DENTAL ENAMEL

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ORAL HISTOLOGY???

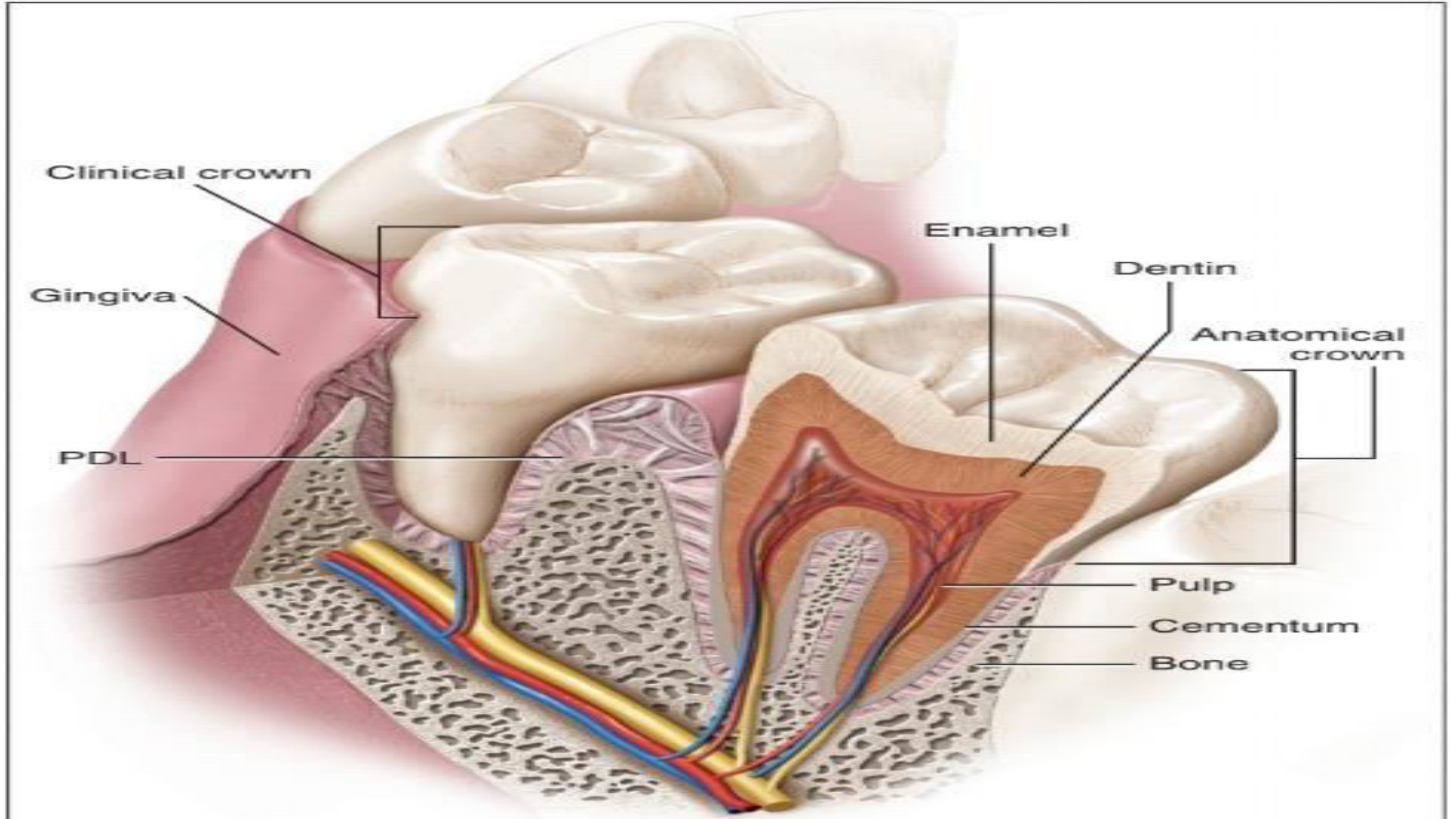
"Microscopic study of oral tissues involving the teeth and the surrounding oral mucosa with the structural variations in relation to the functional requirements."

LEARNING OBJECTIVES

- Components of a tooth
- Enamel
- Properties of enamel
- Structures of enamel
- Age changes

THE TOOTH

- Enamel
- Dentin
- Pulp
- Supporting tissues of the tooth
- Periodontal ligament
- Cementum


Clinical crown
Gingiva
PDL
Enamel
Dentin
Anatomical crown
Pulp
Cementum
Bone

DEFINITION

“Hard calcified tissue covering the dentin in the crown of tooth”.

