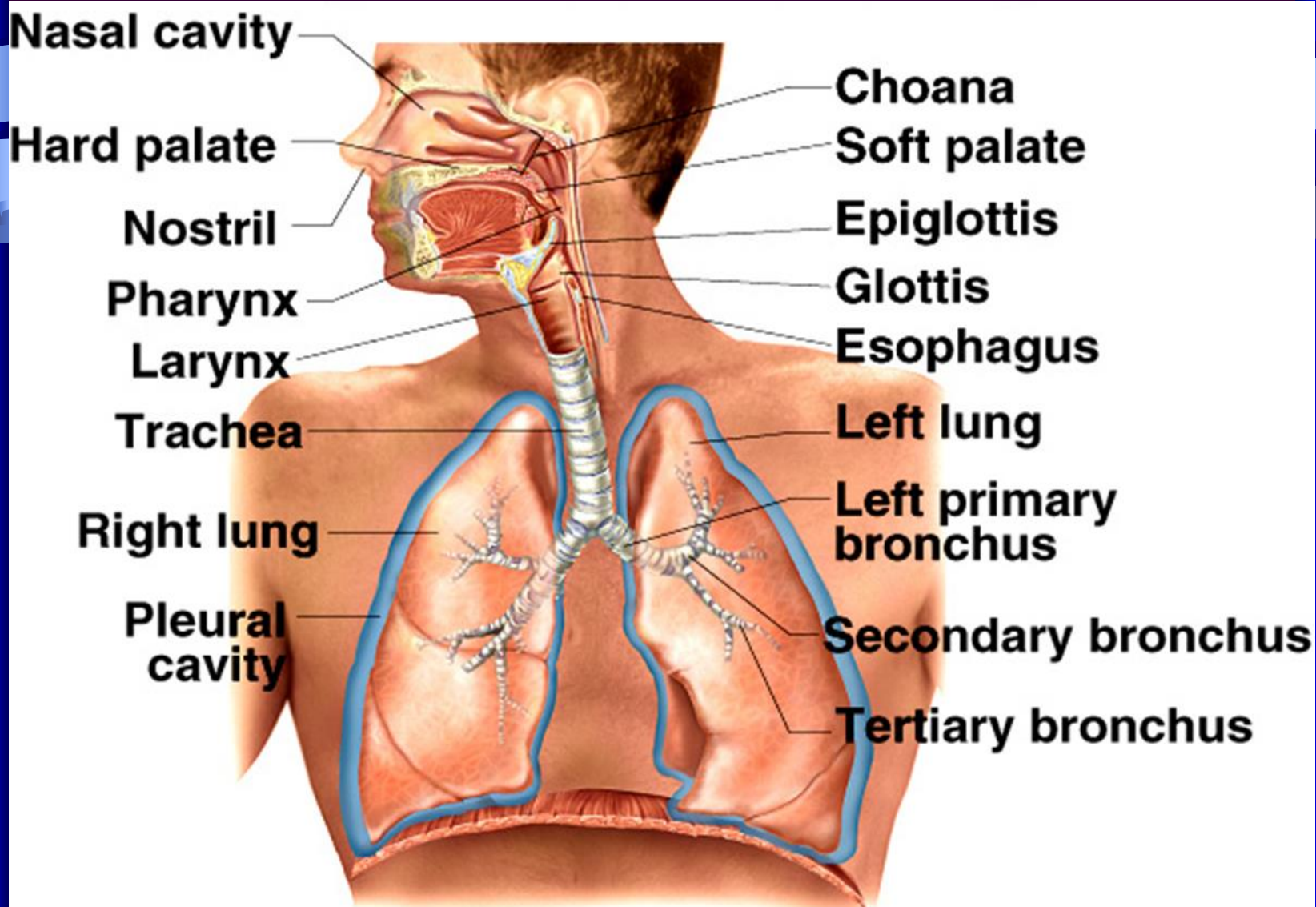


**MICROSCOPIC ORGANIZATION
OF THE
RESPIRATORY SYSTEM**

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DEPARTMENT OF HUMAN ANATOMY
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□ AND THE LORD GOD FORMED MAN OF THE DUST OF THE GROUND, AND BREATHED INTO HIS NOSTRILS THE BREATH OF LIFE; AND MAN BECAME A LIVING SOUL.

MICROSCOPIC ORGANIZATION OF THE RESPIRATORY SYSTEM: EXPECTED LEARNING OUTCOMES

1. OUTLINE THE PARTS AND FUNCTIONAL SUBDIVISIONS OF THE RESPIRATORY SYSTEM
2. STATE THE TISSUE COMPONENTS OF THE RESPIRATORY SYSTEM AND THE FUNCTIONS OF EACH
3. DESCRIBE THE STRUCTURAL ORGANIZATION OF THE WALL OF THE AIRWAY
4. NAME THE CELL TYPES OF THE RESPIRATORY EPITHELIUM AND STATE THE FUNCTIONS
5. STATE THE PROXIMO-DISTAL STRUCTURAL CHANGES IN THE AIRWAY
6. OUTLINE THE DIVISIONS AND SUBDIVISIONS OF THE LUNG
7. STATE THE FEATURES AND COMPONENTS OF THE FUNCTIONAL UNIT OF THE LUNG
8. NAME THE ALVEOLAR CELL TYPES AND STATE THE FUNCTIONS OF EACH
9. DESCRIBE THE COMPONENTS OF THE THICK AND THIN AIR-BLOOD BARRIER



