



HISTOLOGY Lecture 4b

Respiratory Systeme

PCL1 2012

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11: Respiratory system

Introduction

- Function: to bring oxygen to the blood and to remove the carbon dioxide
- composed of two parts:
 - **Conducting Portion**
 - **Respiratory Portion**

Conduction

- a series of cavities and tubes conducting air to the lungs
- composed of :
 - Nose
 - Nasopharynx
 - Larynx
 - Trachea
 - Bronchi
 - Bronchioles (terminal and respiratory)

Functions of the conduction portion

- to *provide a route* for the air to reach the lungs and also for *conditioning* the air
- conditioning functions are performed by a specialized epithelium, the "**respiratory epithelium**"
 - pseudostratified columnar ciliated epithelium with goblet cells.
 - In the smaller tubes of the bronchial tree becomes simple cuboidal epithelium
- Mucus from the Goblet cells moistens and lubricates the ciliary surface and provides a barrier

Respiration

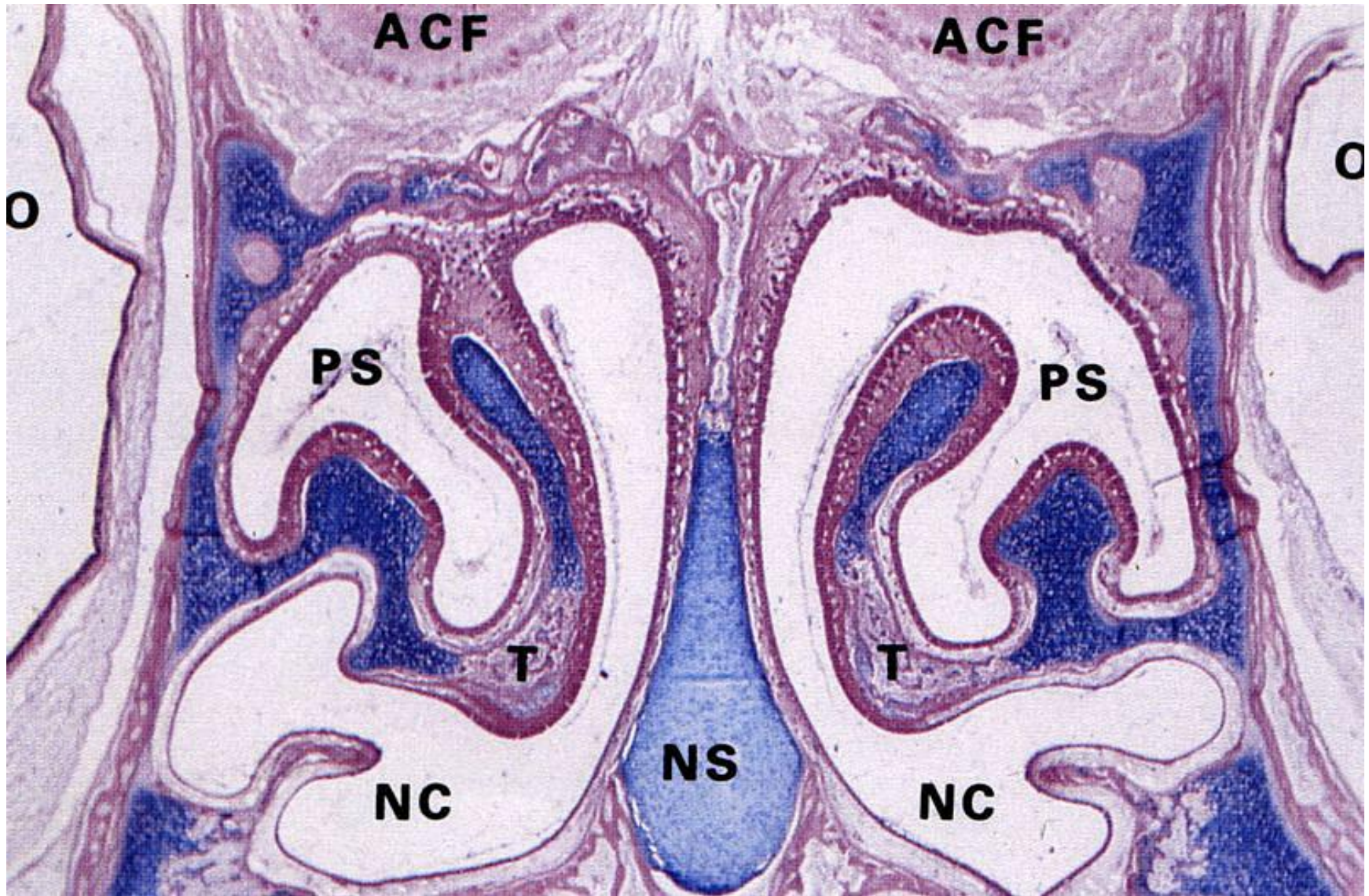
- exchanges of gases
- Respiratory Portion consists of :
 - Alveolar ducts
 - Alveolar sacs
- Alveoli



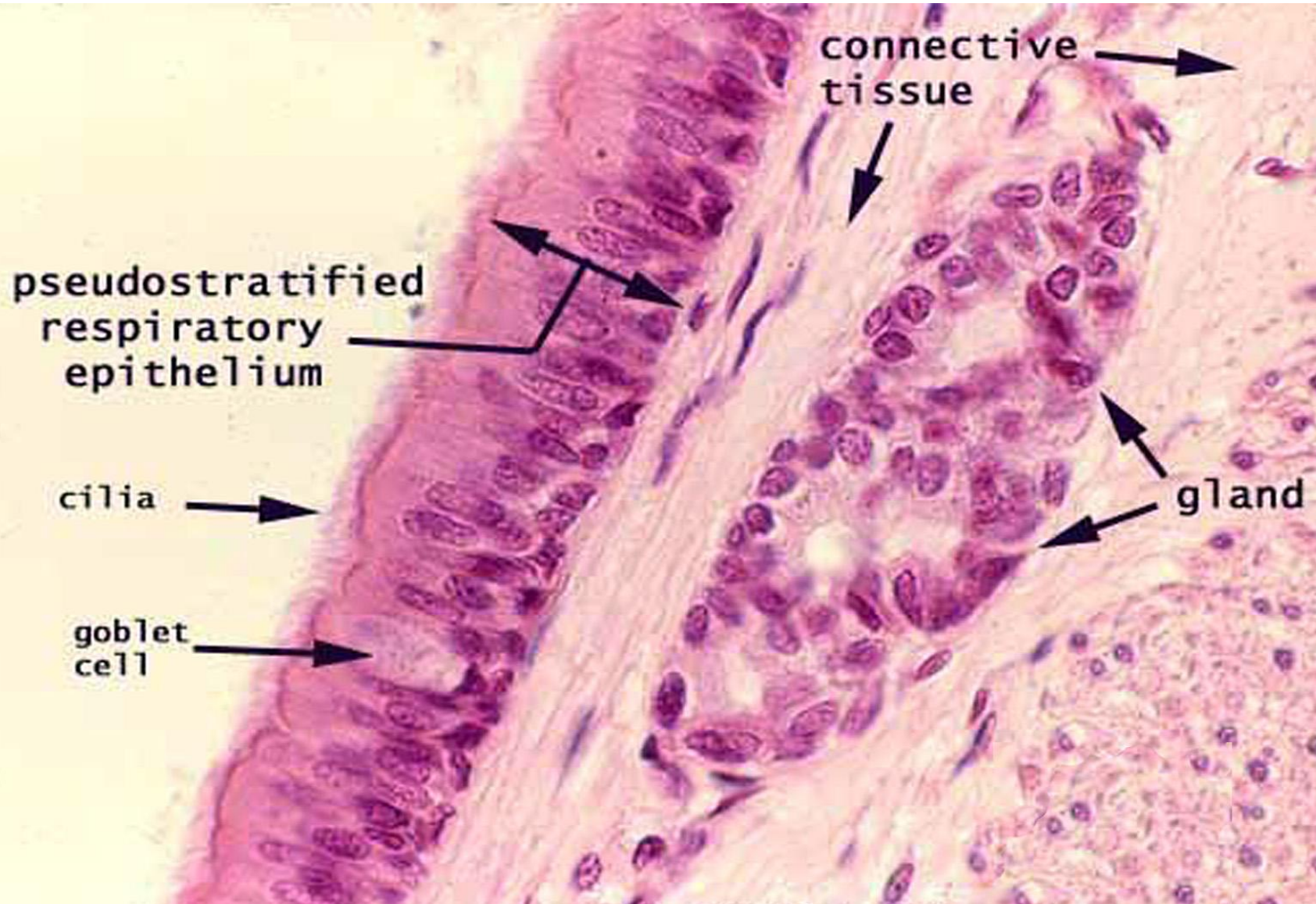
The Nasal Cavity

- divided by the **nasal septum** into two **chambers**
- external nostrils (**nares**) and **vestibule** have coarse hairs to filter large particles
- Three incomplete plates of bone (**conchae or turbinates**) divide each chamber into three smaller chambers (**superior, middle and inferior**)
- ***Regio olfactoria***
 - The olfactory region (about 10 cm²) is lined by a highly specialized sensory "epithelium", which is in fact composed of neurons and glia.

