



THIRD EDITION

# Laboratory Atlas of Anatomy and Physiology

Eder

Kaminsky

Bertram

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THIRD EDITION

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# DEDICATION

*To Suzanne, Nicholas & Daniel, and Mary Ellen*

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We obtained all animal material pictured from Nasco Company, Ft. Atkinson, Wisconsin. Cat cadavers were skinned at the factory and packed in a non-formaldehyde preservative. At our request, Nasco personnel selected particularly well-injected cadavers for us; we thank them for this service. We would also like to thank our colleague, Dave Bolt of West Hills College, who reviewed our animal dissections.

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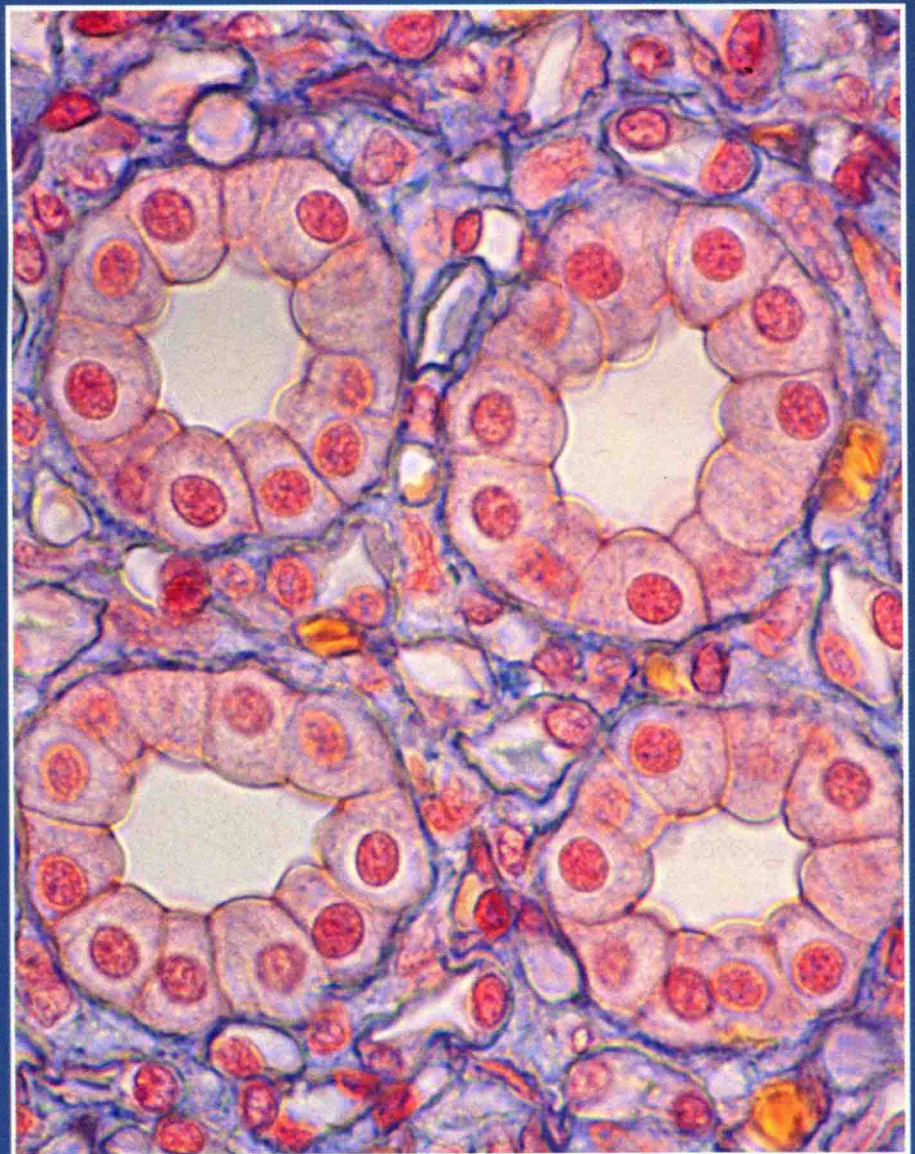
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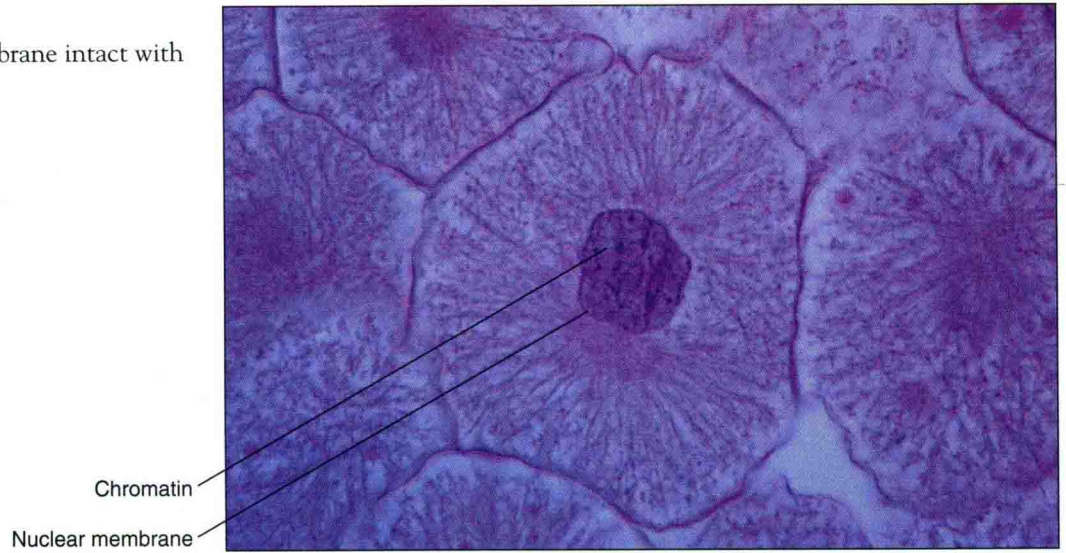
# Histology



