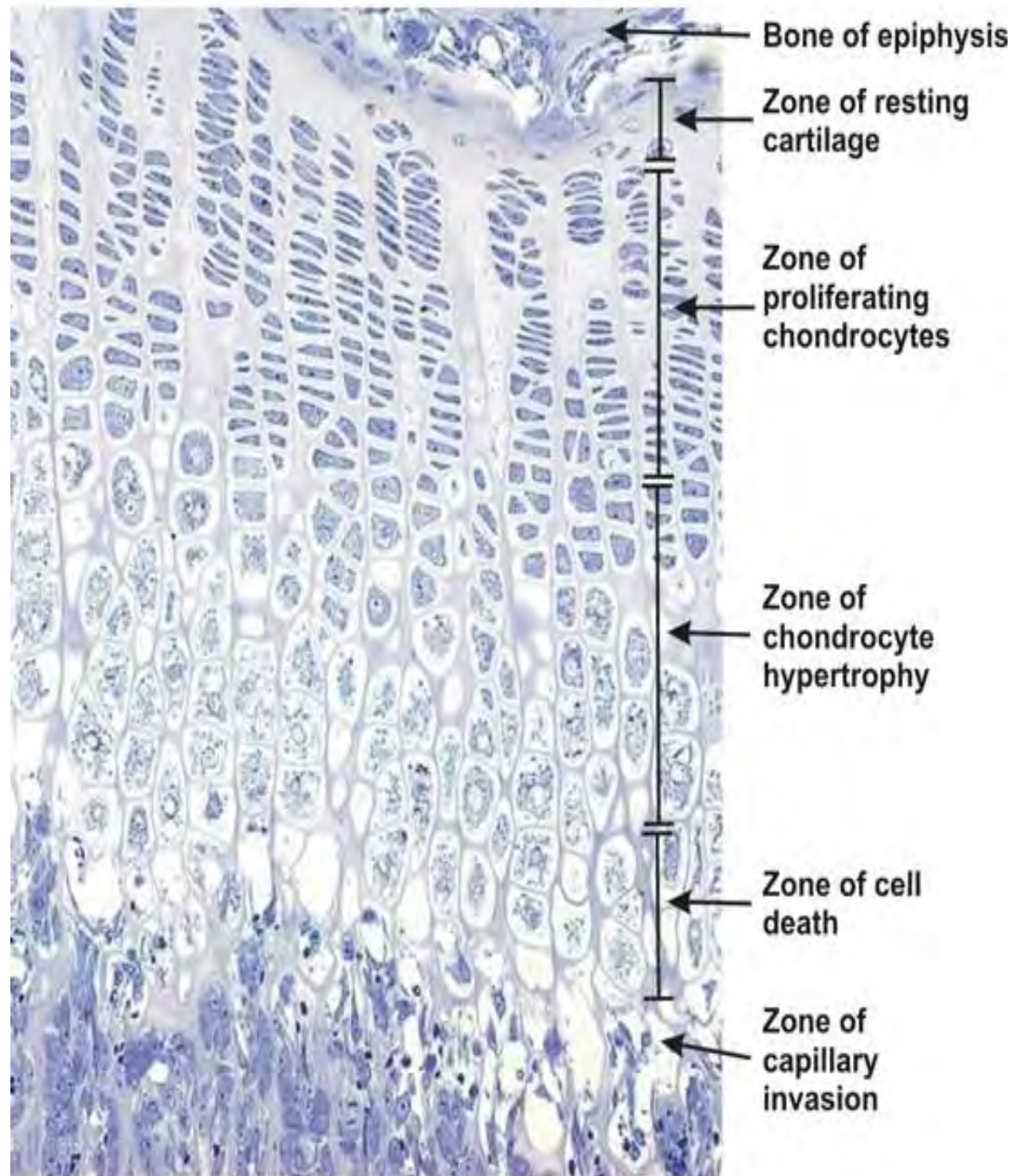
Longitudinal bone growth

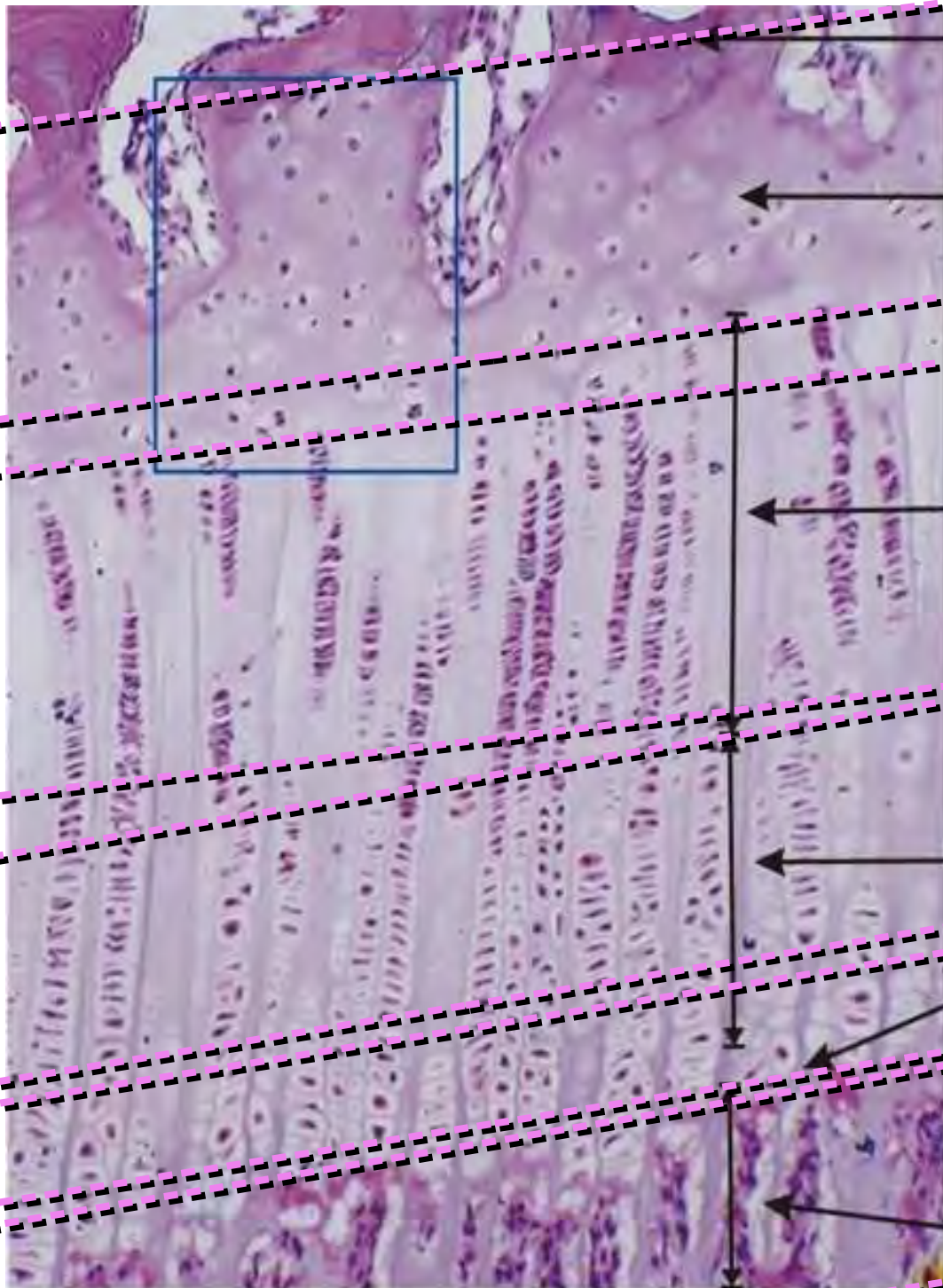


Longitudinal bone growth



EPYPHYSEAL PLATE





Epiphyseal
Bone

Zone of
resting
cartilage

Zone of
proliferating
chondrocytes

Zone of
chondrocyte
hypertrophy

Zone of cell
death

Zone of
capillary
invasion and
of mixed
spicules
formation

Slide 11: Bone development



Bone

slides 12, 13, 14

Decalcified bone – cross section



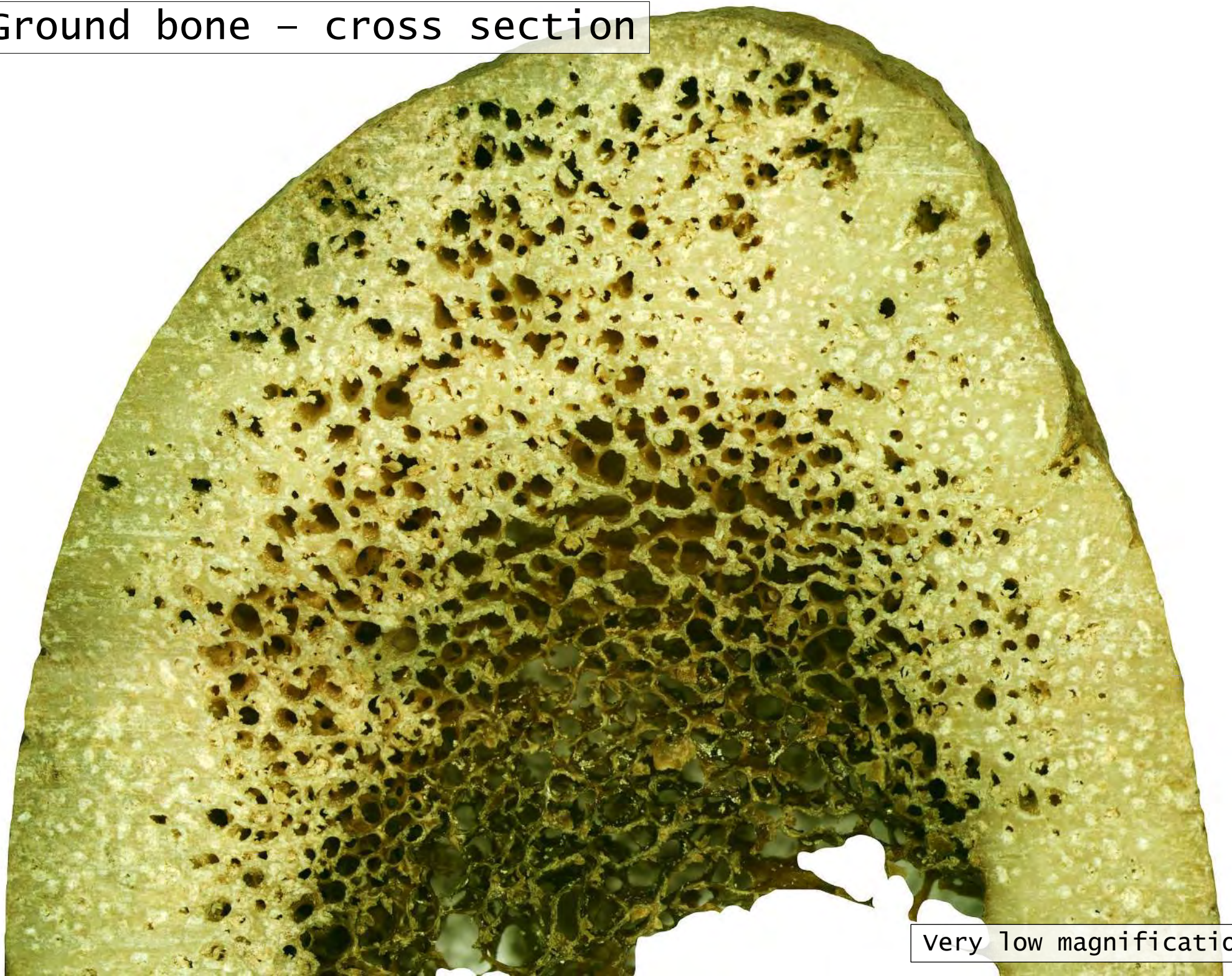
very low magnification

Ground bone – longitudinal section



very low magnification

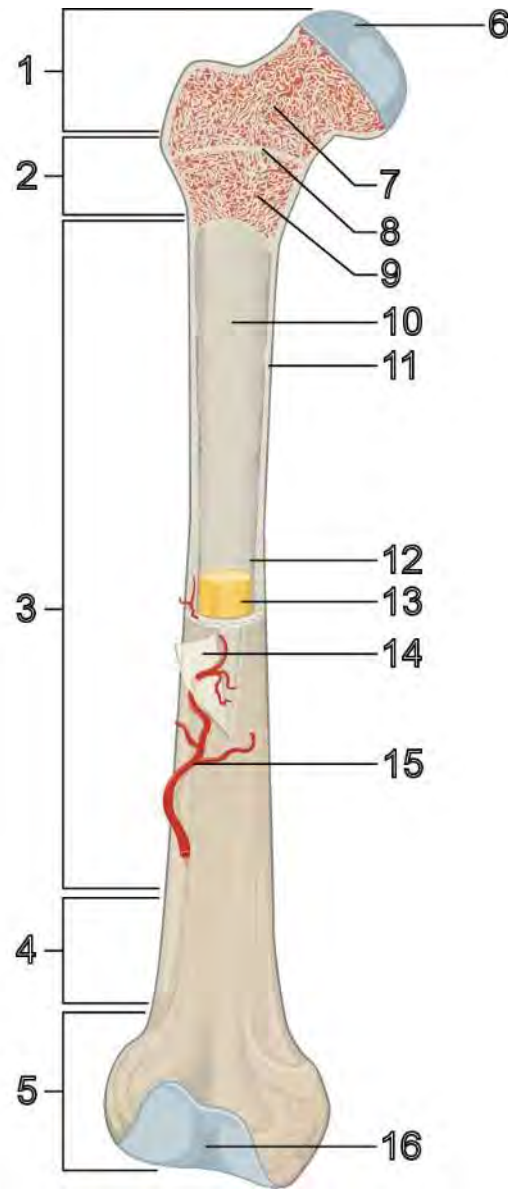
Ground bone – cross section



very low magnification

Make an annotated drawing of a typical long bone, showing external and internal macroscopic structure.