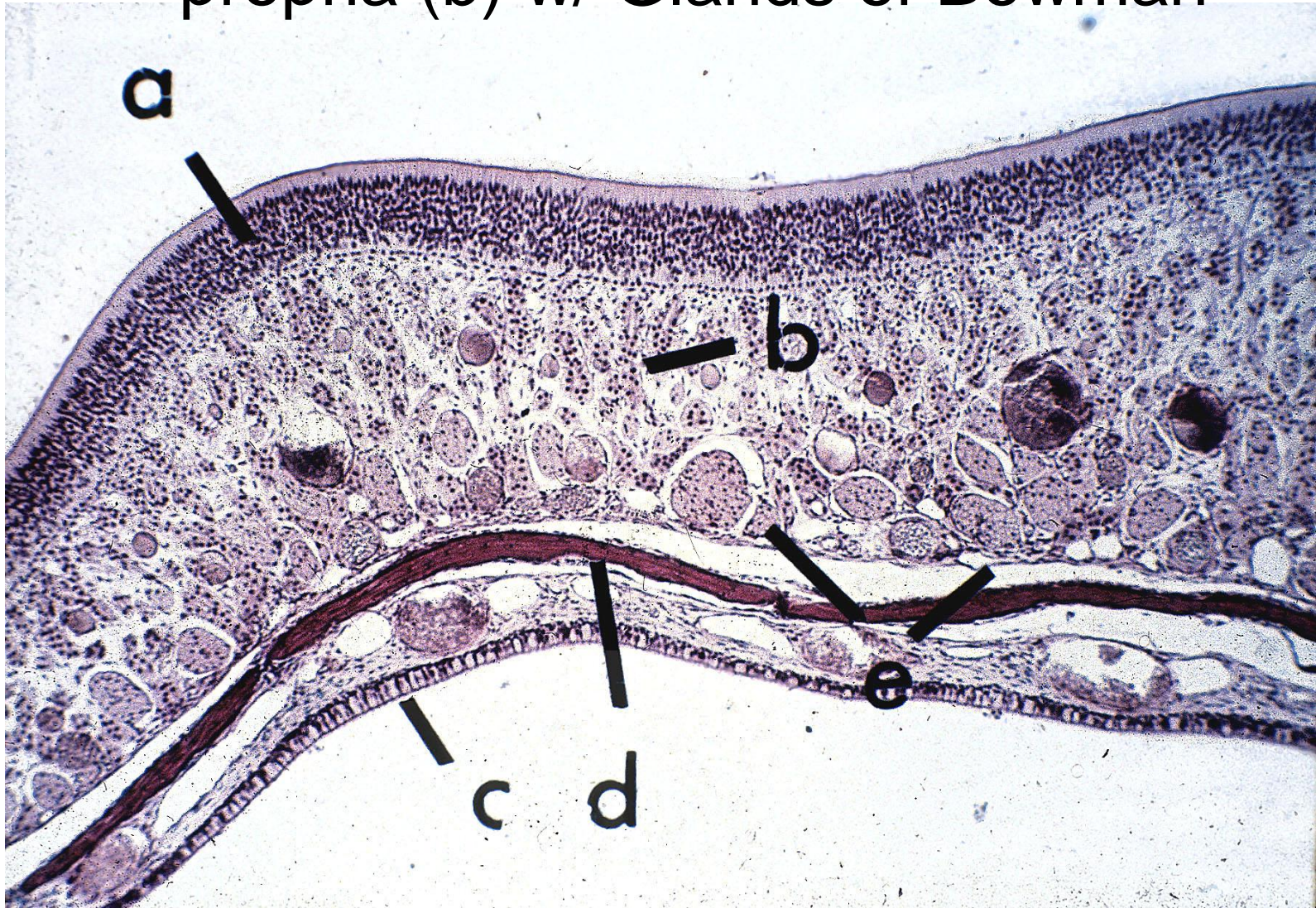
Nasal cavities (NC) separated by the Nasal Septum (NS)



Respiratory Mucus Membrane

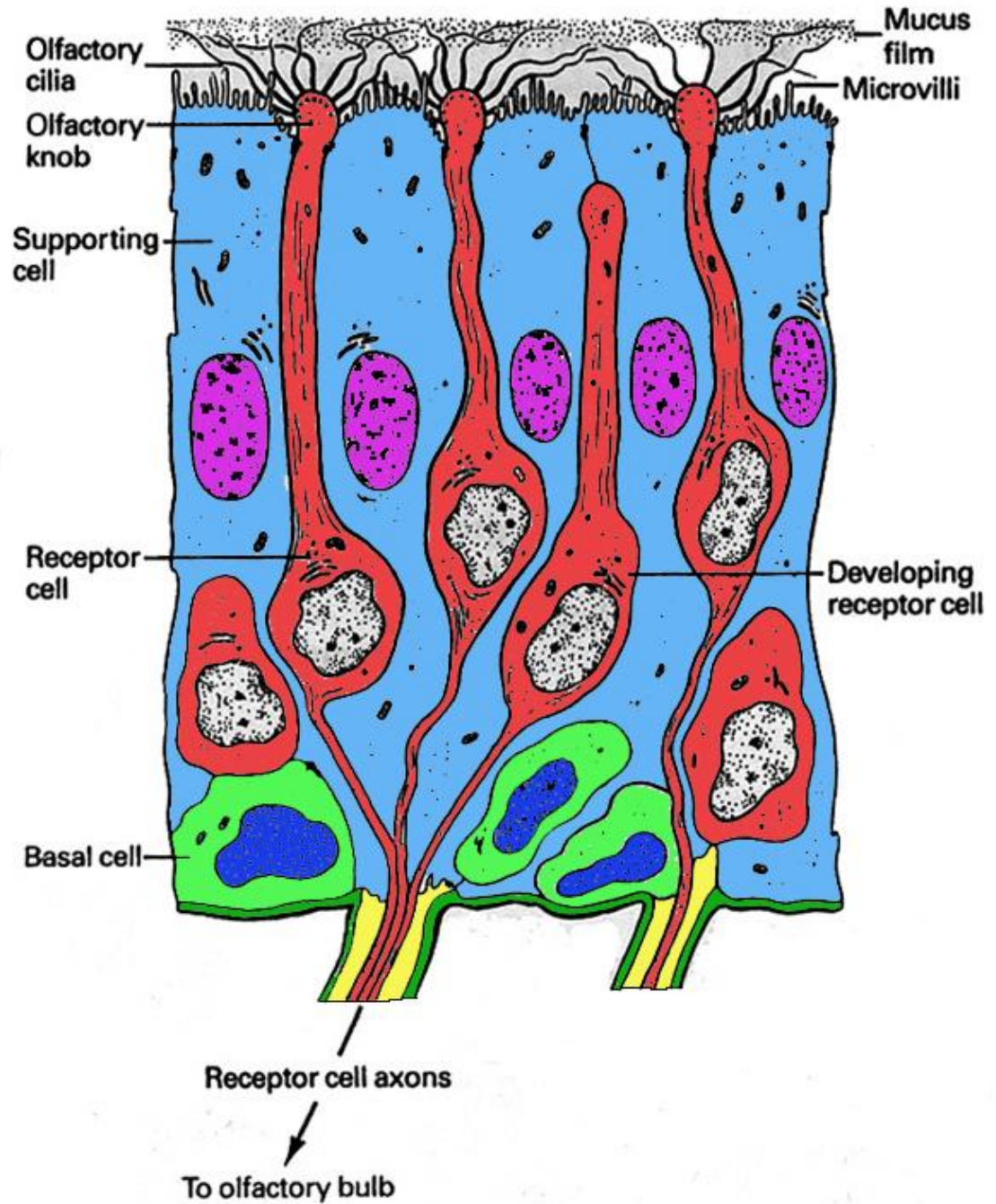


Respiratory Olfactory Epithelium (a) with lamina propria (b) w/ Glands of Bowman



Below the bone (d) is Respiratory Epithelium (c)