PARTS AND FUNCTIONAL SUBDIVISIONS

Conducting Portion

- **Warming**
- **Filtration**
- **Moistening**

Air conditioning

Nasal cavity

Pharynx

Larynx

Trachea

Bronchi

Bronchioles

Transitional

Terminal bronchioles

Respiratory Portion

- **Gaseous exchange**

Respiratory bronchioles

Alveolar ducts

Alveolar antra

Alveolar sacs



TISSUE COMPONENTS AND THEIR RESPECTIVE FUNCTIONS

- EPITHELIUM – AIR FILTRATION; GAS EXCHANGE; DEFENSE; SECRETORY; SENSORY
- ELASTIC FIBRES – PERMIT DISTENSIBILITY
- COLLAGEN FIBRES – RESTRAIN DISTENSIBILITY
- BONE AND CARTILAGE – MAINTAIN PATENCY
- SMOOTH MUSCLE – REGULATE LUMINAL SIZE
- NERVOUS TISSUE – COORDINATE ACTIVITY
- LYMPHOID TISSUE – DEFENSE

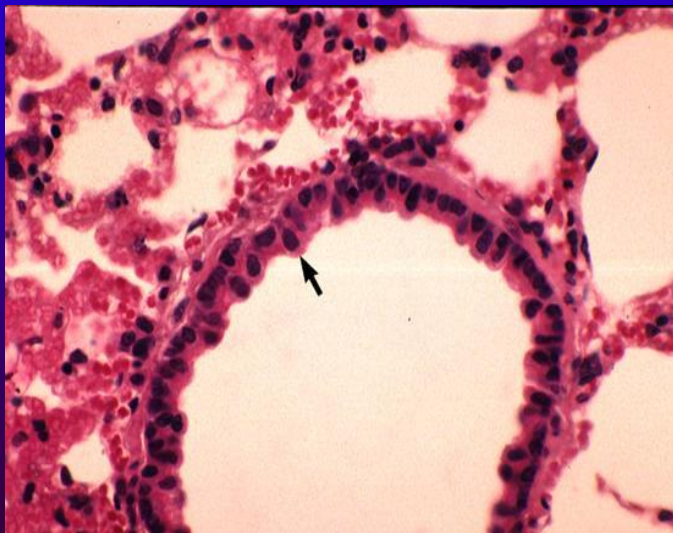
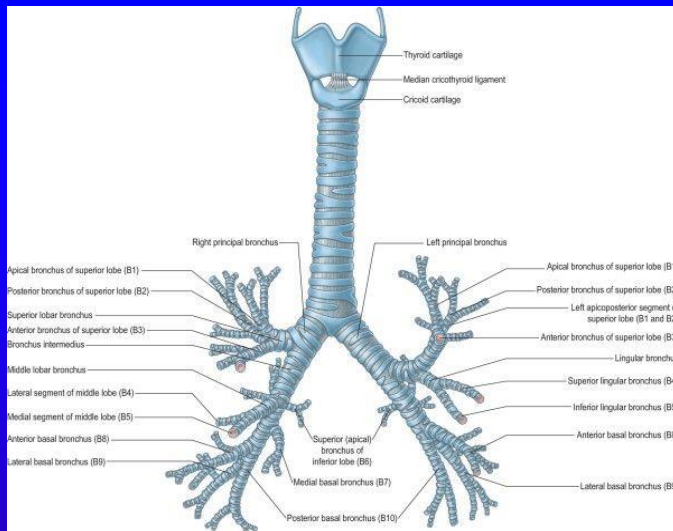
STRUCTURAL ORGANIZATION OF THE AIRWAY WALL – TRACHEA AS A MODEL

- MUCOSA – EPITHELIUM AND LAMINA PROPRIA
- SUBMUCOSA – VASCULAR CONNECTIVE TISSUE
- FIBROUS MEMBRANE – DENSE CONNECTIVE TISSUE***
- MUSCULOCARTILAGINOUS – CARTILAGE RINGS AND MUSCLE TRACHEALIS
- ADVENTITIA – FIBROELASTIC CONNECTIVE TISSUE