Annotate



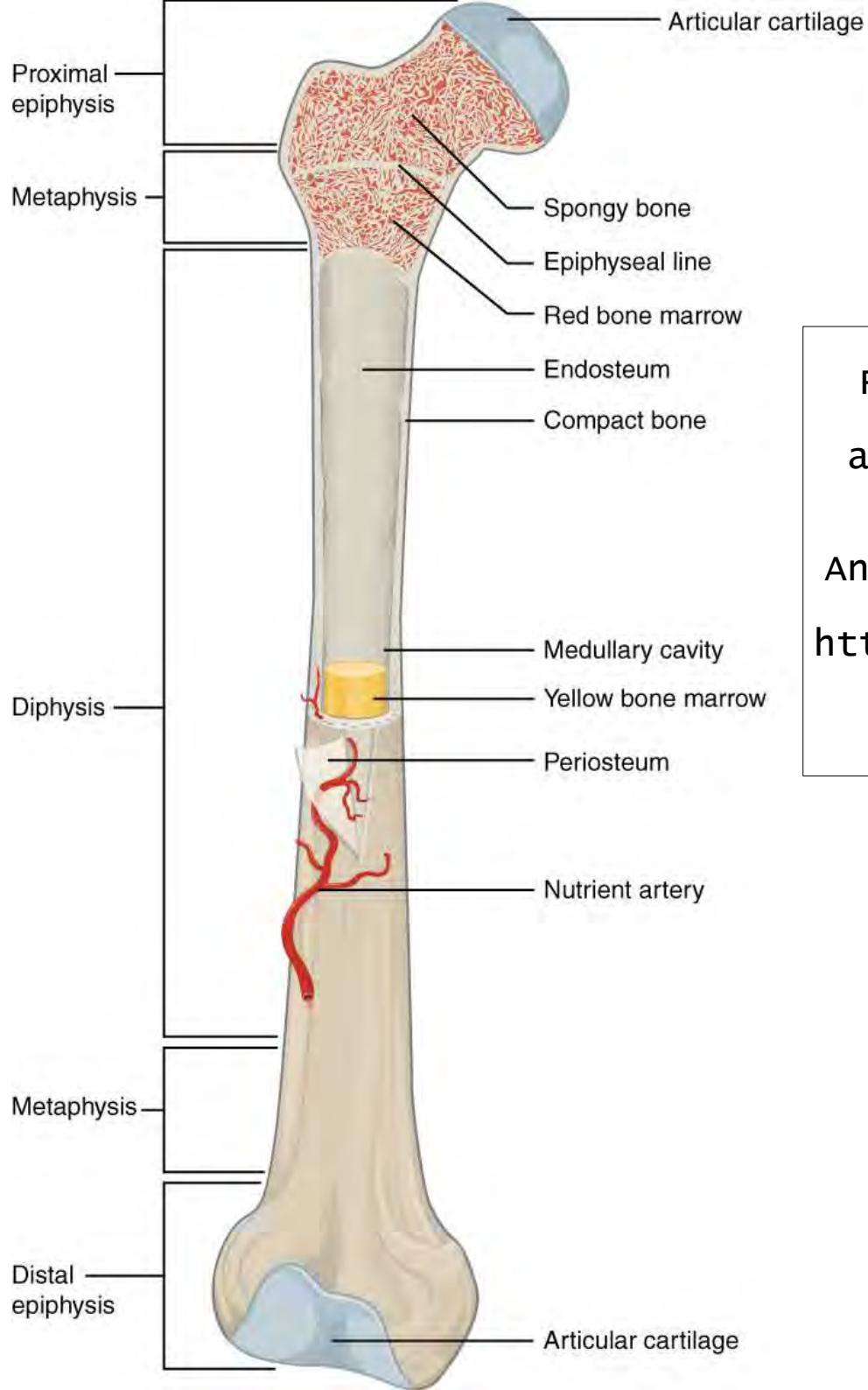
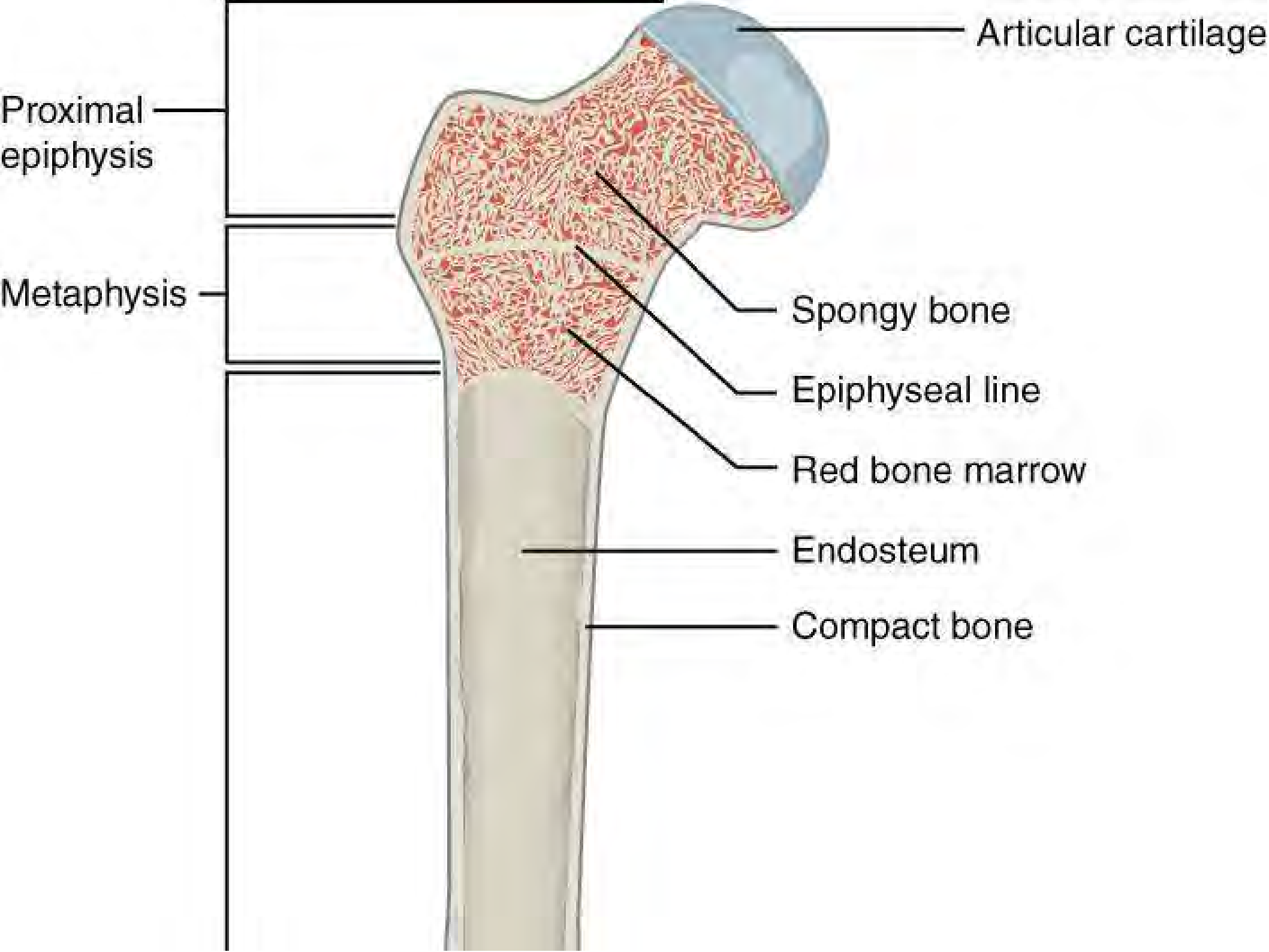
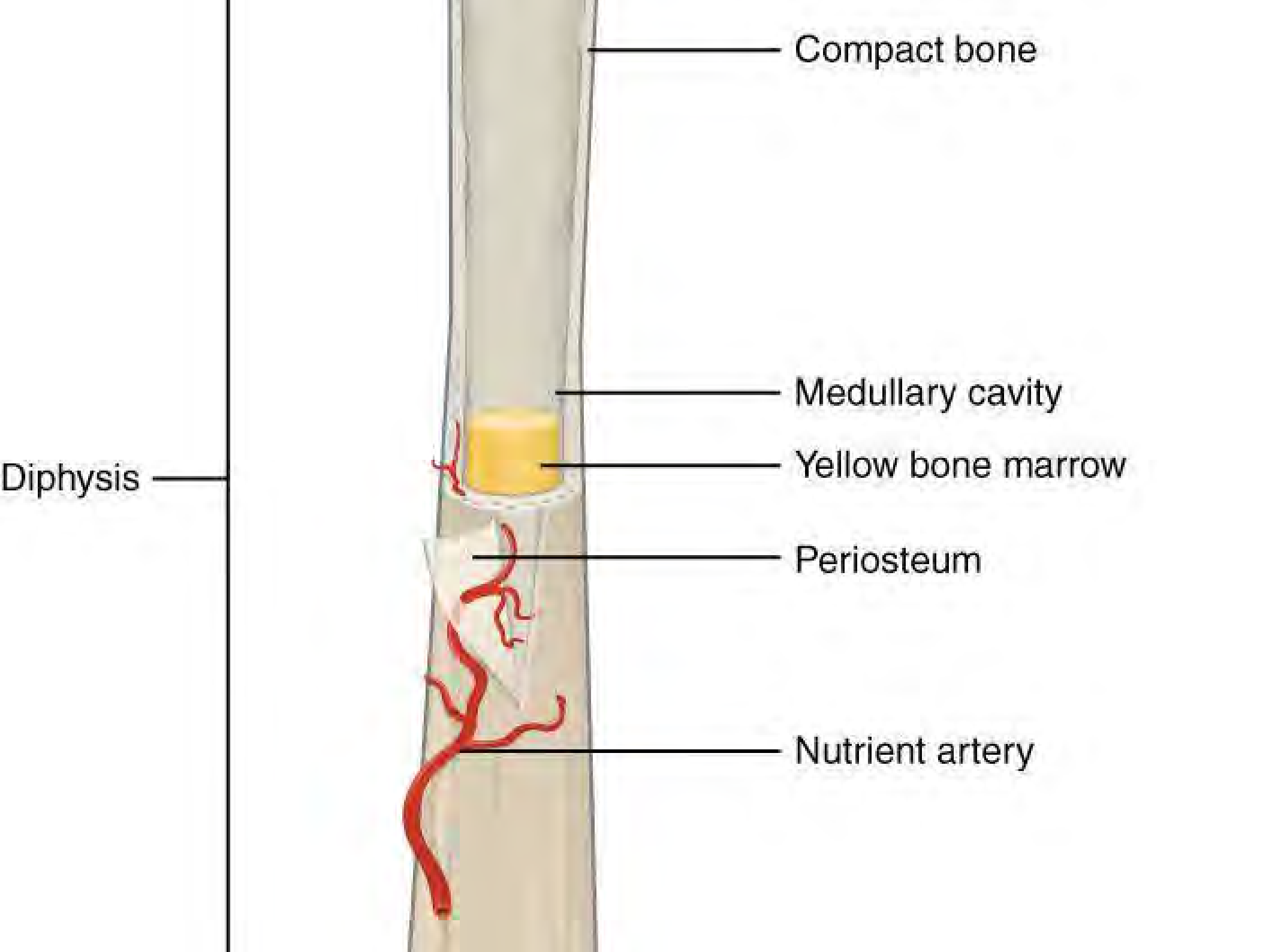
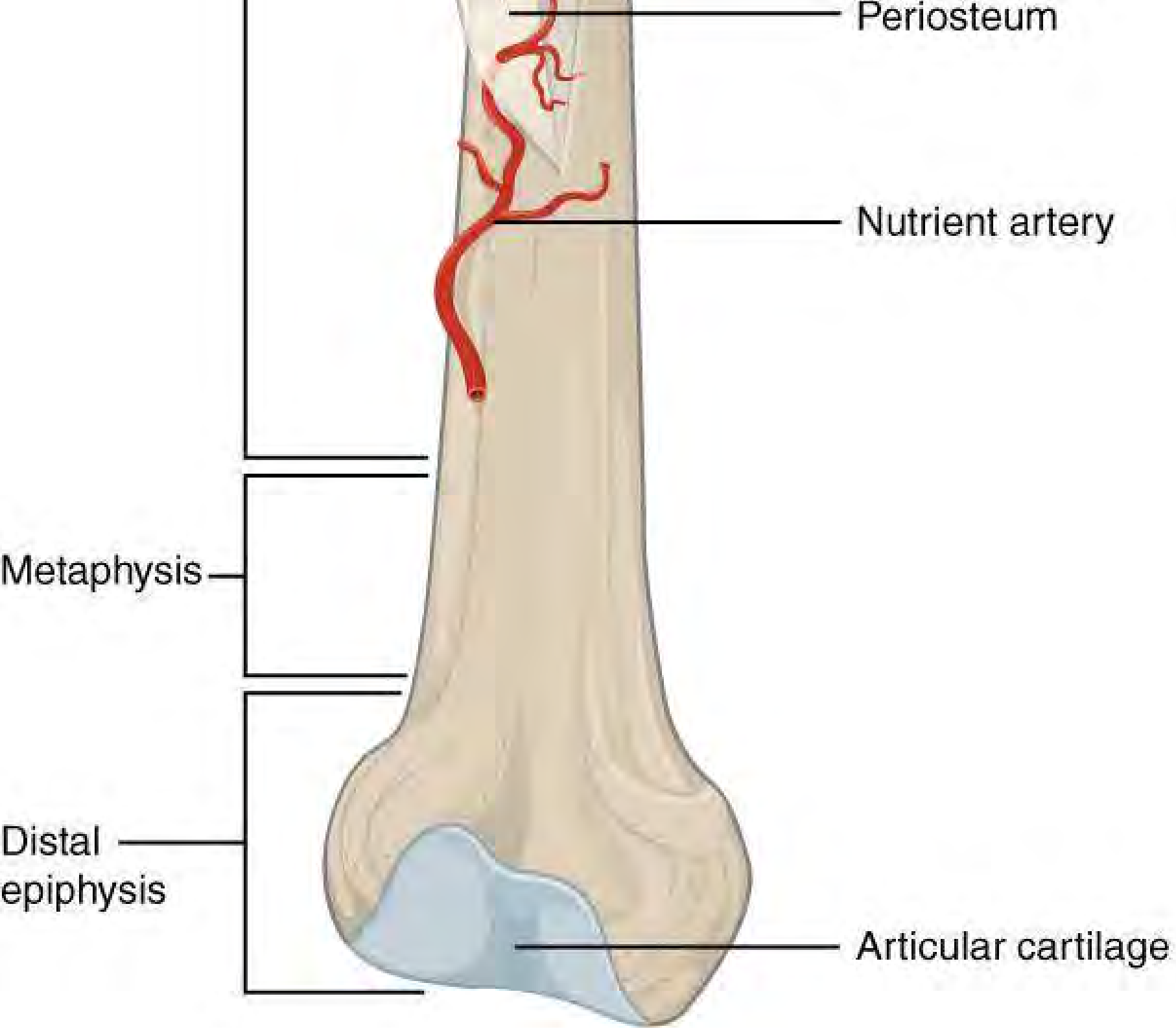


Figure 6.7 Anatomy of a Long Bone, showing the gross anatomical characteristics of bone;

Anatomy and Physiology 25 April 2013; OpenStax; CC-BY 4.0;
<https://openstax.org/books/anatomy-and-physiology/pages/1-introduction>







Bone cells

- Make a list of cells involved with bone metabolism.
- Make a line drawing of each of these cells.
- Give the function of each of these cells.