Diagram of the Olfactory Epithelium

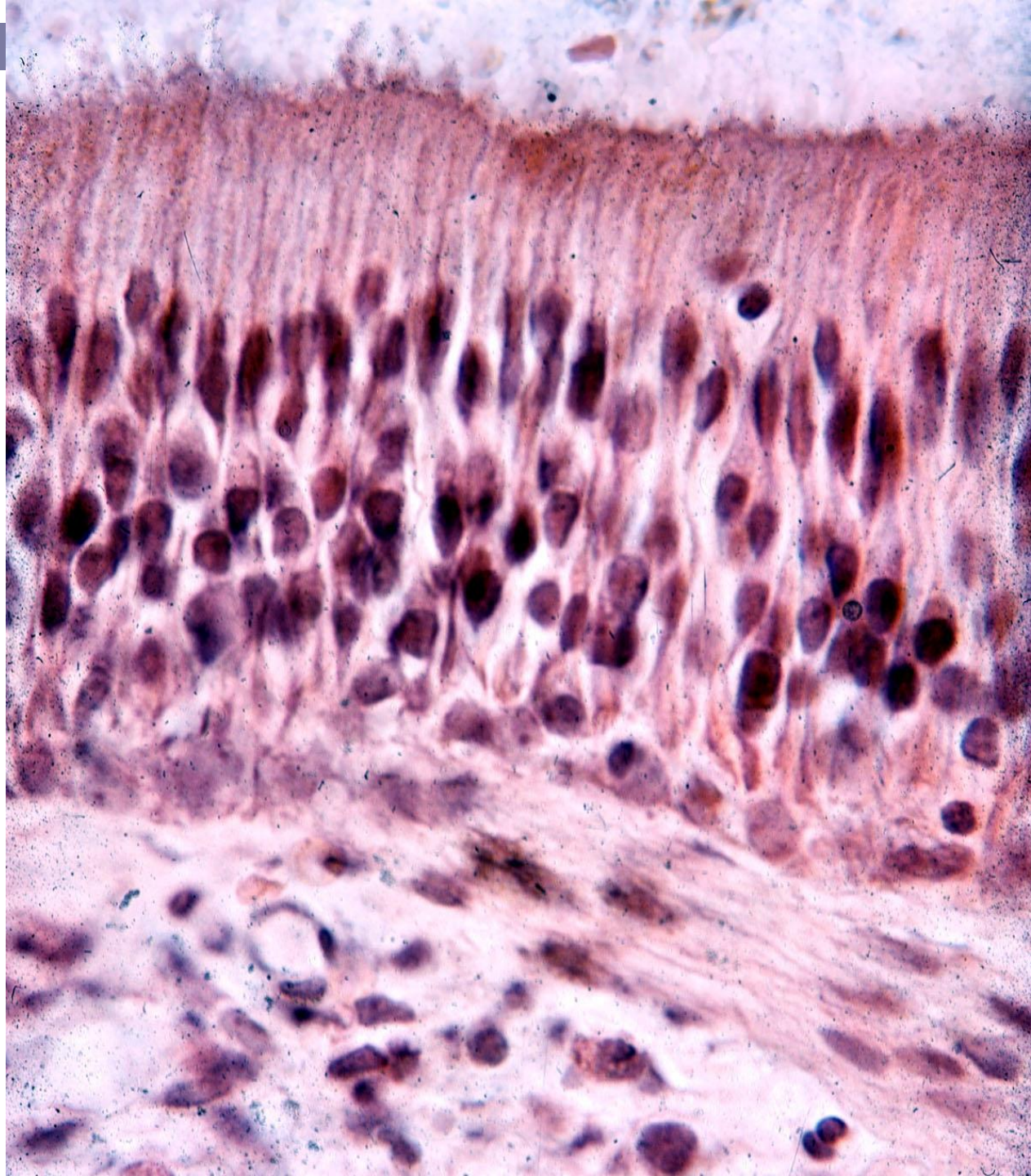


Olfactory Epithelium

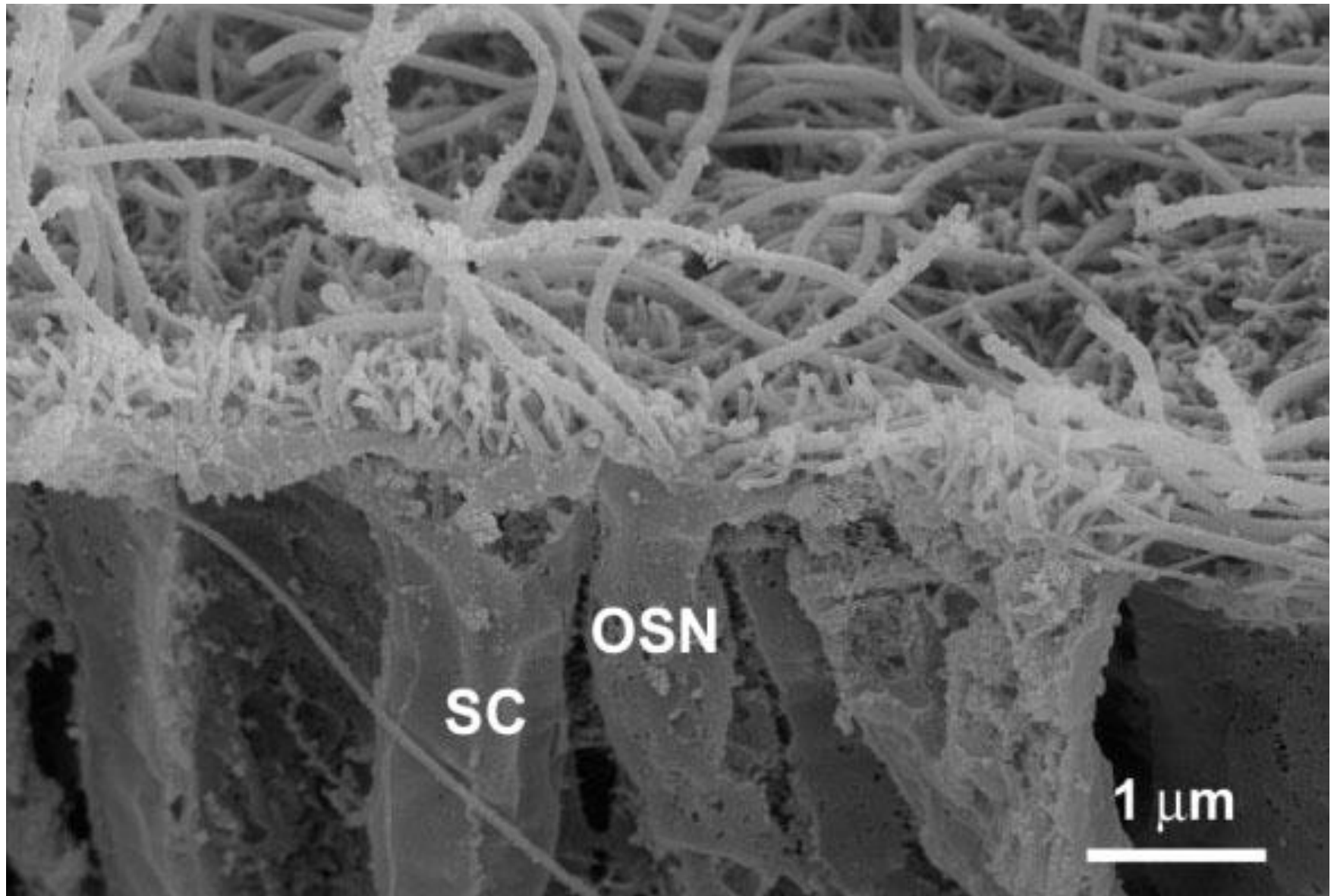
Sustentacular cells
(columnar cells
(really glia) and
contain a yellow
pigment in
their cytoplasm)

***Olfactory receptor
cells*** (bipolar
neurons)

Basal cells



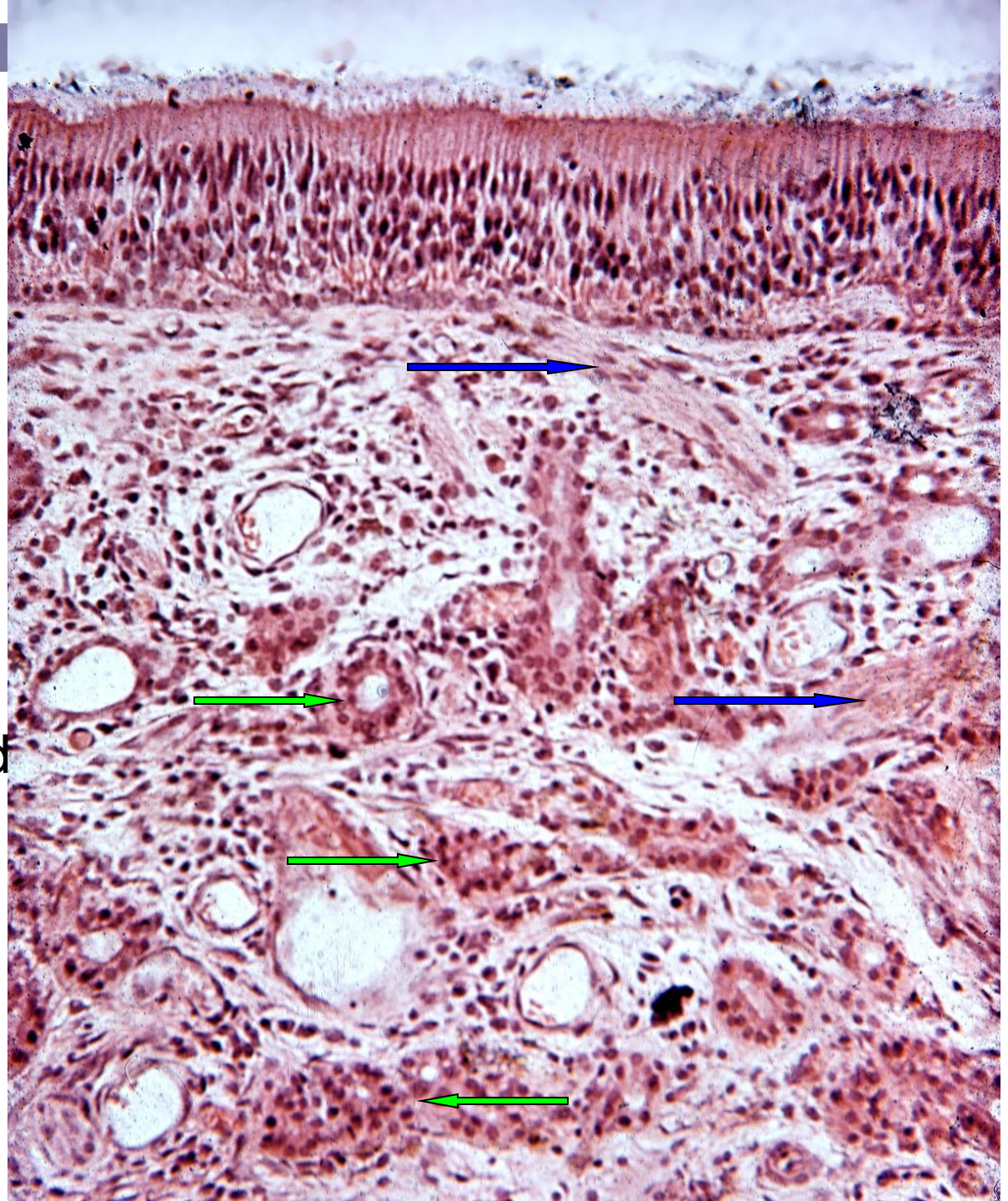
SEM of the surface of the Olfactory Epithelium