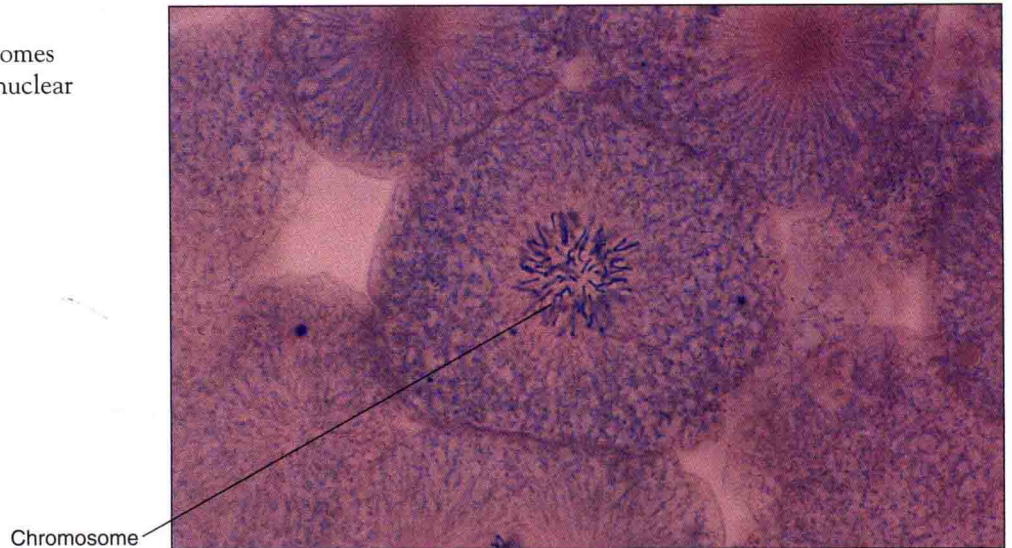
Simple Cuboidal Epithelium

**Figure 1-1**

**Interphase** Nuclear membrane intact with chromatin visible. ( $\times 250$ )

**Figure 1-2**

**Prophase** Duplicated chromosomes condensed into visible strands; nuclear membrane absent. ( $\times 250$ )

**Figure 1-3**

**Metaphase** Darkly stained chromosomes positioned by microtubular framework to align at cell equator. Spindle fibers and aster visible. ( $\times 250$ )





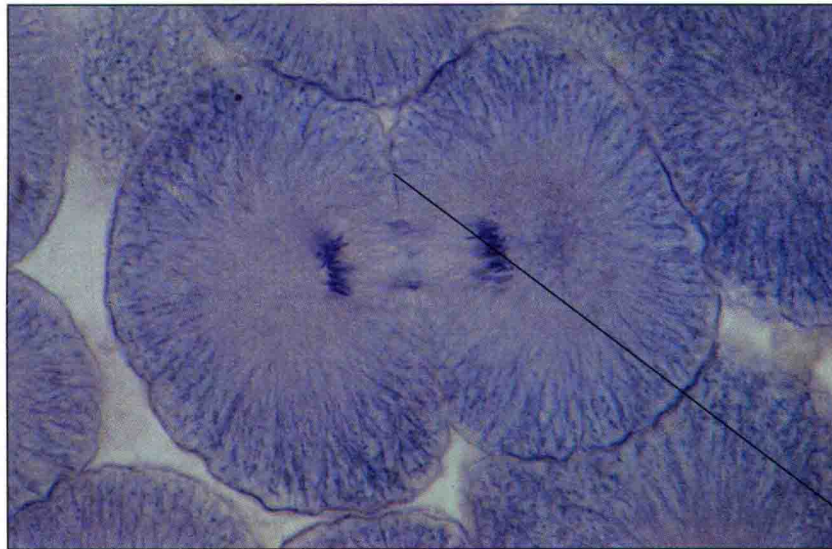
**Figure 1-4**

**Anaphase** Darkly stained chromosomes move to opposite poles under microtubular influence. Spindle fibers and aster visible. ( $\times 250$ )