Identify - Draw - Describe - Function

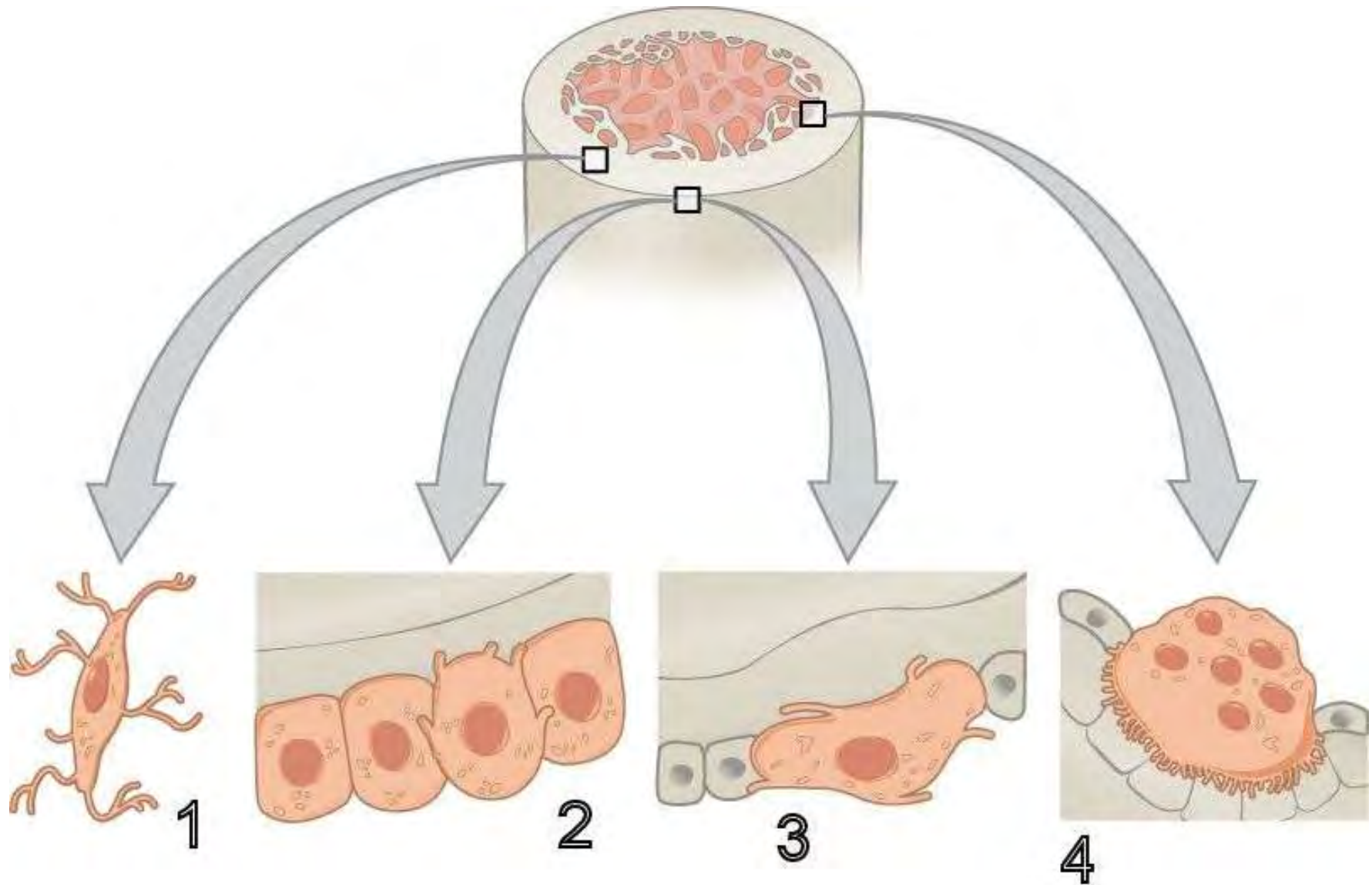
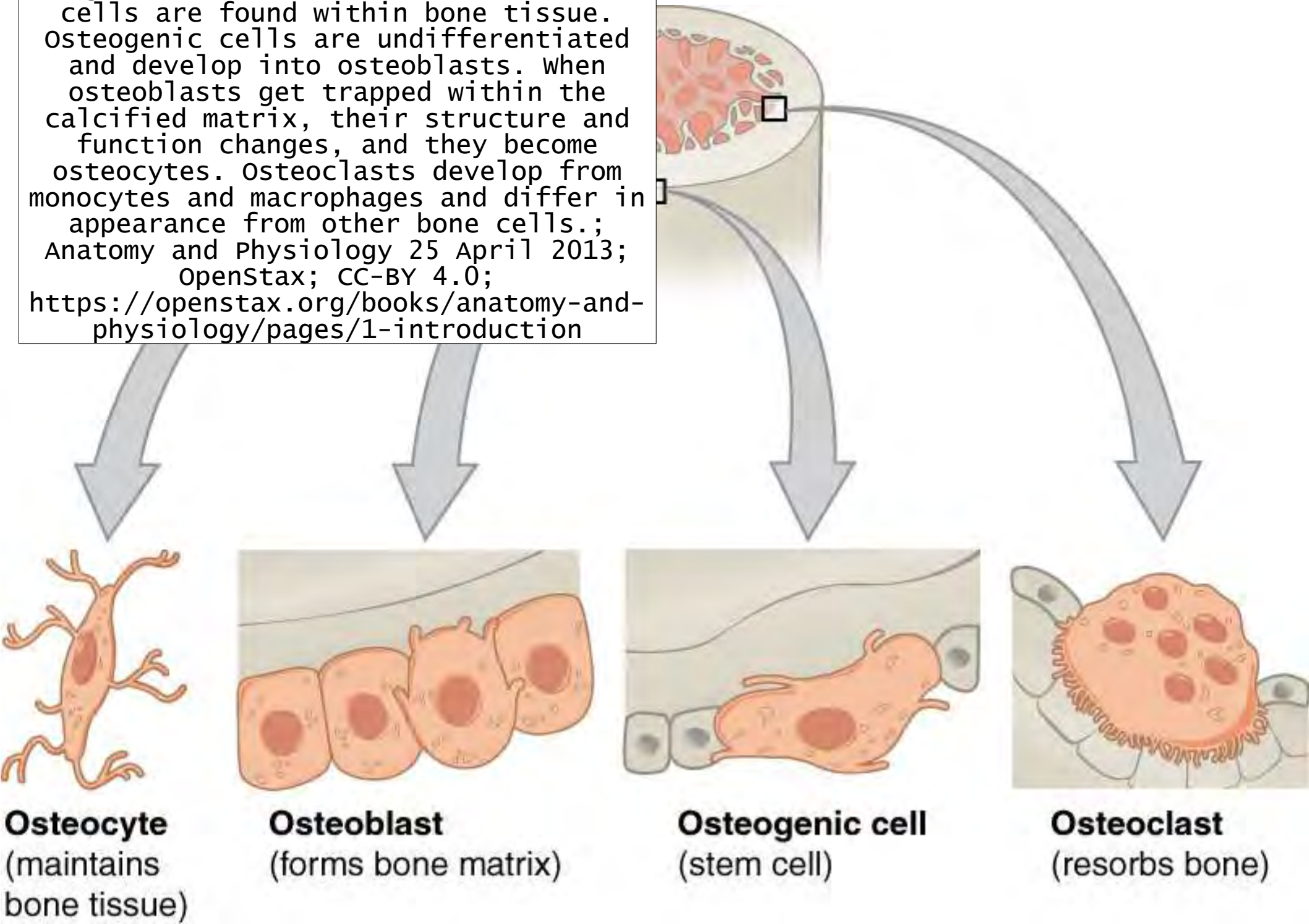
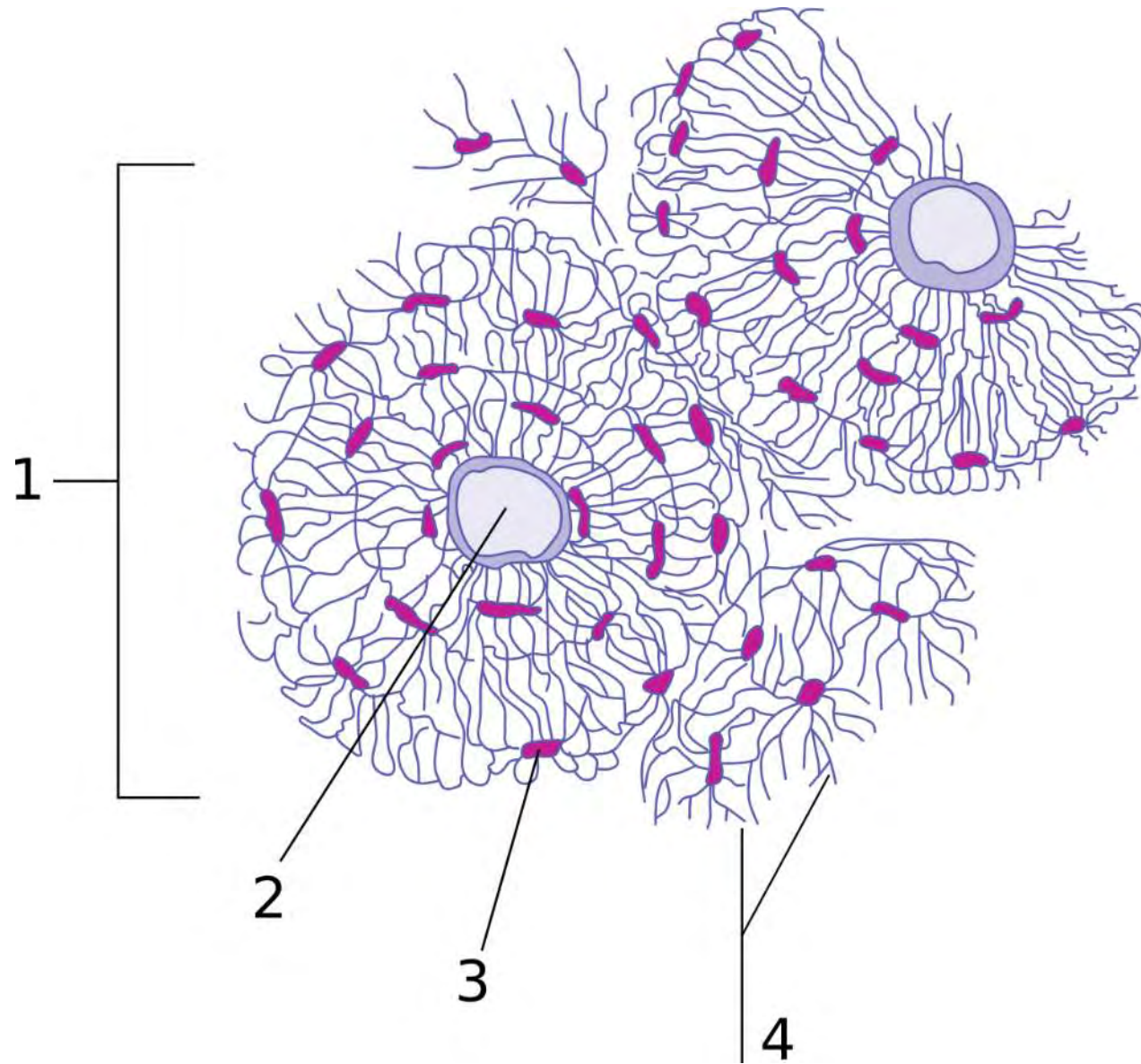


Figure 6.11 Bone Cells Four types of cells are found within bone tissue. Osteogenic cells are undifferentiated and develop into osteoblasts. When osteoblasts get trapped within the calcified matrix, their structure and function changes, and they become osteocytes. Osteoclasts develop from monocytes and macrophages and differ in appearance from other bone cells.; Anatomy and Physiology 25 April 2013; OpenStax; CC-BY 4.0; <https://openstax.org/books/anatomy-and-physiology/pages/1-introduction>

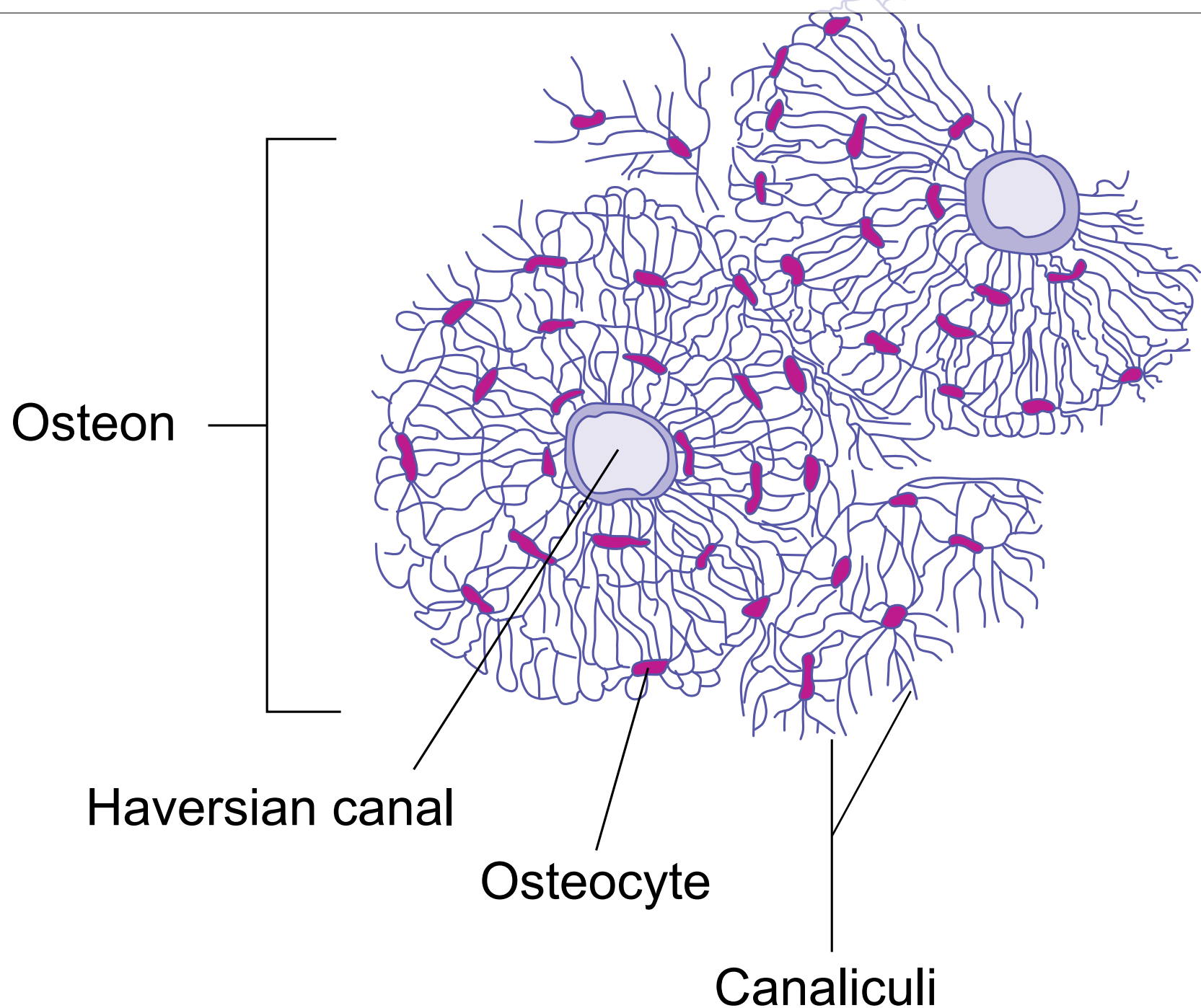


Make an annotated drawing of an osteon and its components.

Annotate



Transverse section of bone to illustrate an osteon



Make an annotated drawing showing
the lamellar systems in bone.

Annotate this diagram of bone.