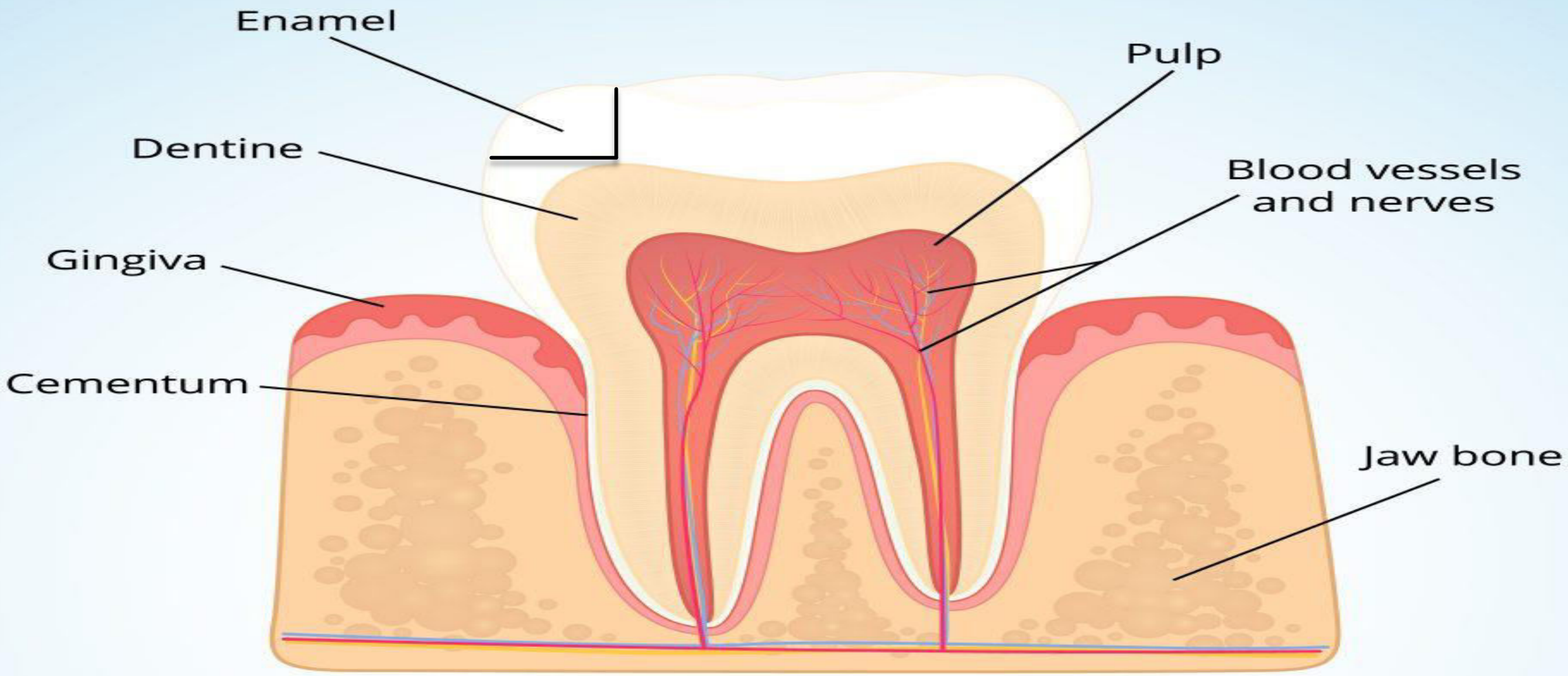
CHEMICAL COMPOSITION

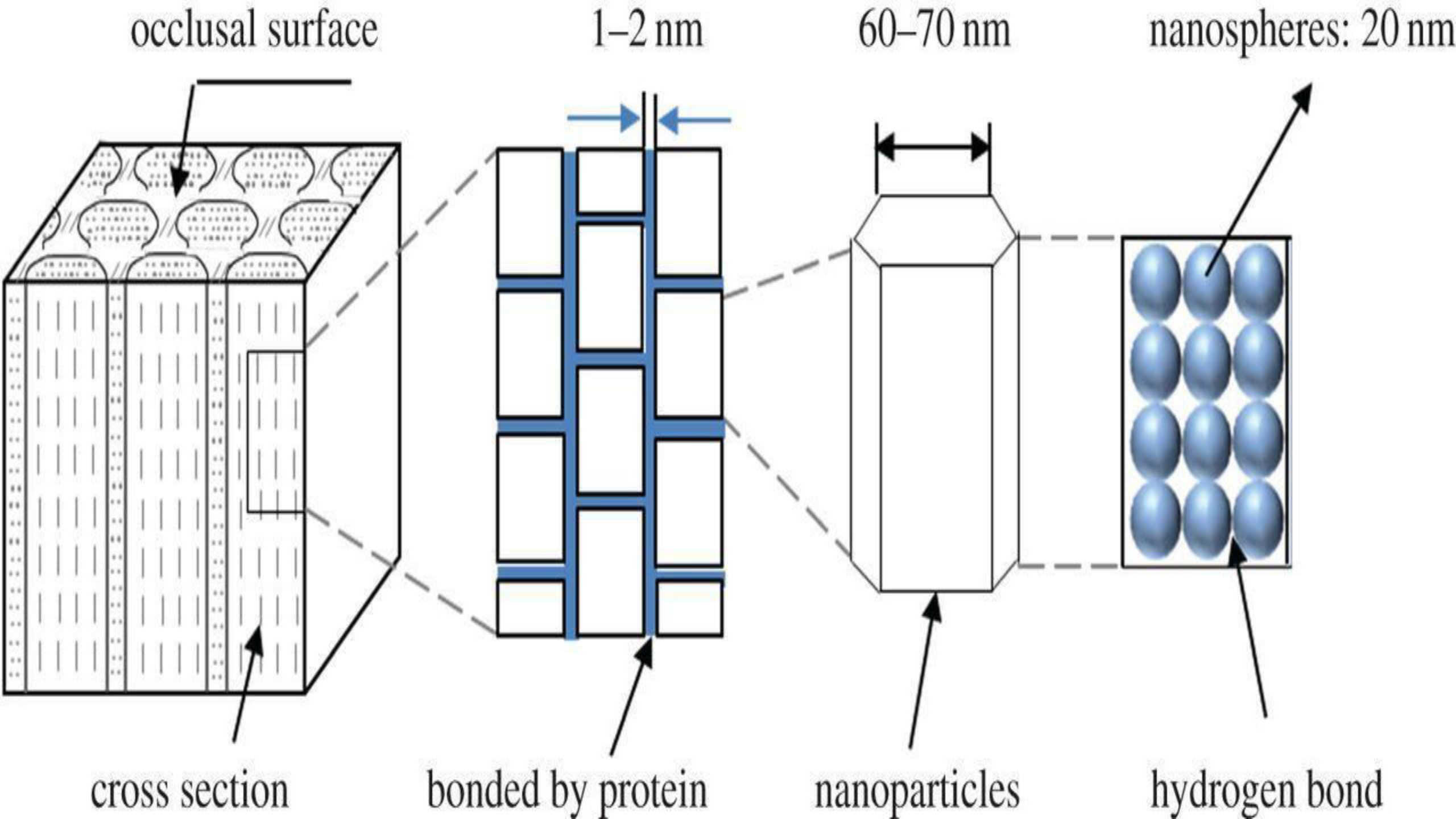
- Most highly mineralized tissue in the body
- Consisting of **96% inorganic material** (Hydroxyapatite Crystal)
- **4% organic material**(Amelogenin & Non-amelogenein)
- Develops from **ameloblasts.**
- Loss of ameloblasts renders enamel non-vital & insensitive
- Can’t be regenerated