STRUCTURE OF THE BRONCHI

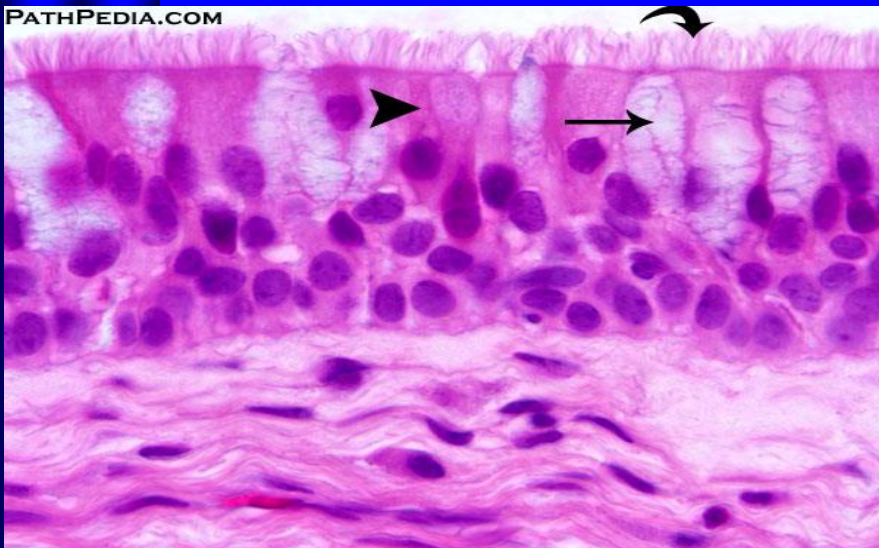
- EXTRAPULMONARY BRONCHI RESEMBLE TRACHEA
 - EXCEPT THE CARTILAGE RINGS ARE COMPLETE
 - COMPLETE CIRCUMFERENTIAL LAYER OF SMOOTH MUSCLE
- INTRAPULMONARY BRONCHI DIFFER FROM THE TRACHEA BY:
 - CARTILAGE RINGS ARE REPLACED BY DISCONTINUOUS CARTILAGE PLATES
 - SMOOTH MUSCLE FORMS A COMPLETE CIRCUMFERENTIAL LAYER

STRUCTURE OF THE BRONCHIOLES

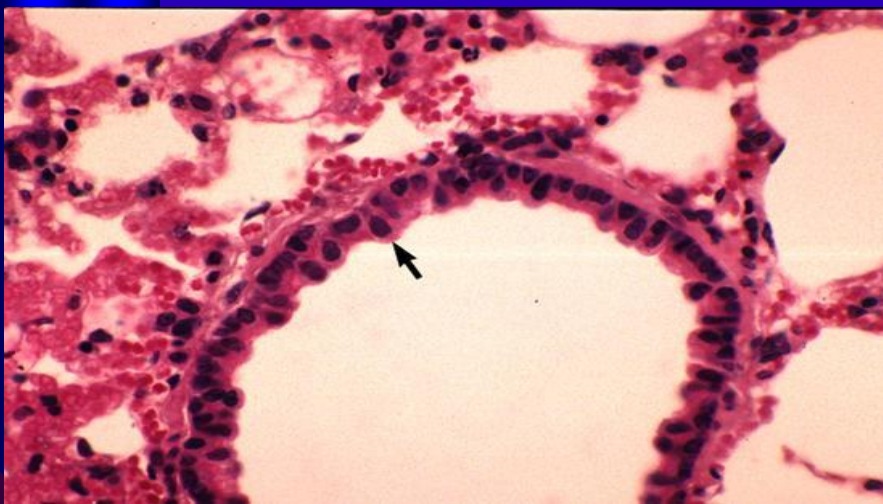


- ❑ CILIATED PSEUDOSTRATIFIED COLUMNAR
- ❑ CILIATED SIMPLE COLUMNAR OR CUBOIDAL
- ❑ SCATTERED GOBLET CELLS
- ❑ CLARA CELLS
- ❑ NO CARTILAGE
- ❑ THICK LAYER OF SMOOTH MUSCLE

AIRWAY EPITHELIAL LINING



- RESPIRATORY EPITHELIUM
- PSEUDOSTRATIFIED COLUMNAR CILIATED EPITHELIUM, WITH GOBLET CELLS
- CILIATED COLUMNAR CELLS
- GOBLET CELLS
- BASAL CELLS
- SMALL GRANULE (KULCHITSKY) CELLS
- BRUSH CELLS
- MAST CELLS
- CLARA CELLS





