Liver, Gallbladder, Pancreas, And Salivary Glands

Undergraduate - Graduate
Histology Lecture Series

Larry Johnson, Professor
Veterinary Integrative
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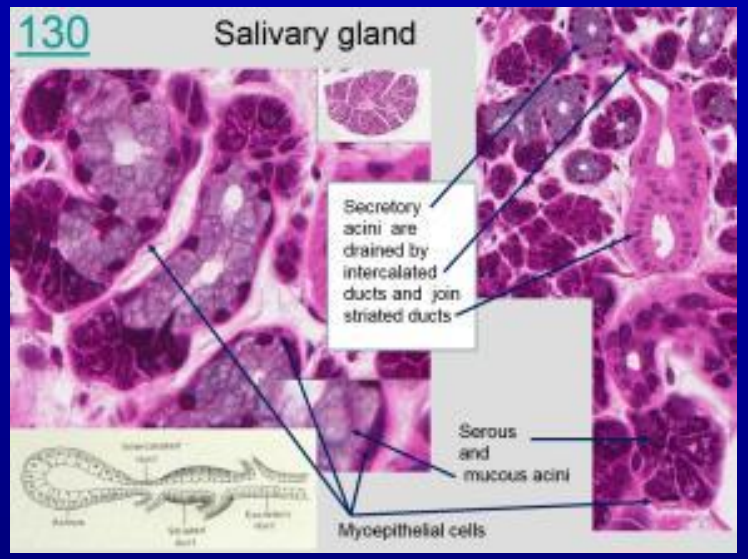
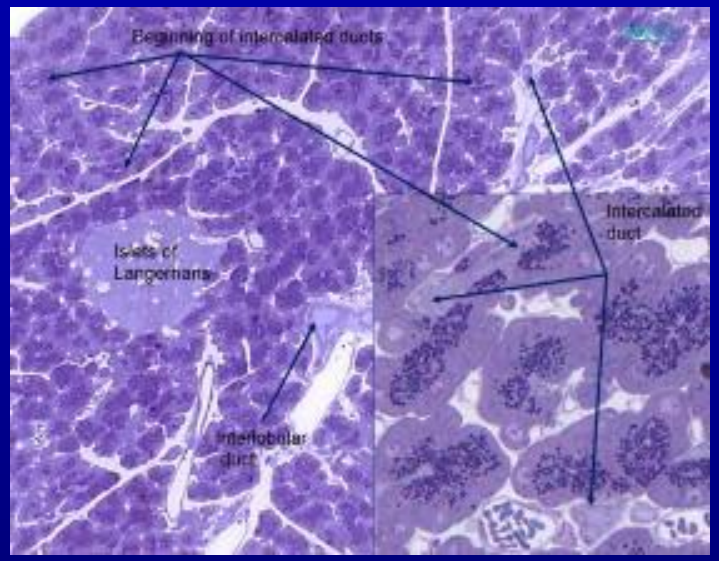
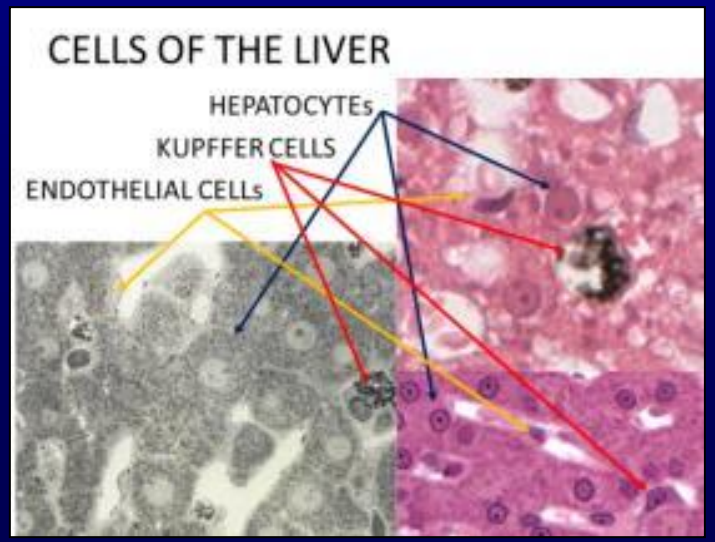
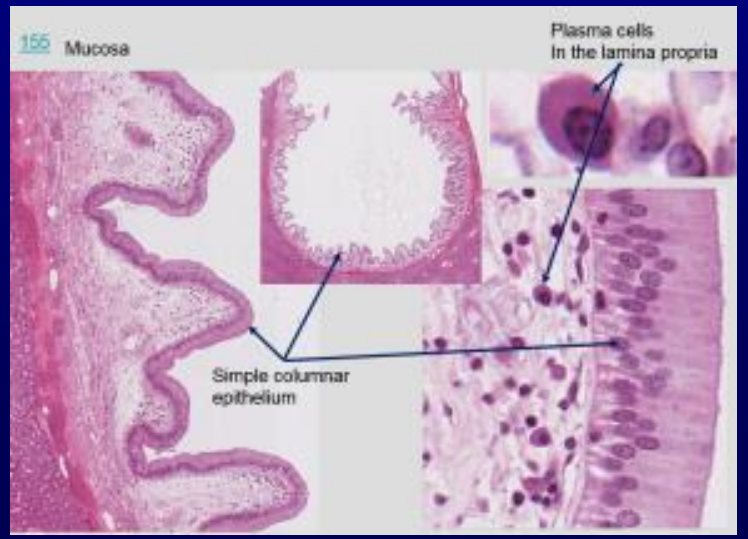
College Station, TX 77843









Objectives

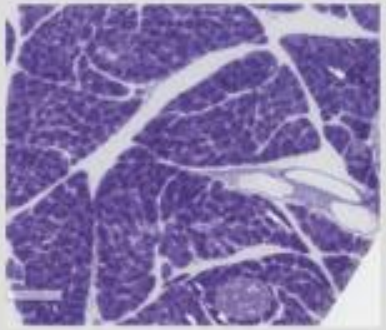
To understand the general organization of the accessory organs of the digestive system and how they contribute to obtaining metabolites necessary for growth and energy for the body.

To learn the origin of these glands and how structural features of these glands contribute to their function in digestion and absorption of food stuffs

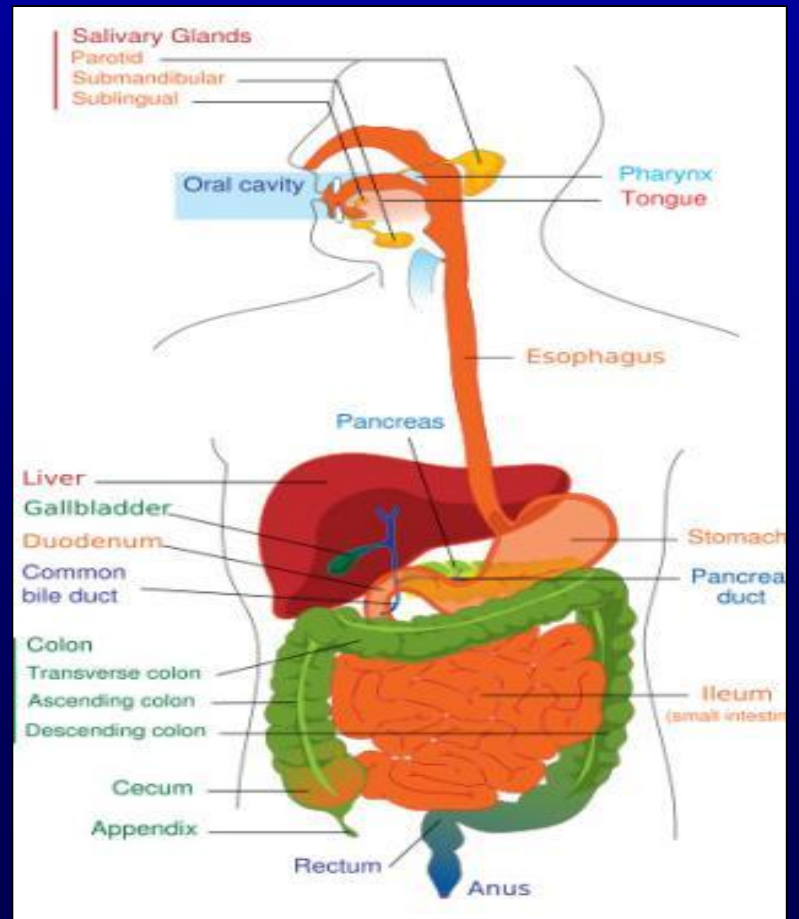
Liver
Histo
67

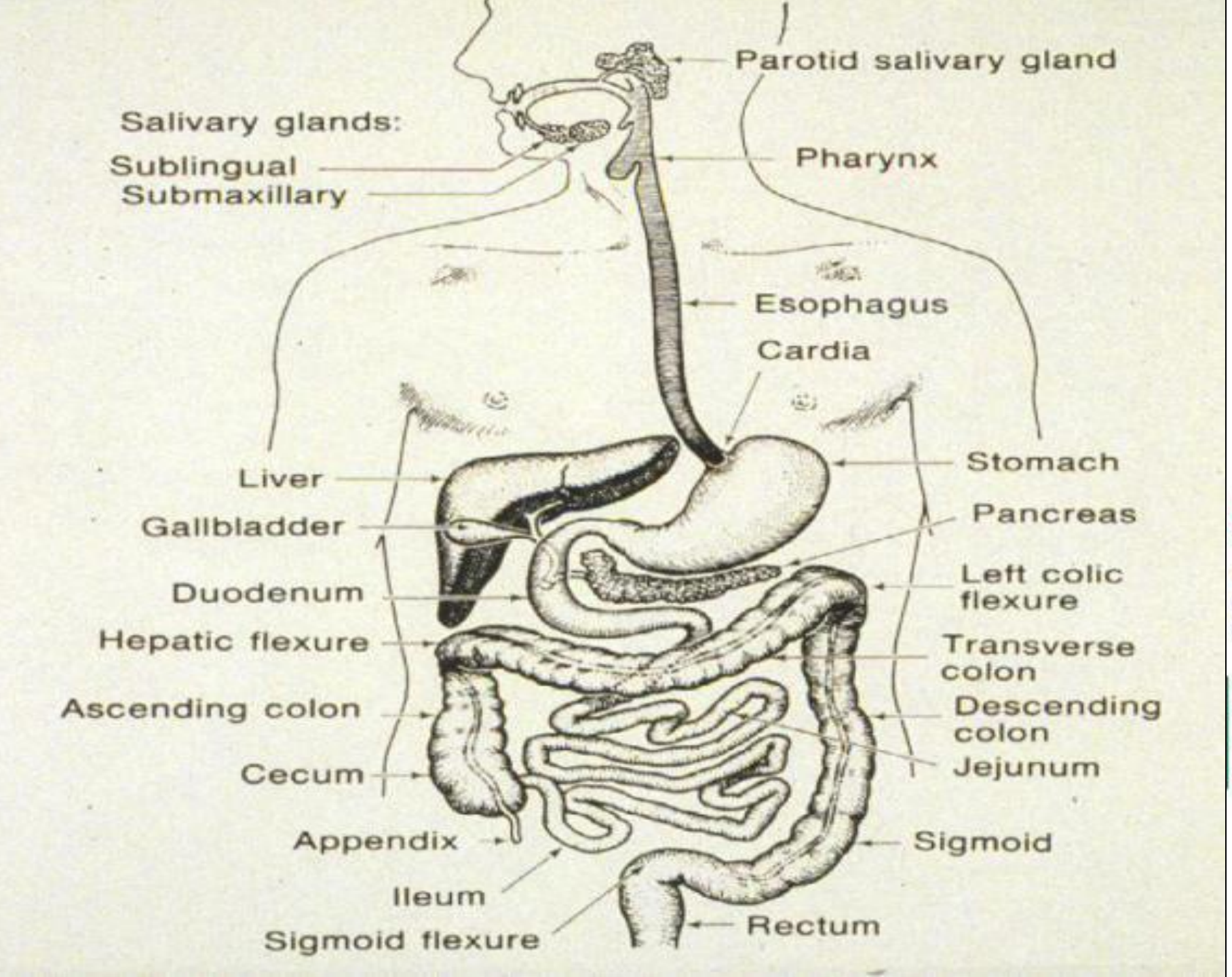
155
Gallbladder

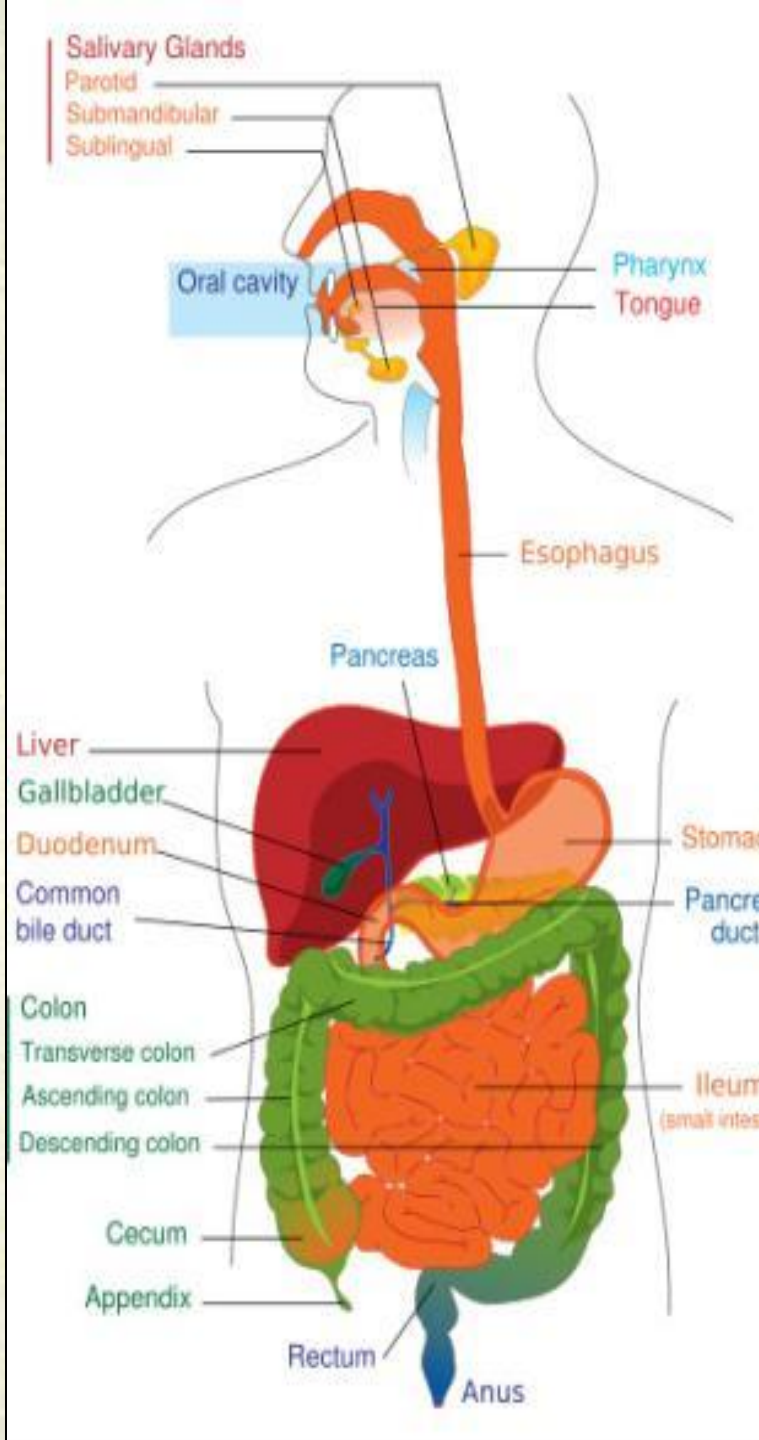
Salivary
gland
19758



Pancreas
158




Parotid salivary gland
Salivary glands:
Sublingual
Submaxillary
Pharynx
Esophagus
Cardia
Stomach
Liver
Gallbladder
Pancreas
Duodenum
Left colic flexure
Hepatic flexure
Transverse colon
Ascending colon
Descending colon
Cecum
Jejunum
Appendix
Sigmoid
Ileum
Sigmoid flexure
Rectum