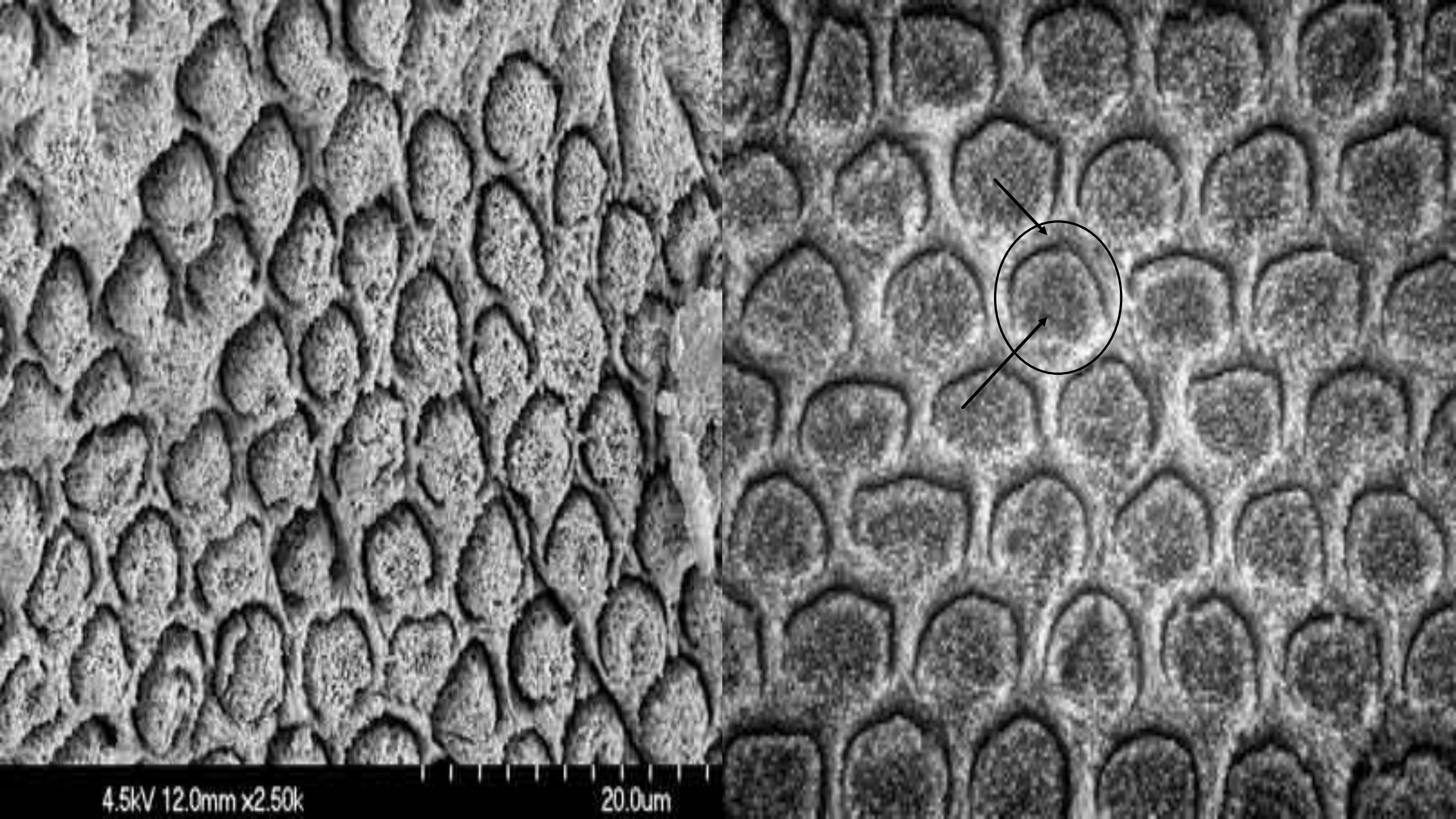
ENAMEL

- Enamel acquired a high degree of mineralization and a complex organization
- Apatite crystals within enamel pack together to create a structure of enamel rods separated by interrod.
- Permeable, ionic exchange can be occur between enamel and environment of oral cavity.

TOOTH STRUCTURE




occlusal surface
1–2 nm
60–70 nm
nanospheres: 20 nm
cross section
bonded by protein
nanoparticles
hydrogen bond