Spindle fibers

Asters

Chromosomes



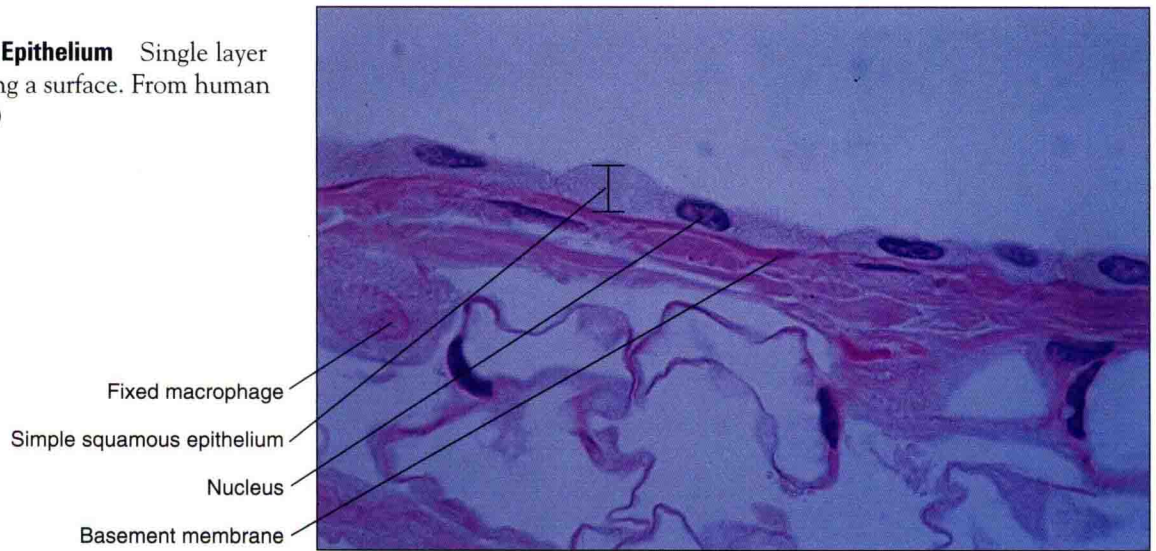
**Figure 1-5**

**Telophase** Separated chromosomes lose microtubular attachments. Belt of actinomyosin forms at equator, assists in formation of new cell membranes and cytokinesis. Cleavage furrow forms two daughter cells. ( $\times 250$ )