Olfactory Membrane

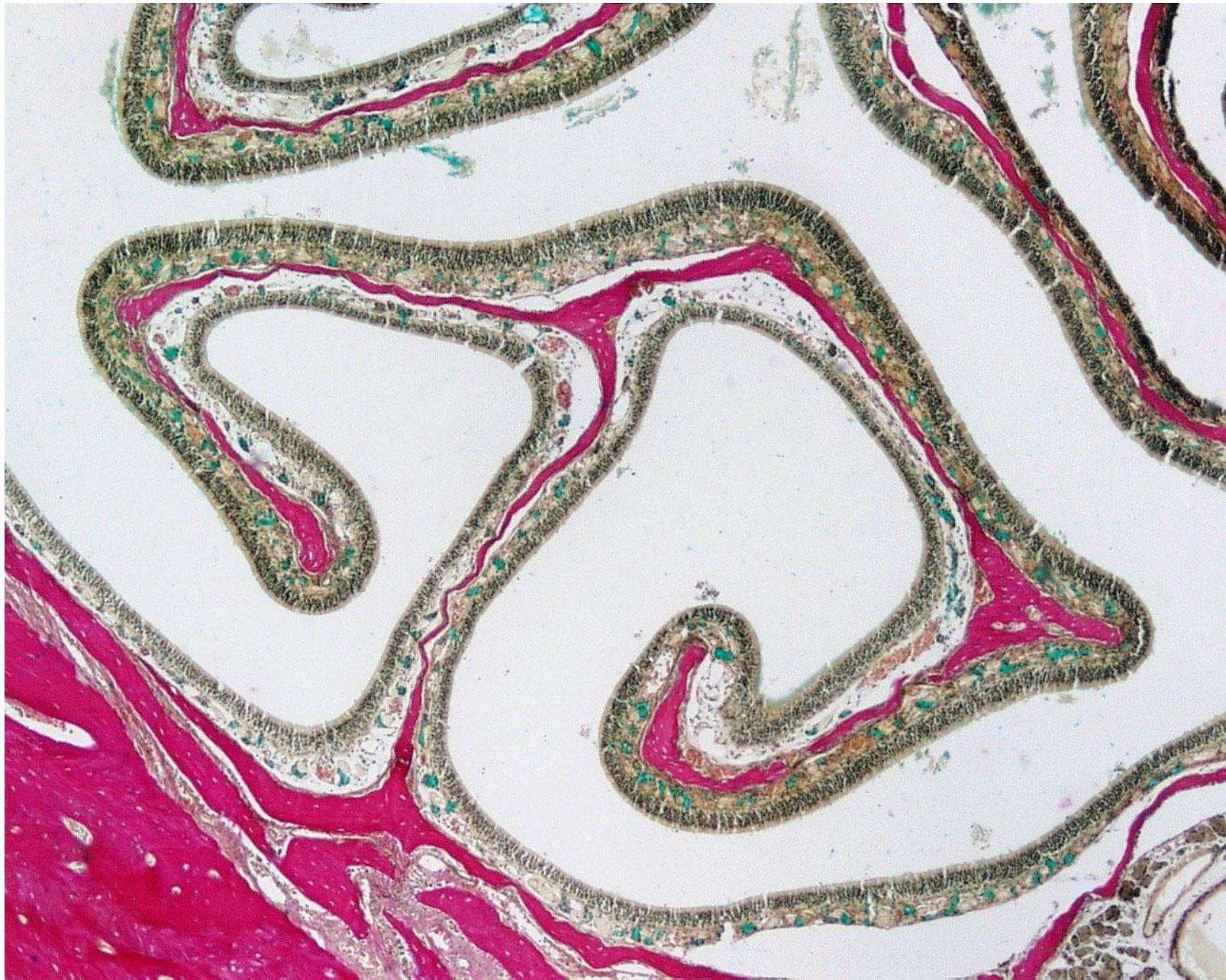
olfactory epithelium

Lamina propria with nerve bundles (→) and *epithelial tubulo-alveolar* Glands of Bowman (→) in addition to *fila olfactoria*



- Most food that we eat is "tasted" by chemoreception of the olfactory organ
- taste buds of the tongue can only distinguish between sweet, bitter, acid and salt
 - People suffering from colds are unable to distinguish the aromas of food and typically do not have an appetite.

Nasal Conchae



Conchae

- The *lamina propria of the conchae*, including those of the Regio olfactoria, possesses *large* vascular venous plexuses
- the blood vessels are thin-walled and possess both longitudinal and circular smooth muscle
- can engorge with blood (similar to erectile vessels of the penis)
- Erotic stimulation can cause engorgement
- also known as "**swell bodies**"
- engorge periodically on alternate sides of the nose to reduce the rate of airflow and protect the epithelium from desiccation

- Nasal Conchae – spicule of bone covered with Resp Epith w/ a lamina propria w/ many veins





The Larynx, Trachea, and Bronchial Tree

Epiglottis



- Core of Elastic Cartilage covered by a respiratory mucus membrane
- lined by **stratified squamous epithelium**
- passive role in preventing food or fluids from entering the larynx

Larynx

- tube connecting the pharynx to the trachea
- has two functions:
 - **phonation** (creation of sounds for speech)
 - **control of the air pathway**
- During swallowing the larynx moves upwards and directs the food to the esophagus
- a **cough reflex** helps to prevent fluids or food entering the trachea

- The mucosa of the larynx has two pairs of folds:
 - **false vocal cords (upper folds)**
 - **true vocal cords (lower folds):** the slit-like opening (*rima glottidis*) enables us to produce sounds.
- The true vocal cords consist of:
 - stratified squamous epithelium
 - vocal ligament (connective tissue, which is mainly elastic bundles)
 - vocal muscle (skeletal muscle, which regulates the tension of the folds).
- The false vocal cords consist of:
 - respiratory epithelium
 - *lamina propria with many exocrine glands*

The Larynx

a Resp Mucus
Membrane w/ a
lamina propria
rich in elastic

Cartilage support
is seen in the wall



Vocal Chord – a fold in the laryngeal wall

covered
with St Sq
Non-K
Epith with
fibroelastic
LP and
core of
skeletal
muscle
(VM)