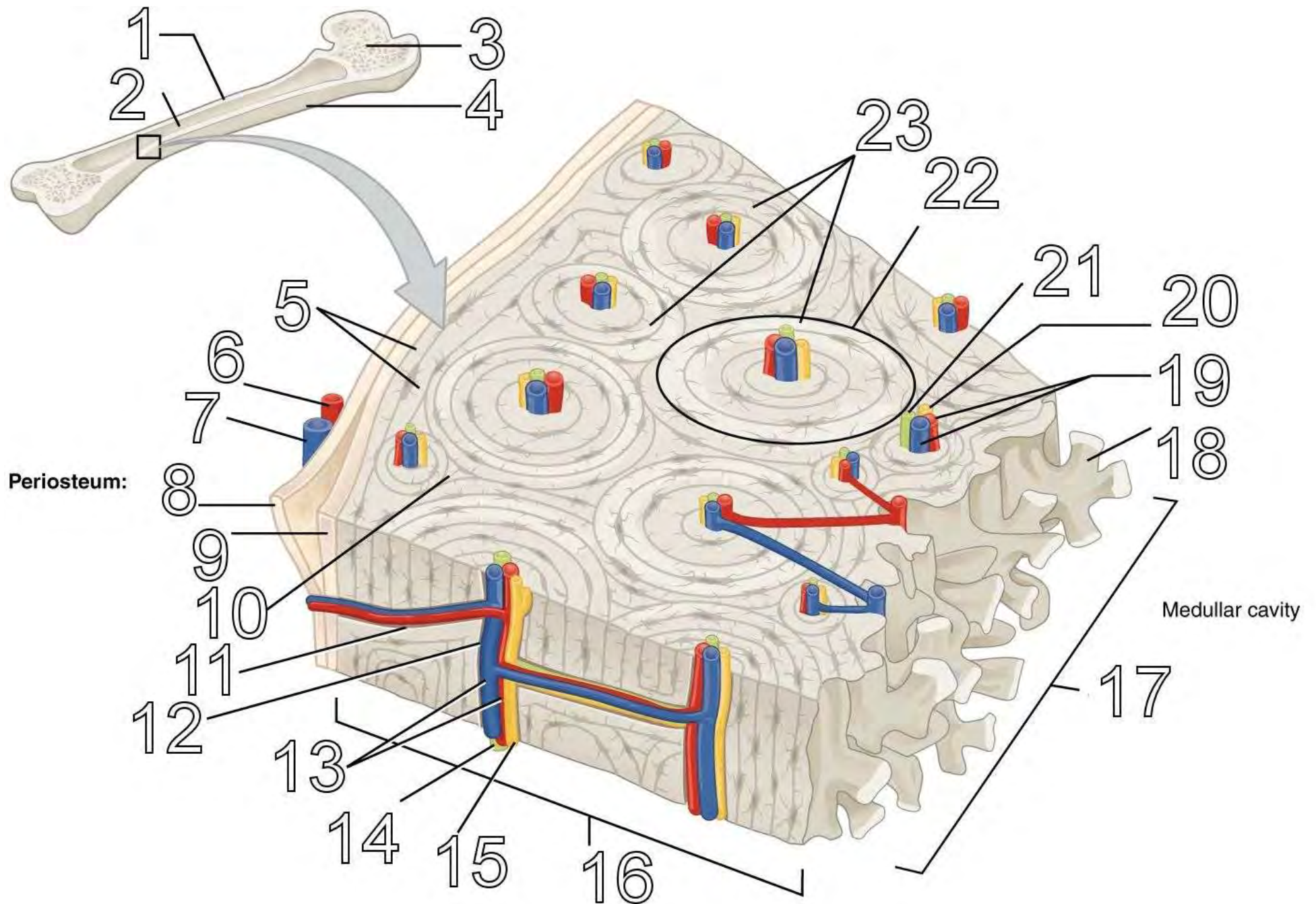
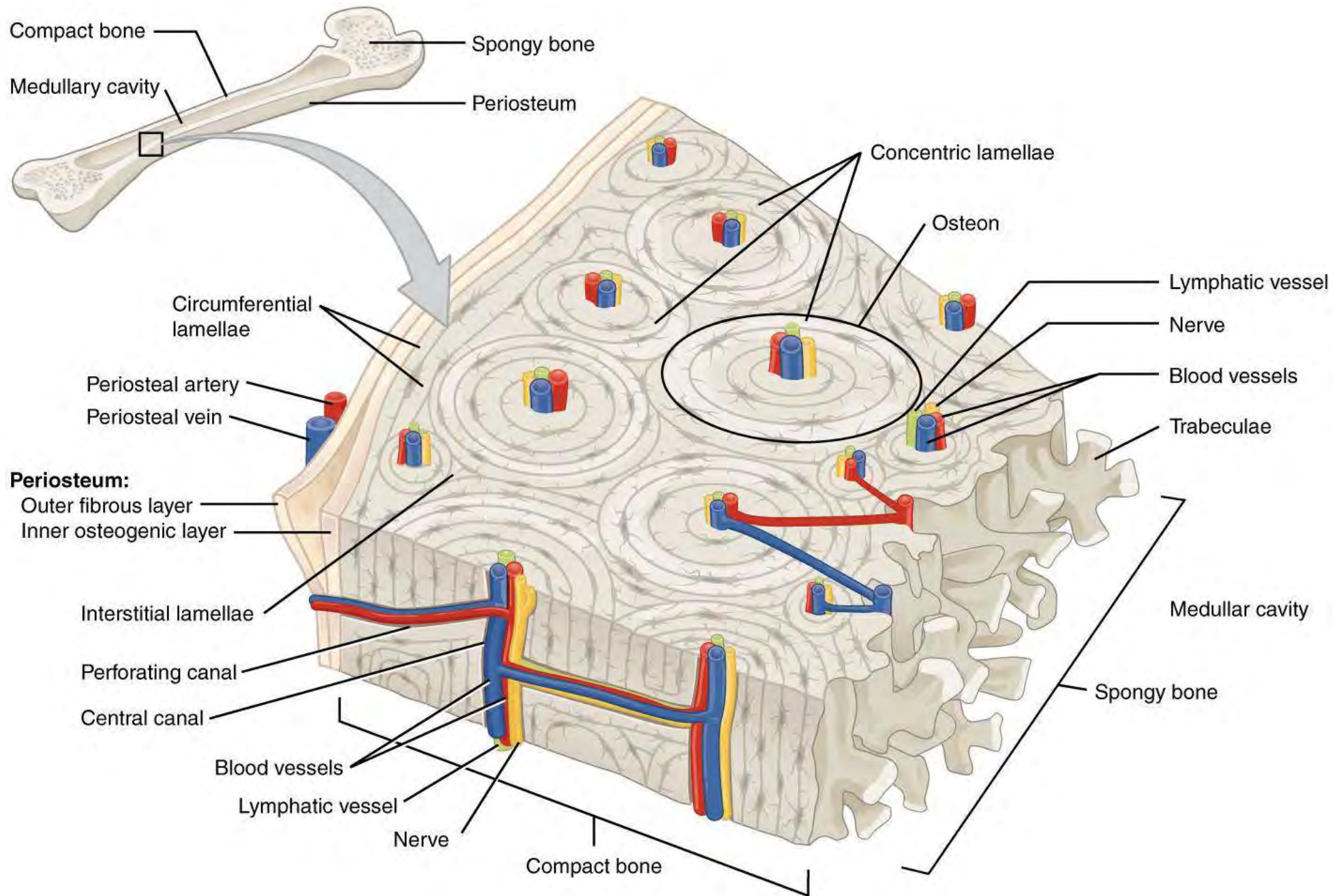


Figure 6.12 Diagram of Compact Bone showing basic structural units; Anatomy and Physiology 25 April 2013; OpenStax; CC-BY 4.0; <https://openstax.org/books/anatomy-and-physiology/pages/1-introduction>