✓ COMPARE AND CONTRAST OLFACTORY
AND RESPIRATORY EPITHELIA

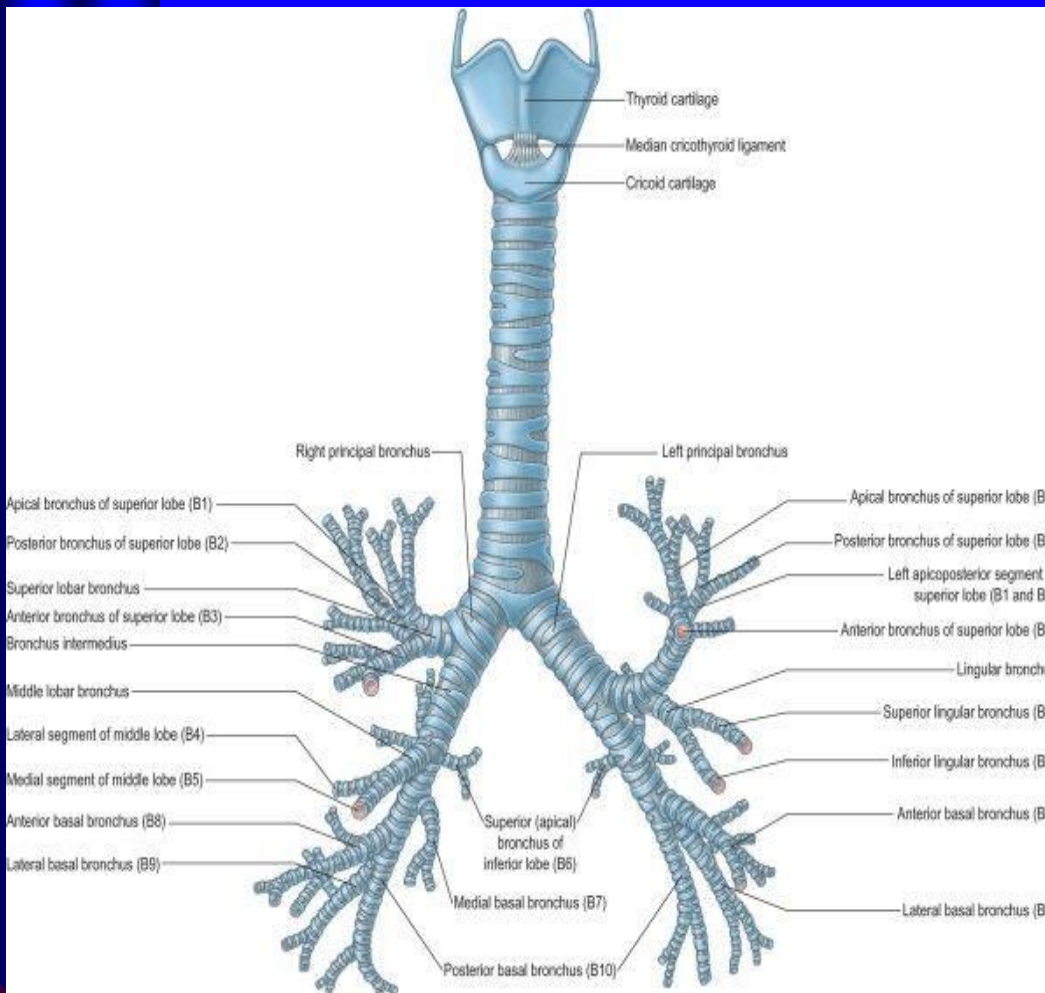
PROXIMODISTAL CHANGES IN THE AIRWAY STRUCTURE AND TISSUE COMPONENTS

1. CONTINUOUS BRANCHING
2. REDUCTION IN WALL THICKNESS AND COMPOSITION
3. REDUCTION IN CONNECTIVE TISSUE
4. SIMPLIFICATION OF THE EPITHELIUM
5. REDUCTION OF GOBLET CELLS
6. DIMINUTION OF CILIA
7. INTRODUCTION OF CLARA CELLS
8. CARTILAGE
9. SMOOTH MUSCLE
10. GLANDS
11. MUCOSA ASSOCIATED LYMPHOID TISSUE