Salivary Glands
Parotid
Submandibular
Sublingual
Oral cavity
Pharynx
Tongue
Esophagus
Pancreas
Liver
Gallbladder
Duodenum
Common bile duct
Colon
Transverse colon
Ascending colon
Descending colon
Cecum
Appendix
Rectum
Anus

Origin And Distribution Of Epithelium

Ectoderm - epidermis of skin and epithelium of cornea together covers the entire surface of the body; sebaceous and mammary glands, oral cavity

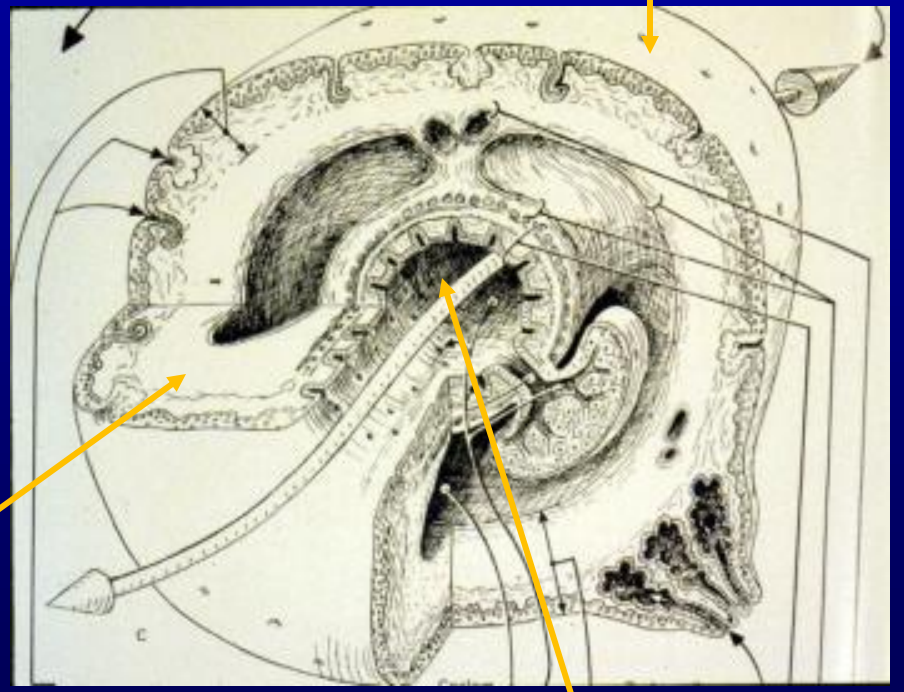
Endoderm - alimentary tract, Liver, pancreas, gastric glands, intestinal glands

- Endocrine glands - lose connection with surface

Mesoderm

Endothelium - lining of blood vessels

Mesothelium - lining serous cavities



Function of the Digestive System

Role of liver, gall bladder, salivary glands, and pancreas

Movement of food

Salivary glands lubricates

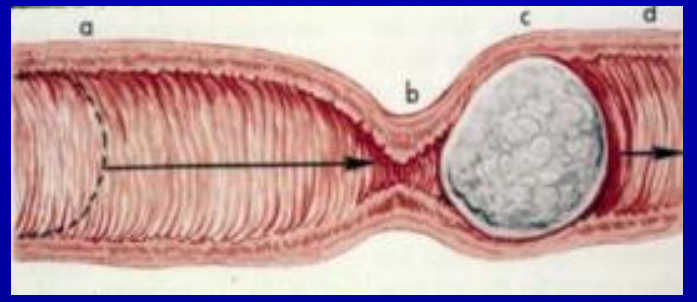
Secretion of digestive juices

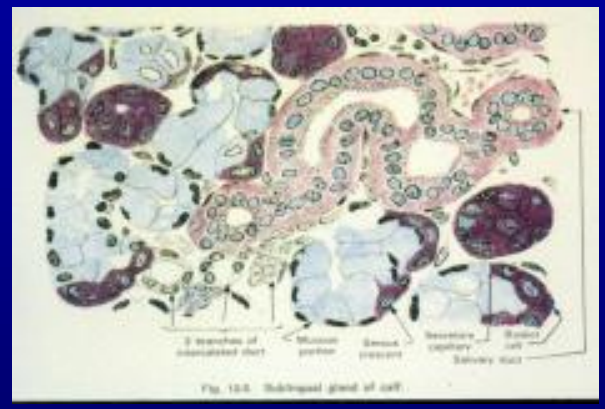
Salivary glands and pancreas secretes digestive juices and liver secretes bile

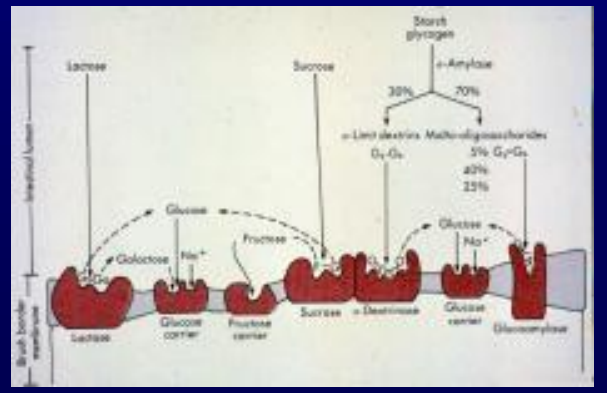
Absorption of digested foods, water, and electrolytes

Liver stores nutrients and cleans the blood.

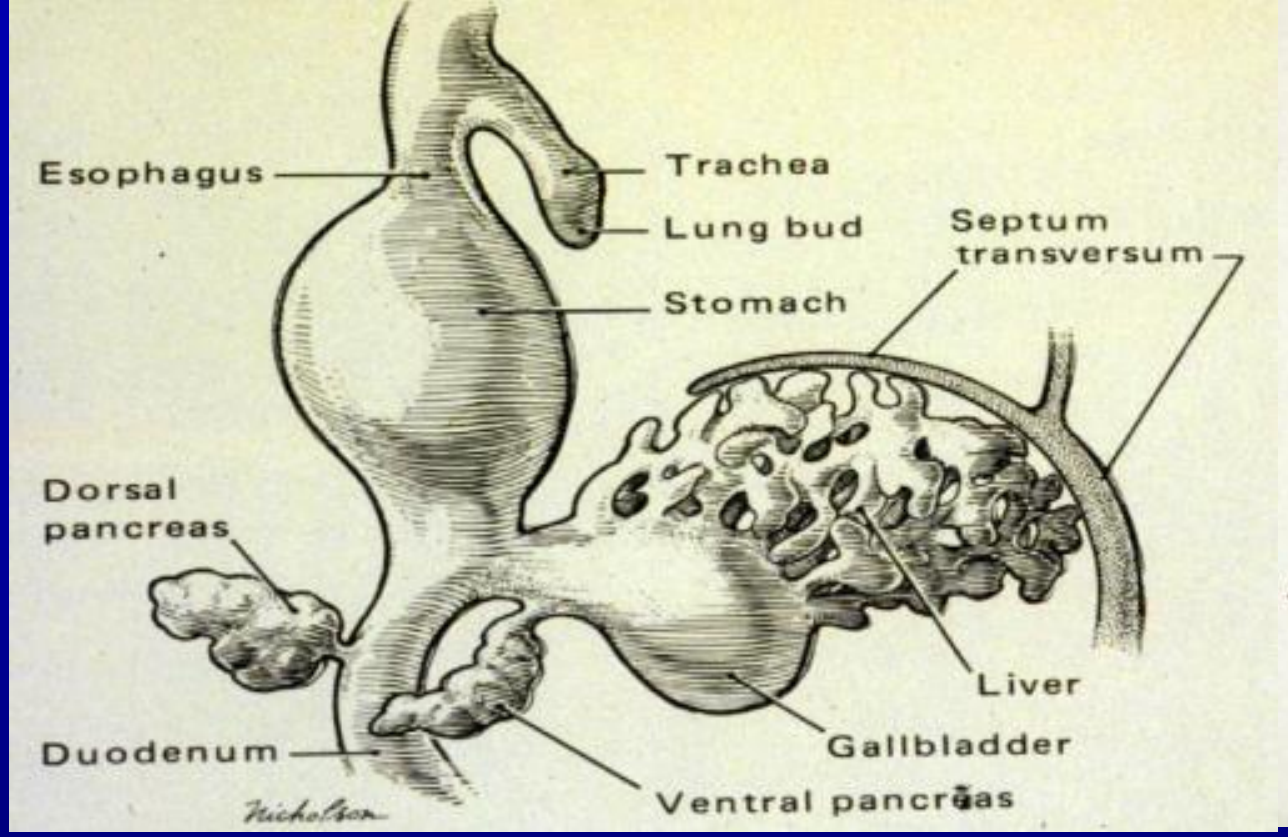
Also, the accessory digestive organs contribute antibodies and antibacterial/viral growth substances.