esophagus

thyroid gland

posterior cartilage

folded mucosa

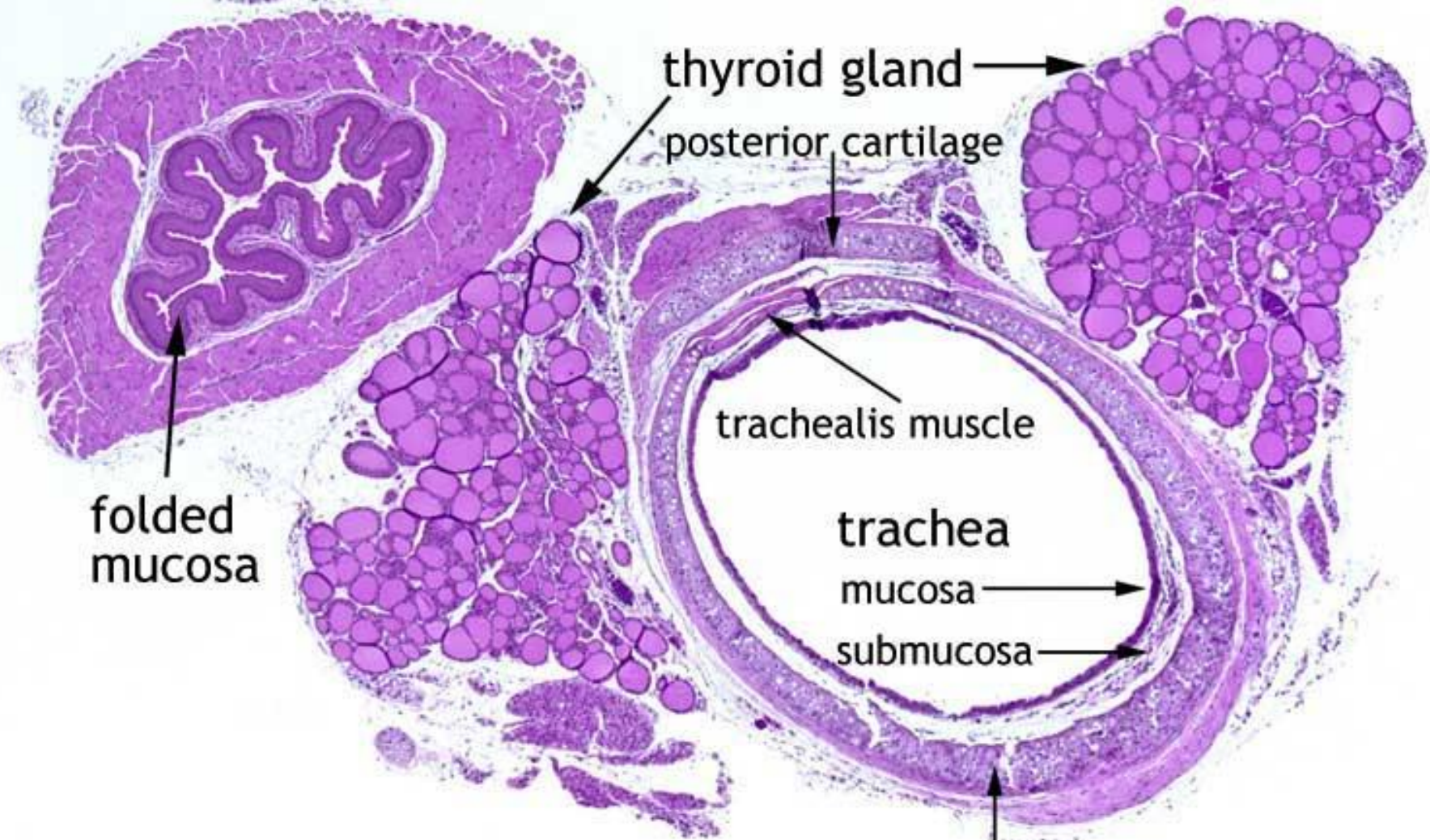
trachealis muscle

trachea

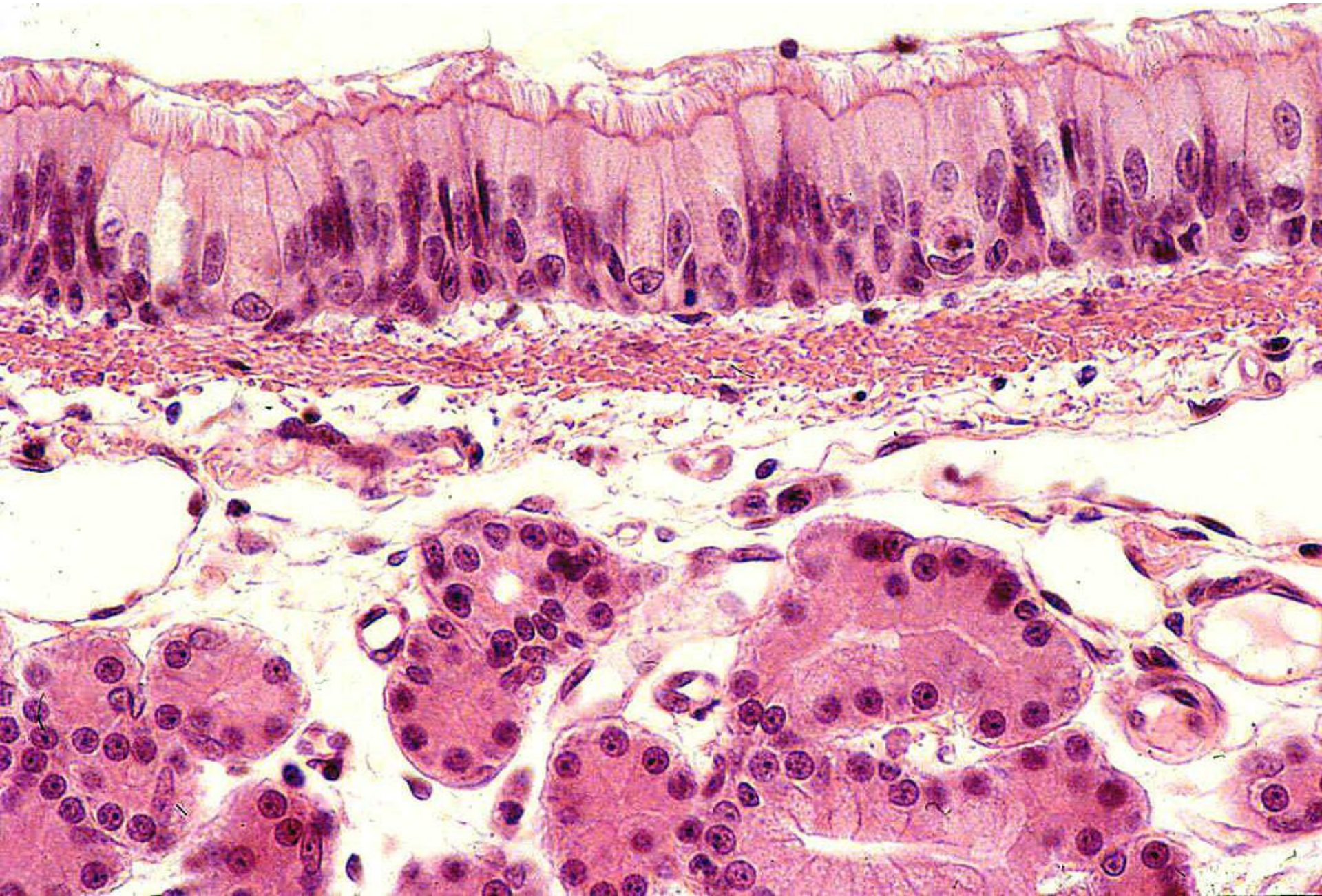
mucosa

submucosa

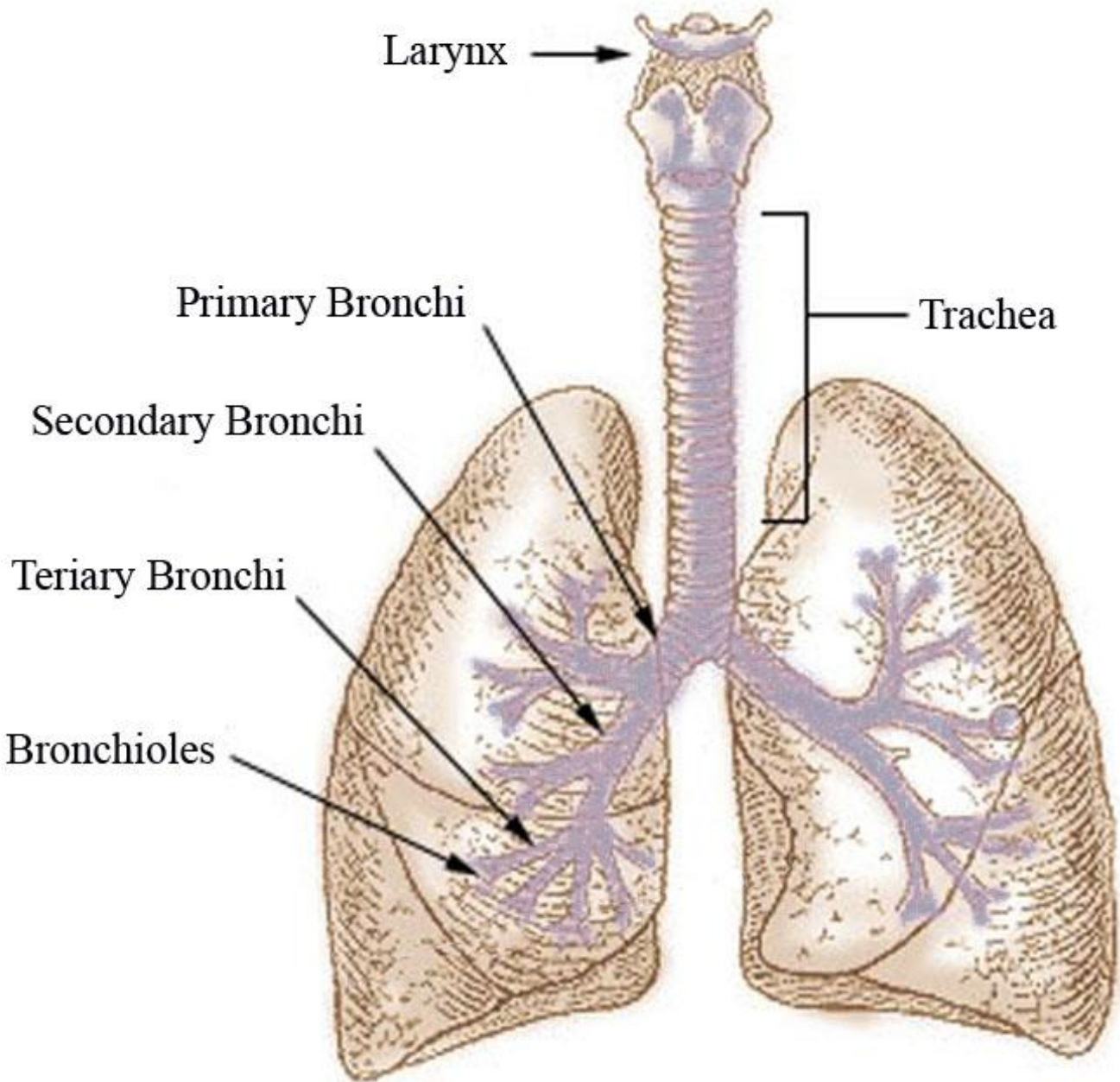
c-shaped ring of cartilage



Trachea - Mucus Membrane