Decalcified bone – cross section



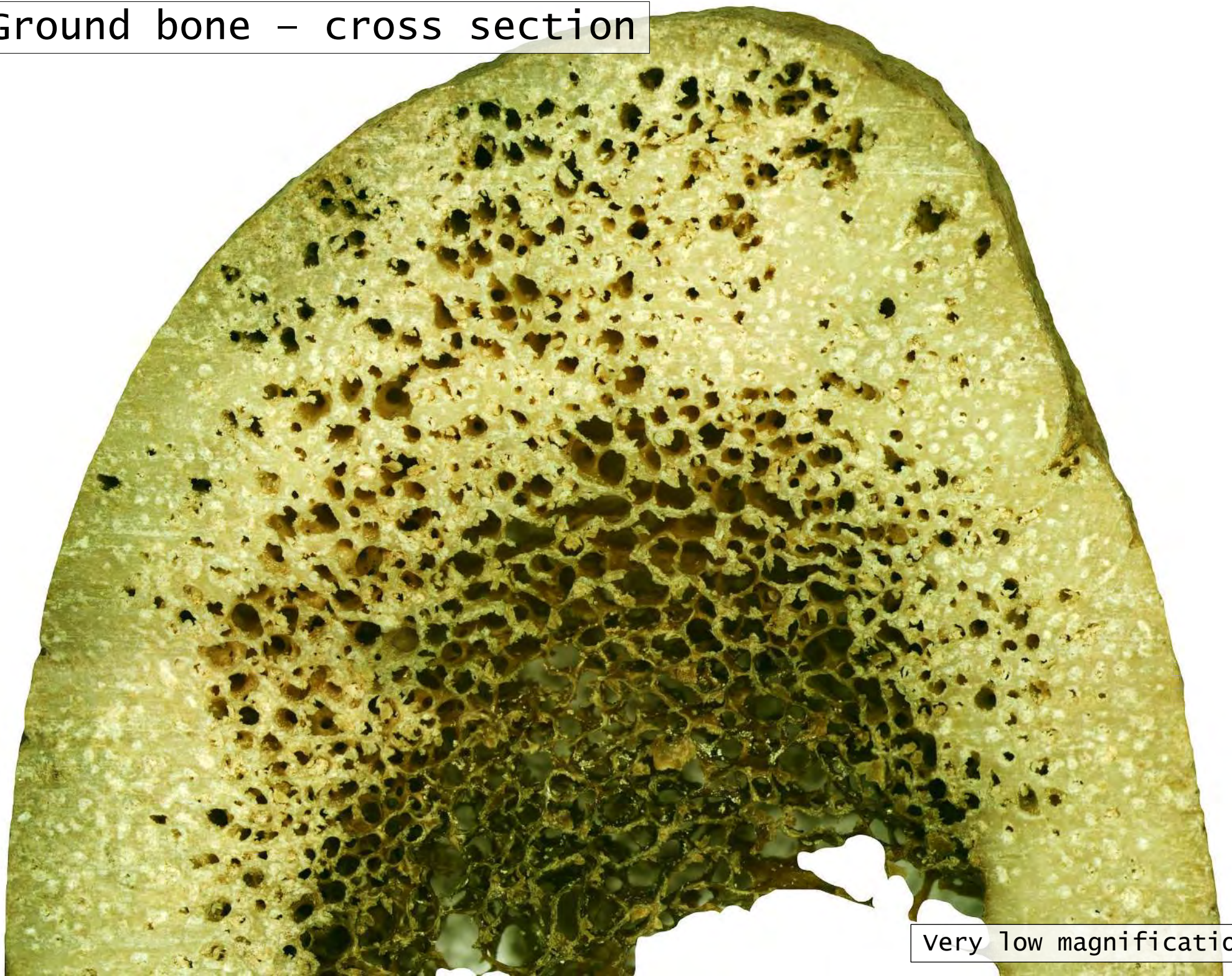
very low magnification

Ground bone – longitudinal section



very low magnification

Ground bone – cross section



very low magnification

Osteon

Osteon

Osteocytes

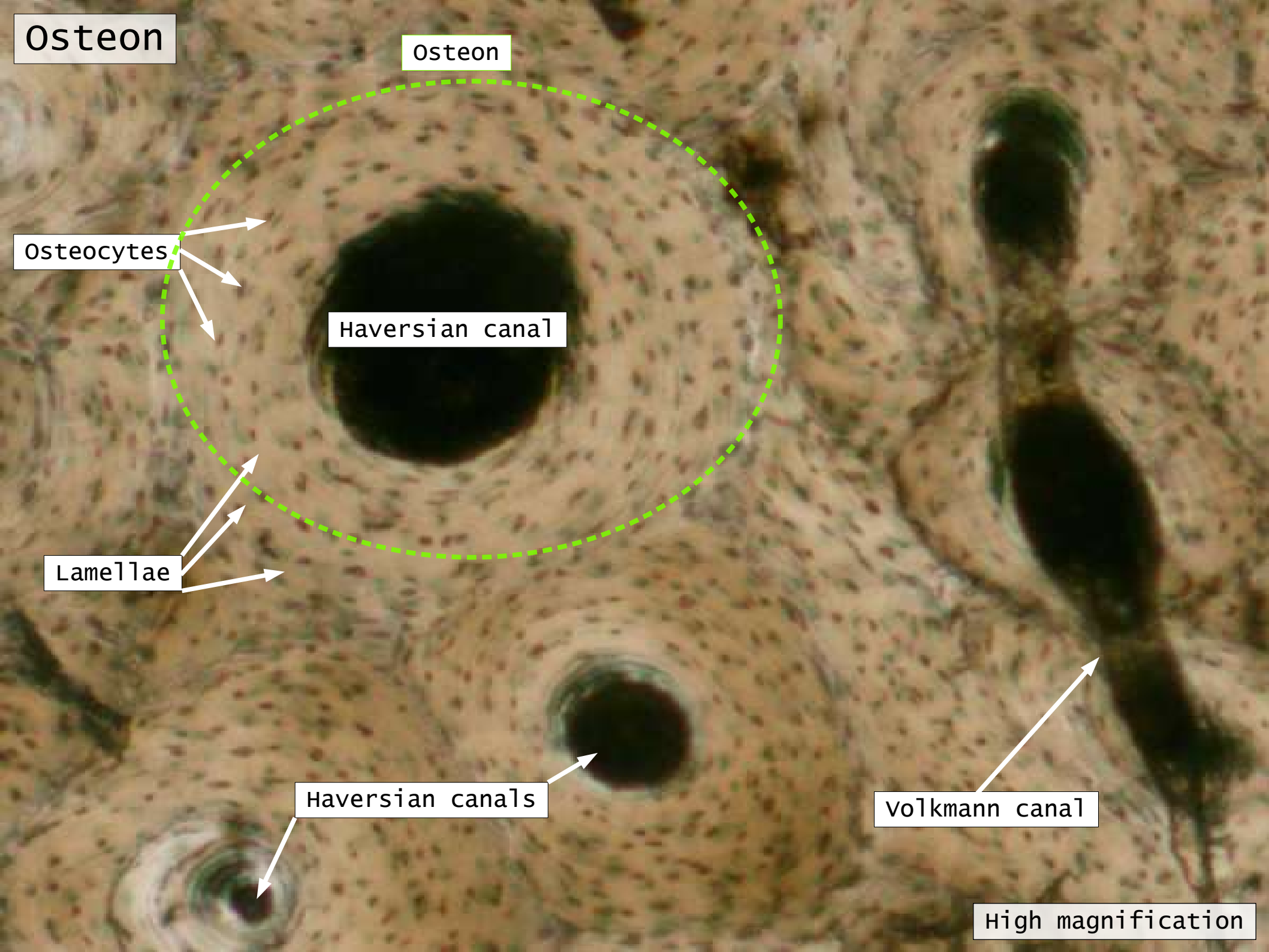
Haversian canal

Lamellae

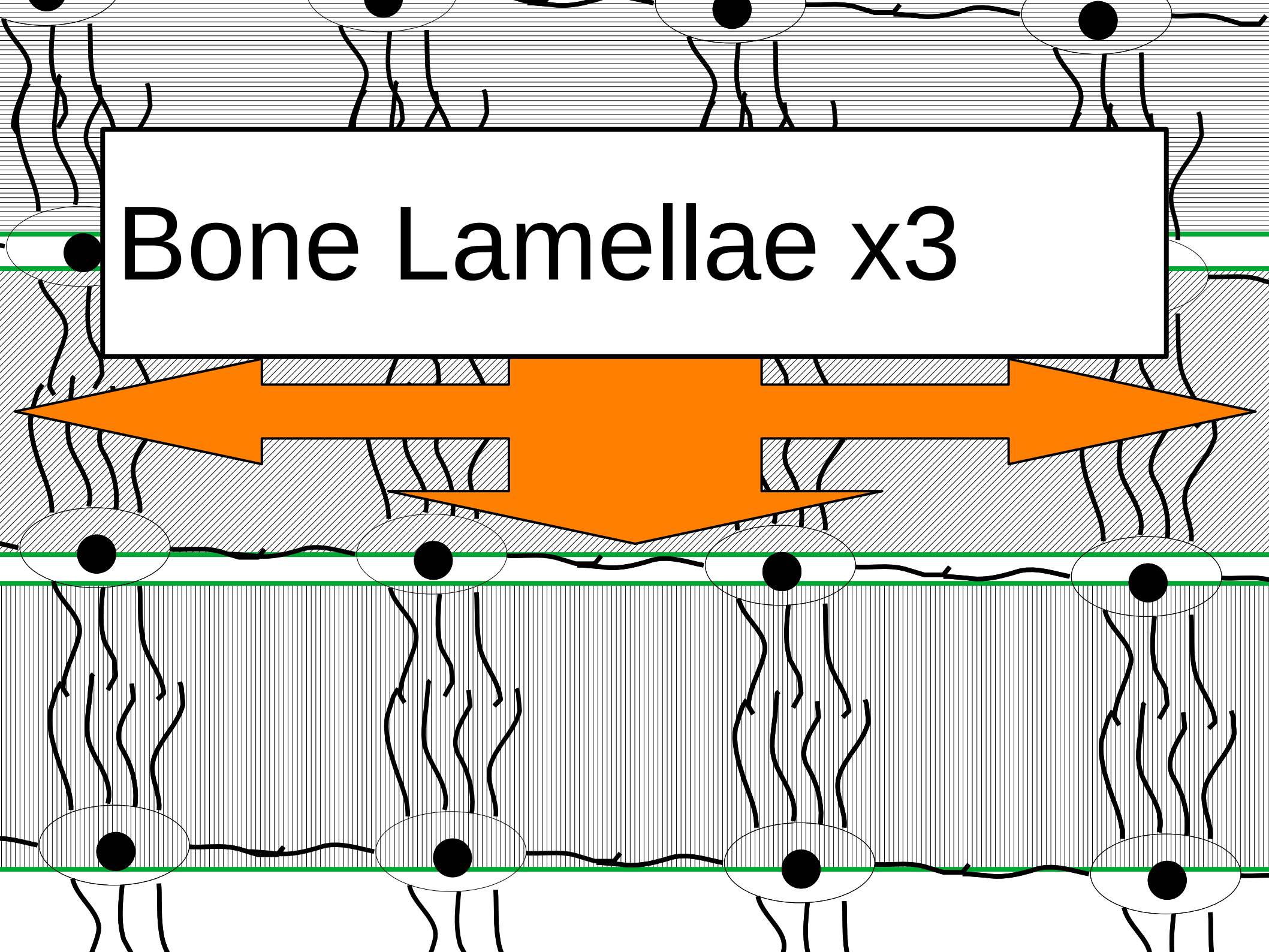
Haversian canals

Volkmann canal

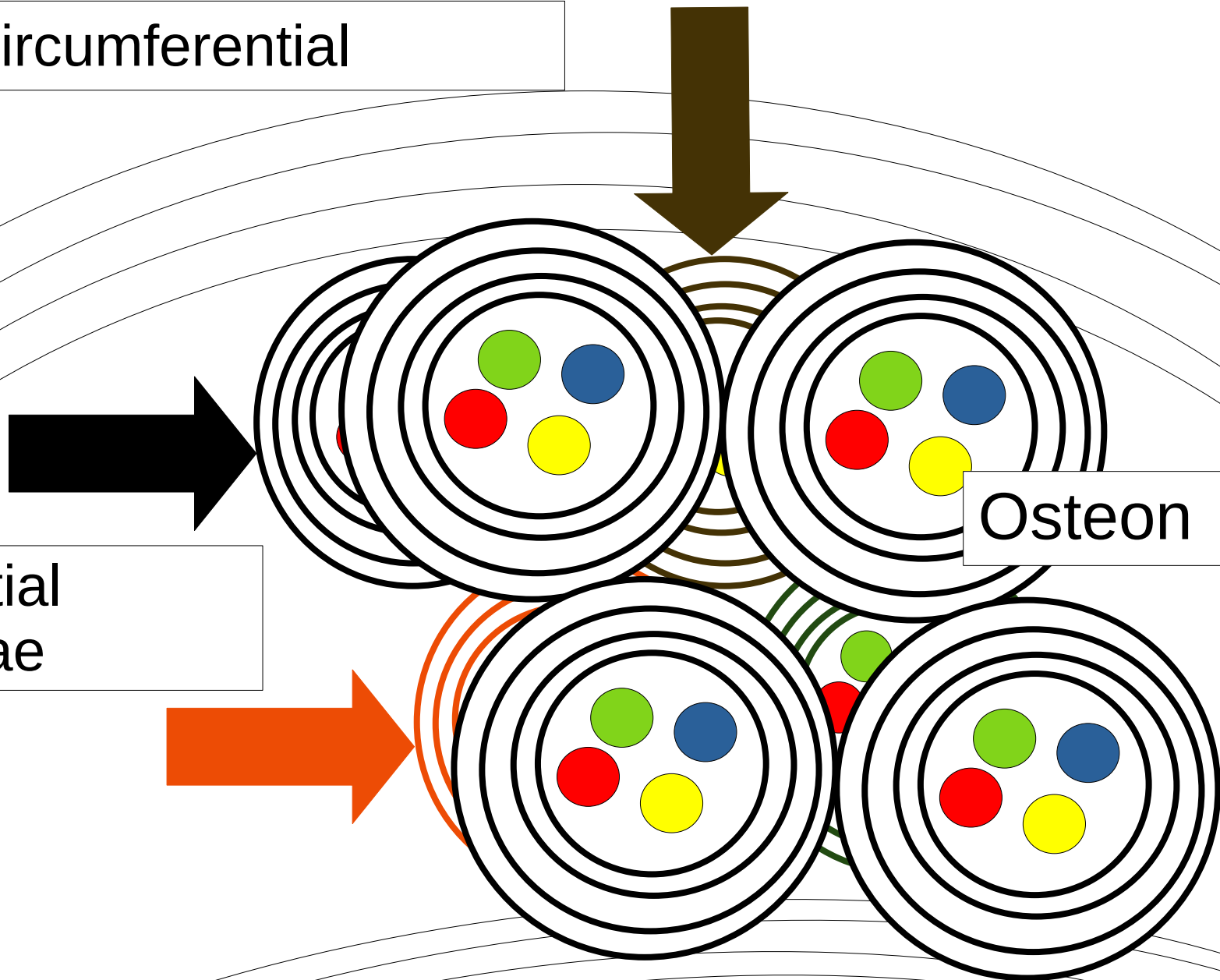
High magnification



● Bone Lamellae x3



Outer circumferential

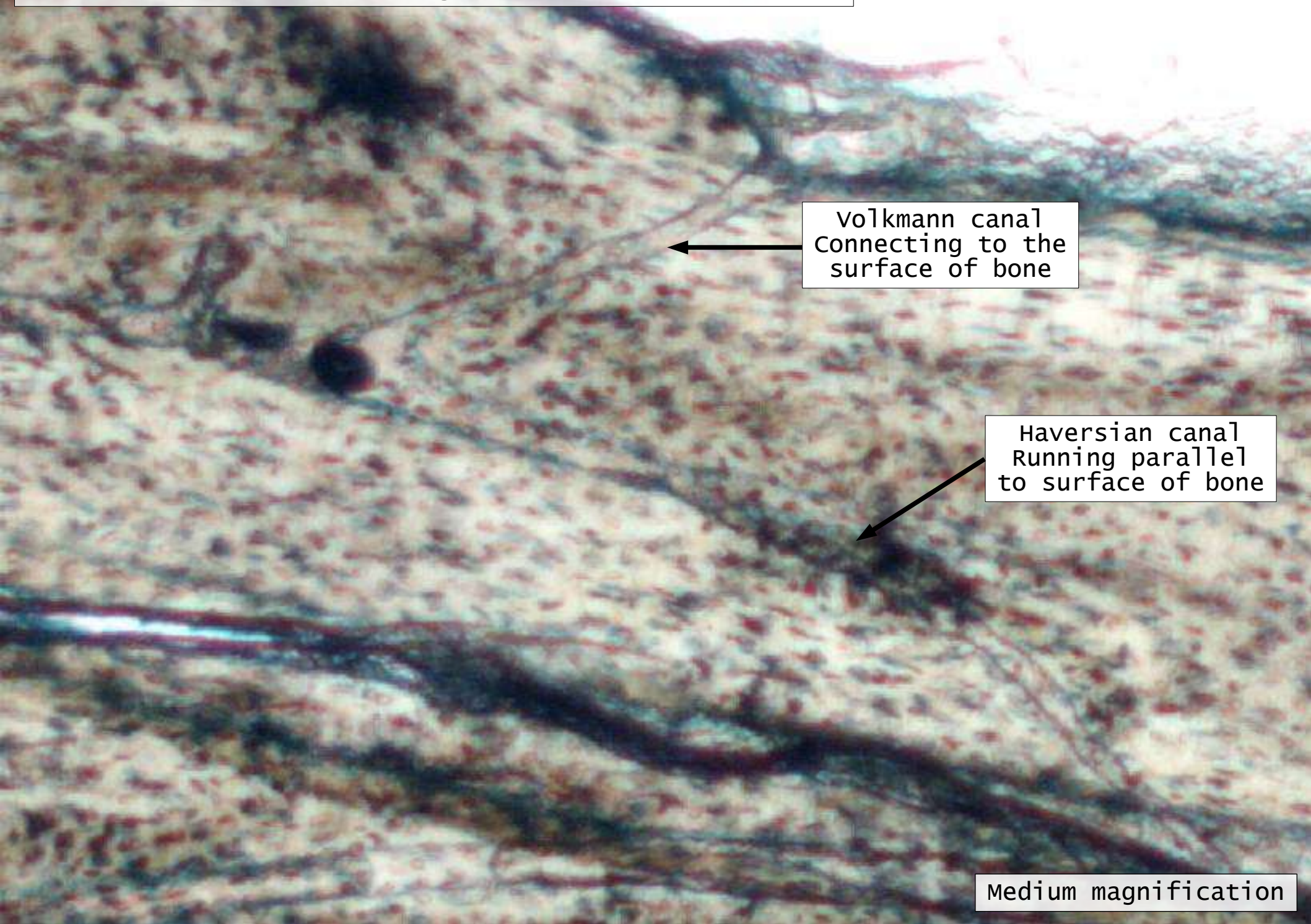


Osteon

Interstitial
lamellae