OUTLINE THE STRUCTURAL ADAPTATIONS OF THE
AIRWAY TO ITS FUNCTIONS

DIVISIONS OF THE LUNG



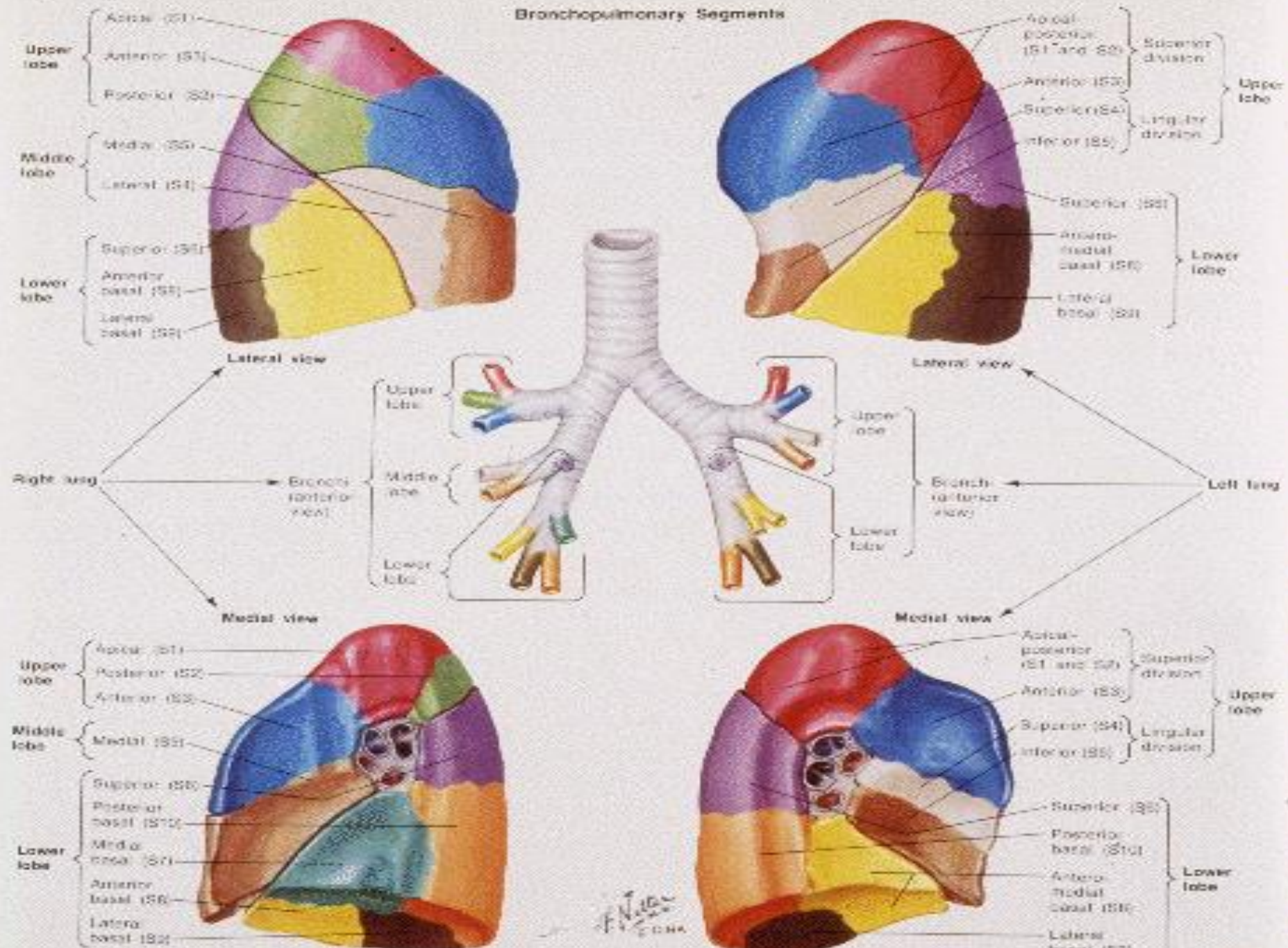
- LOBES
- BRONCHOPULMONARY SEGMENT
- LOBULE
- FUNCTIONAL UNIT



BRONCHOPULMONARY SEGMENT

- ❑ A LUNG SEGMENT SUPPLIED BY A SINGLE SEGMENTAL (TERTIARY) BRONCHUS
 - ❑ AND ALL THE ASSOCIATED BLOOD VESSELS, NERVES, LYMPHATICS
- ❑ STRUCTURALLY SEPARATE
- ❑ FUNCTIONALLY INDEPENDENT
- ❑ BENIGN DISEASE USUALLY LOCALIZED TO EACH
- ❑ CAN BE INDEPENDENTLY SURGICALLY RESECTED
- ❑ CAN BE BRONCHOSCOPICALLY AND RADIOGRAPHICALLY VISUALIZED INDEPENDENTLY