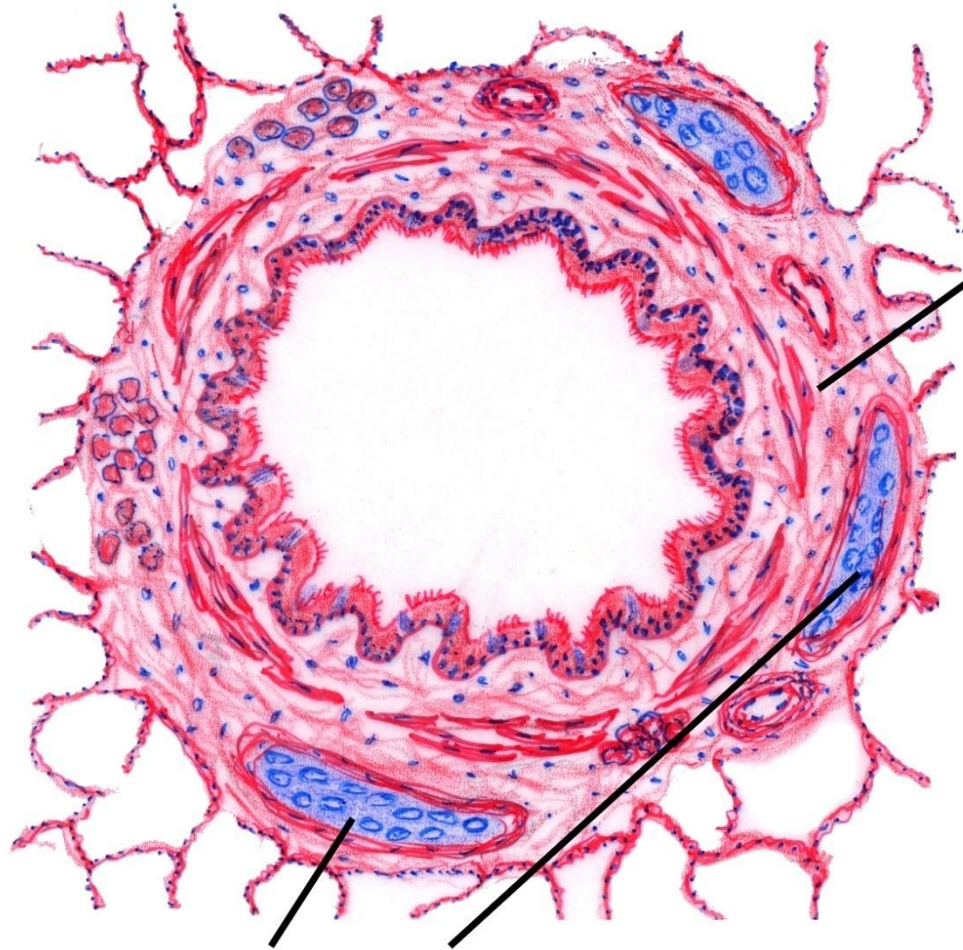


Bronchial Tree



BRONCHUS

BRONCHIOLE

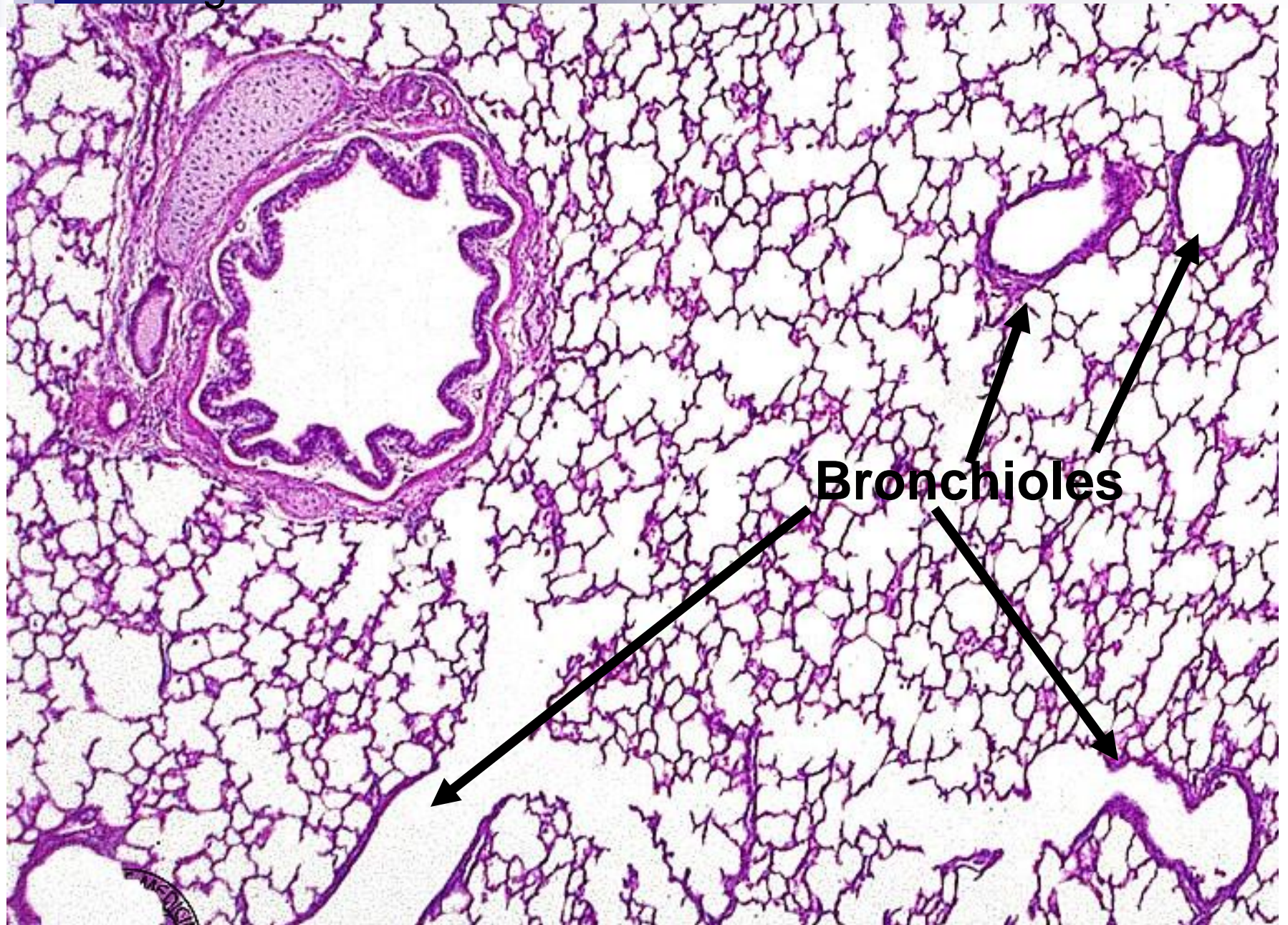


Smooth muscle

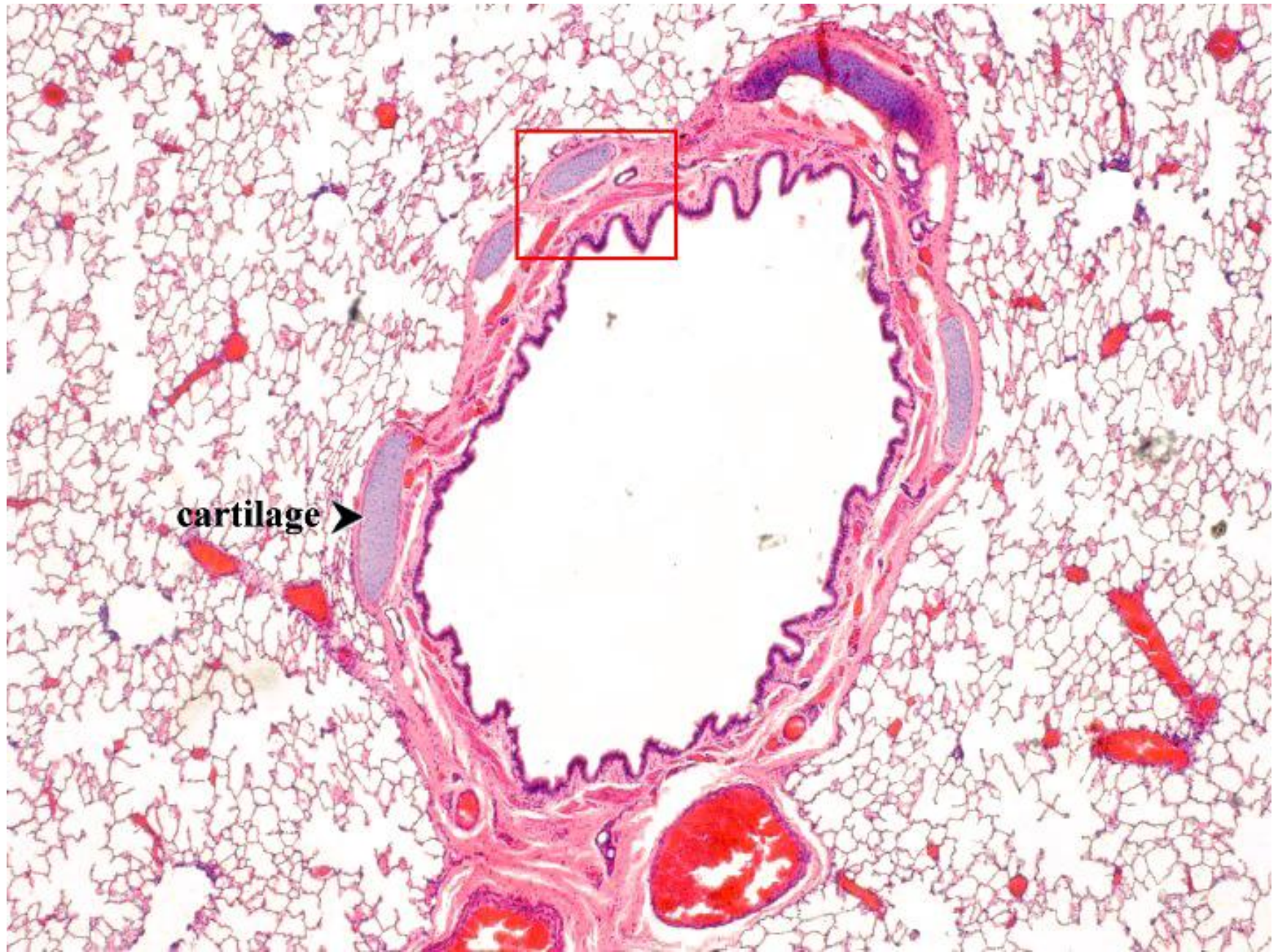


Cartilage plates

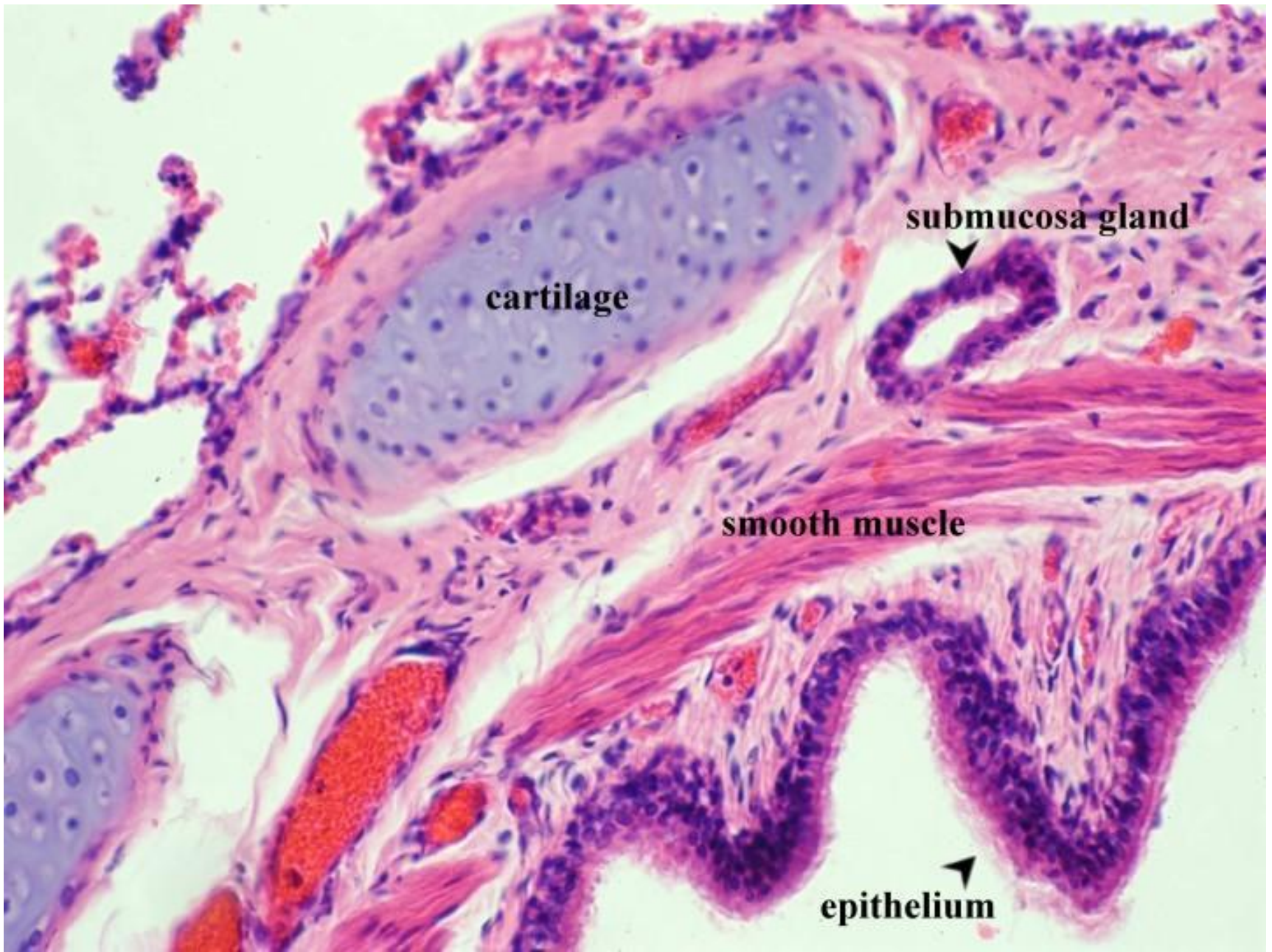
3° or Segmental Bronchus