Cleavage furrow at equator

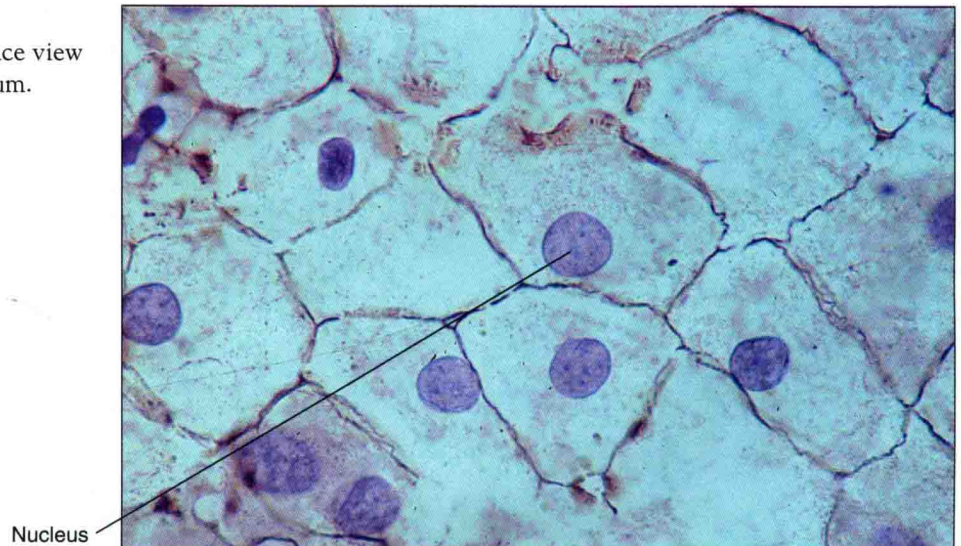
**Figure 1-6**

**Simple Squamous Epithelium** Single layer of flat cells covering a surface. From human omentum. ( $\times 250$ )



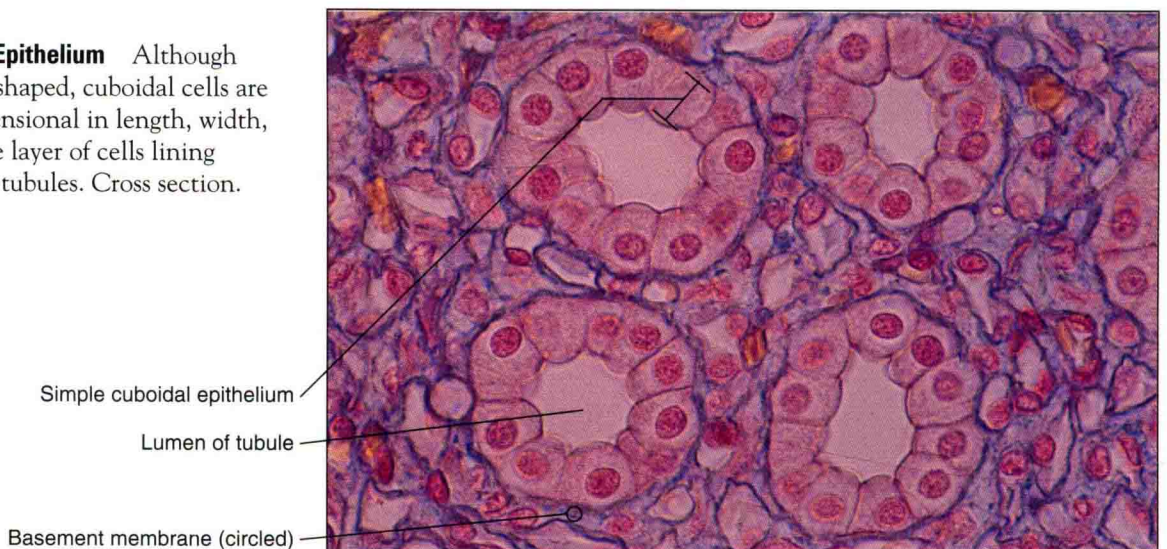
**Figure 1-7**

**Simple Squamous Epithelium** Surface view of flattened cells. Human mesothelium. ( $\times 250$ )



**Figure 1-8**

**Simple Cuboidal Epithelium** Although not strictly cube shaped, cuboidal cells are roughly equidimensional in length, width, and depth. Single layer of cells lining surface of kidney tubules. Cross section. ( $\times 250$ )





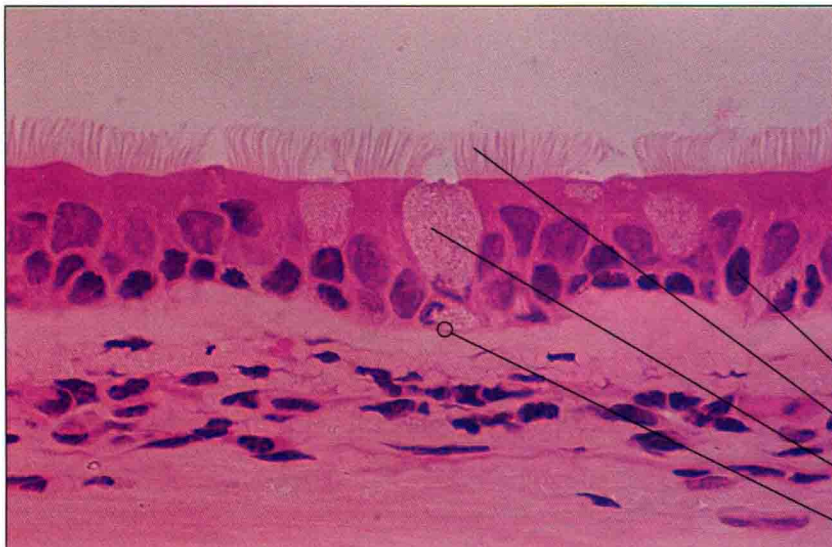
**Figure 1-9**  
**Simple Cuboidal Epithelium** Longitudinal section of kidney tubule. ( $\times 250$ )

Basement membrane  
 Simple cuboidal epithelium  
 Lumen of tubule



**Figure 1-10**  
**Simple Columnar Epithelium** Cellular height is much greater than width or length. Nuclei generally appear in a row. From pancreatic duct. ( $\times 250$ )