Inner circumferential

Ground bone – longitudinal section

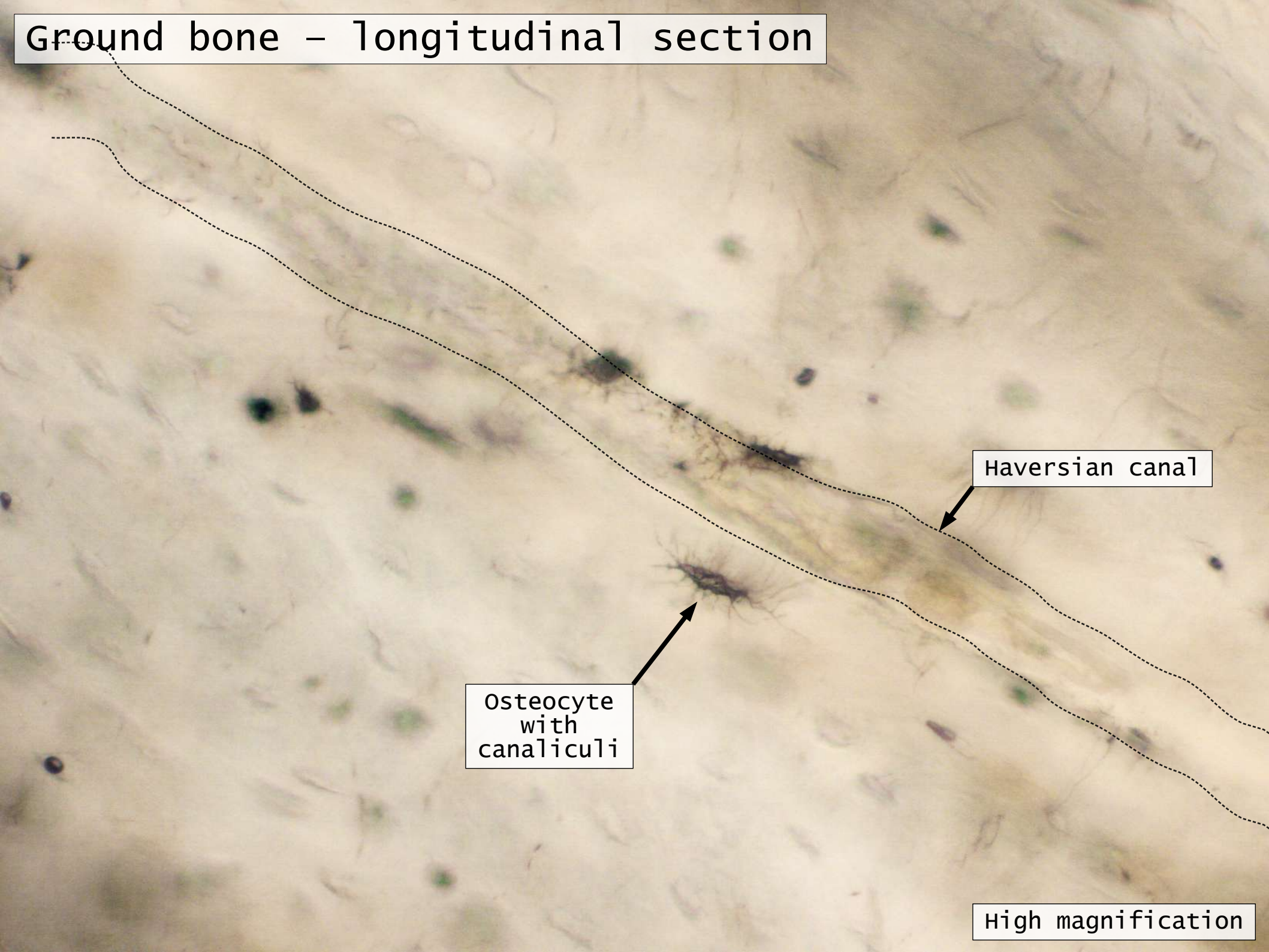


volkmann canal
Connecting to the
surface of bone

Haversian canal
Running parallel
to surface of bone

Medium magnification

Ground bone – longitudinal section

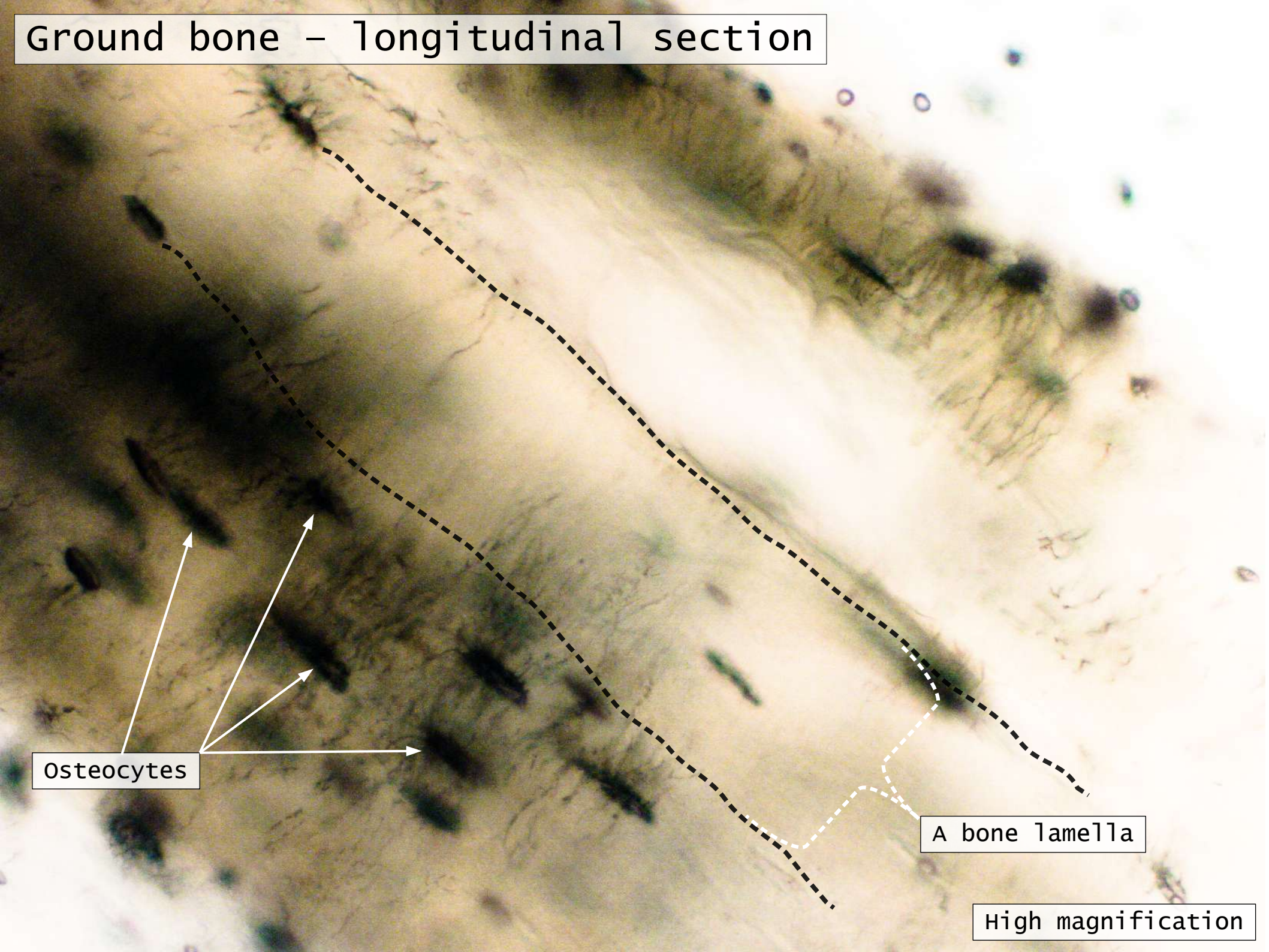


Haversian canal

Osteocyte
with
canaliculi

High magnification

Ground bone – longitudinal section

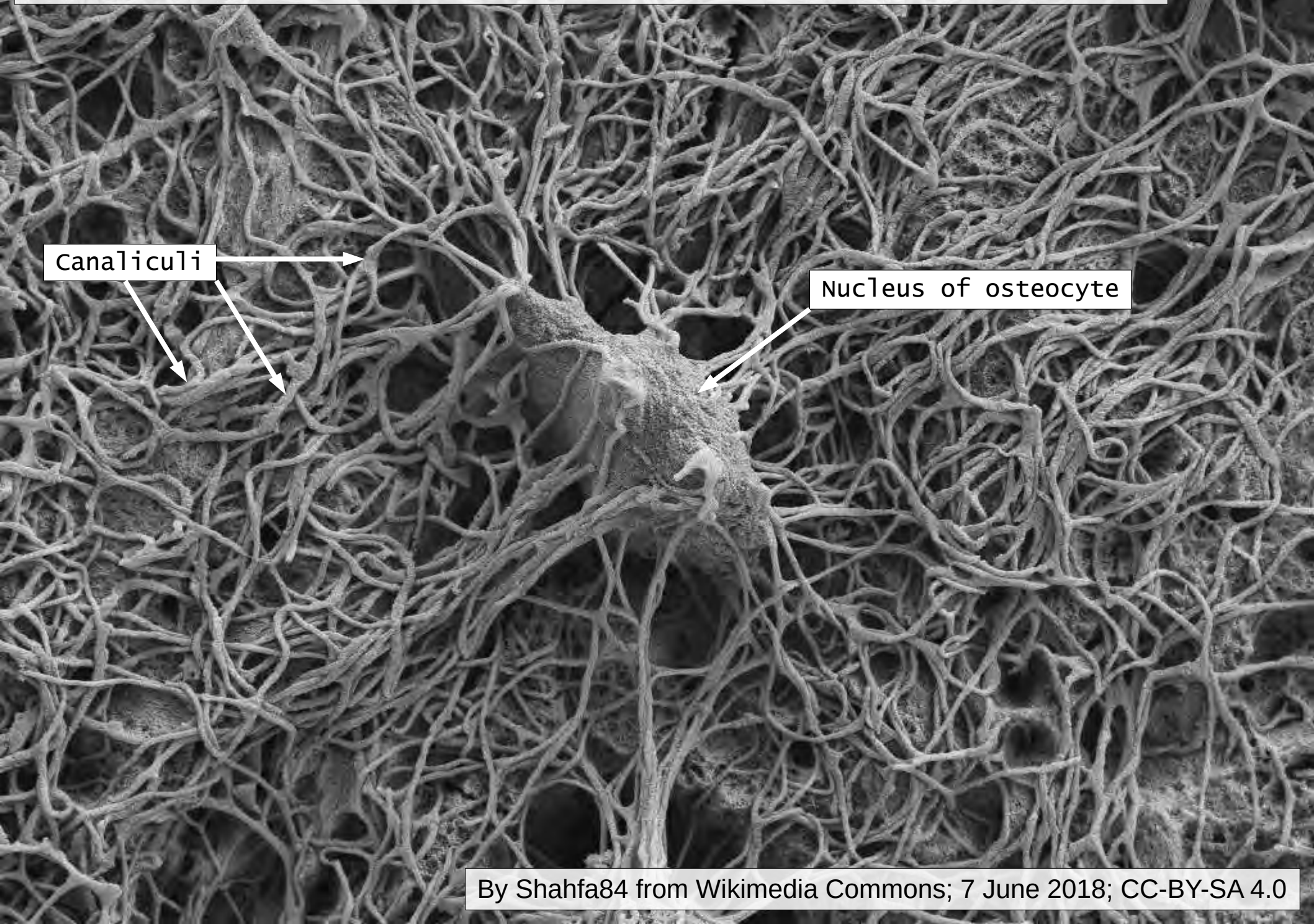


Osteocytes

A bone lamella

High magnification

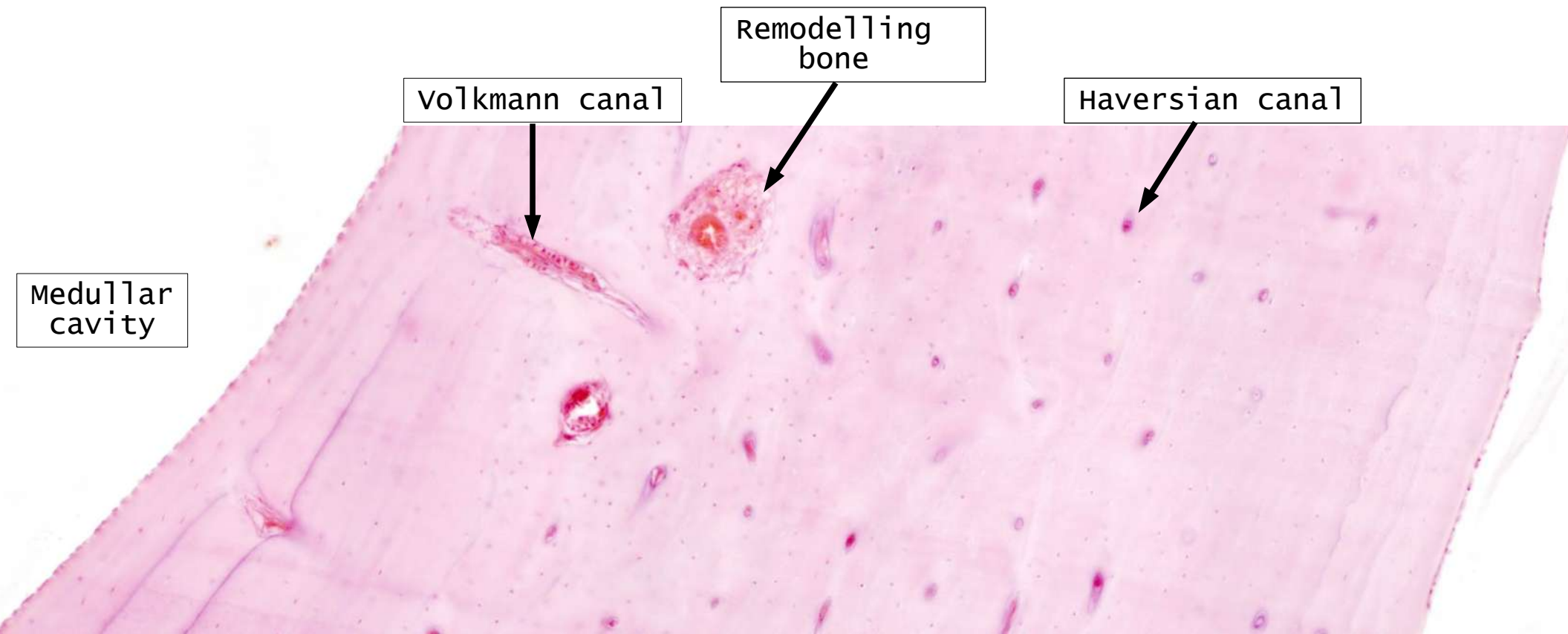
An osteocyte bone exposed by resin cast etching