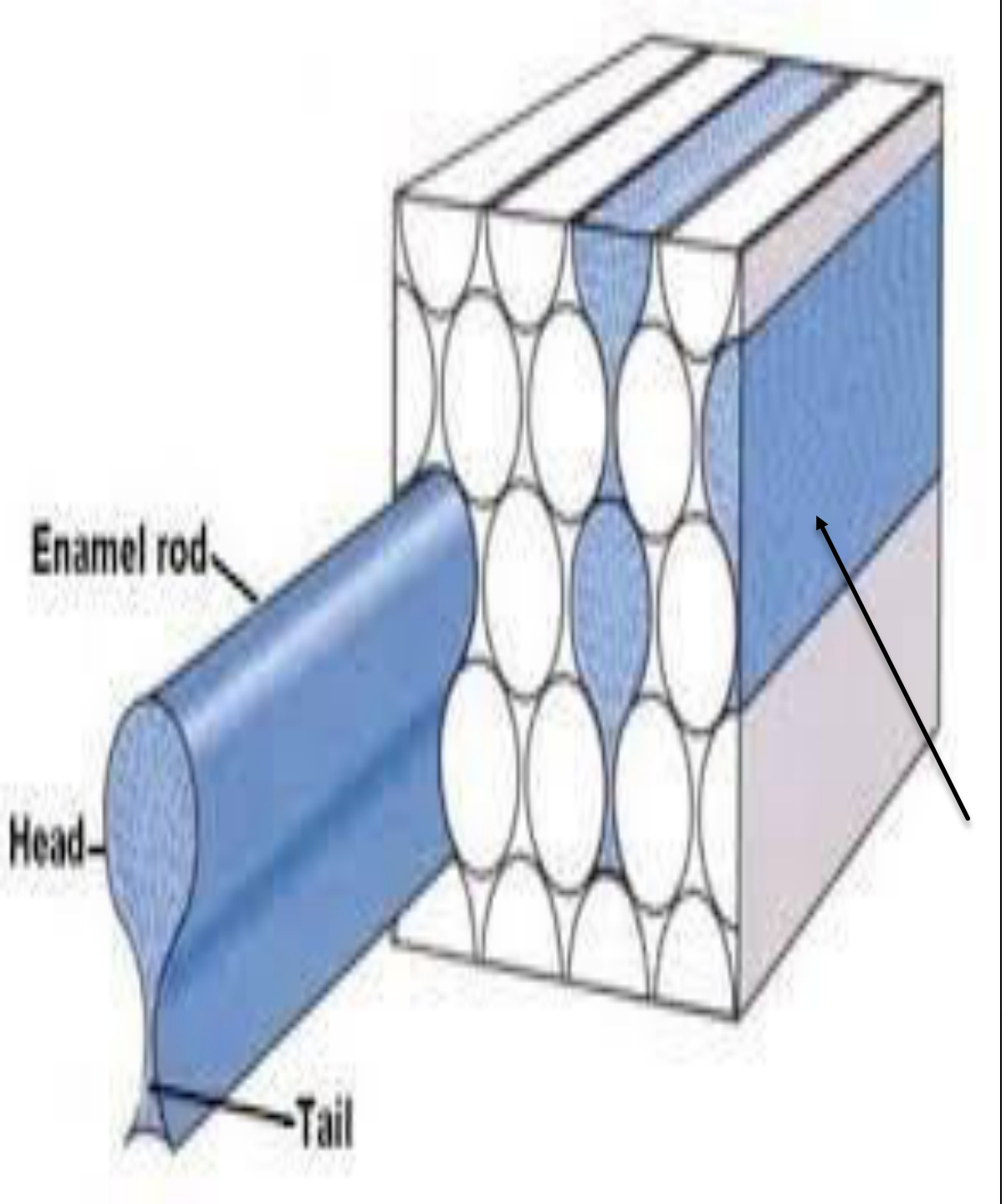

4.5kV 12.0mm x2.50k
20.0um

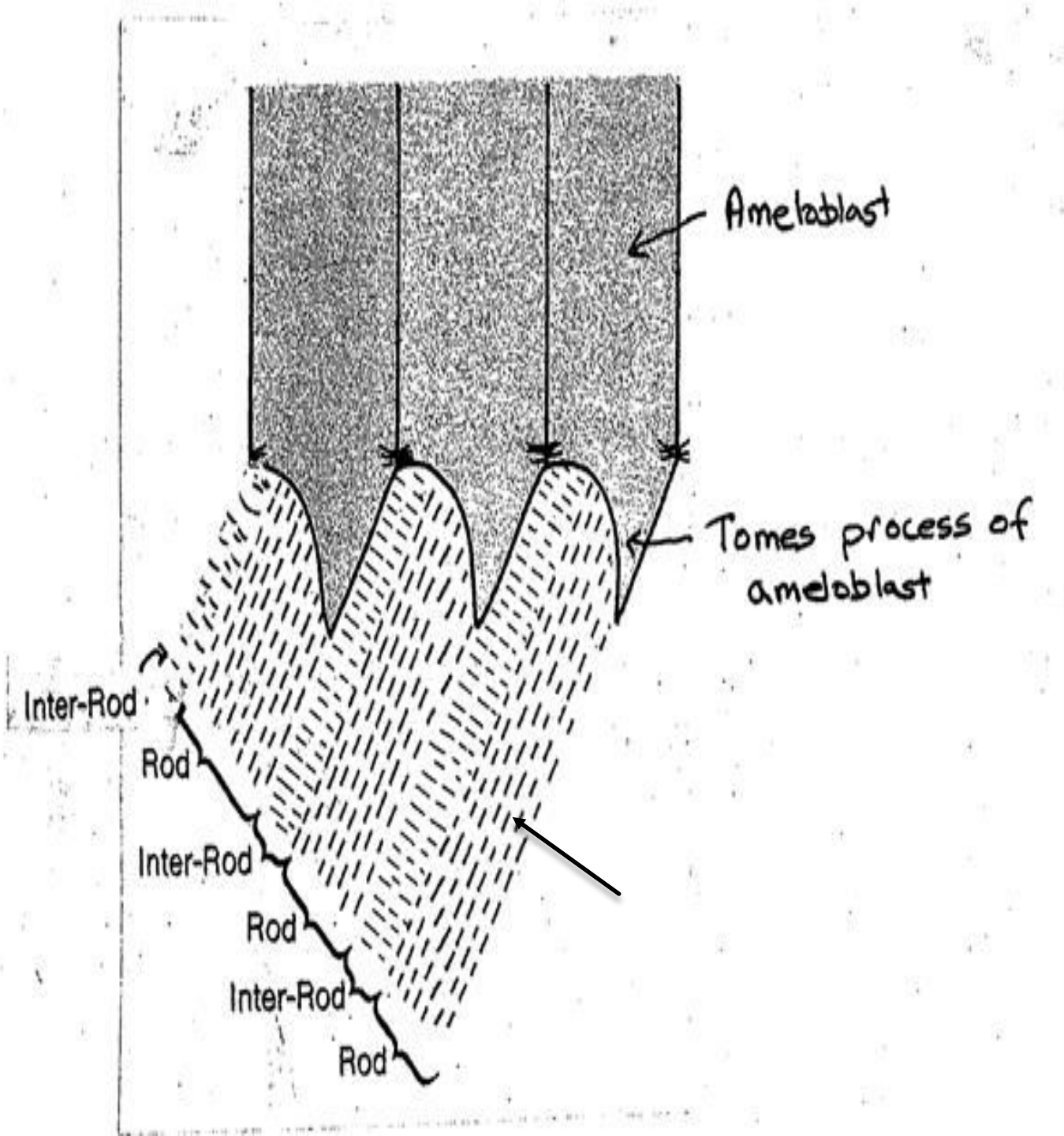
PHYSICAL PROPERTIES

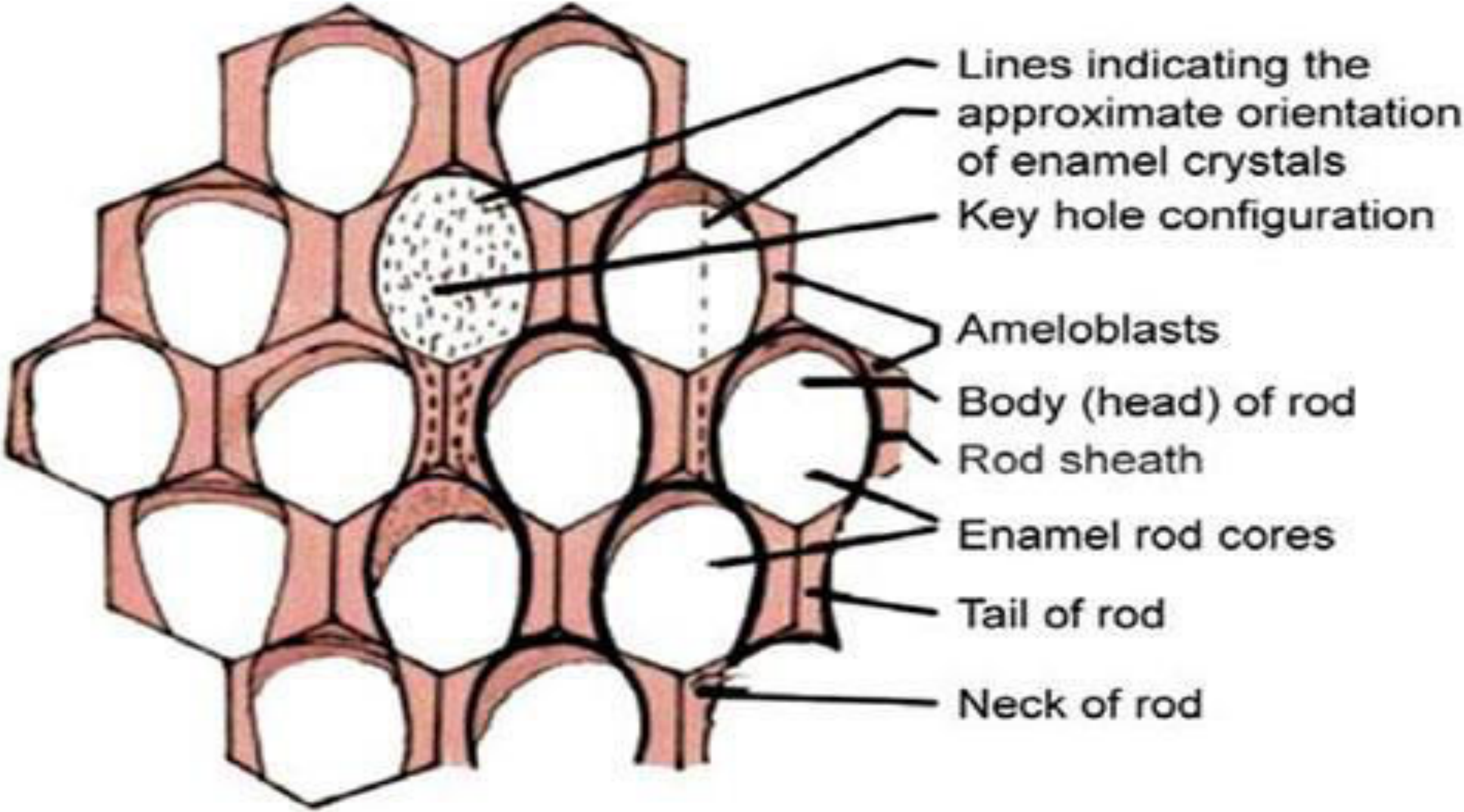
- Resistant covering for the teeth and enables it to withstand the mechanical forces applied during mastication.
- It is thicker in the cusp of the molars and premolars,
- The hardness and density decreases from the surface of the enamel to the dentinoenamel junction
- It has been found that the enamel acts like a semipermeable membrane