Nucleus  
 Simple columnar epithelium  
 Basement membrane



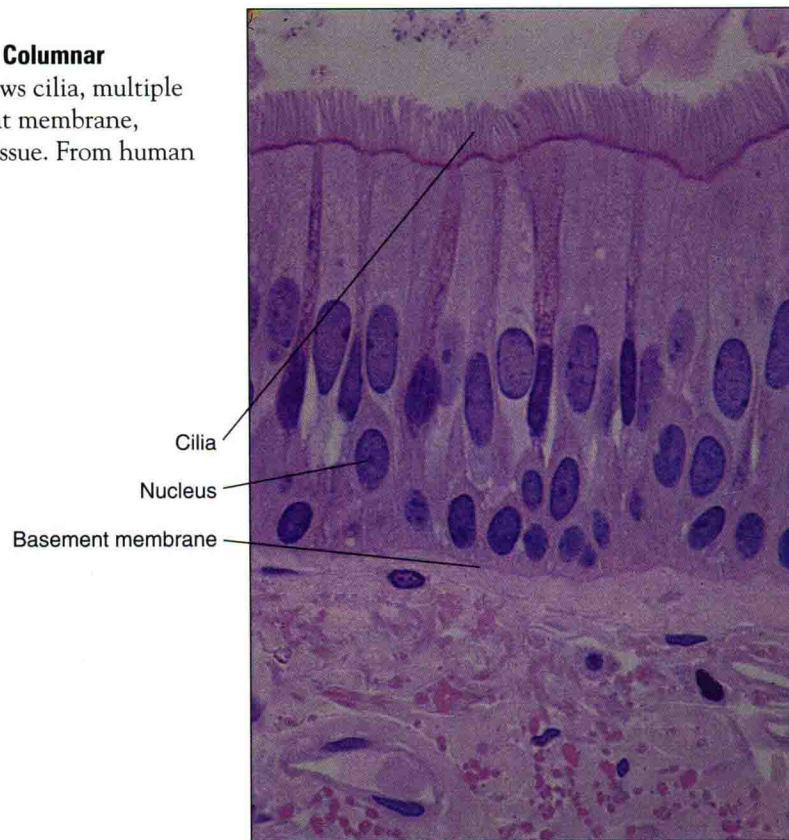
**Figure 1-11**  
**Pseudostratified Ciliated Columnar Epithelium** Nuclei appear to lie in two rows, but in fact all cells in single layer are in contact with basement membrane. Section shows well-defined cilia, three goblet cells, basement membrane, underlying connective tissue. From monkey trachea. ( $\times 100$ )

Nucleus  
 Cilia  
 Goblet cell  
 Basement membrane

**Figure 1-12**

**Pseudostratified Ciliated Columnar Epithelium**

Section shows cilia, multiple layers of nuclei, basement membrane, underlying connective tissue. From human trachea. ( $\times 250$ )



**Figure 1-13**

**Stratified Squamous Epithelium**

Flattened cells at surface change to less flattened morphology in deeper layers. Oral cavity of rabbit. ( $\times 100$ )



**Figure 1-14**

**Stratified Squamous Epithelium** Flattened, keratinized cells at surface show variations in form in deeper layers. From human skin. ( $\times 100$ )

Keratinized cells

Papilla

**Figure 1-15**

**Transitional Epithelium from Urinary Bladder** Umbrella cells stretch and flatten as bladder fills. Basement membrane separates epithelium from underlying connective tissue containing blood vessels. ( $\times 250$ )