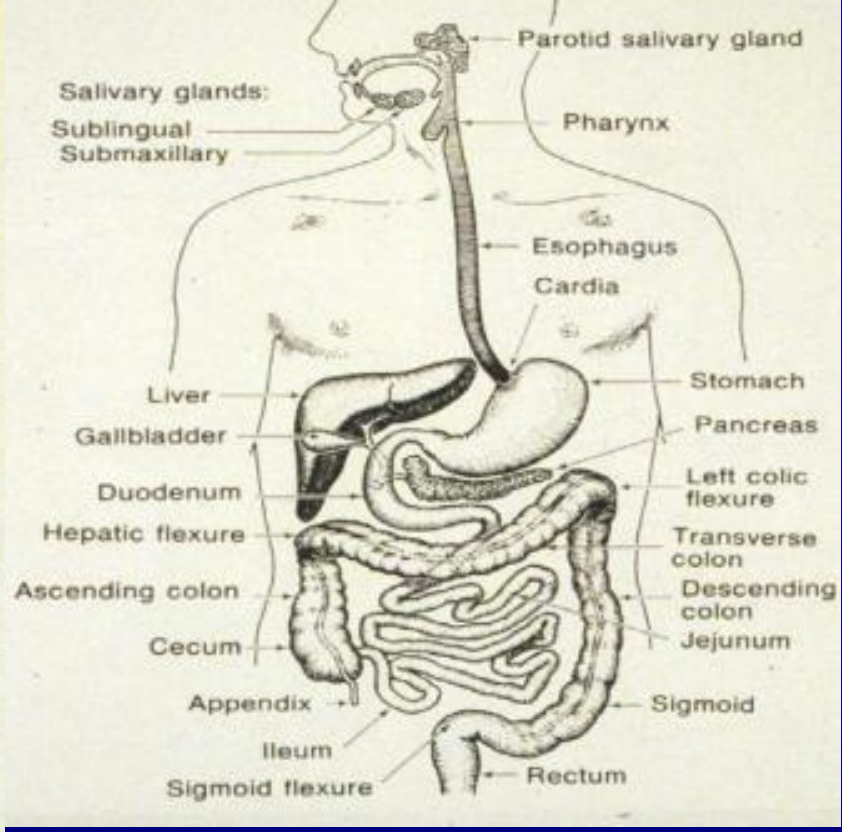


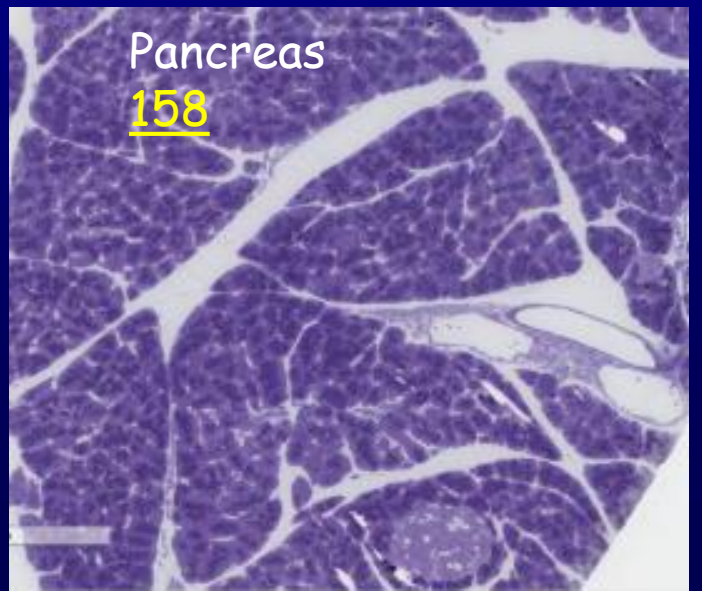




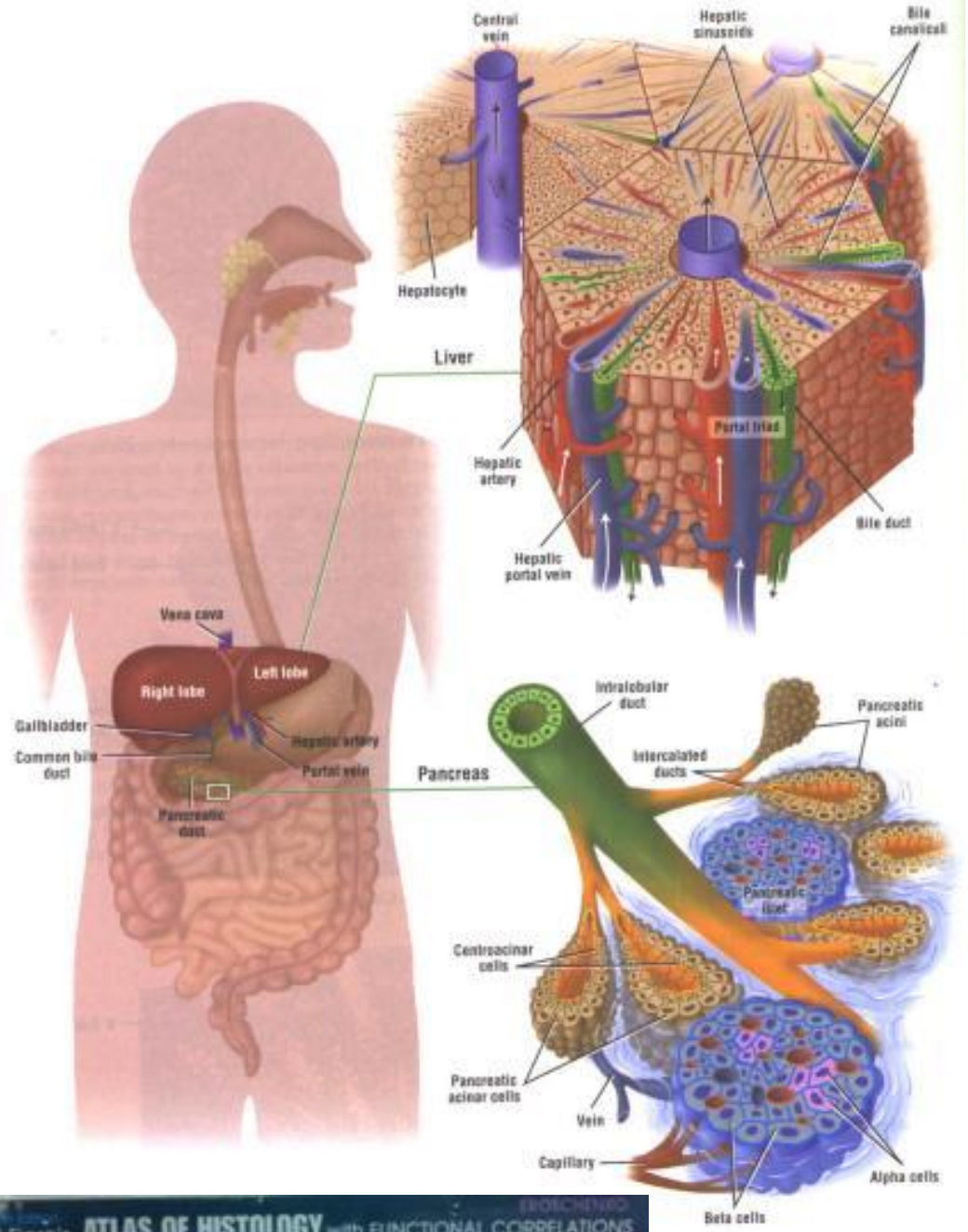
ORIGIN AND DISTRIBUTION OF EPITHELIUM con'd








Gunther von Hagens'
BODY WORLDS
The Anatomical Exhibition of Real Human Bodies



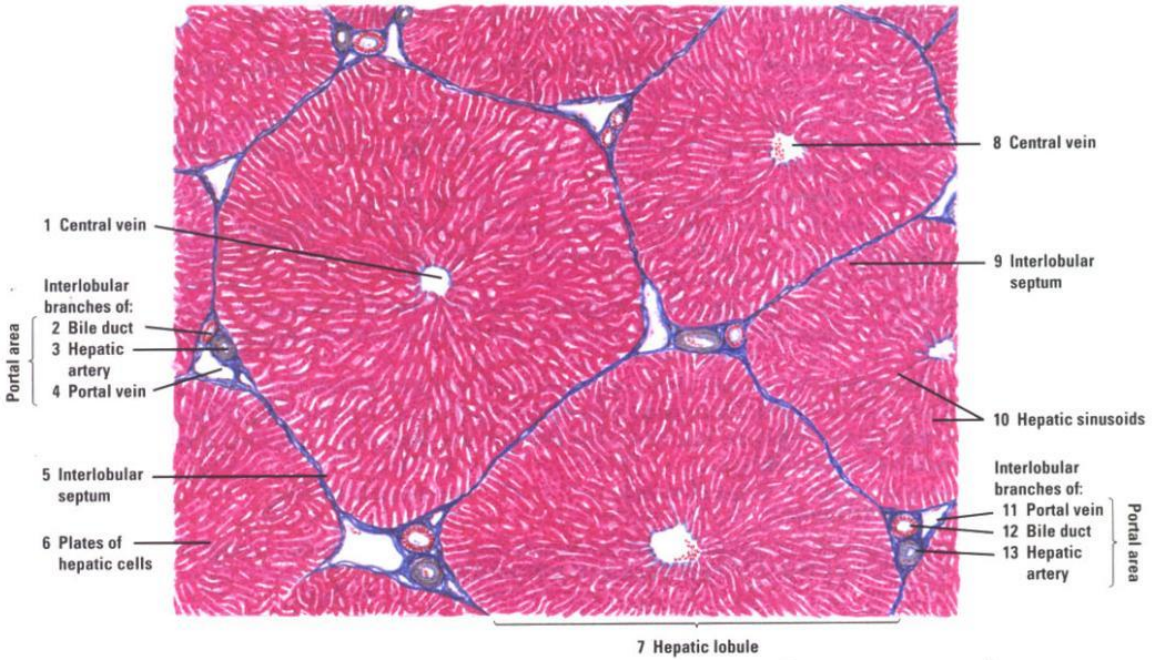
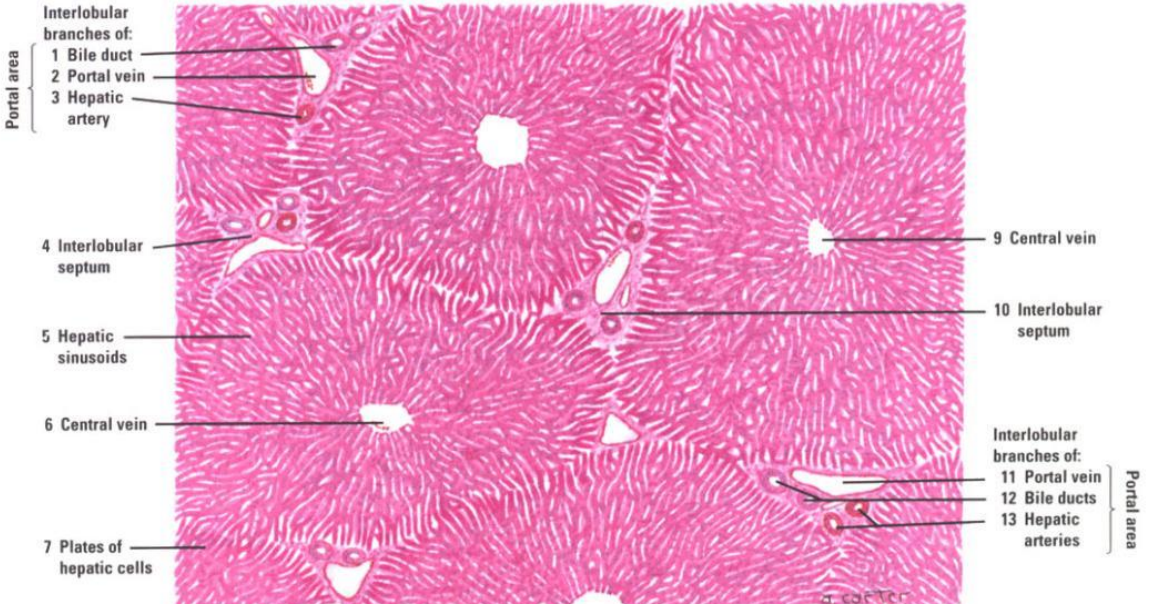


Fig. 13-1 Pig's Liver (panoramic view, transverse section). Stain: Mallory-azan. Low magnification.



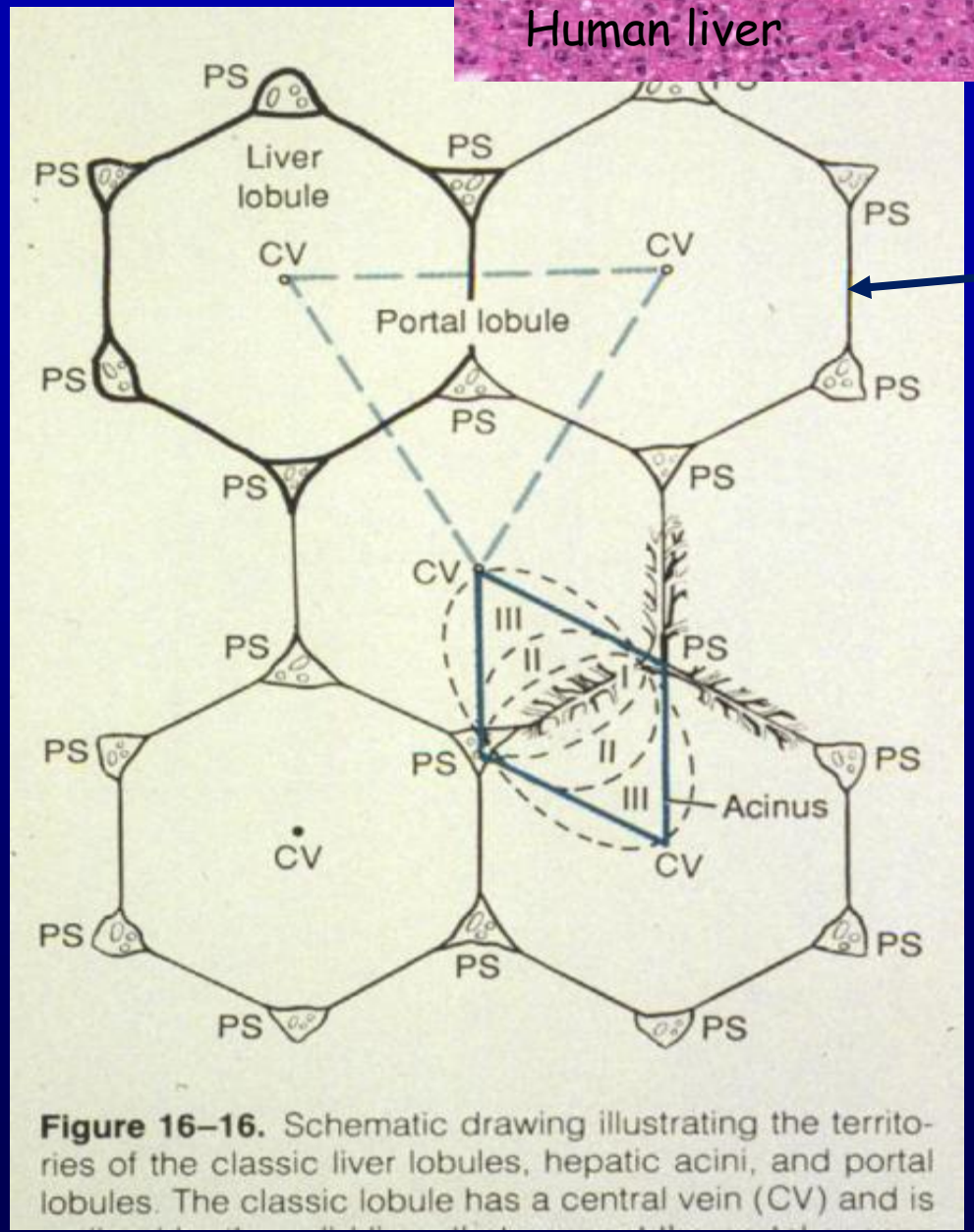
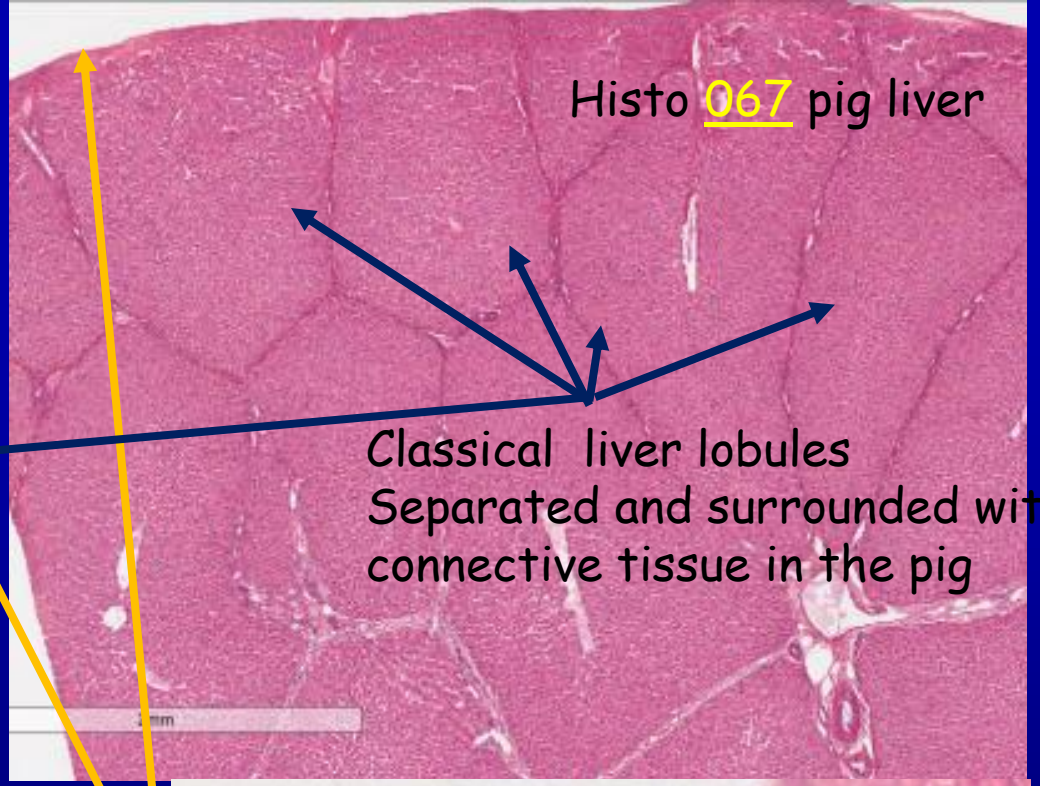
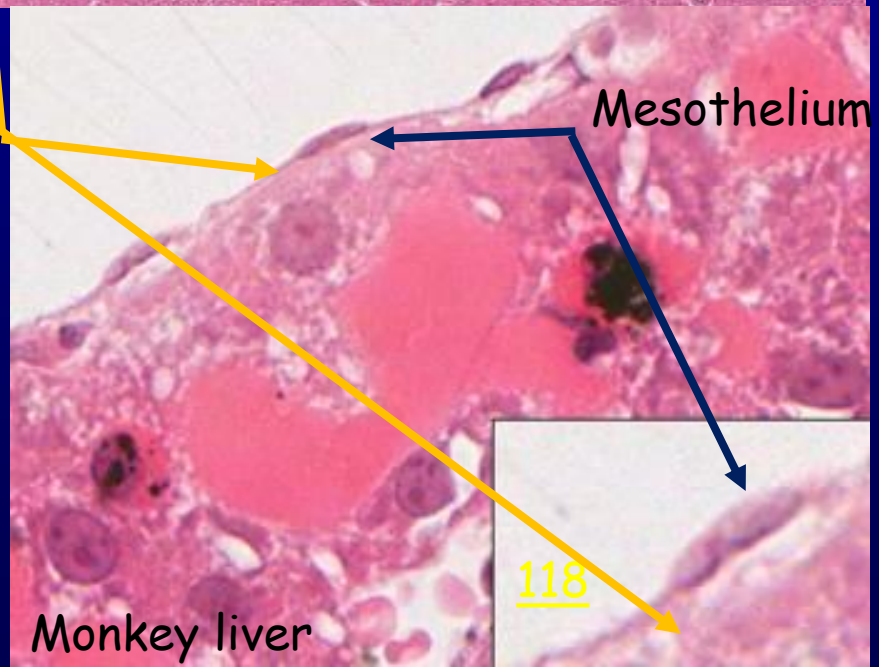