PHYSICAL PROPERTIES

- Structure and hardness of the enamel makes it brittle.
- Color depends on the translucency of the enamel.
- Yellow teeth probably have translucent enamel through which the yellow color of the underlying dentin is seen.
- The cervical area appears slightly yellow even in greyish white teeth as a result of the thinner enamel layer in the cervical region allowing light to pass through


Enamel rod
Head
Tail


Ameloblast
Tomes process of ameloblast
Inter-Rod
Rod
Inter-Rod
Rod
Inter-Rod
Rod


Lines indicating the approximate orientation of enamel crystals
Key hole configuration
Ameloblasts
Body (head) of rod
Rod sheath
Enamel rod cores
Tail of rod
Neck of rod

STRUCTURES OF ENAMEL

- Incremental Lines
- Hunter-Schreger bands
- Enamel Spindle
- Enamel Lamella
- Enamel Tufts
- Enamel Cuticle
- Dentinoenamel Junction
- Cementoenamel Junction

INCREMENTAL LINES

Striae of Retzius

- **Incremental growth lines or bands seen in tooth enamel**. They represent the incremental pattern of enamel, the successive apposition of different layers of enamel during crown formation

Cross striations

- Each enamel rod is built up of segments separated by dark lines that give it a striated appearance. *cross-striations* demarcate rod segments and become more visible by the action of mild acids