Umbrella cell

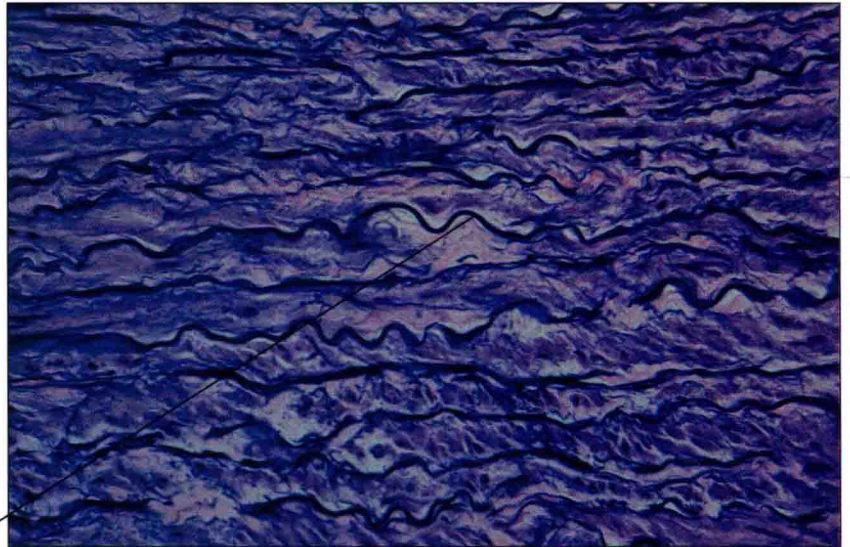
Basement membrane

Blood vessel lumen

**Figure 1-16**

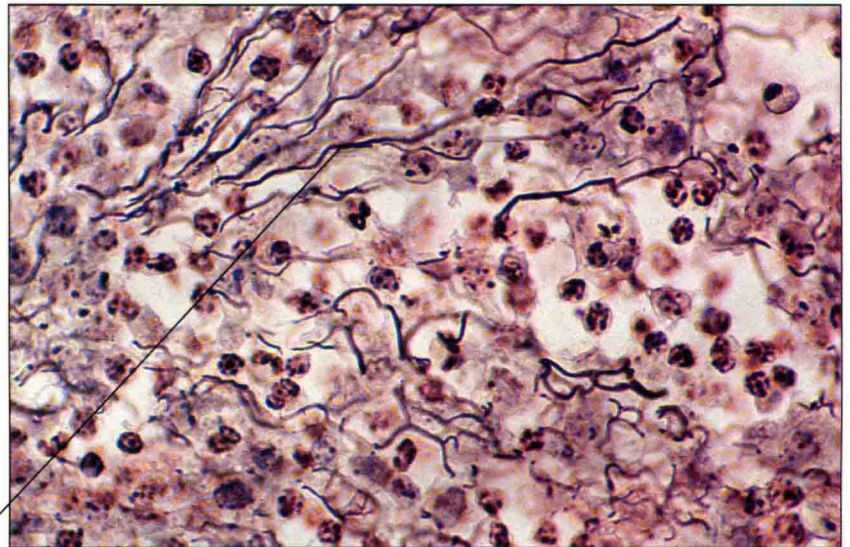
**Wall of Elastic Artery** Extracellular elastic fibers running parallel in a plane. Structure permits tissue elasticity and recoil. From aorta. ( $\times 100$ )

Elastic fiber

**Figure 1-17**

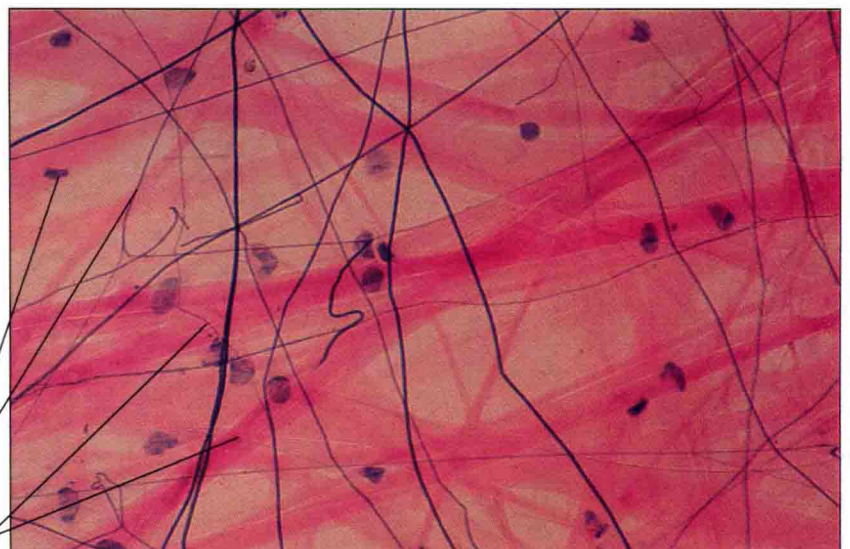
**Reticular Connective Tissue** Mesh of reticular fibers appears as dark lines; provides scaffold for cellular organization of this lymph node. ( $\times 250$ )