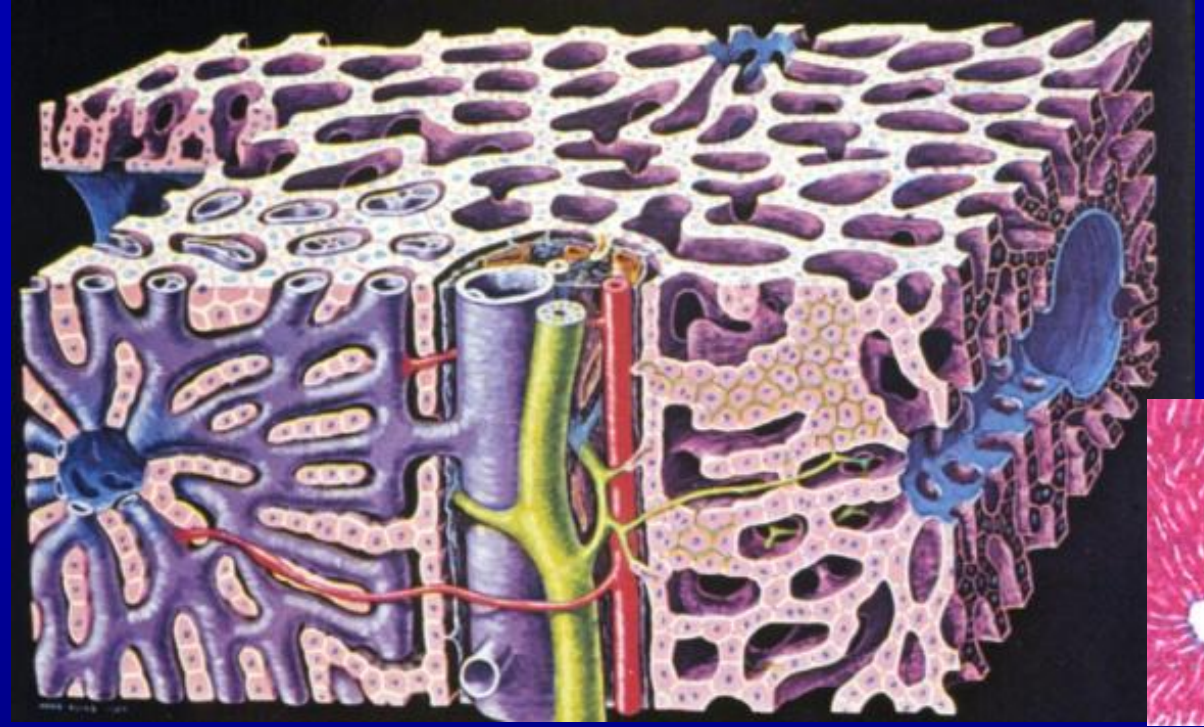
Figure 16–16. Schematic drawing illustrating the territories of the classic liver lobules, hepatic acini, and portal lobules. The classic lobule has a central vein (CV) and is

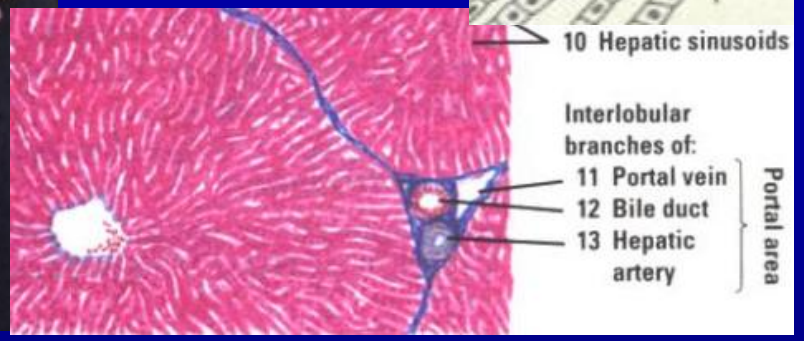


Connective tissue capsule



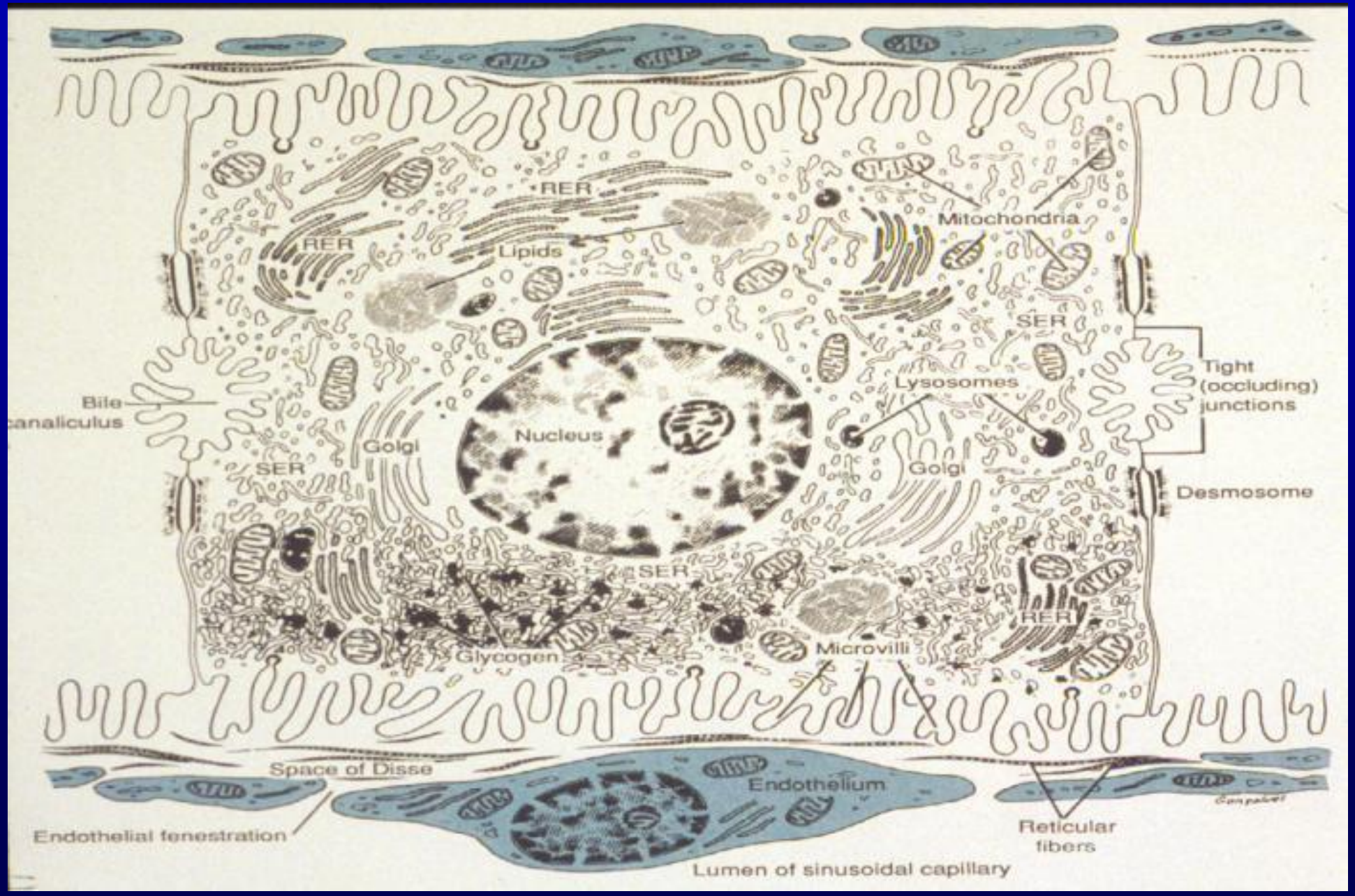
Liver

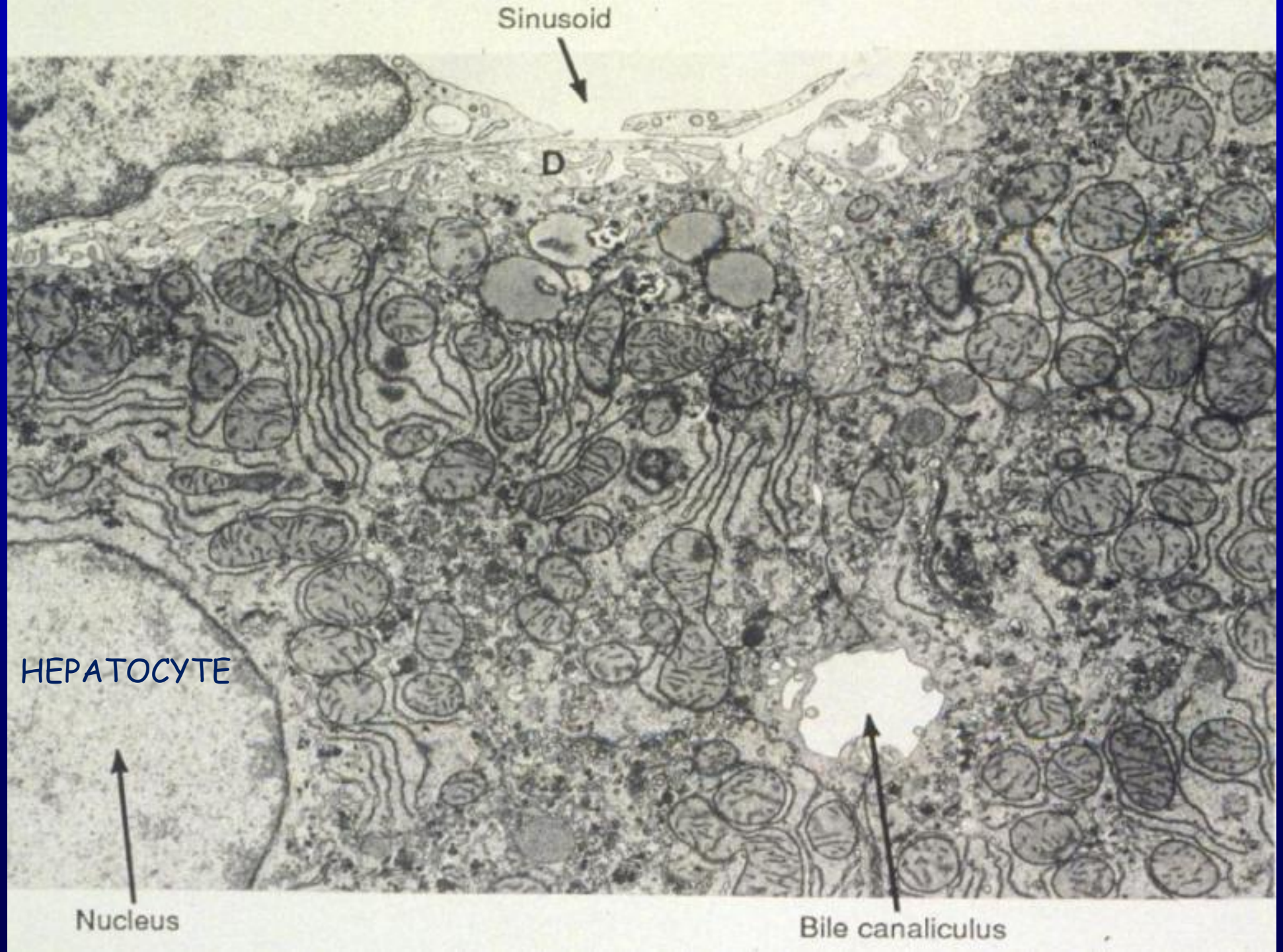




The hepatocyte functions as an endocrine-like cell (e.g., secretion of glucose and plasma proteins directly into the blood vascular system) and as an exocrine cell (e.g., secretion of bile into the bile canaliculi). This dual export of secretory products by a single cell requires a unique cellular arrangement in the liver in order to separate and compartmentalize the exocrine and endocrine-like products. Hepatocytes are arranged in fenestrated, anastomosing plates of one cell thick. Also each hepatocyte may have as many as four areas of access to the lumen.