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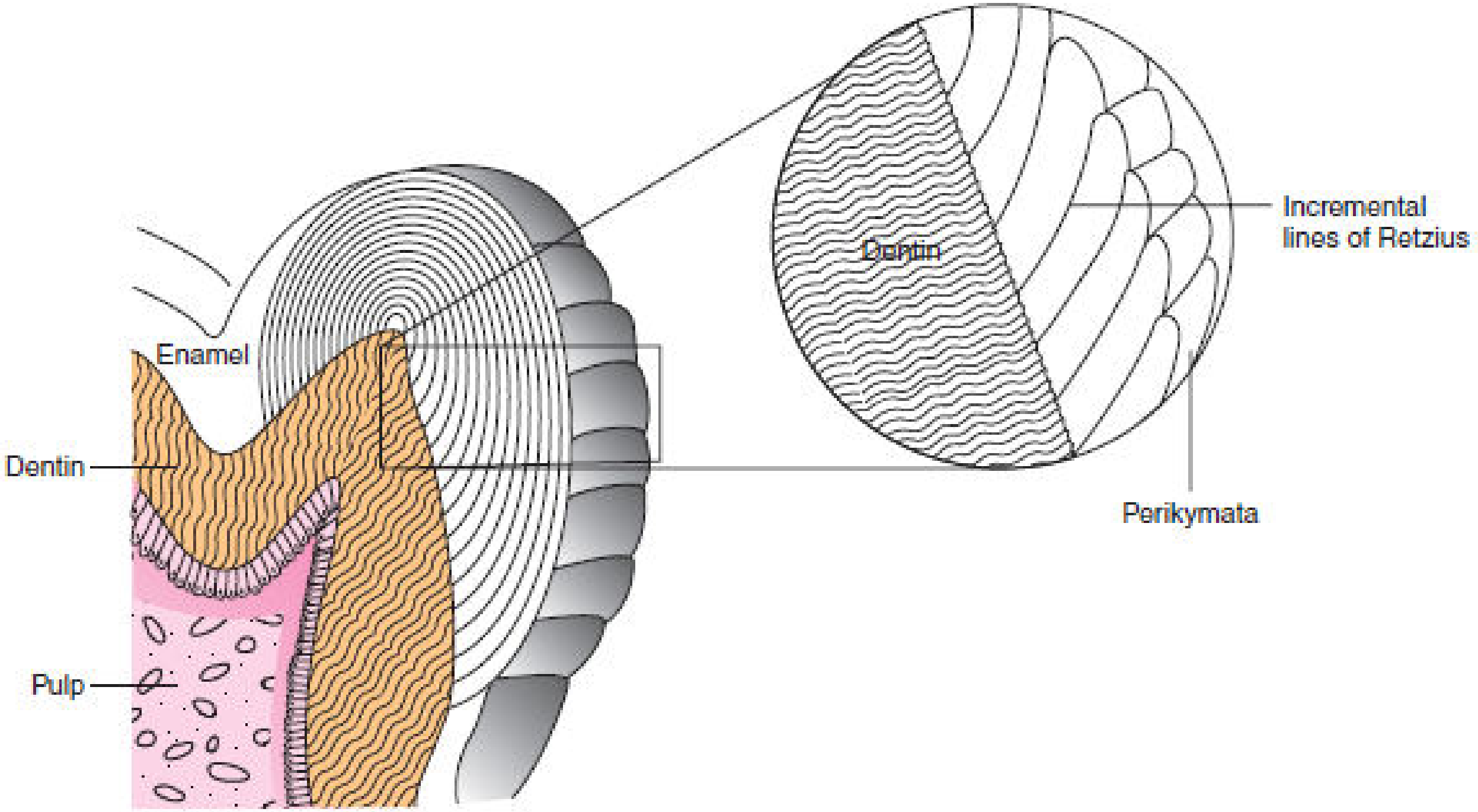
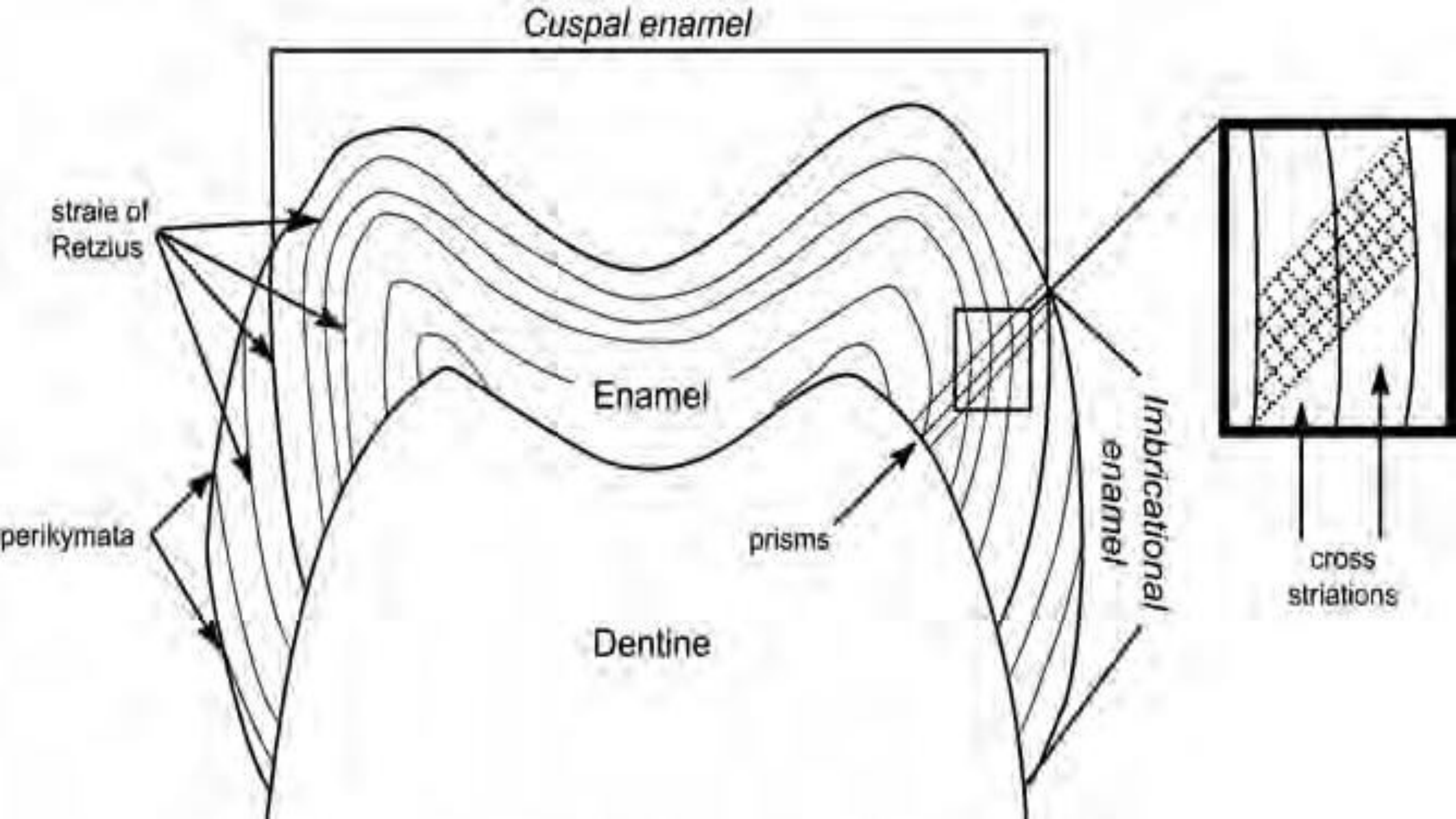
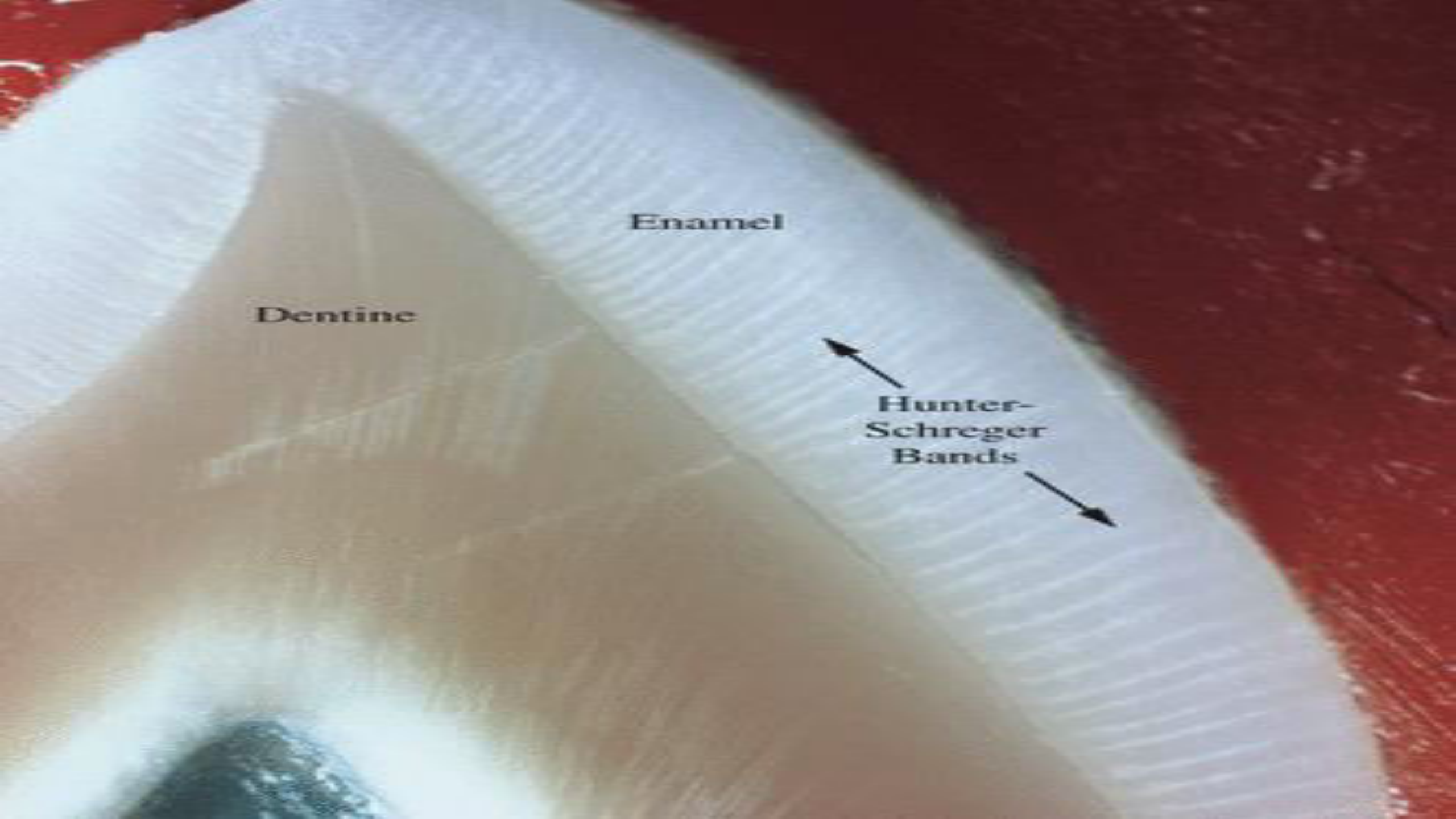

Enamel
Dentin
Pulp
Dentin
Incremental
lines of Retzius
Perikymata


Cuspal enamel
straie of Retzius
Enamel
perikymata
prisms
Imbricational enamel
cross striations
Dentine

HUNTER-SCHREGER BANDS

These are alternating dark and light strips of varying widths, that can best be seen in a longitudinal ground section under oblique reflected light.