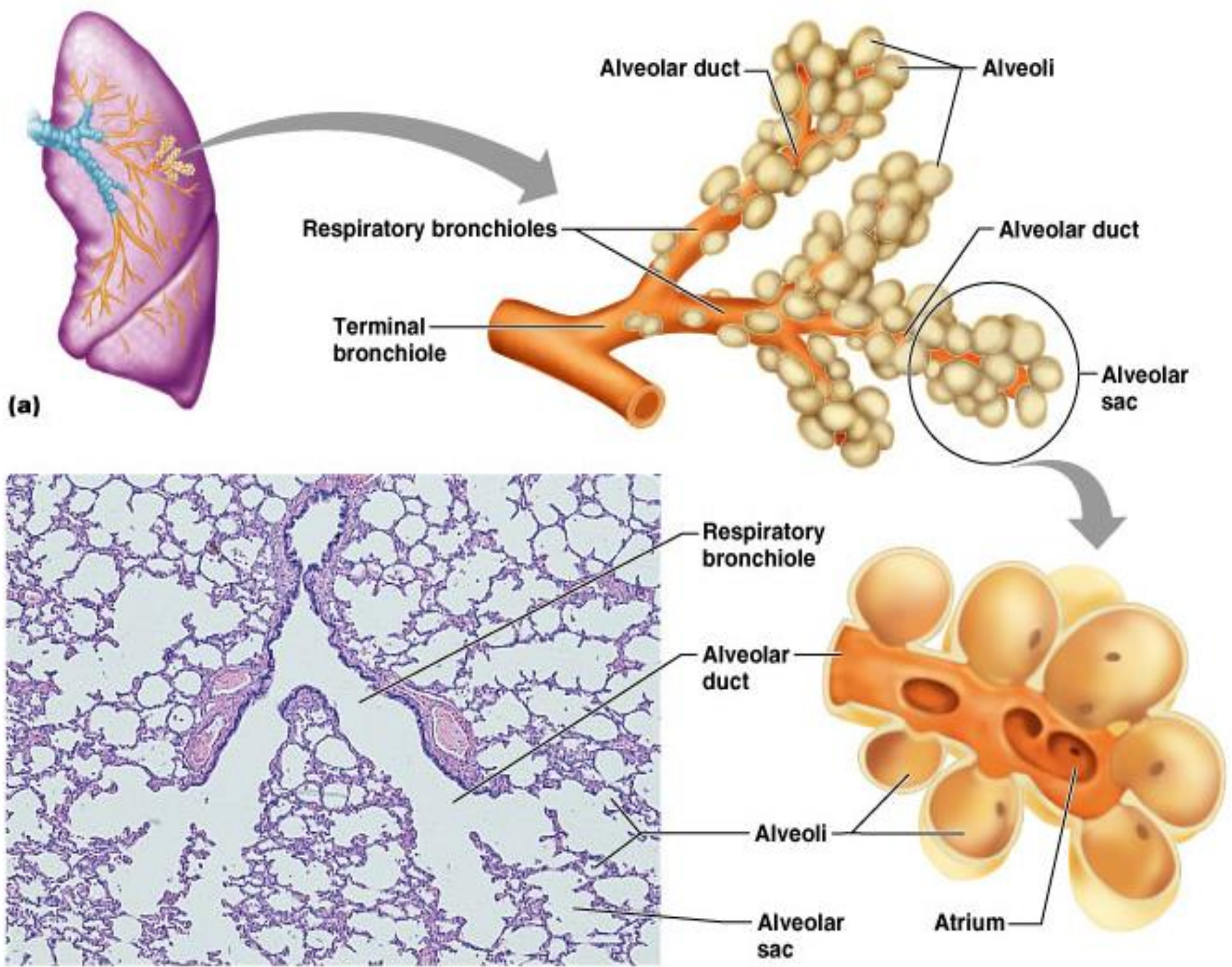
Branchopulmonary Segments

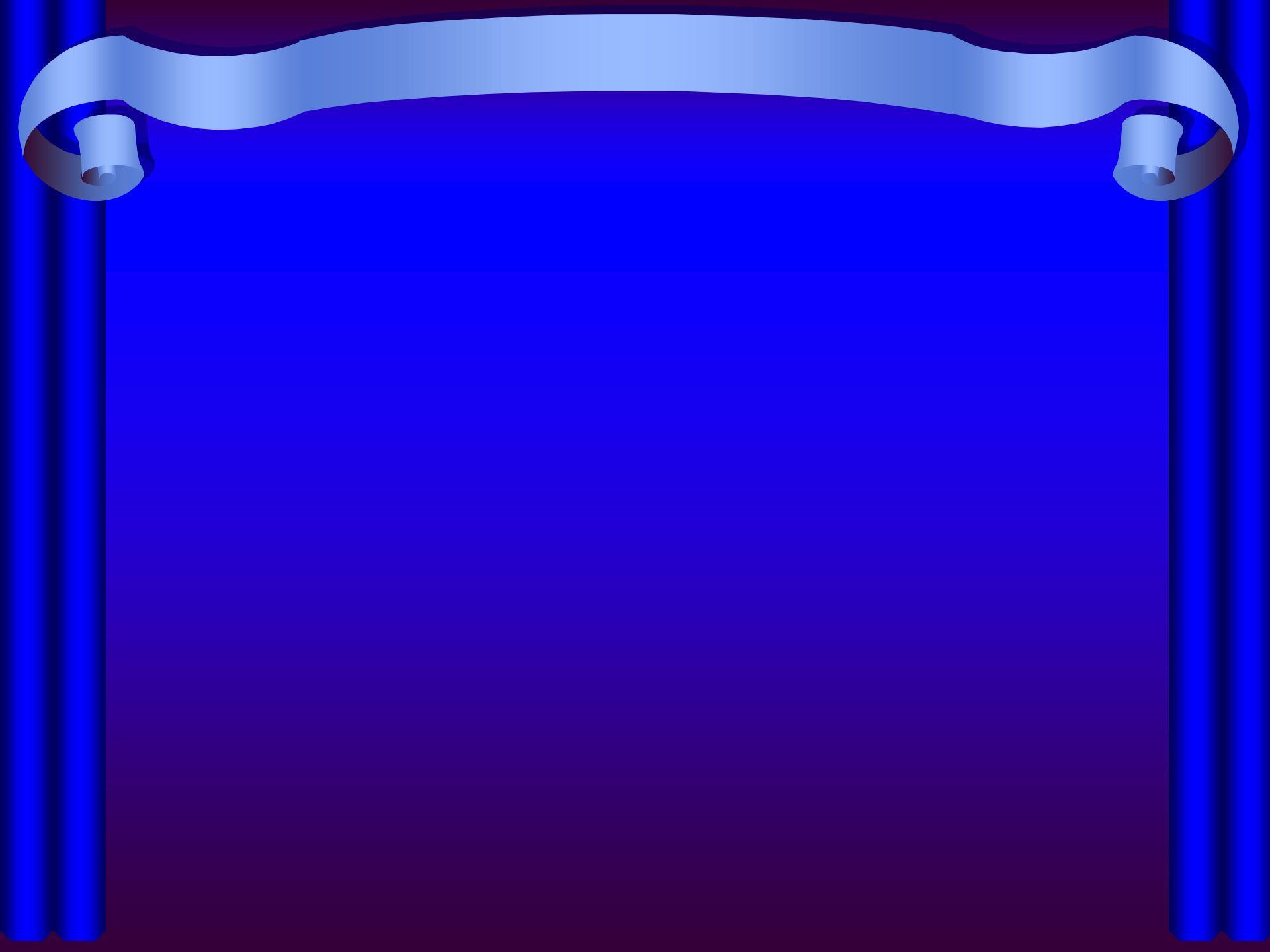




FUNCTIONAL UNIT OF THE LUNG

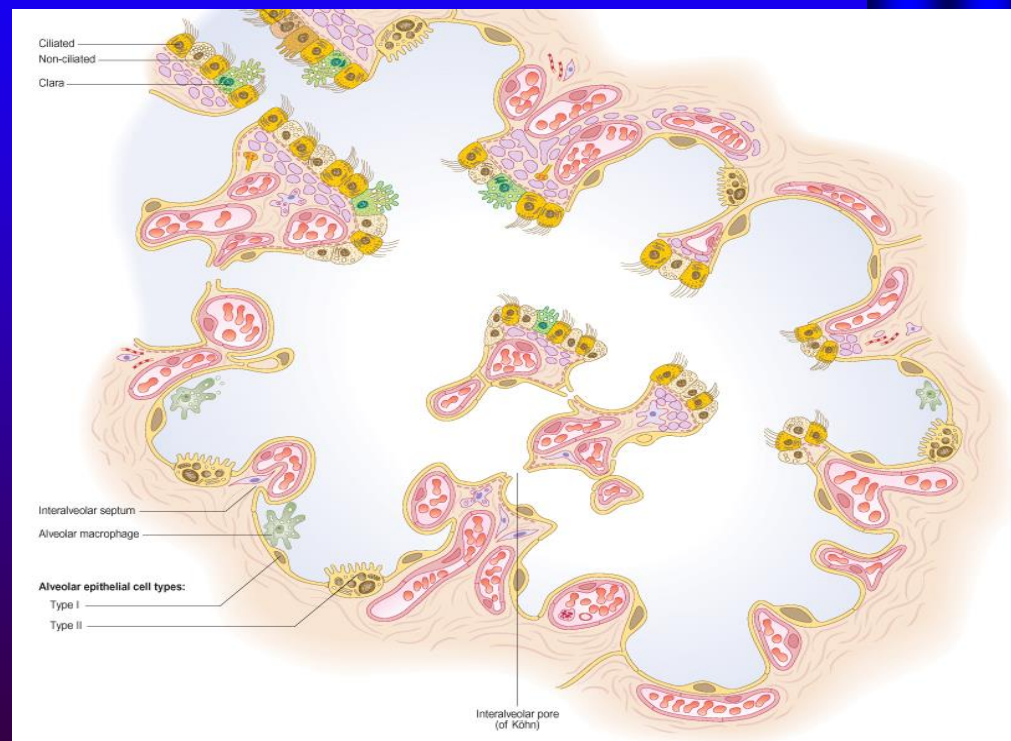
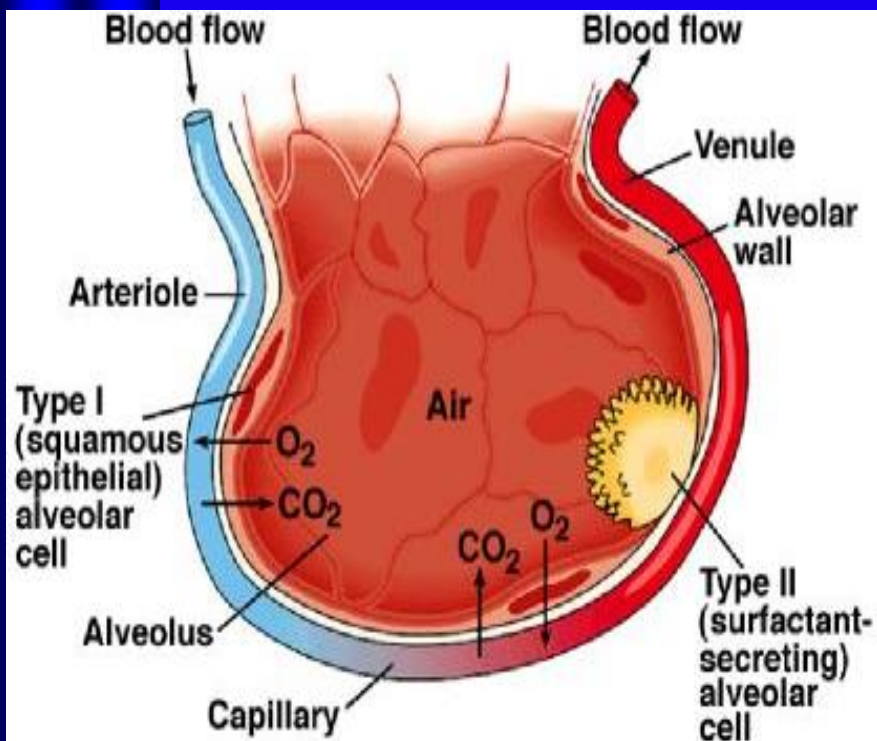
- COMPRISE OF ALL THE PARTS OF THE LUNG WHERE GAS EXCHANGE OCCURS
- CHARACTERIZED BY
 - PRESENCE OF ALVEOLI
 - EXTENSIVE VASCULARITY
 - THIN BLOOD-AIR INTERFACE
 - SIMPLE SQUAMOUS EPITHELIAL LINING
- COMPONENTS?