Landscape of the Hepatocyte – Four Luminal Regions



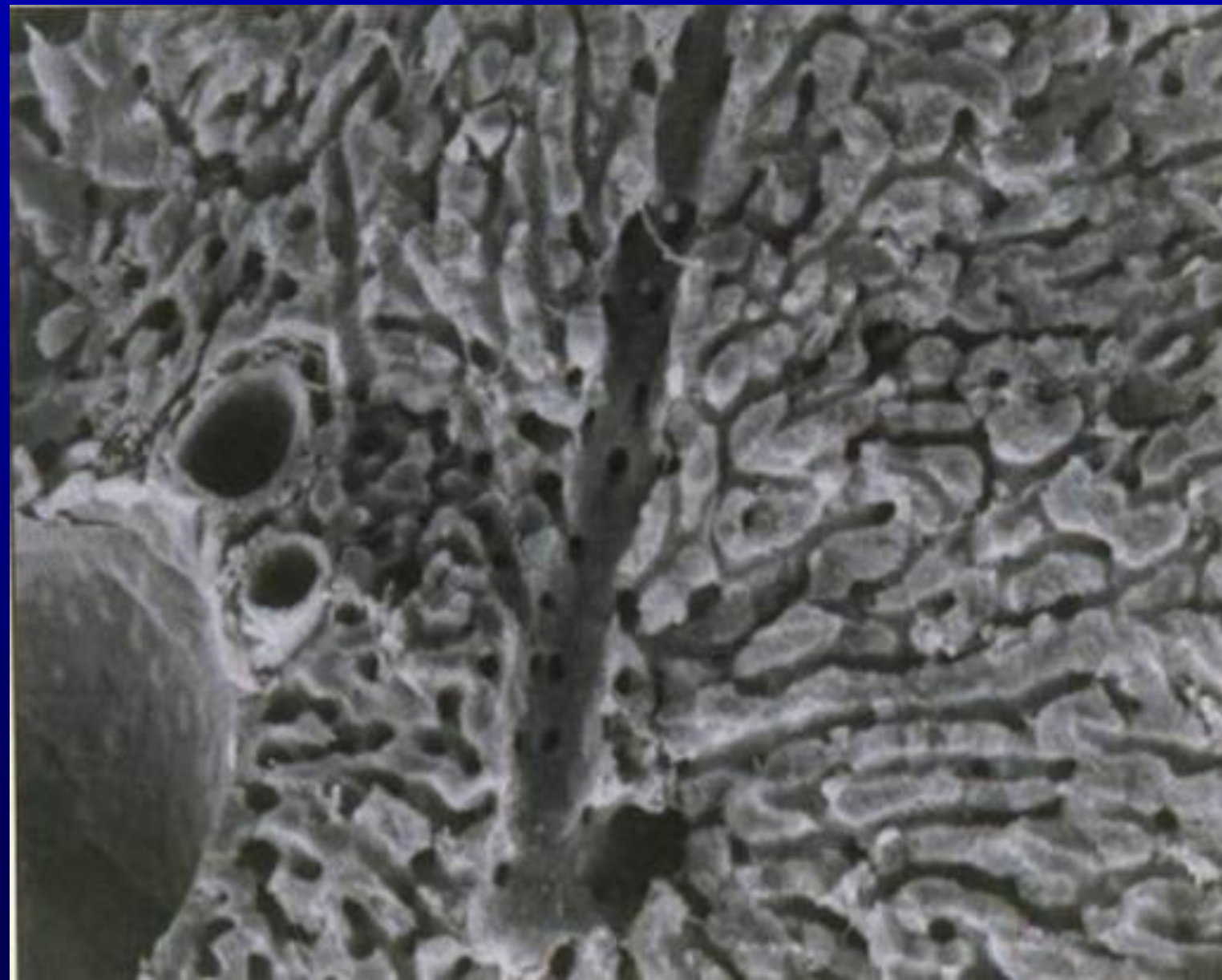

Sinusoid
D
HEPATOCYTE
Nucleus
Bile canaliculus

LIVER FUNCTION - LARGEST GLAND

EXOCRINE - BILE ACIDS, BILIRUBIN

ENDOCRINE - ALBUMIN, FIBRINOGEN,

ETC.



LIVER FUNCTIONS

Blood filtration - 1.2 x 107 Kupffer cells/g

Blood storage - liver size and sinusoids expand

Maintain normal blood glucose concentrations

Metabolism and transport of lipids

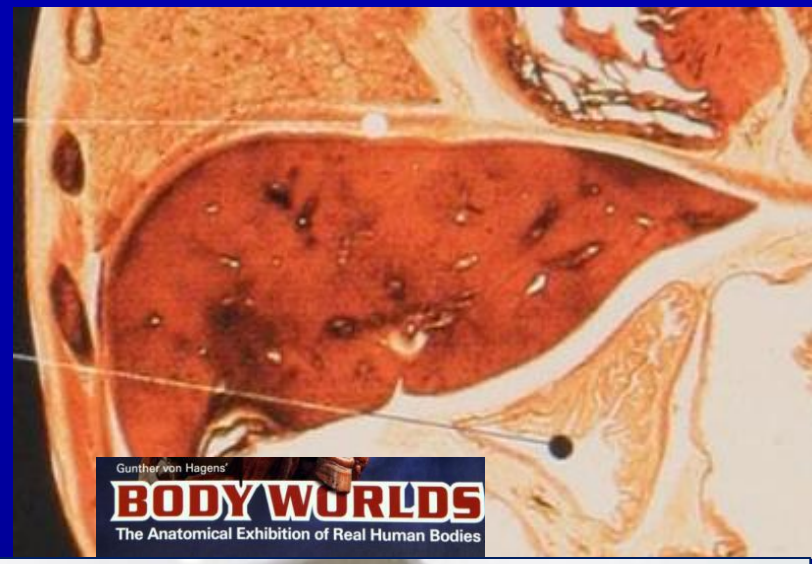
Secrete plasma proteins - blood clotting

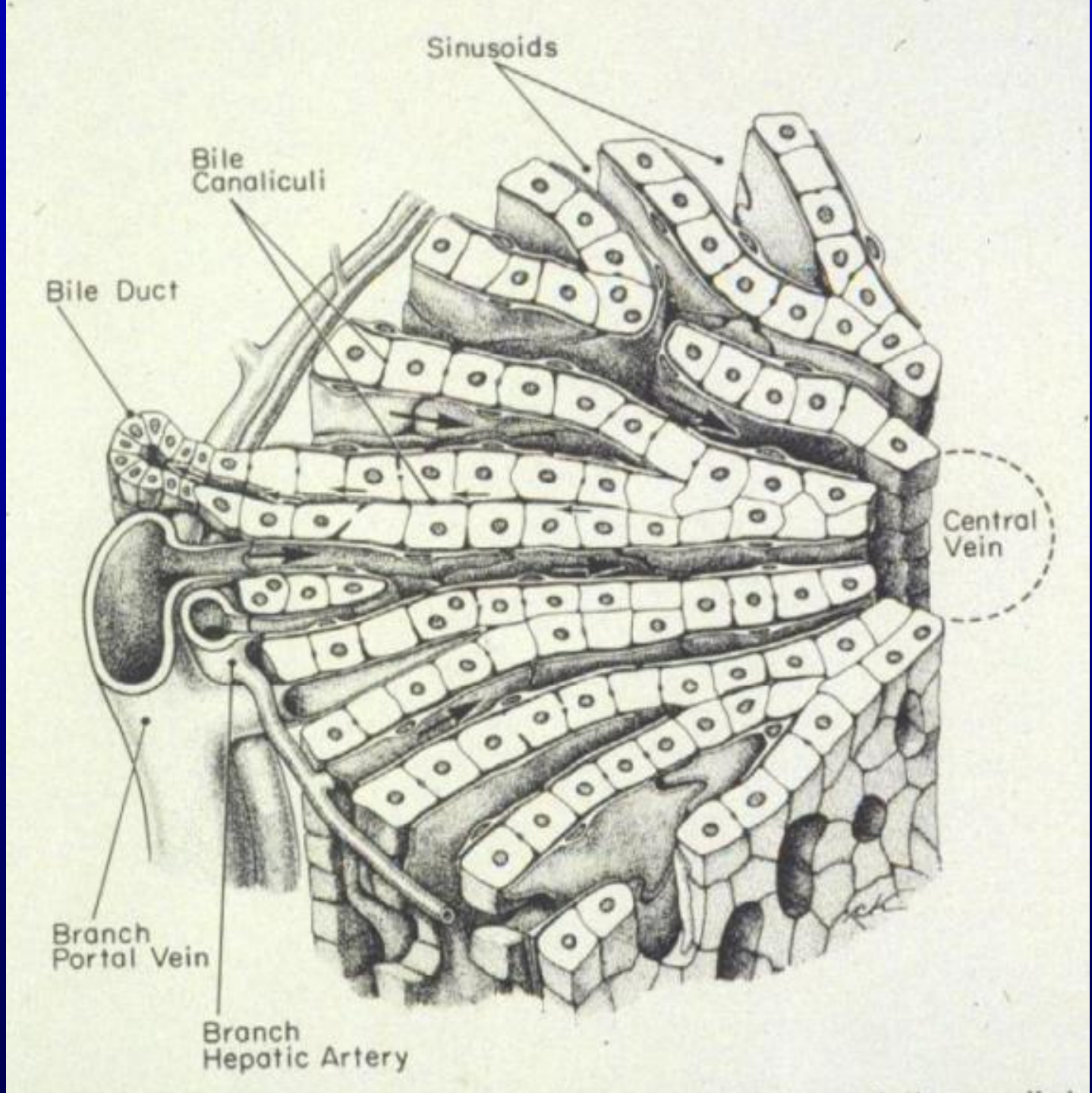
Nutritional metabolism and bile secretion