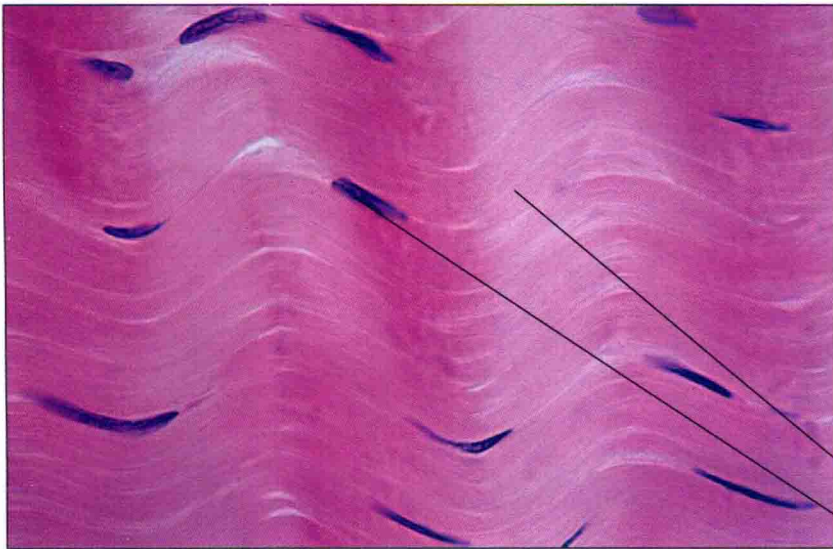
Reticular fiber

**Figure 1-18**

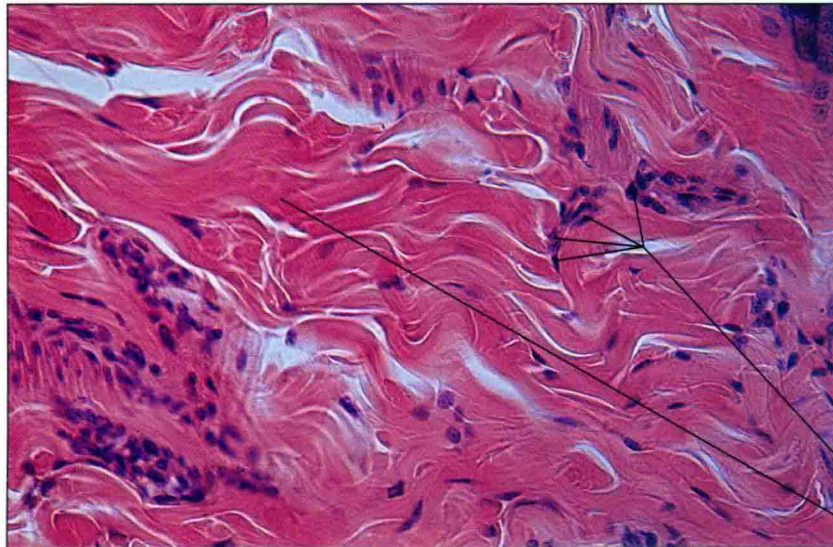
**Loose (Areolar) Connective Tissue** Pink bands of collagen fibers run in all directions through intercellular spaces of subcutaneous tissue, permit flexible resistance to mechanical stress. ( $\times 100$ )

Fibroblast  
Elastic fiber  
Collagen fibers

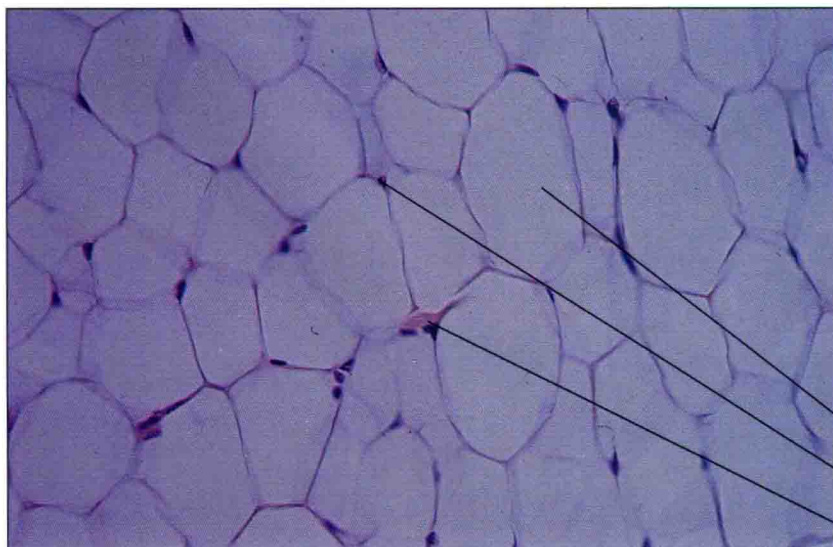


**Figure 1-19**

**Dense Regular Connective Tissue** Bands of collagen fibers running in regular, parallel rows resist mechanical stress mainly along course of fibers. Monkey tendon. ( $\times 250$ )

**Figure 1-20**

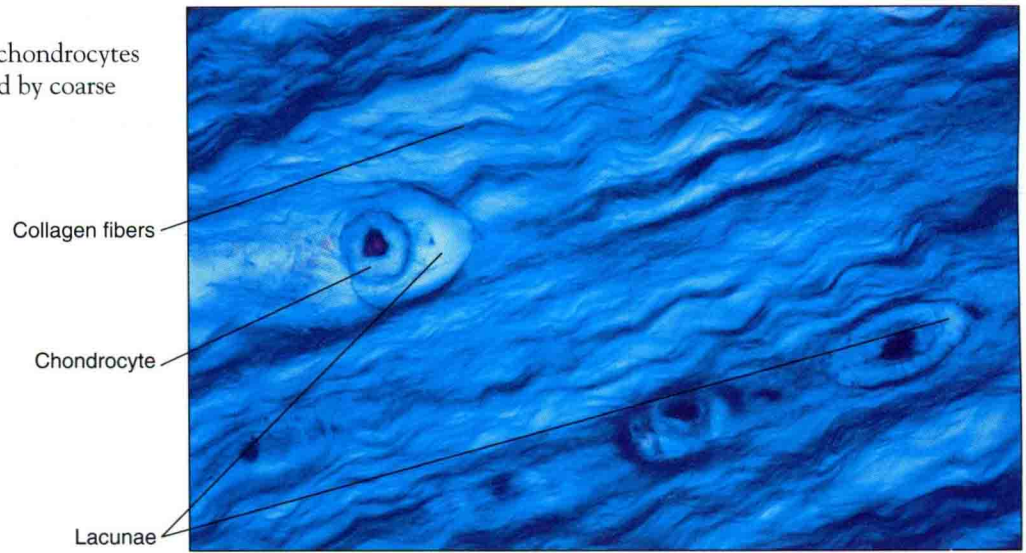
**Dense Irregular Connective Tissue** Bands of collagen running in irregular rows give multidirectional tensile strength. Collagen-secreting fibroblasts appear throughout. ( $\times 100$ )