3^o or Segmental Bronchus



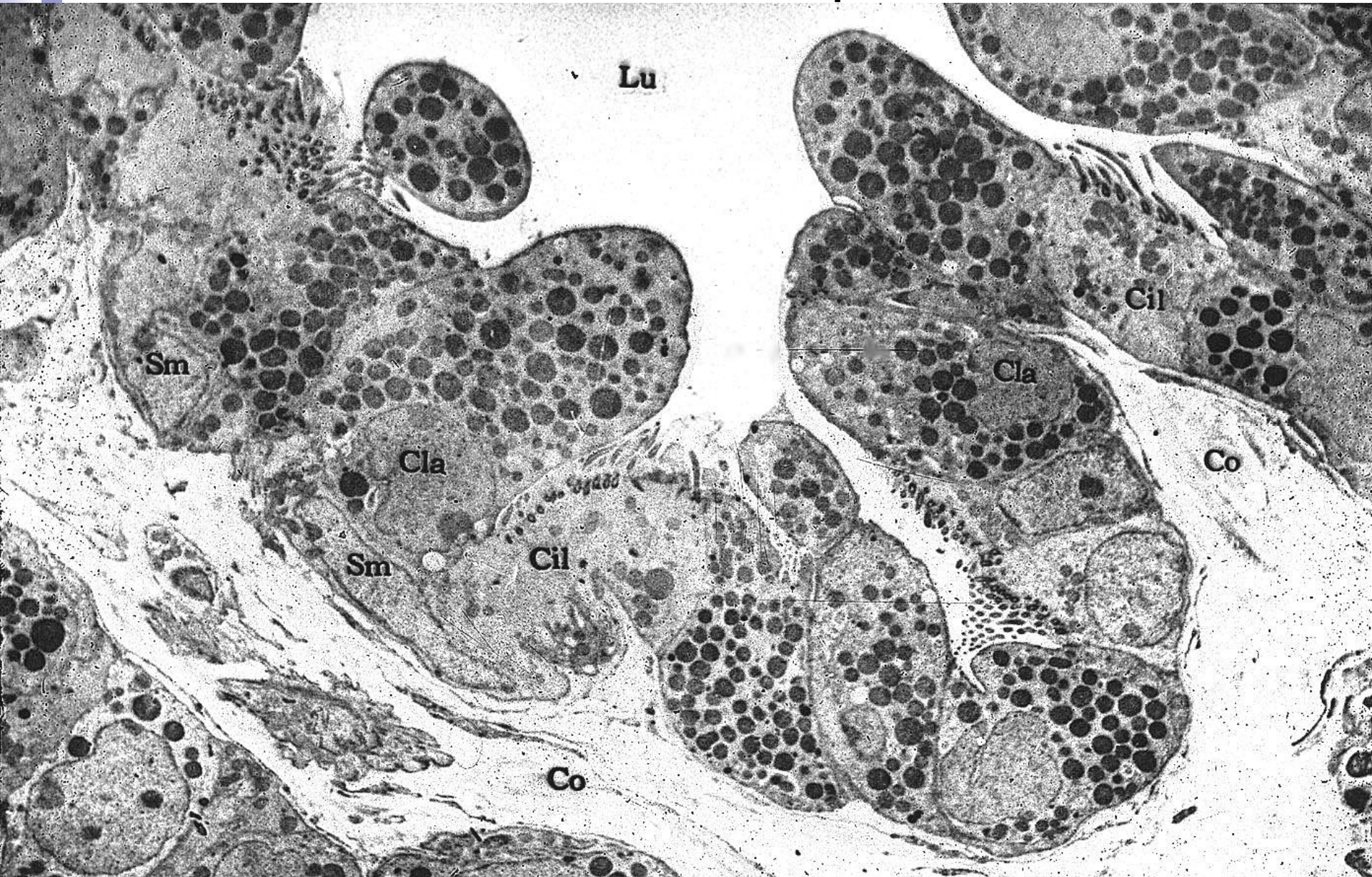
3^o or Segmental Bronchus



Pre-terminal Bronchiole



TEM of Bronchiole Epithelium

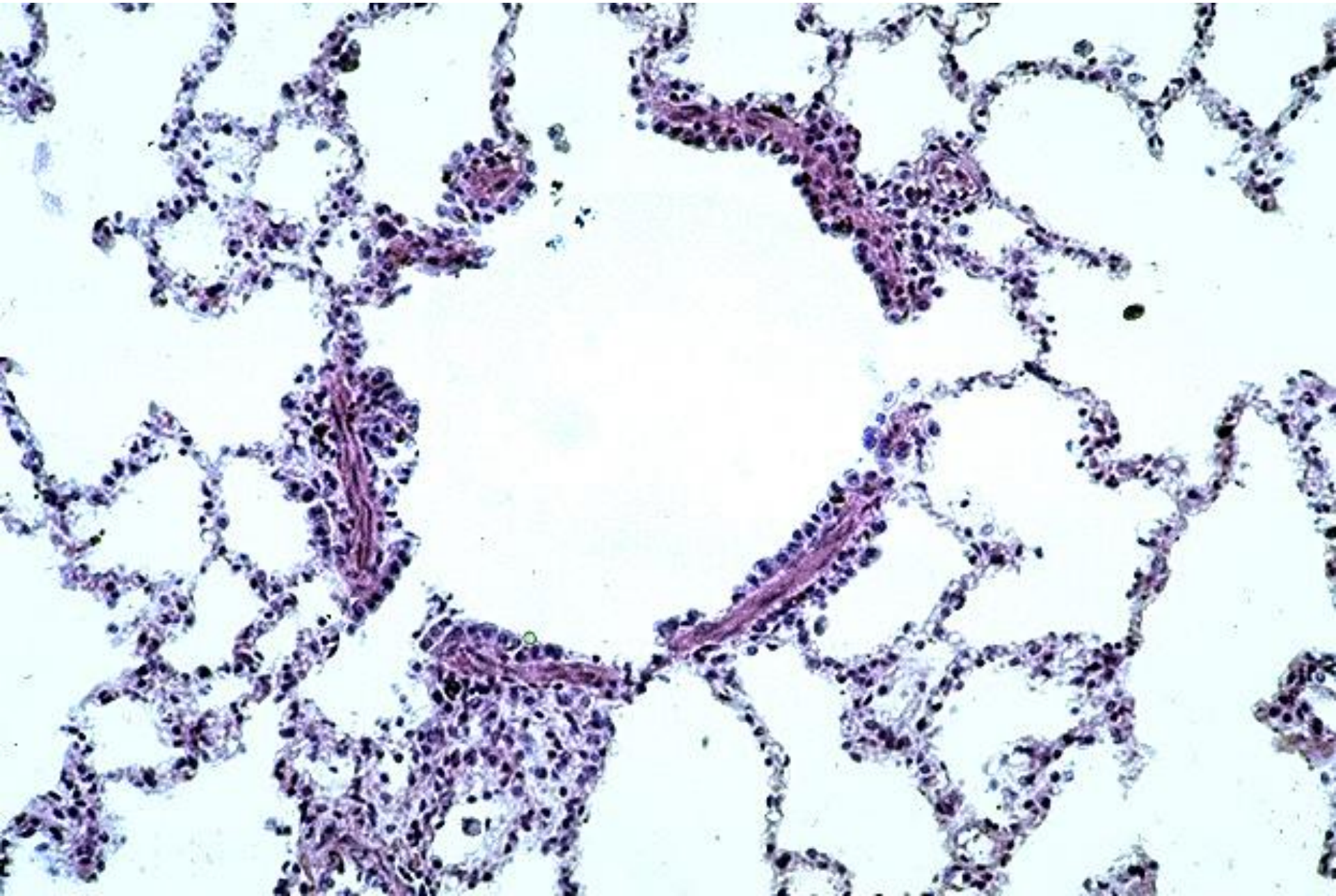


Cla, Clara Cells; Cil, Ciliated Columnar

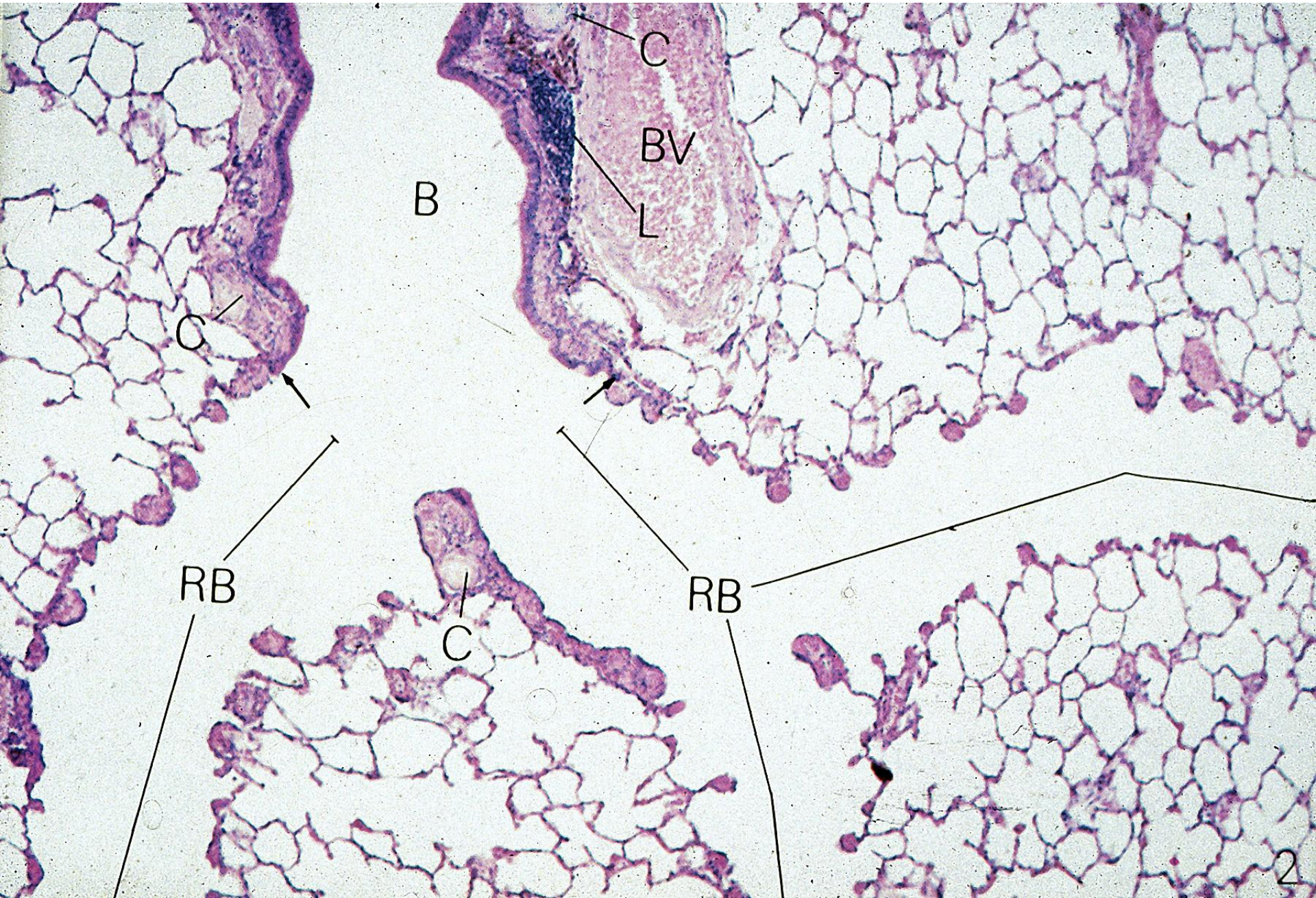