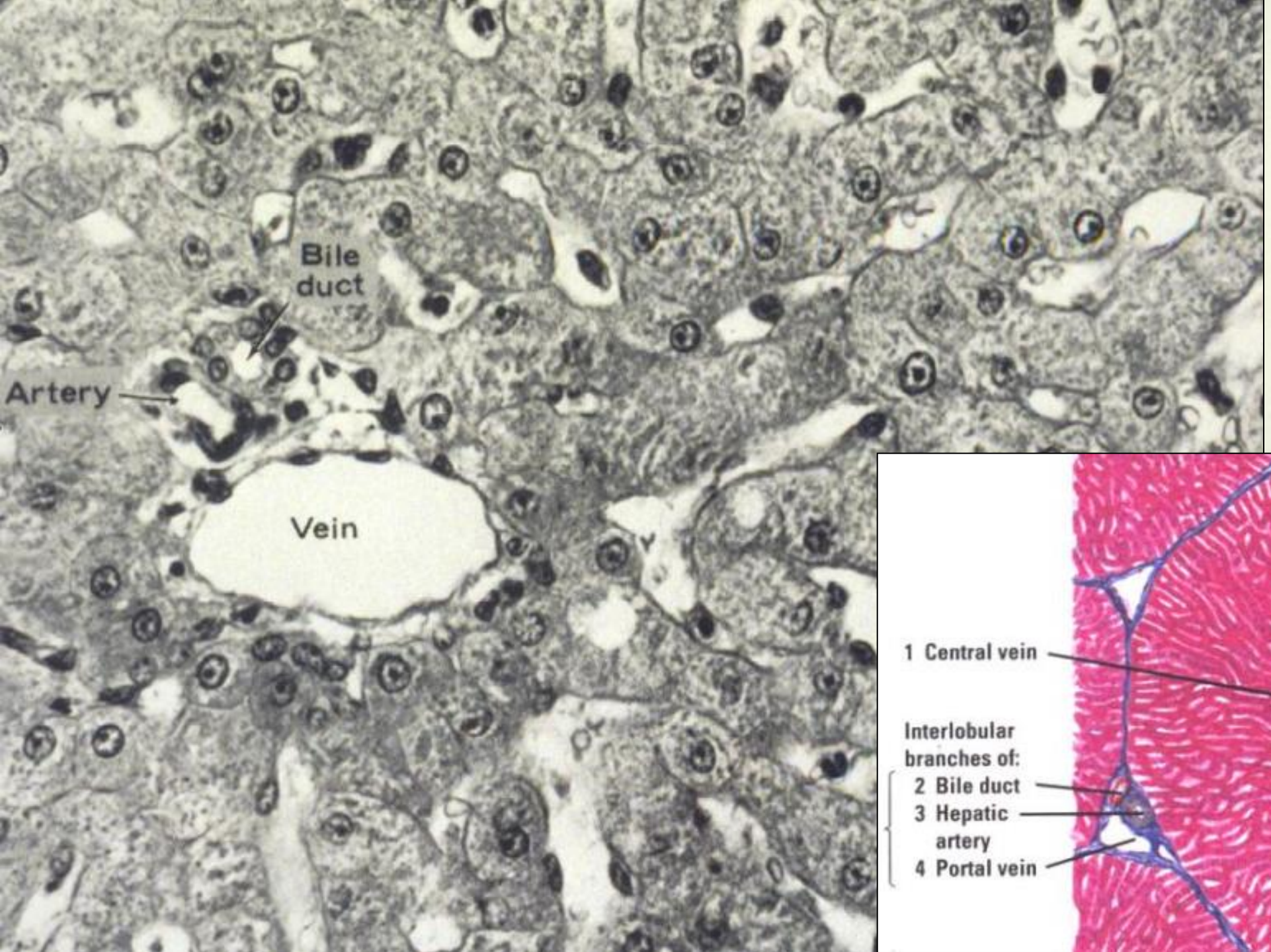
Drug metabolism - drug tolerance

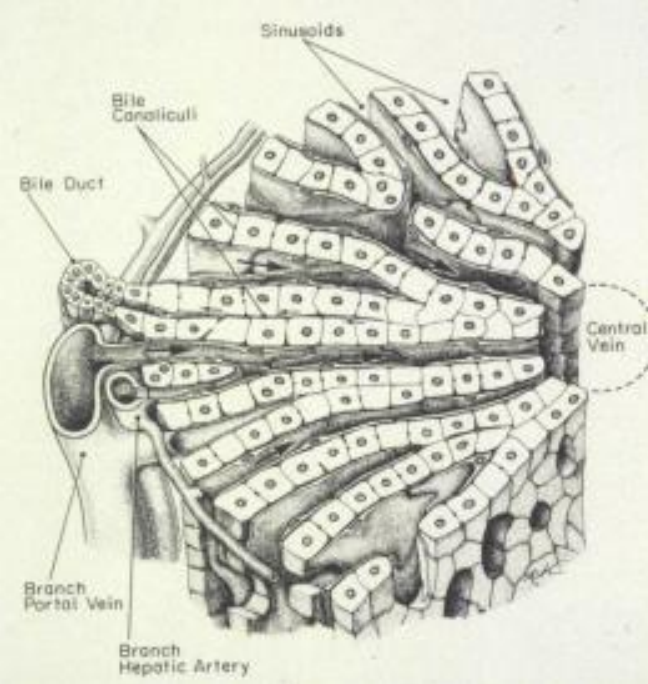
Excretion of bilirubin - jaundice

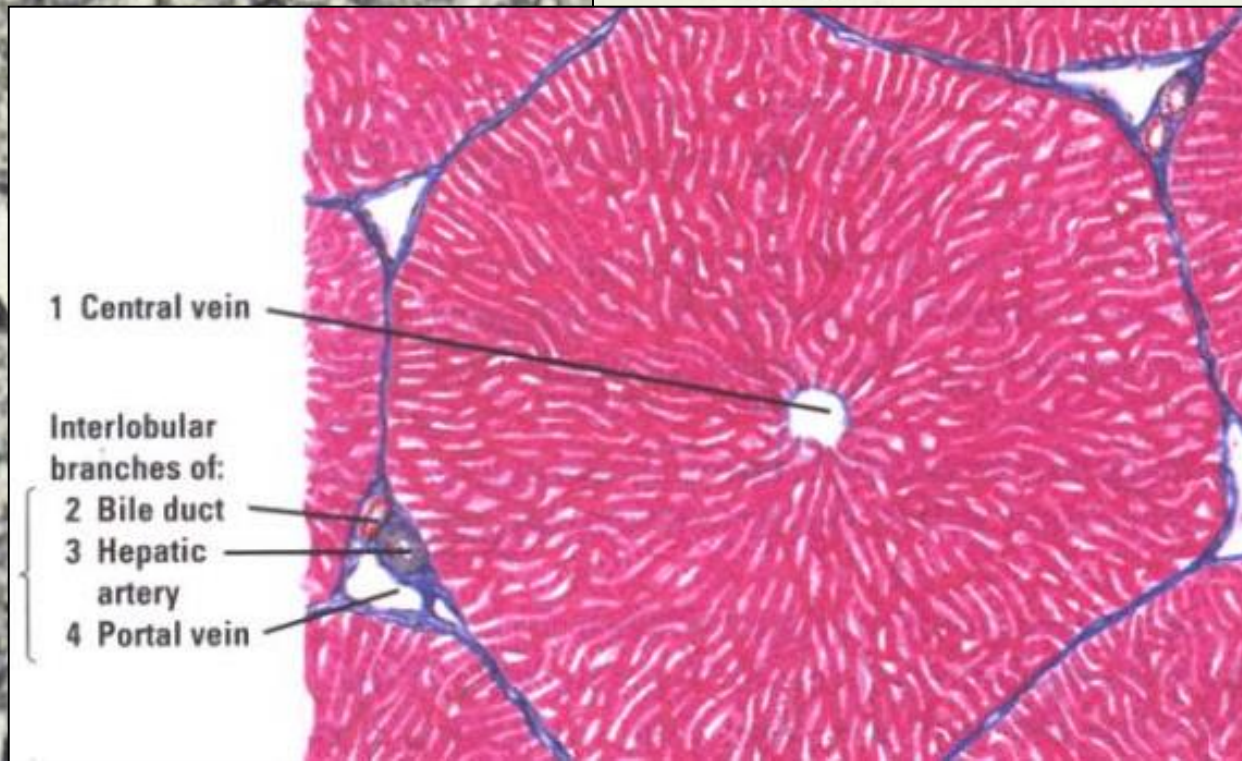
Secrete bile - emulsifying fats




Sinusoids
Bile
Canaliculi
Bile Duct
Central
Vein
Branch
Portal Vein
Branch
Hepatic Artery

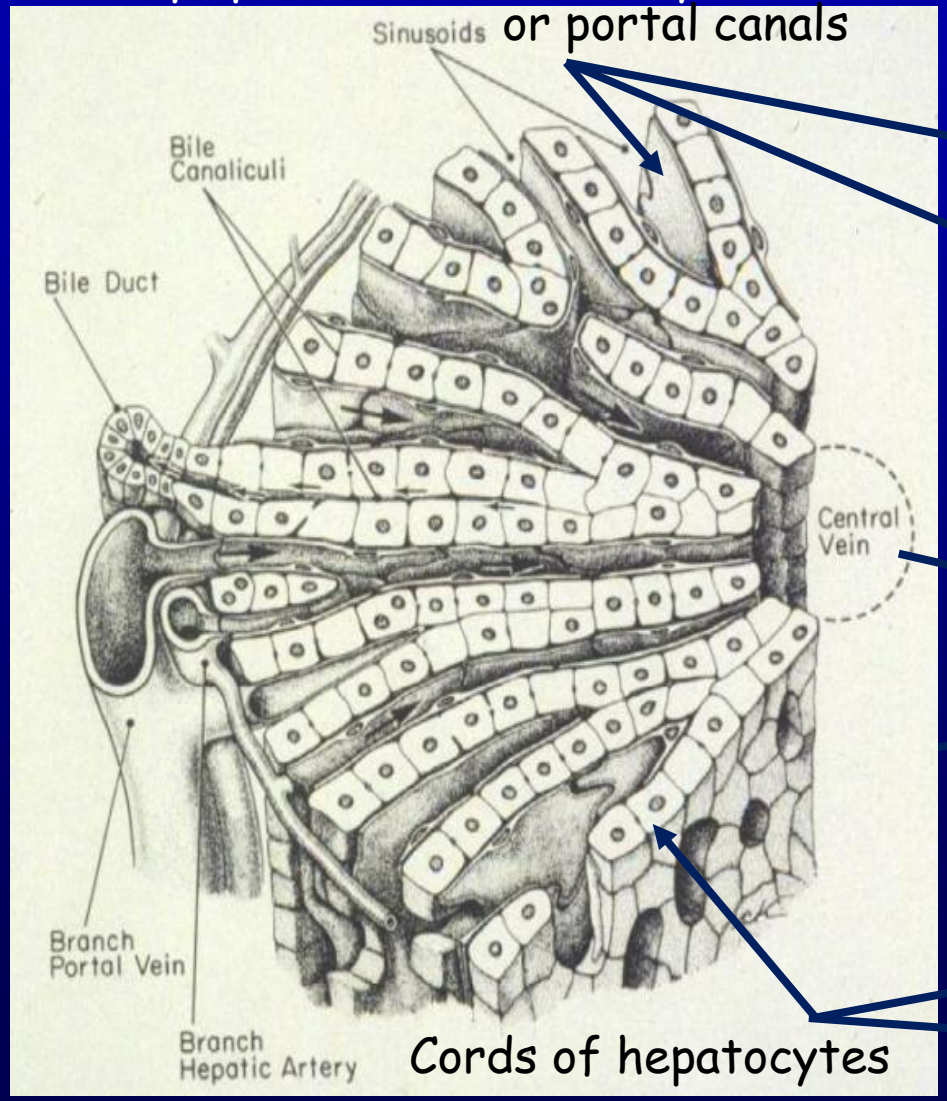

Bile duct
Artery
Vein


Sinusoids
Bile Canaliculi
Bile Duct
Central Vein
Branch Portal Vein
Branch Hepatic Artery

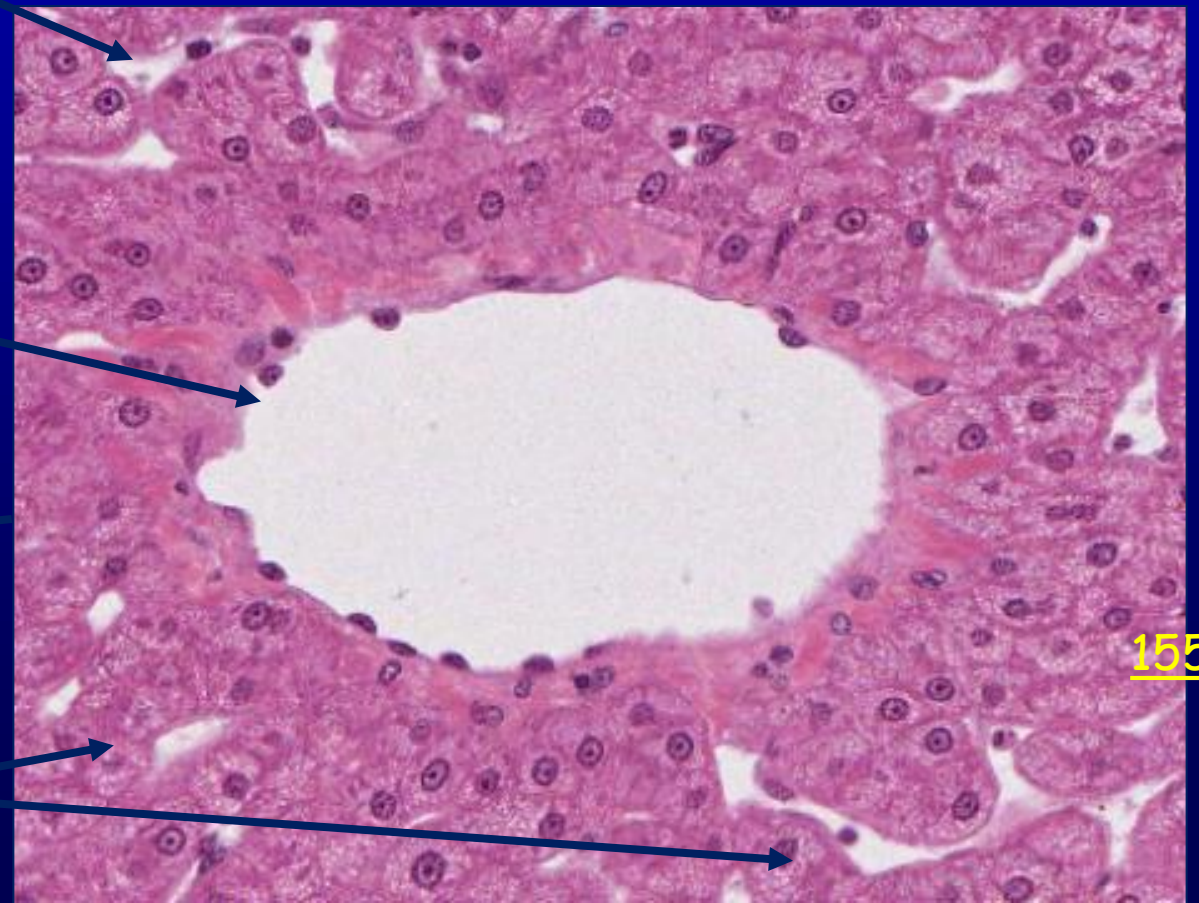

1 Central vein
Interlobular branches of:
2 Bile duct
3 Hepatic artery
4 Portal vein

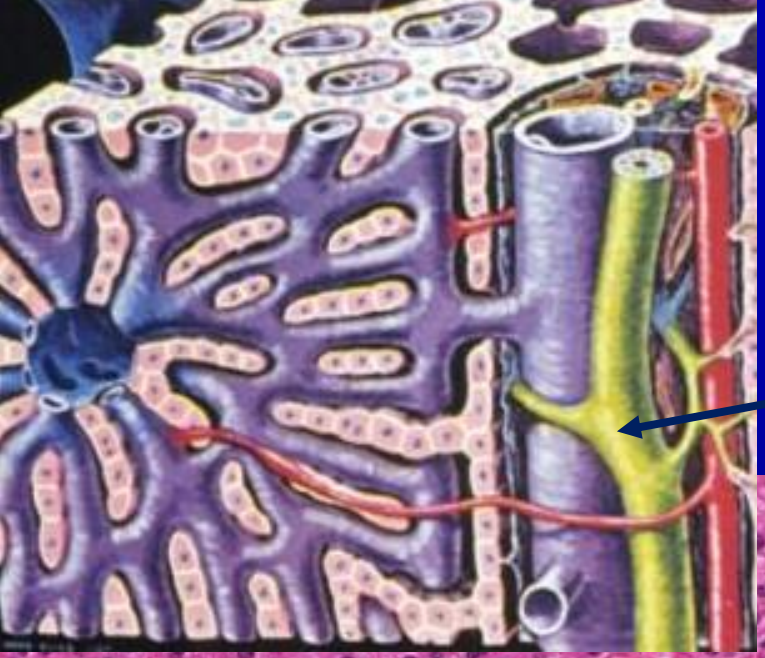
Liver

Portal radicles containing:
A bile duct
Branch of portal vein,
Branch of hepatic artery
Lymphatic vessel (usually)
or portal canals



Cords of hepatocytes





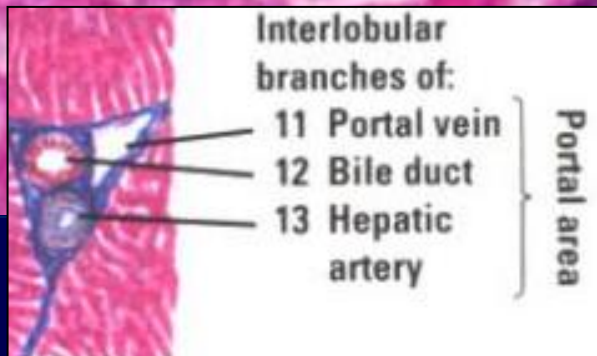
454 Liver

Central vein

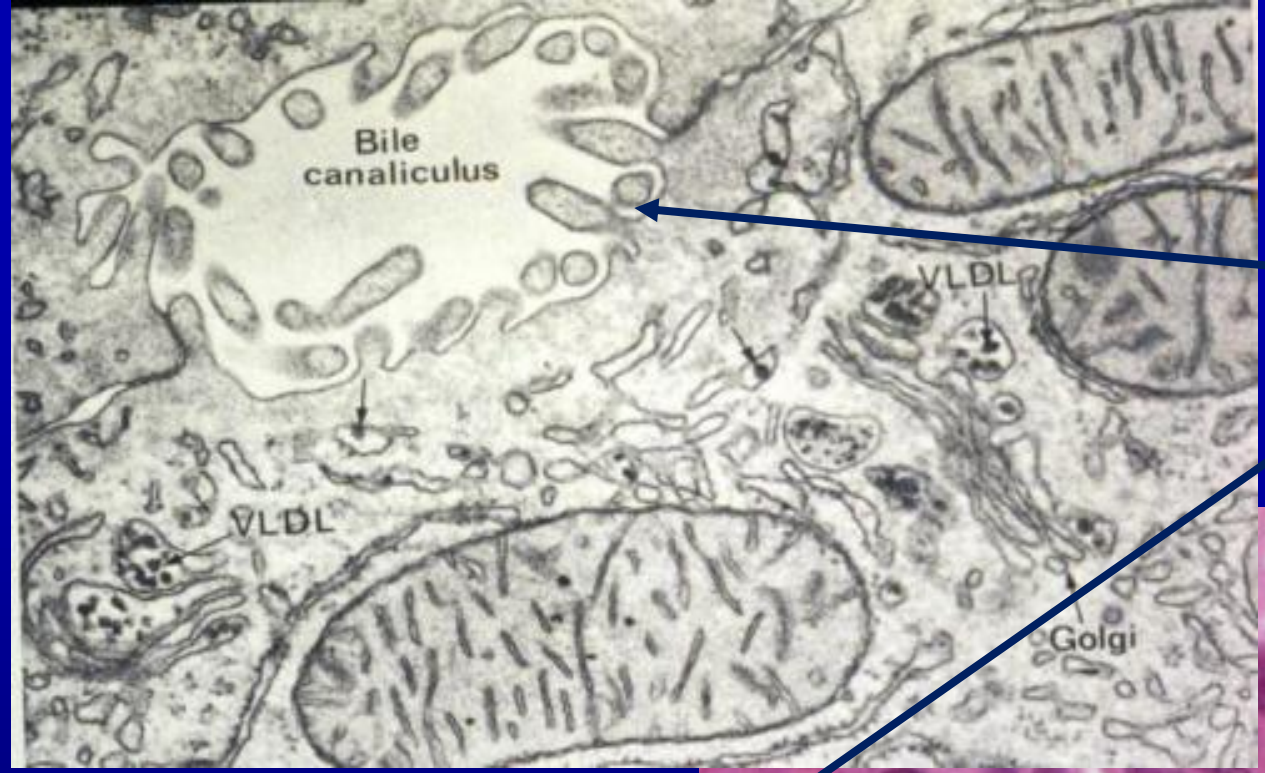
454

Portal radicles containing:
A bile duct
Branch of hepatic artery
Branch of portal vein
Lymphatic vessel (usually)