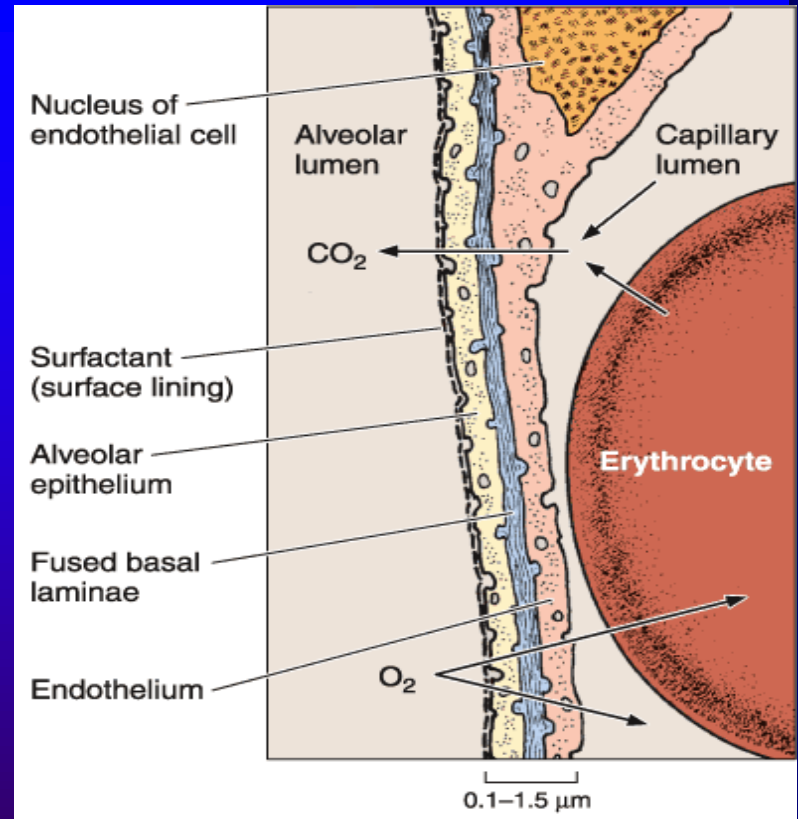
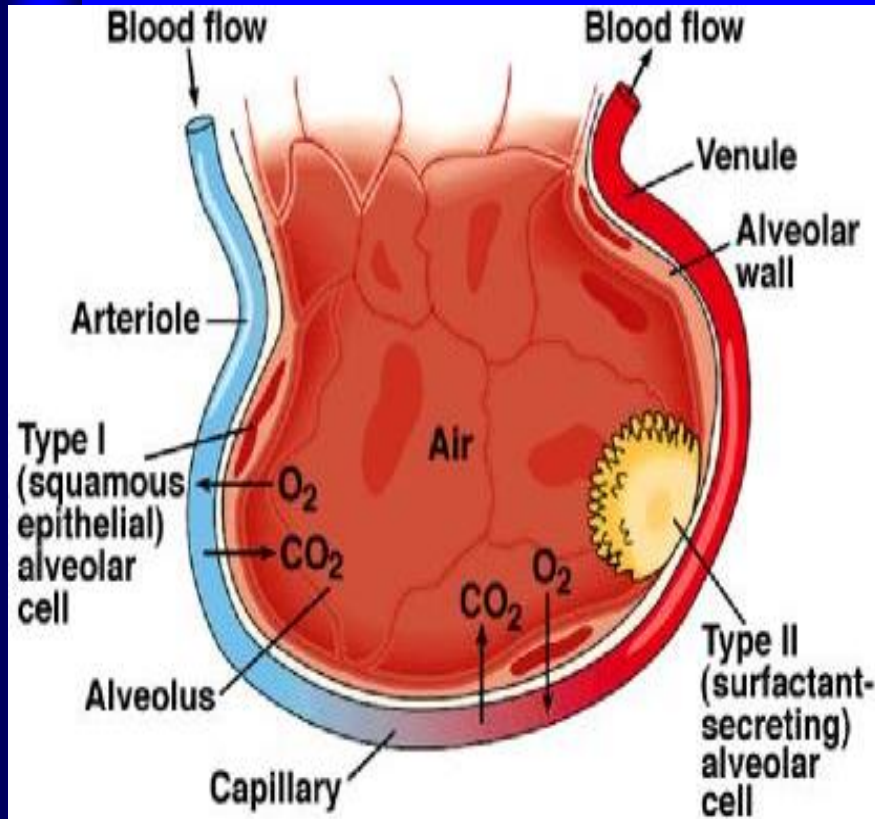


ALVEOLAR CELL TYPES

□ PNEUMOCYTE TYPES I, II & III



AIR-BLOOD BARRIER



RESPIRATORY HISTOLOGY: CLINICAL ASPECTS

- IMMOTILE CILIA SYNDROME
- HYALINE MEMBRANE DISEASE
- ASTHMA
- ATELECTASIS
- EMPHYSEMA
- SIDEROPHAGE (HEART FAILURE) CELLS
- TAR BODIES
- PNEUMOCONIOSIS



HYMNS 150:6

□ LET EVERY THING THAT HATH BREATH
PRAISE THE LORD. PRAISE YE THE LORD!



Thank you for
your attention