Canaliculi

Nucleus of osteocyte

Decalcified bone – cross section



Medullar
cavity

Volkmann canal

Remodelling
bone

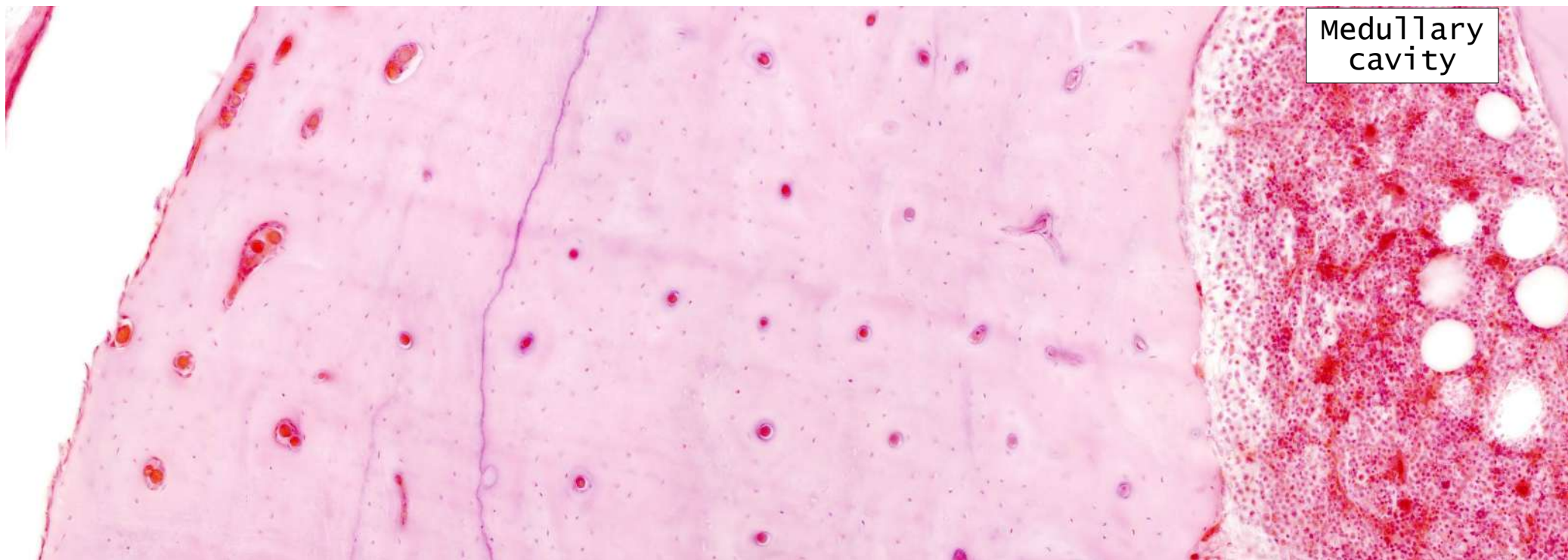
Haversian canal

Inner
circumferential
lamellae

Outer
circumferential
lamellae

Low magnification

Decalcified bone – cross section



Low magnification

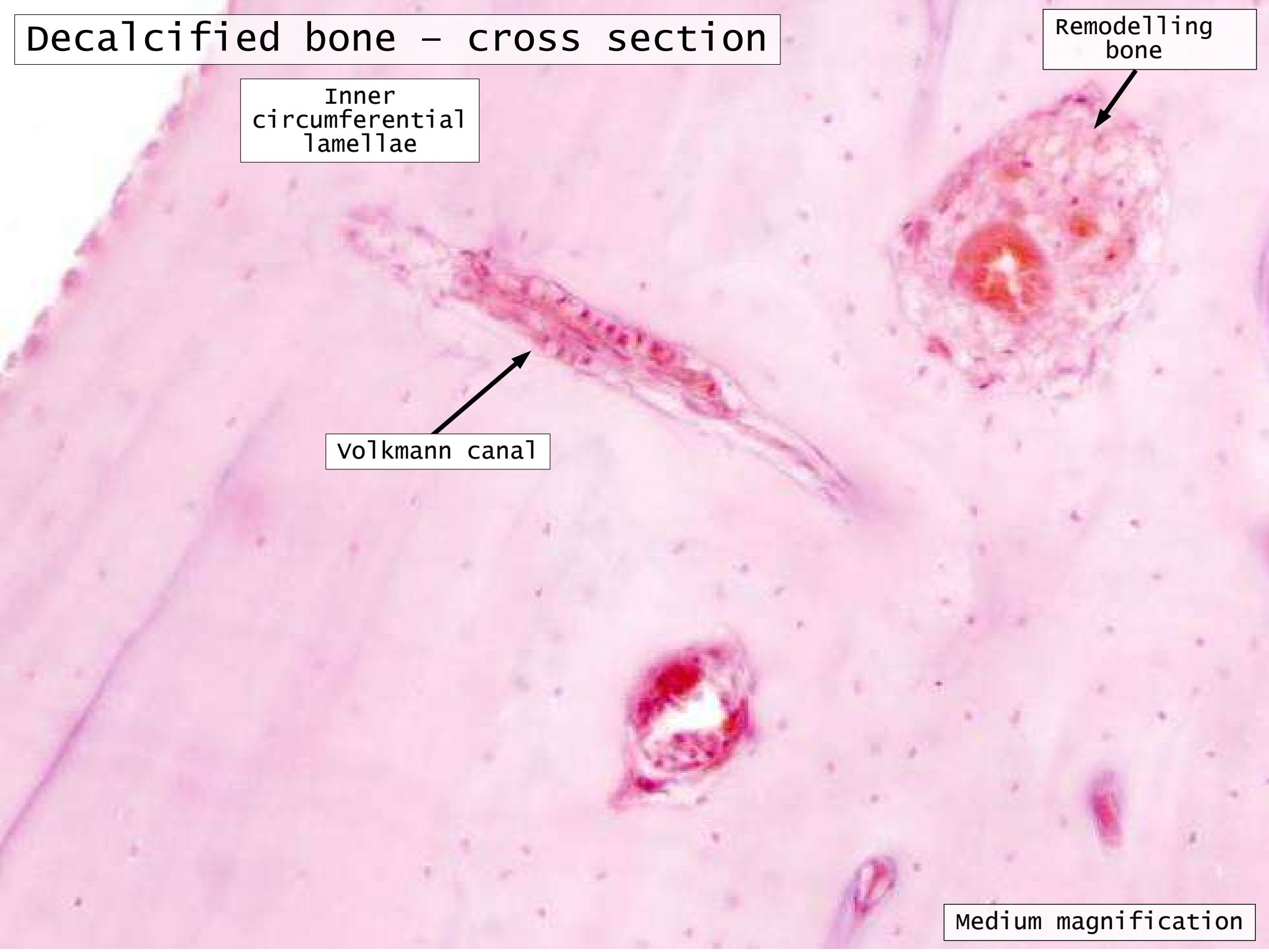
Decalcified bone – cross section

Inner
circumferential
lamellae

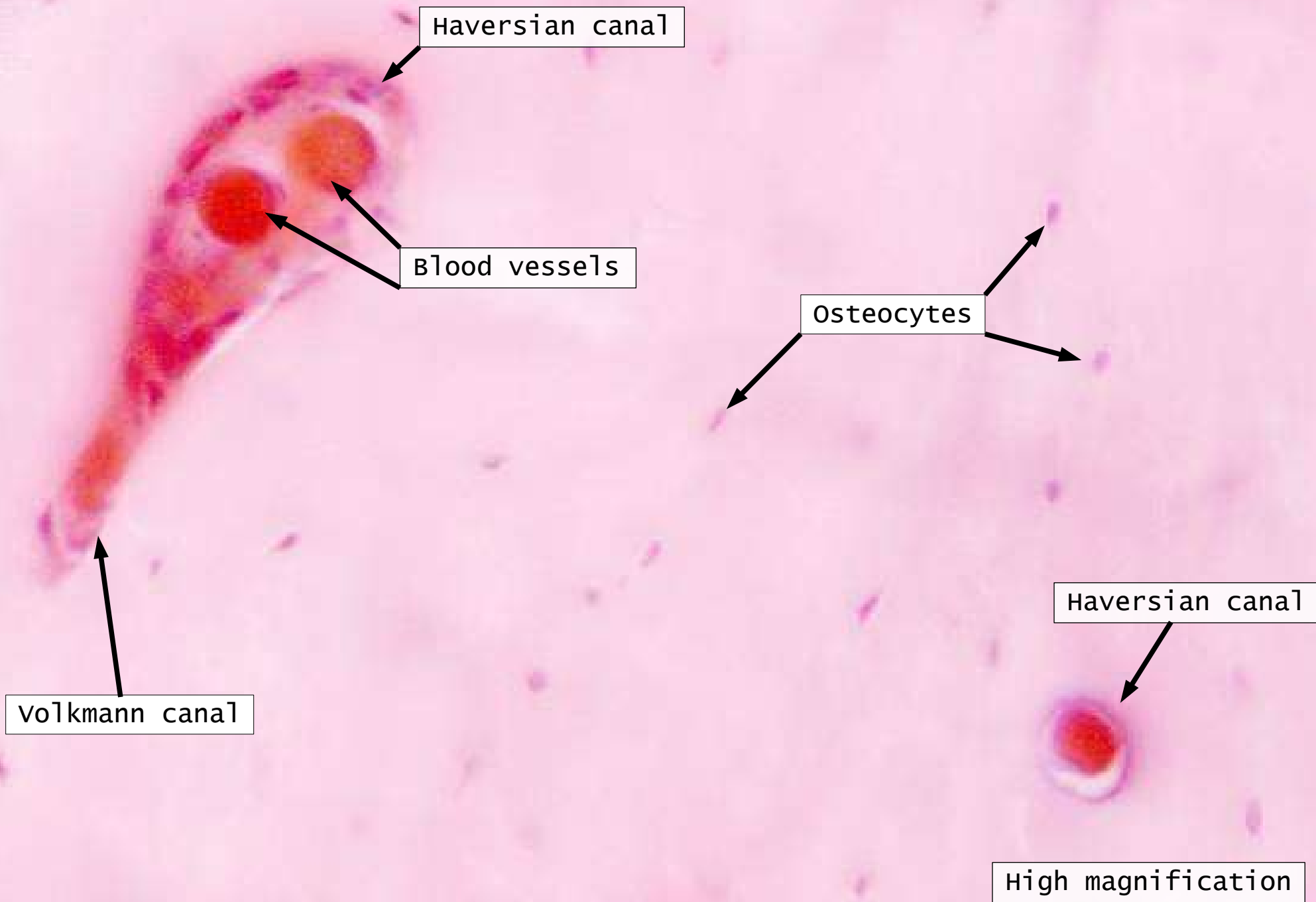
Remodelling
bone

volkmann canal

Medium magnification



Decalcified bone – cross section



Osteon

Osteocytes

Haversian canal

Blood vessel

Osteon

High magnification



Bone marrow

Fat cells

Developing
red
and
white
blood cells



very high magnification

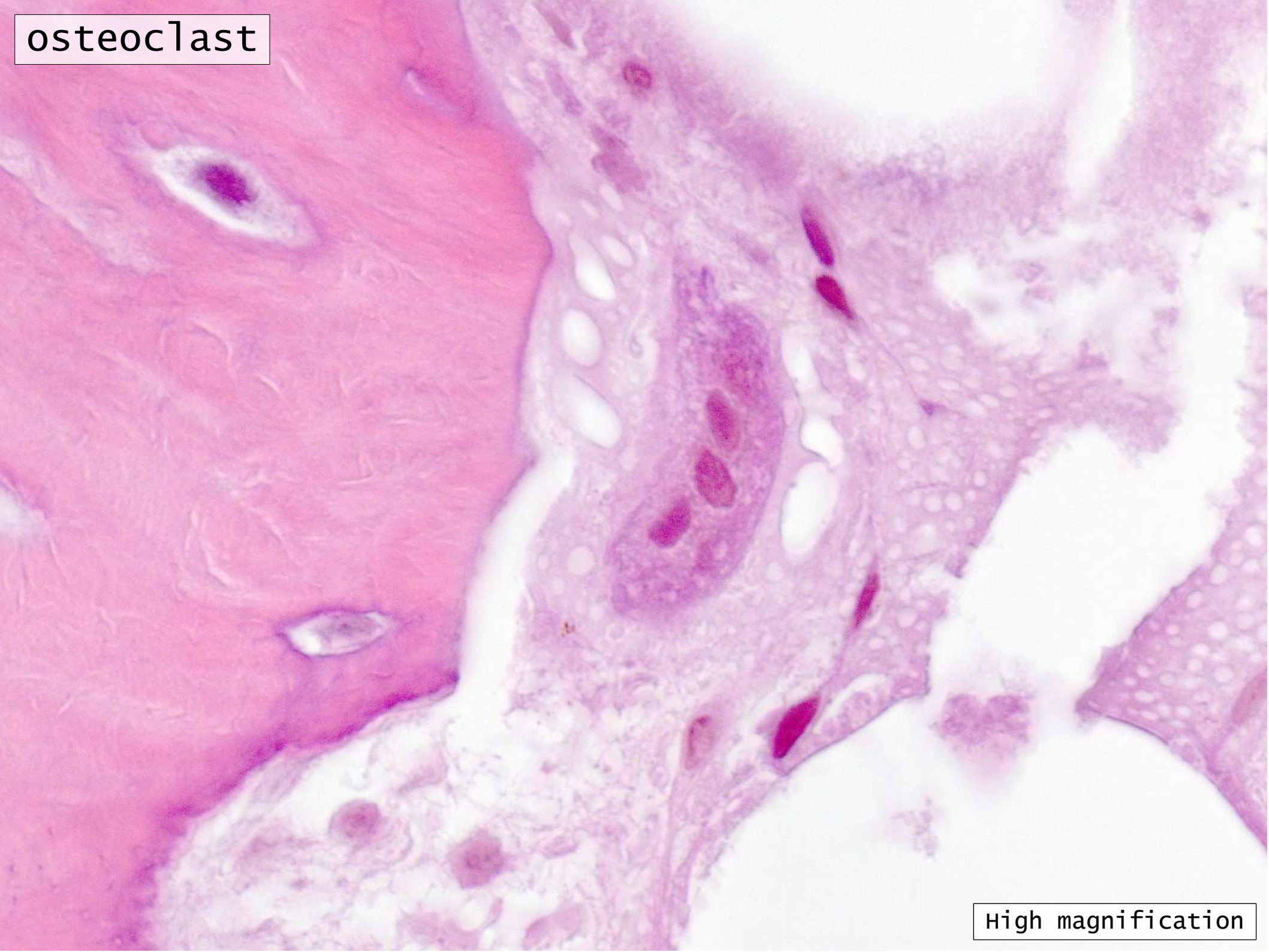
Decalcified bone – cross section



Osteoclast

Medium magnification

osteoclast