Cords of hepatocytes

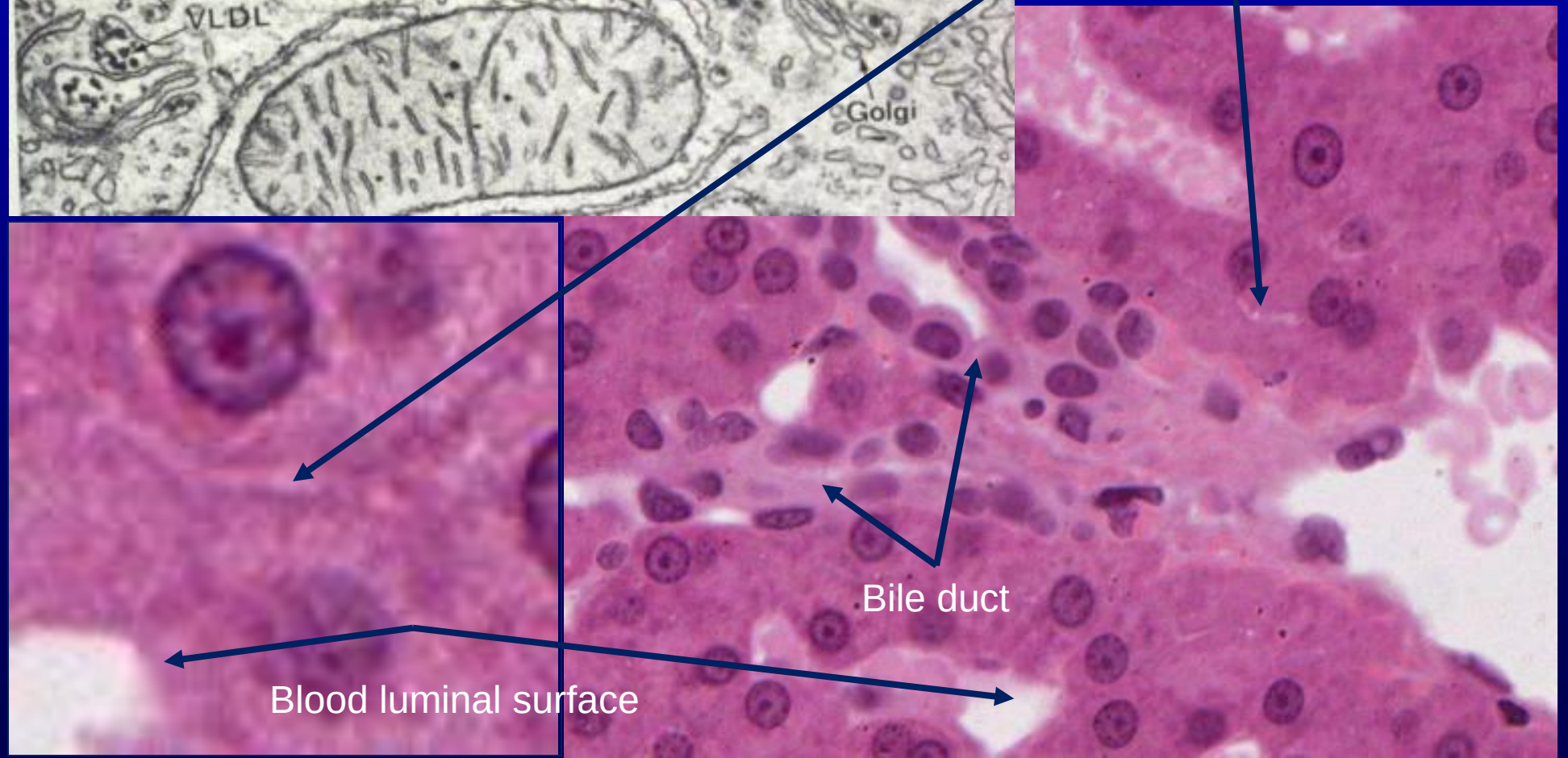


Bile Canaliculi

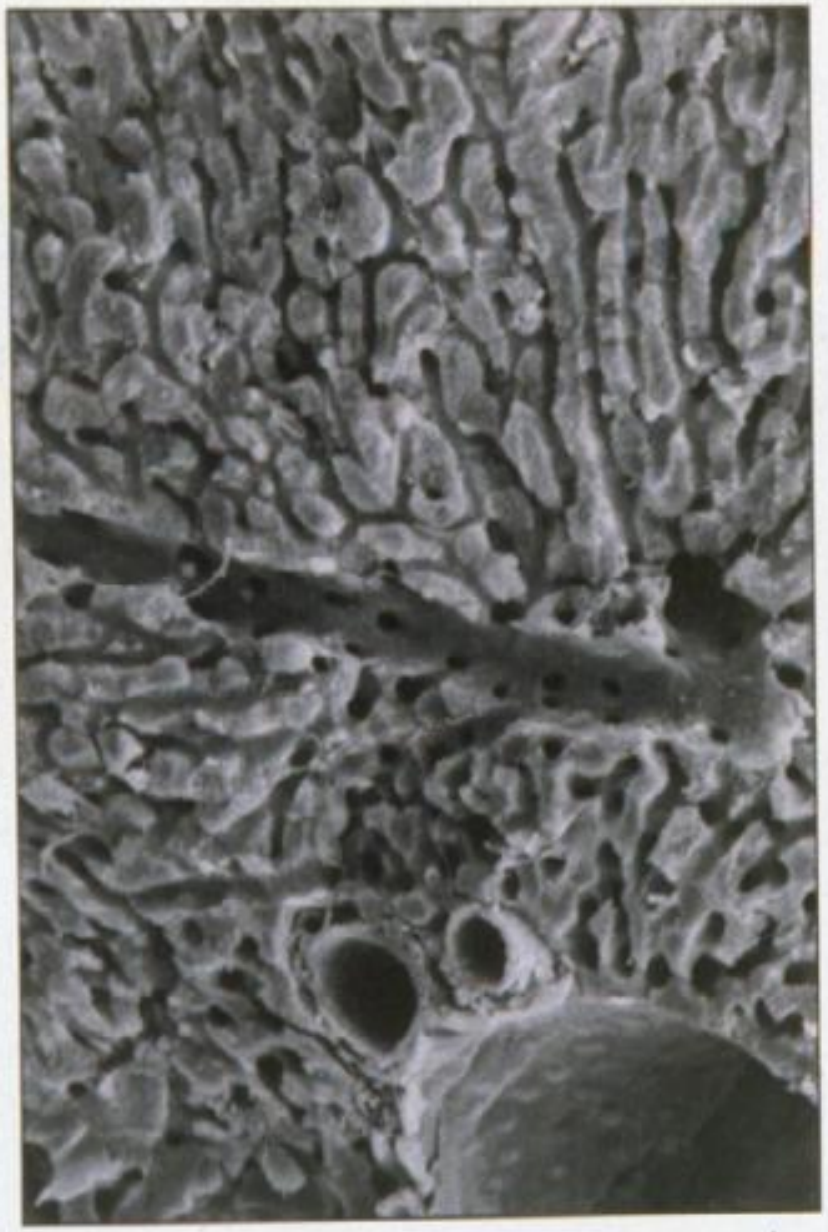


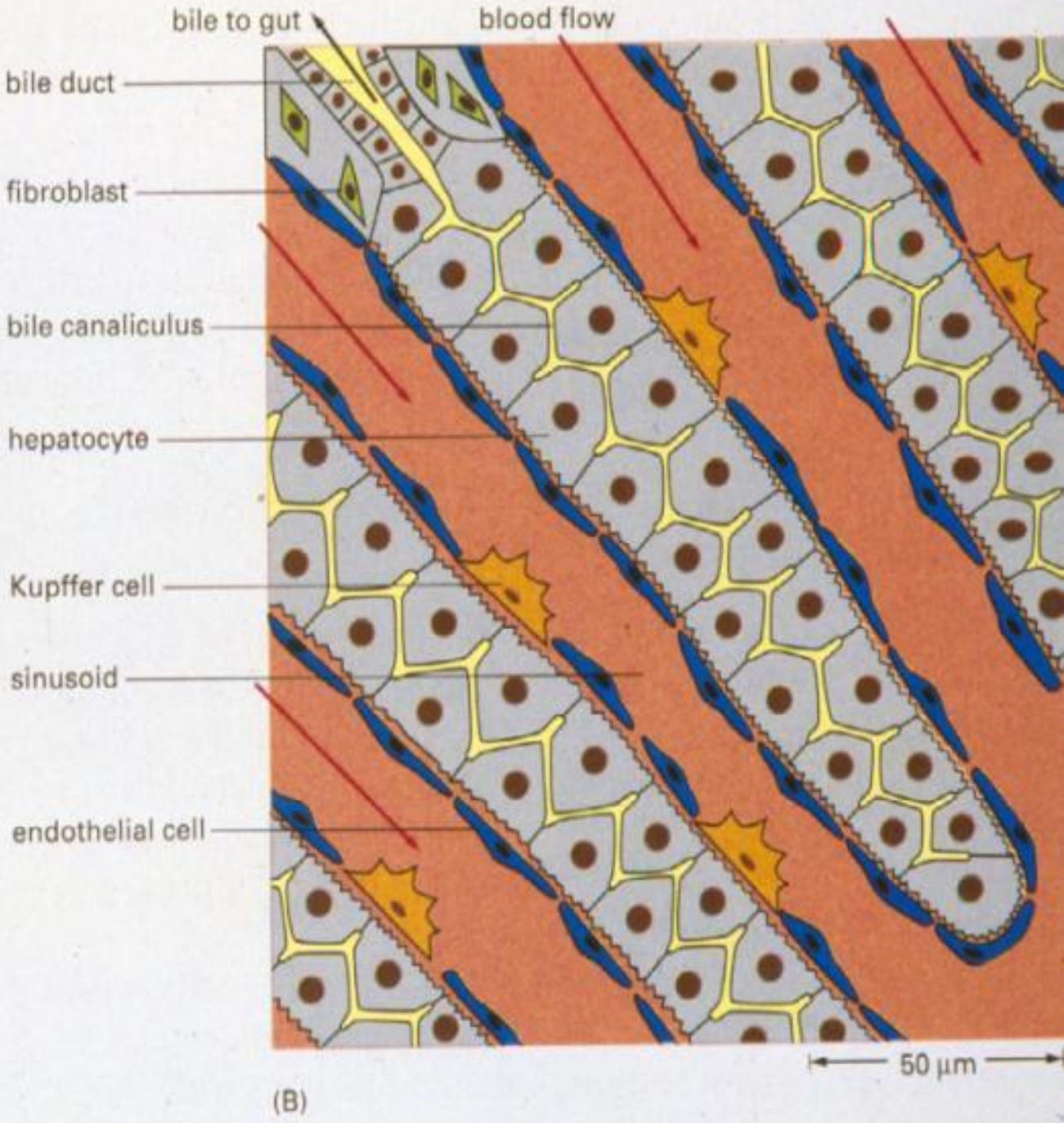
Bile luminal surfaces

155



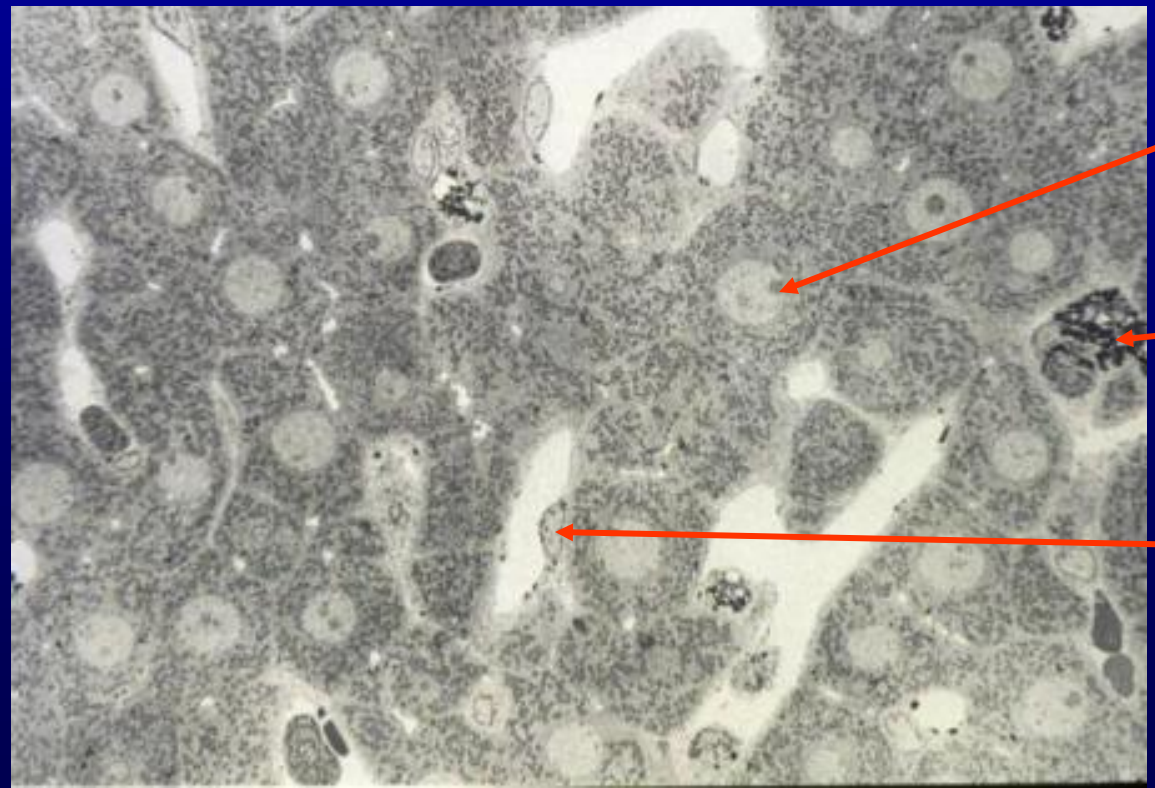
Liver


100 µm
(A)


bile to gut
blood flow
bile duct
fibroblast
bile canaliculus
hepatocyte
Kupffer cell
sinusoid
endothelial cell
50 µm
(B)