Enamel
Dentine
Hunter–
Schreger
Bands

ENAMEL LAMELLA

A thin, leaf-like structures that extend from the enamel surface toward the DE junction


Enamel
Lamella
Tufts
DE junction
Dentinal part of lamella
Dentin

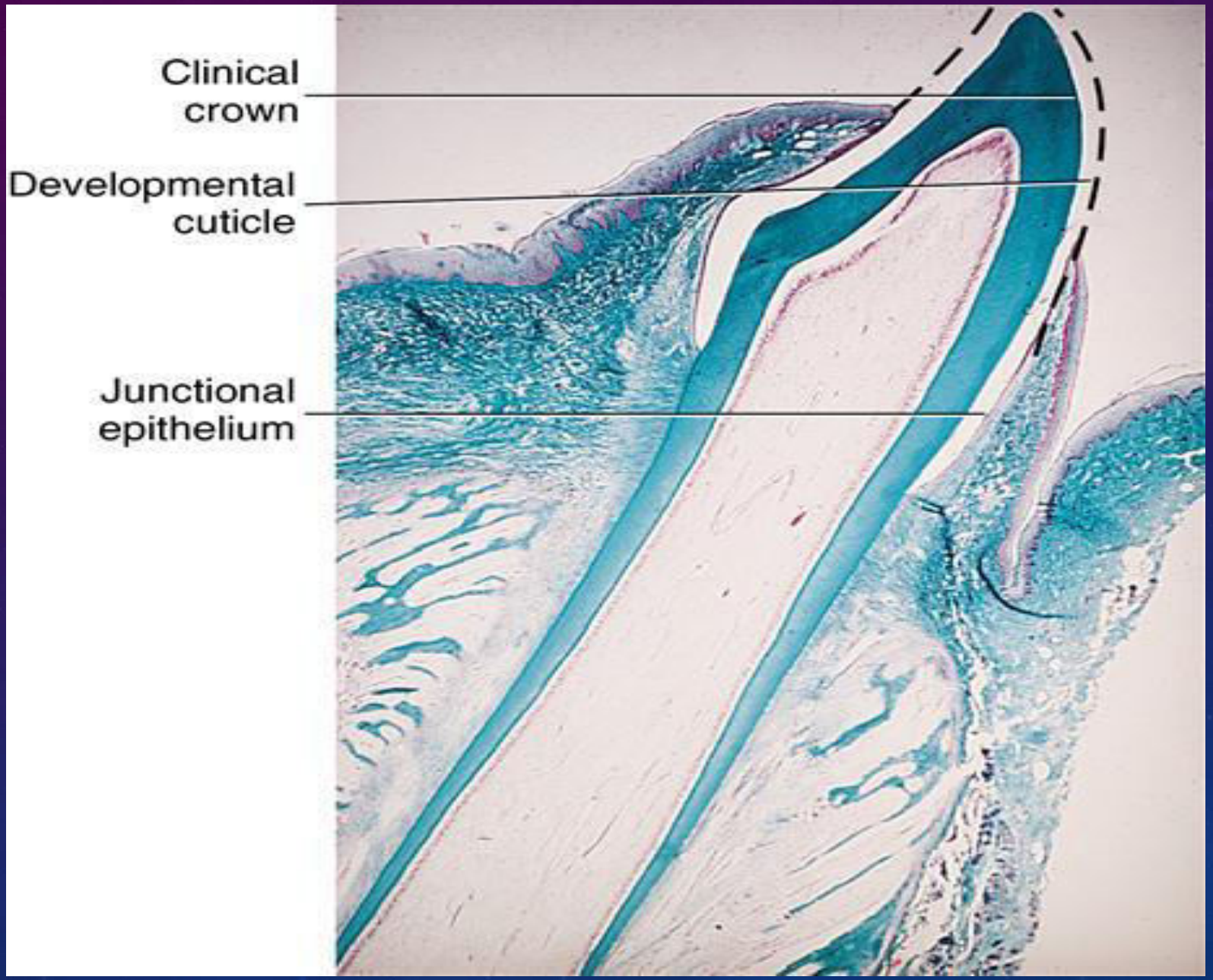
ENAMEL TUFTS

Enamel tufts arise at the DE junction and reach into the enamel to about one-fifth to one-third of its thickness