Terminal Bronchiole



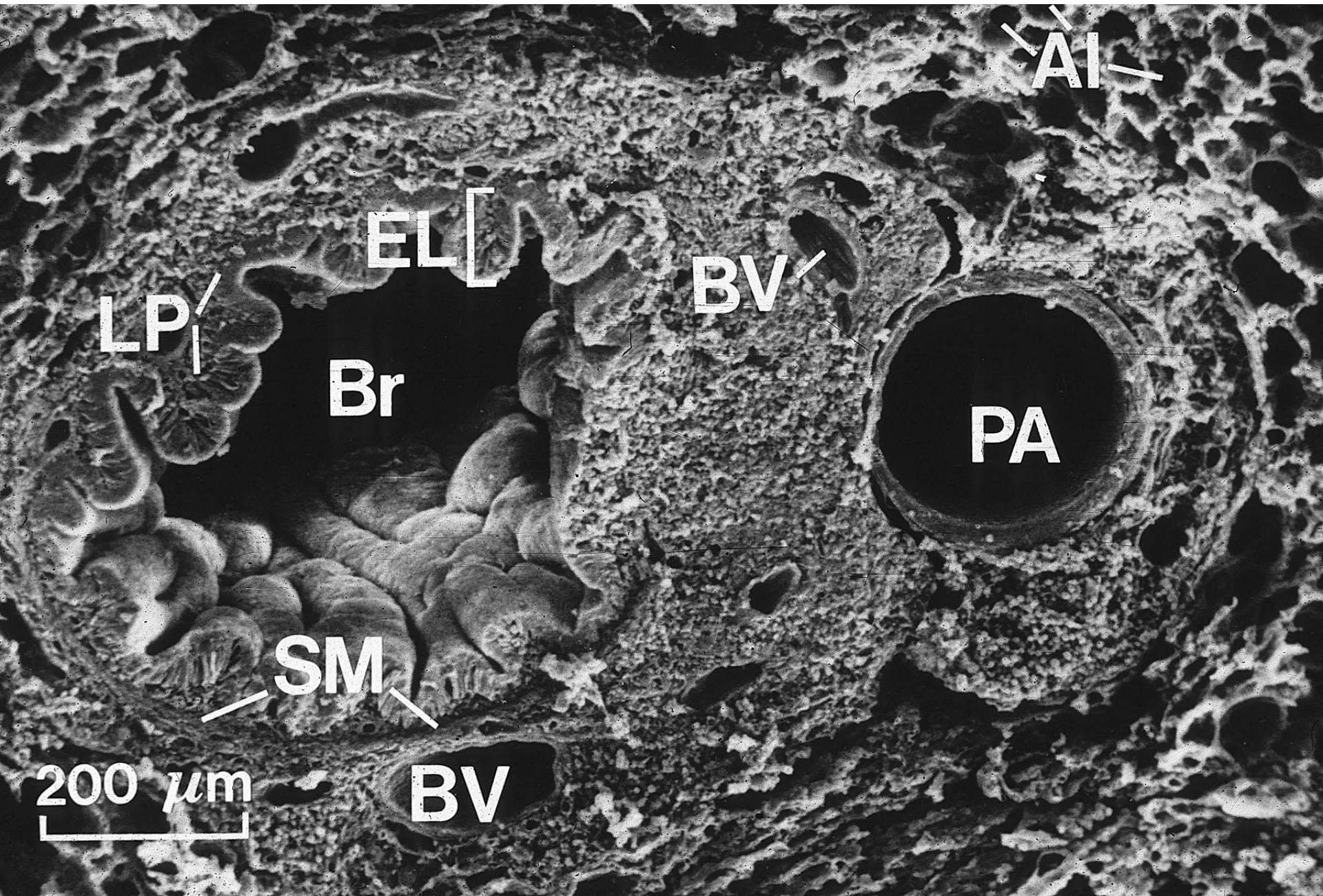
Respiratory Bronchiole



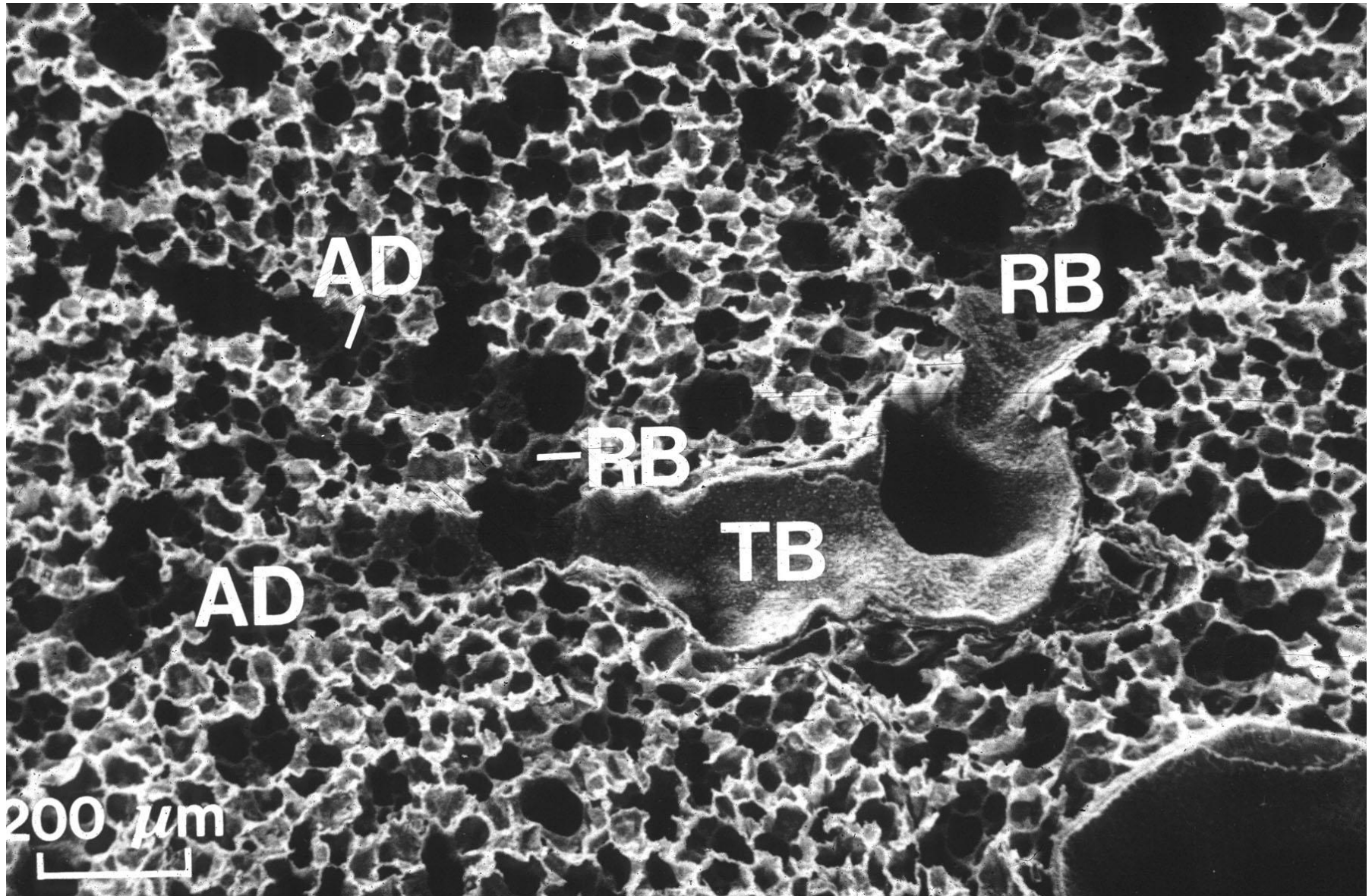
Terminal (B) branching into Resp Bronchioles (RB)



SEM of a Pre-terminal Bronchiole (Br)



SEM of Terminal (TB) and Resp Bronchioles (RB)



AD, Alveolar Duct