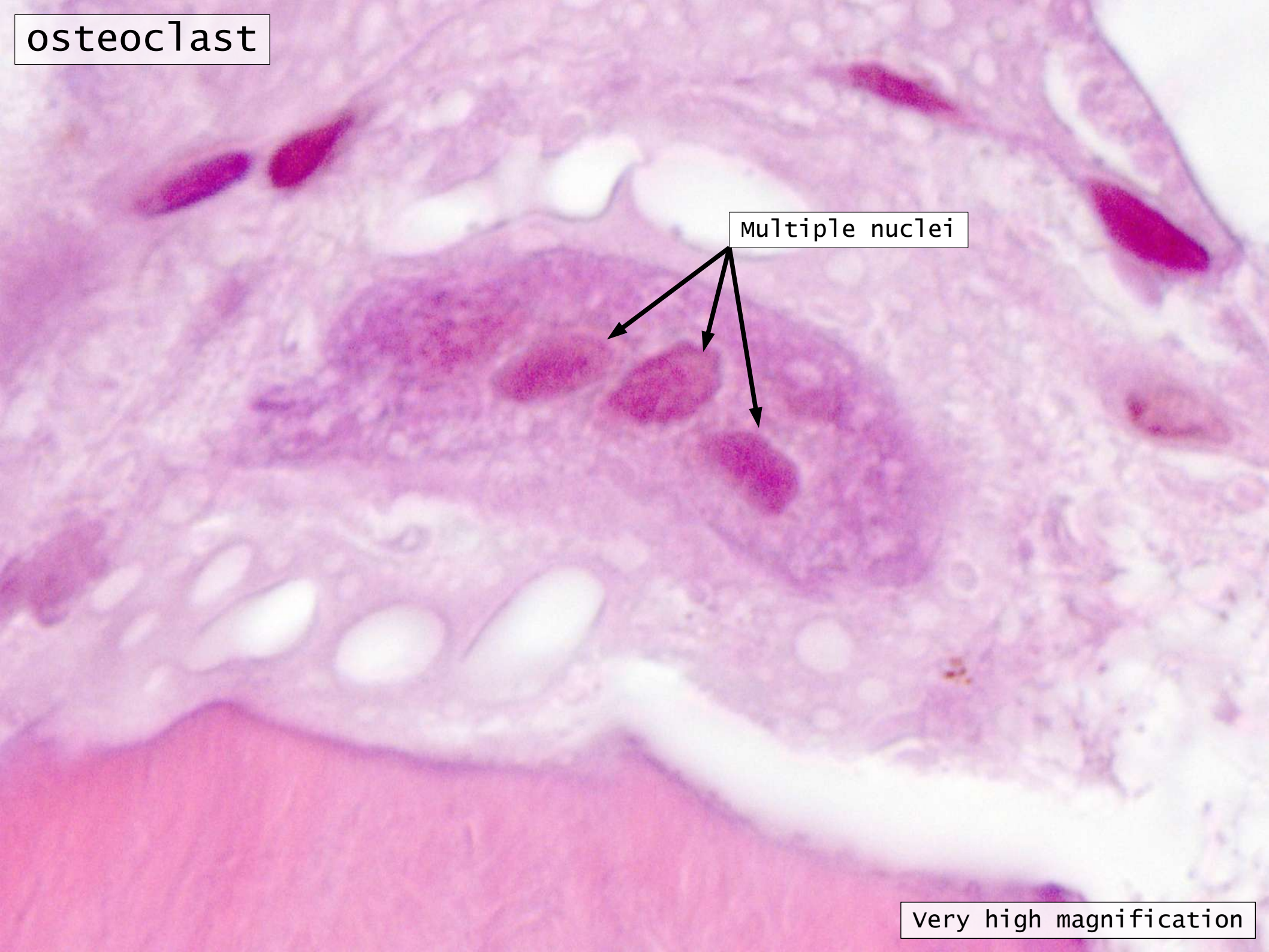


High magnification

osteoclast

Multiple nuclei

very high magnification



osteoblasts

Newly deposited bone matrix

Row of osteoblasts

High magnification



osteoblasts



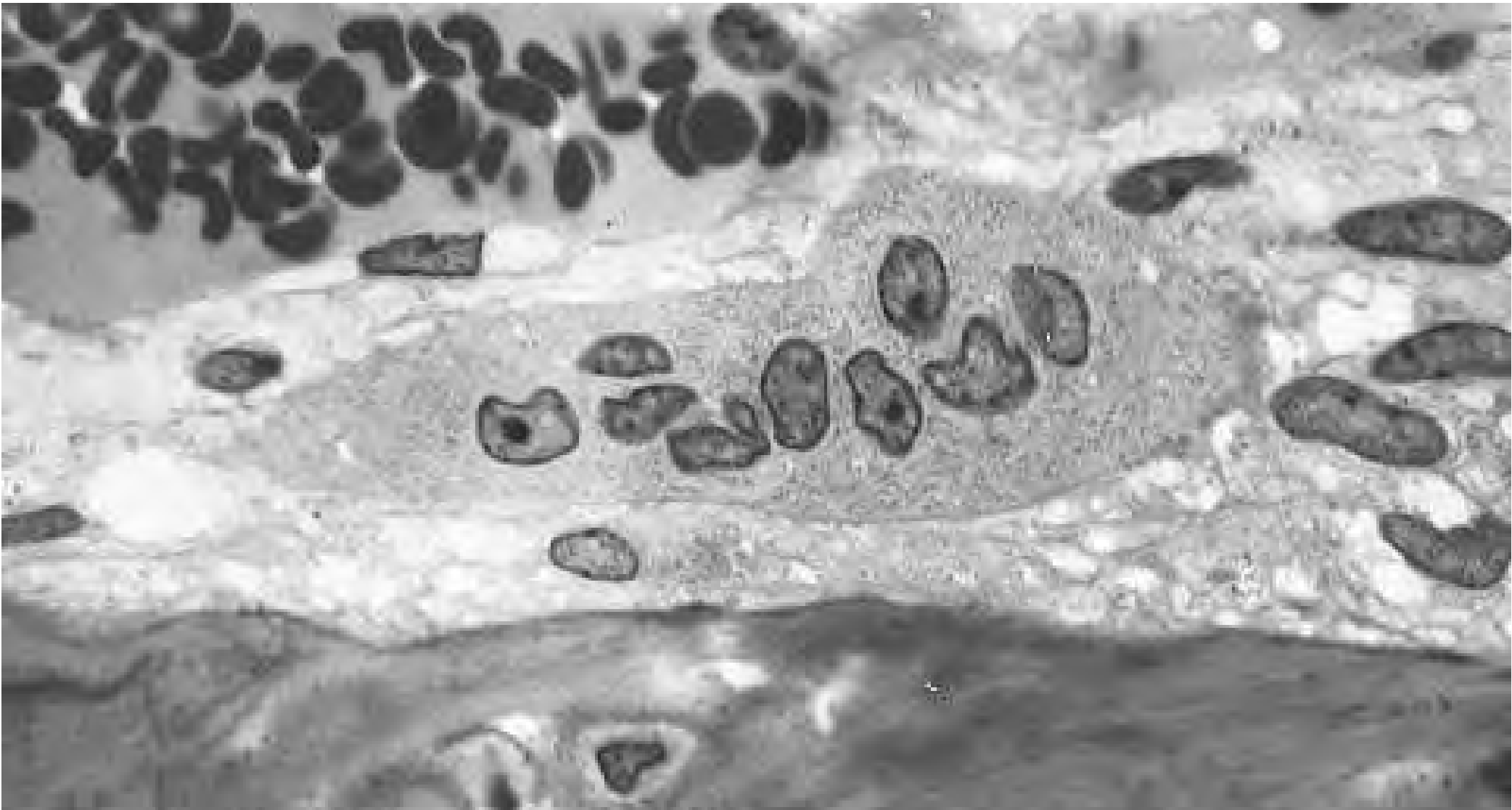
very high magnification

Newly deposited bone matrix



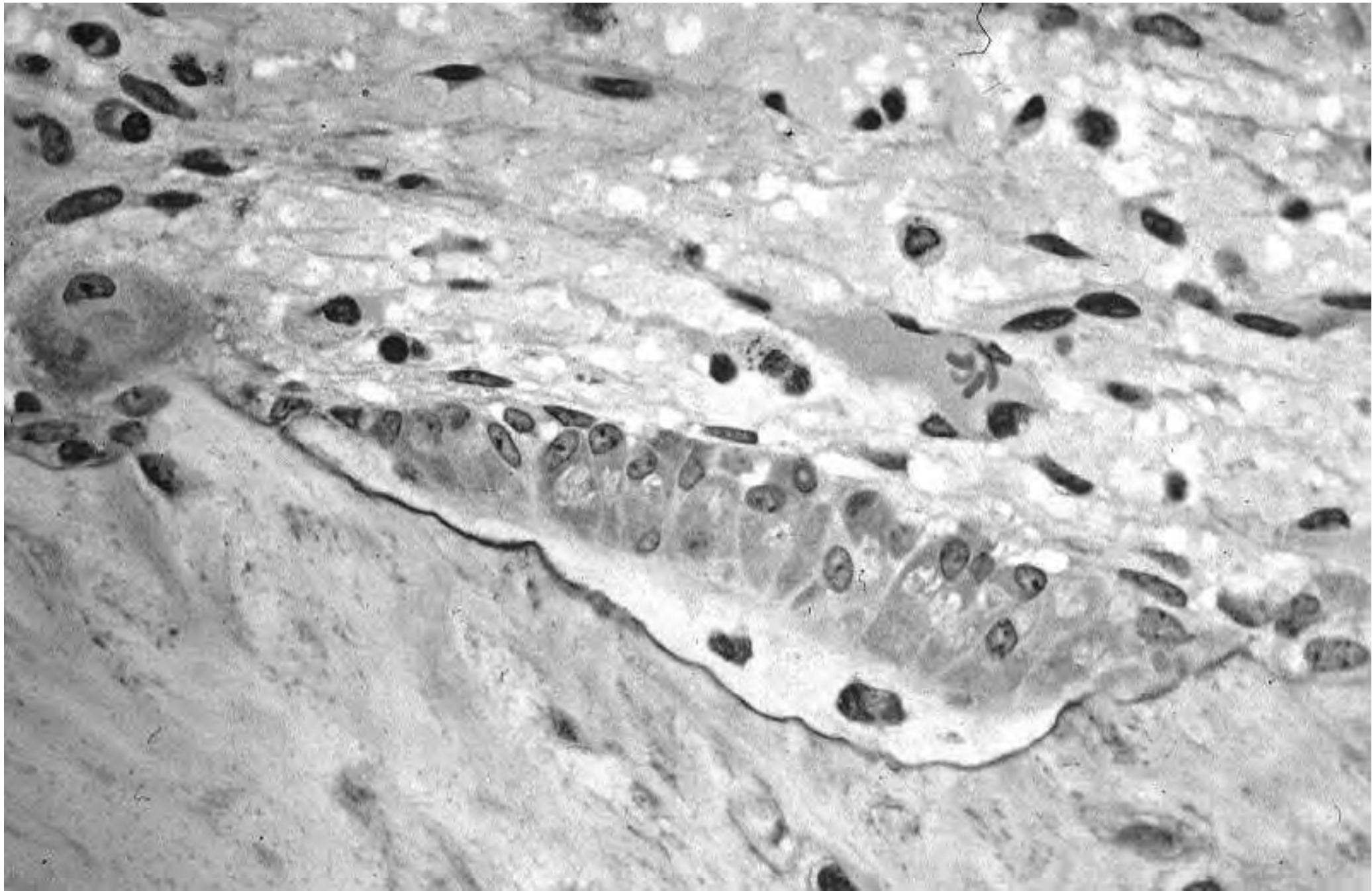
High magnification

Osteoclast



very high magnification; PD

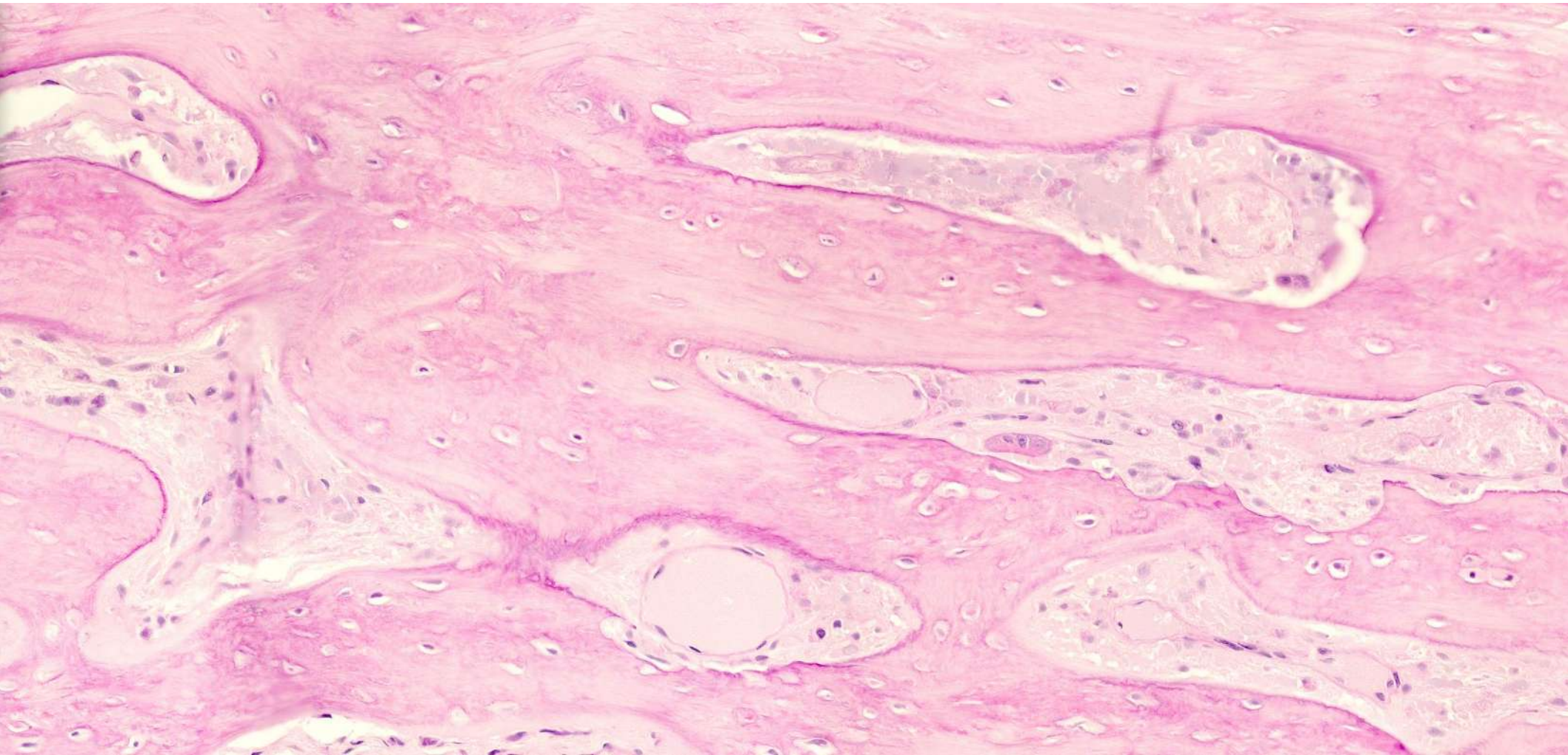
Active osteoblasts



Very high magnification

By Robert M Hunt; 16 June 2008; CC-BY-SA 3.0

Active bone remodelling



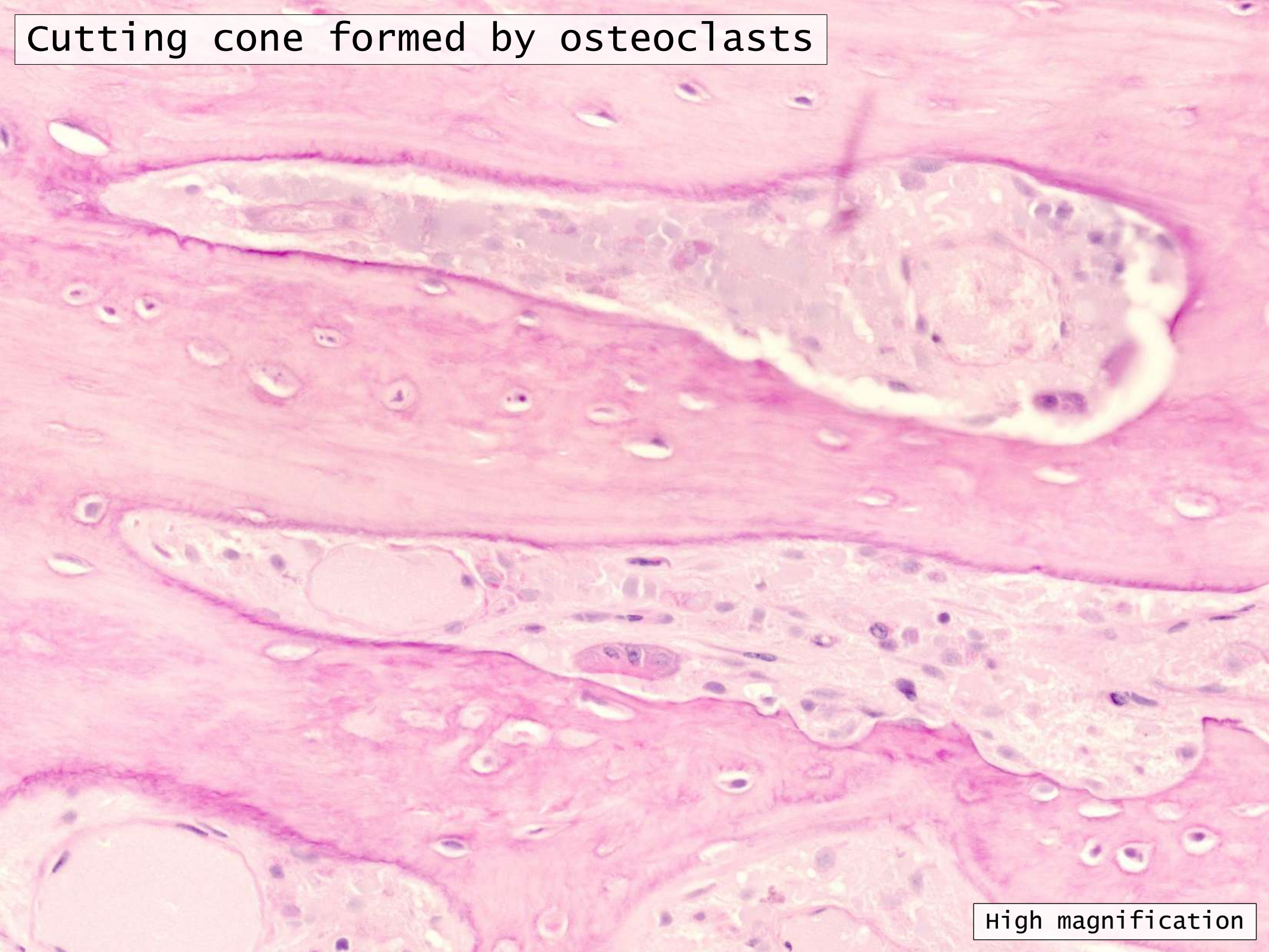
Medium magnification

Active bone remodelling



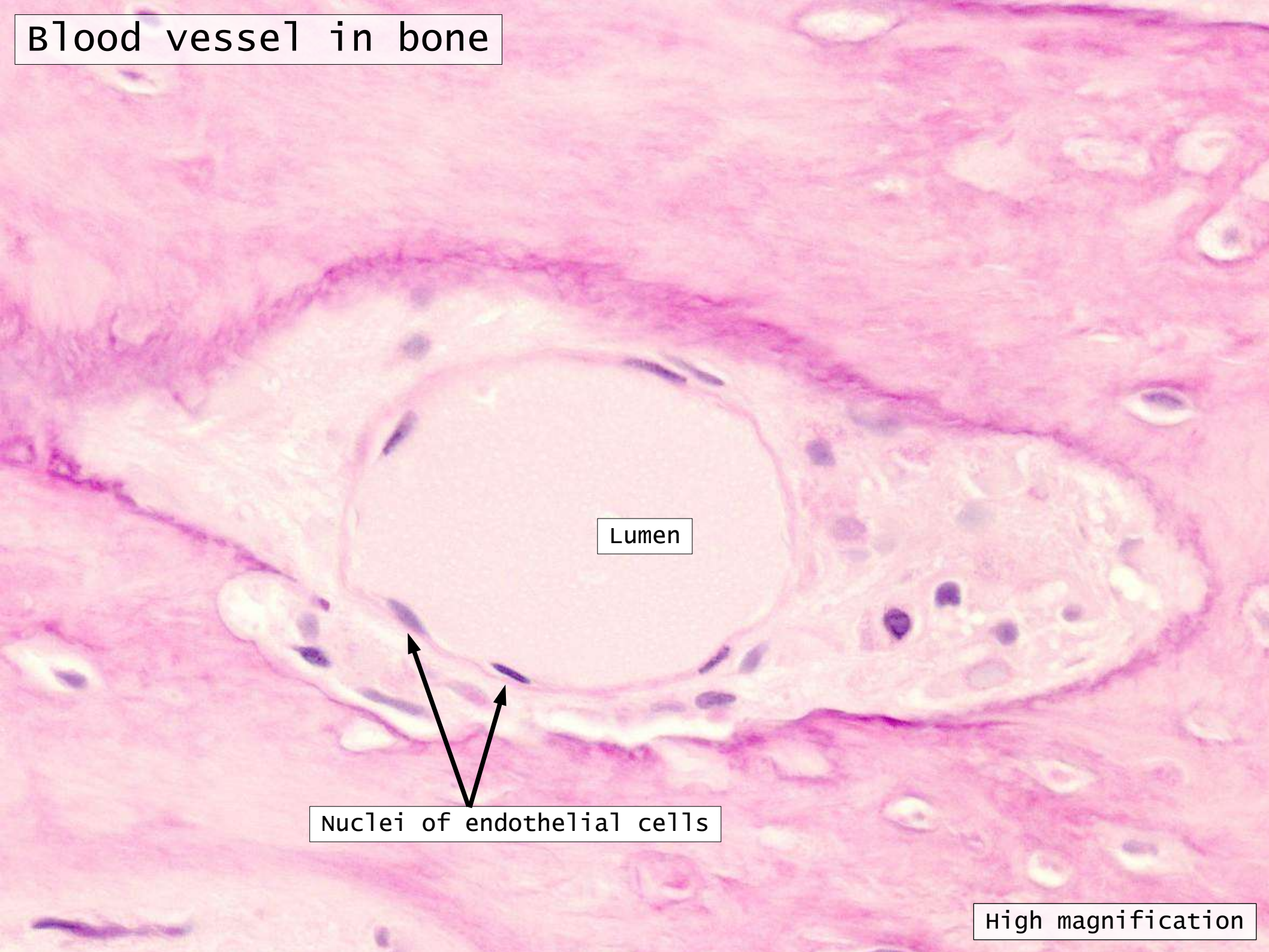
High magnification

Cutting cone formed by osteoclasts



High magnification

Blood vessel in bone



Lumen

Nuclei of endothelial cells

High magnification