Enamel
Tufts
DE junction
Dentin

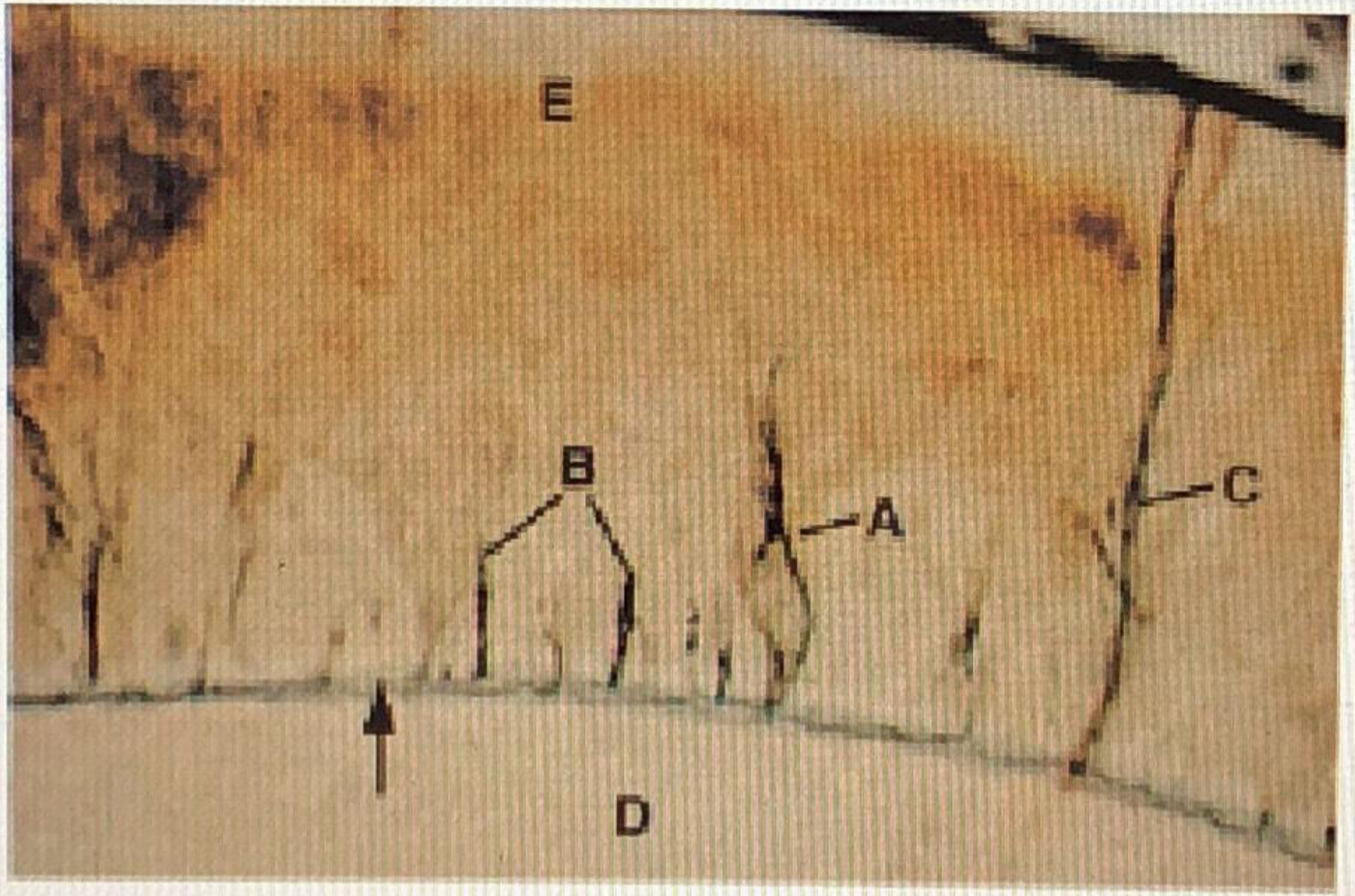
ENAMEL CUTICLE

A membrane that covers the entire crown of the newly erupted tooth but is probably soon removed by mastication


Clinical crown
Developmental cuticle
Junctional epithelium

ENAMEL SPINDLE

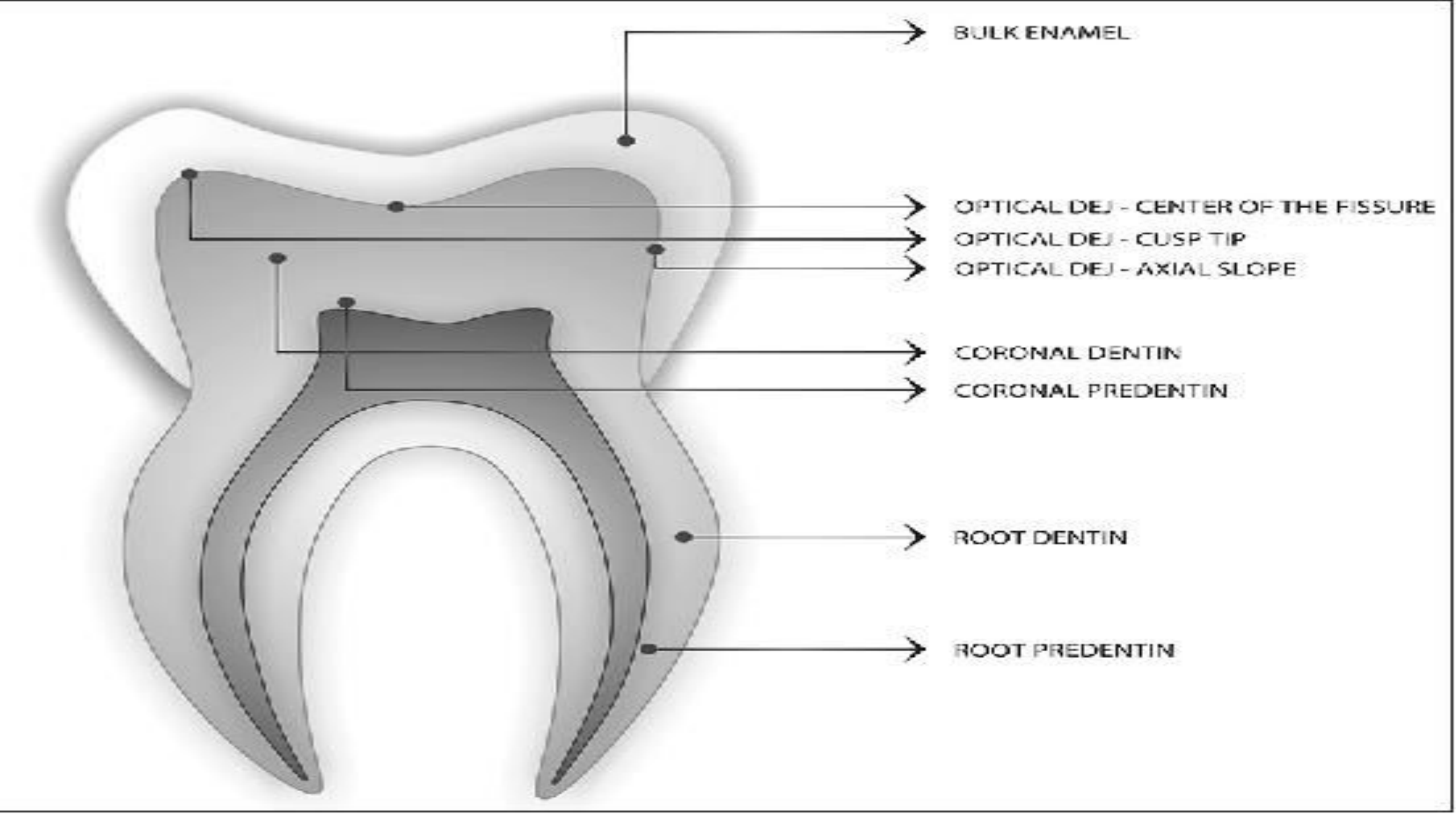
Odontoblast processes pass across the DE junction into the enamel.



A= tuft, B= spindle and C= lamella

DENTINOENAMEL JUNCTIONS

The internal line of meeting of the dentin and enamel in the anatomical crown of a tooth


BULK ENAMEL
OPTICAL DEJ - CENTER OF THE FISSURE
OPTICAL DEJ - CUSP TIP
OPTICAL DEJ - AXIAL SLOPE
CORONAL DENTIN
CORONAL PREDENTIN
ROOT DENTIN
ROOT PREDENTIN

CEMENTOENAMEL JUNCTION

Region on the tooth where the enamel and cementum meet at the cervical line

AGE CHANGES

- Attrition or wear of the occlusal surfaces and proximal contact points
- Loss of Mamelons
- Surface hardness increase
- Increased uptake of fluoride ions
- Reduced permeability because crystals become bigger