**Figure 1-21**

**Adipose Tissue** Large, empty, polyhedral vacuoles dominate small, eccentrically located cell nuclei of adipocytes. Fine capillaries run through tissue. ( $\times 100$ )

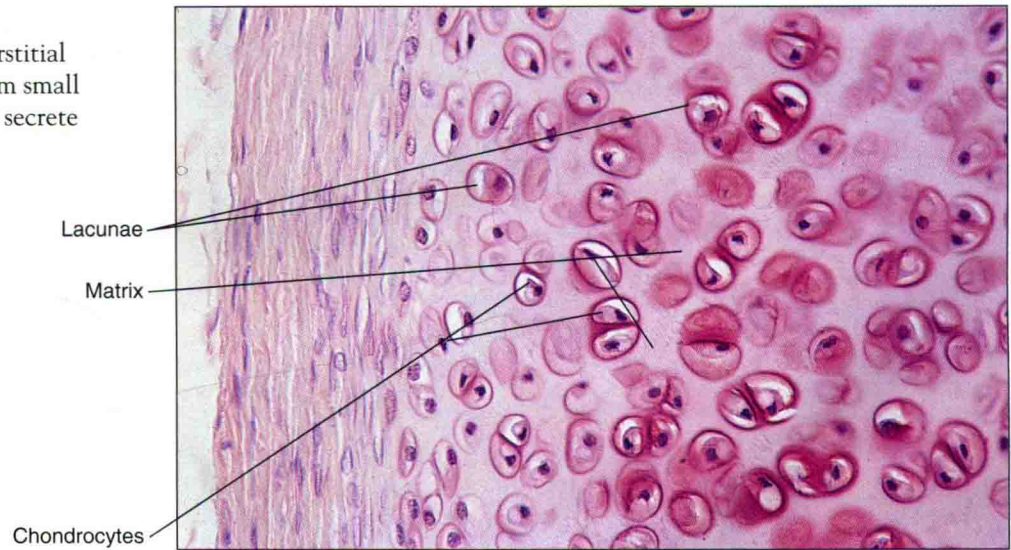
**Figure 1-22**

**Fibrocartilage** Cell nests of chondrocytes in territorial matrix surrounded by coarse extracellular fibers. ( $\times 250$ )



**Figure 1-23**

**Hyaline Cartilage** During interstitial growth, cartilage cells often form small clusters and move apart as they secrete extracellular matrix. ( $\times 100$ )

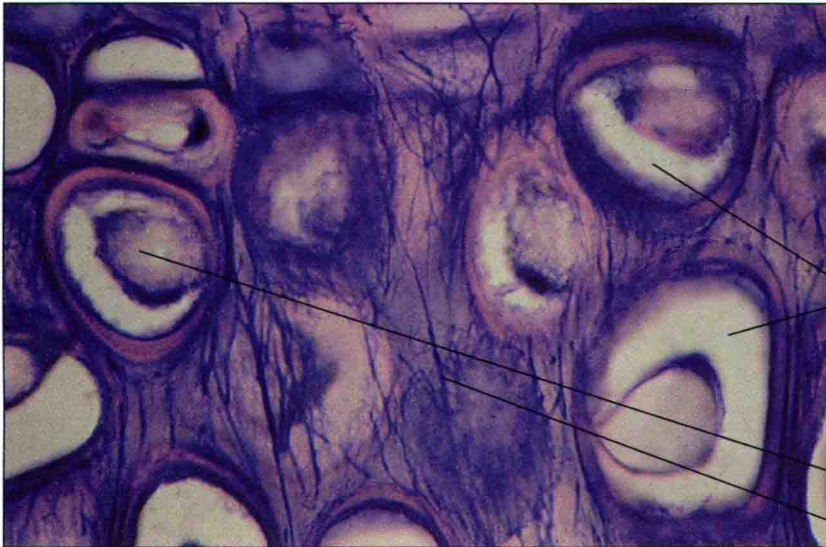


**Figure 1-24**

**Hyaline Cartilage** Artifacts of vacuolation forms characteristic lacunae around chondrocyte cell bodies. From trachea. ( $\times 250$ )

Lacuna

Chondrocyte

**Figure 1-25**

**Elastic Cartilage** Extracellular matrix contains elastic fibers that confer elastic recoil to this tissue. ( $\times 250$ )

Lacunae

Chondrocyte

Elastic fiber