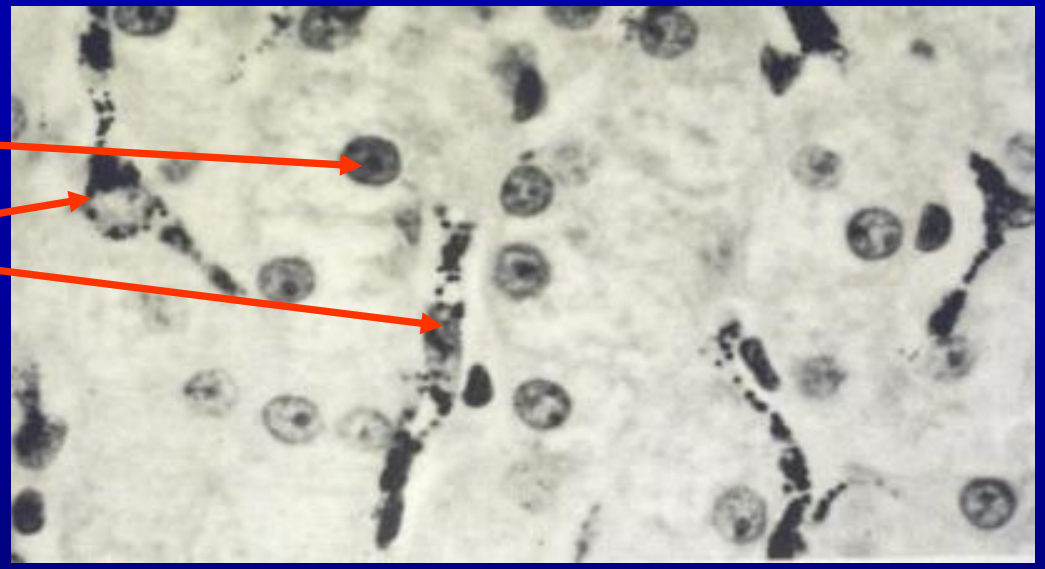
Cells of the Liver Lobule

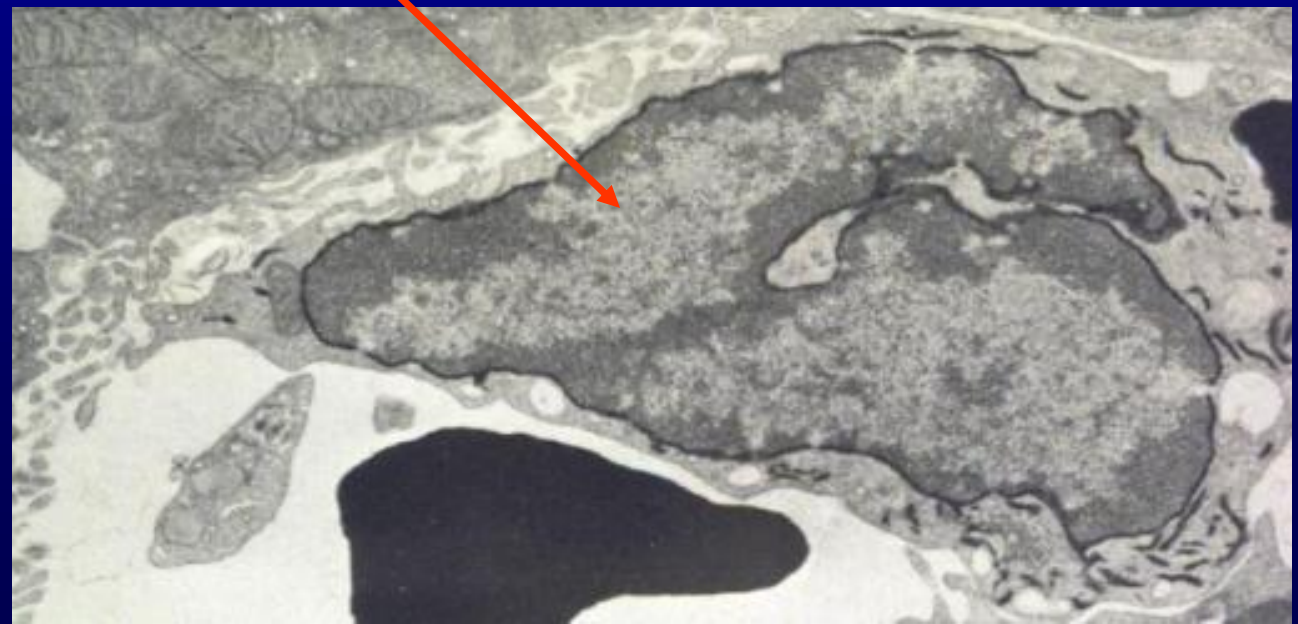
A. Hepatocyte
B. Kupffer and fat-storing cells
C. Endothelial cell



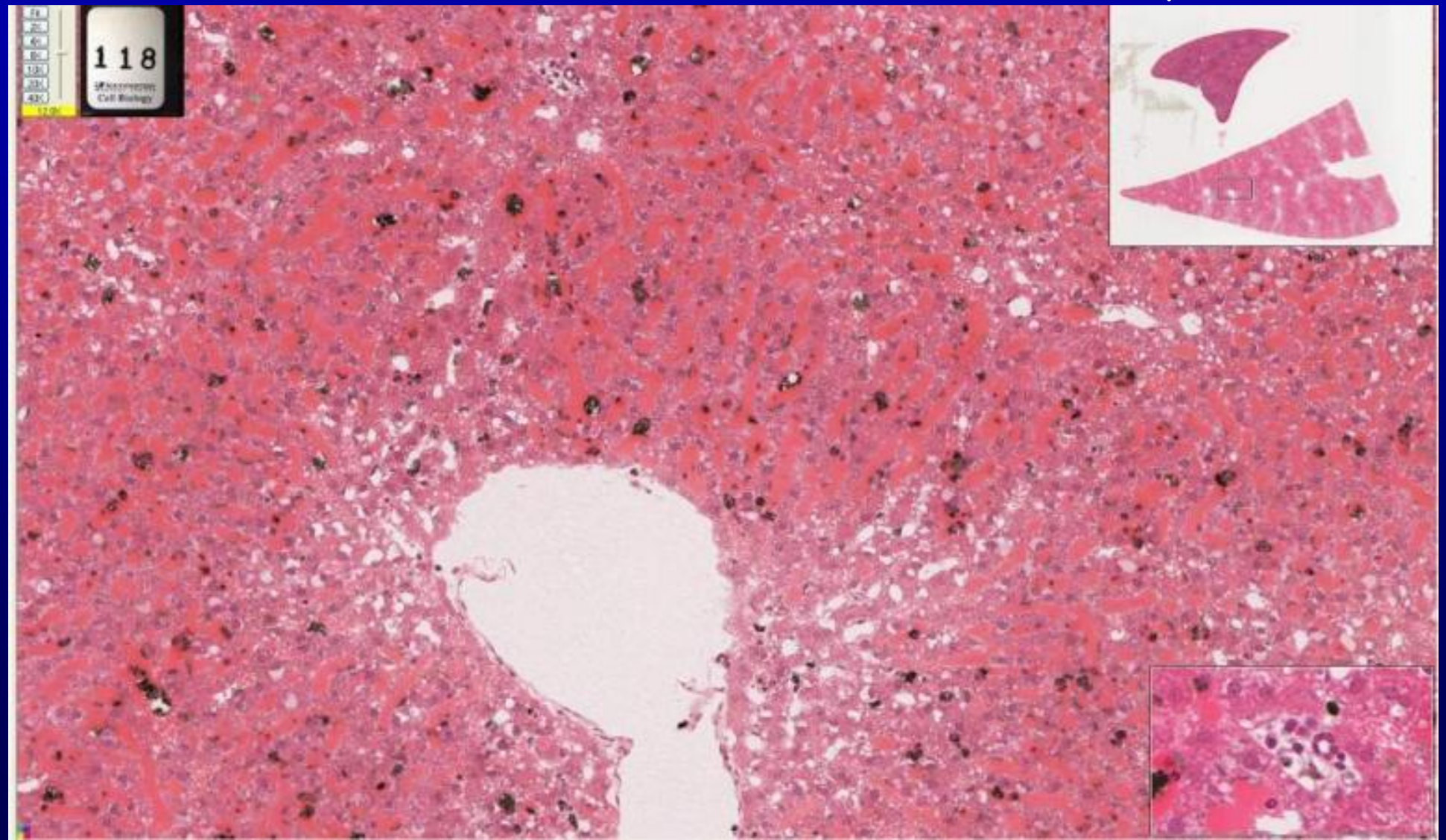
Cells of the Liver Lobule

A. Hepatocyte
B. Kupffer cells
C. Endothelial cell



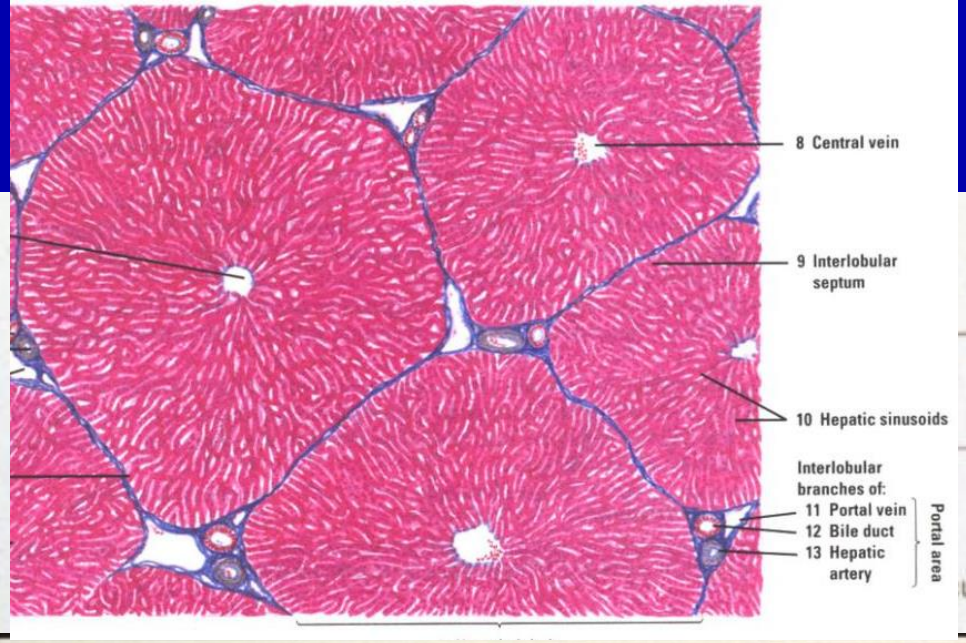


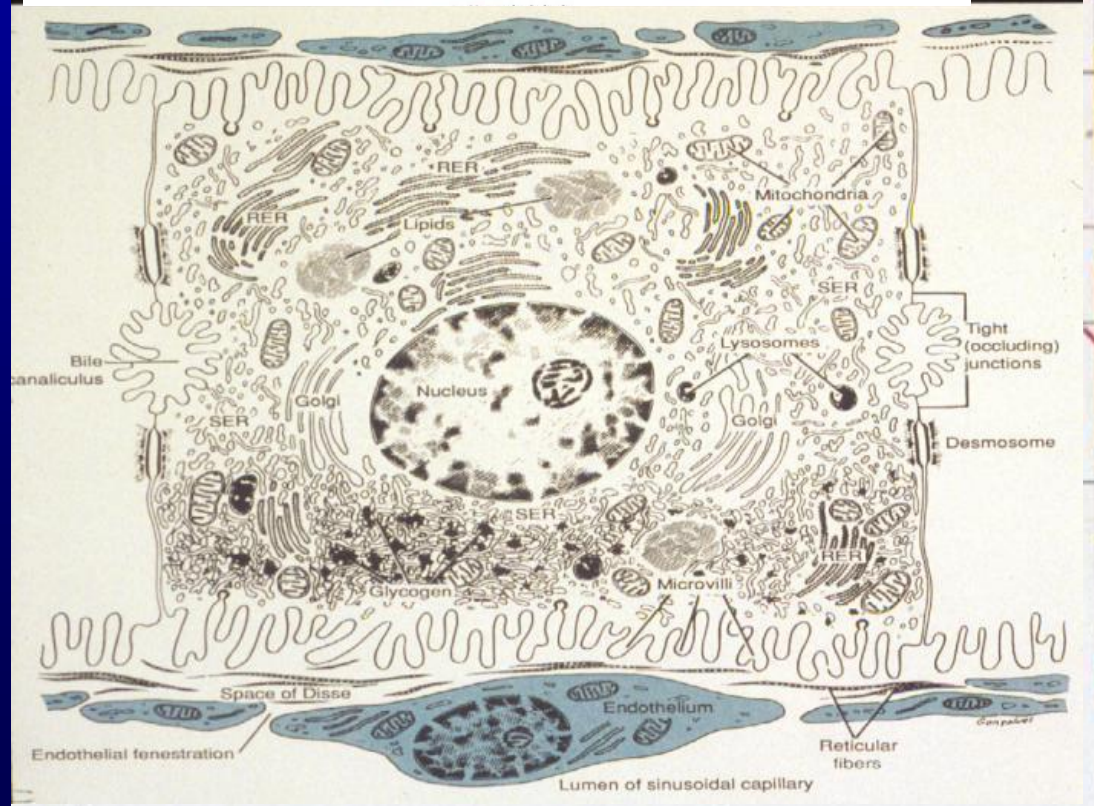
Triad with bile duct and central vein Liver with colloidal carbon, rat

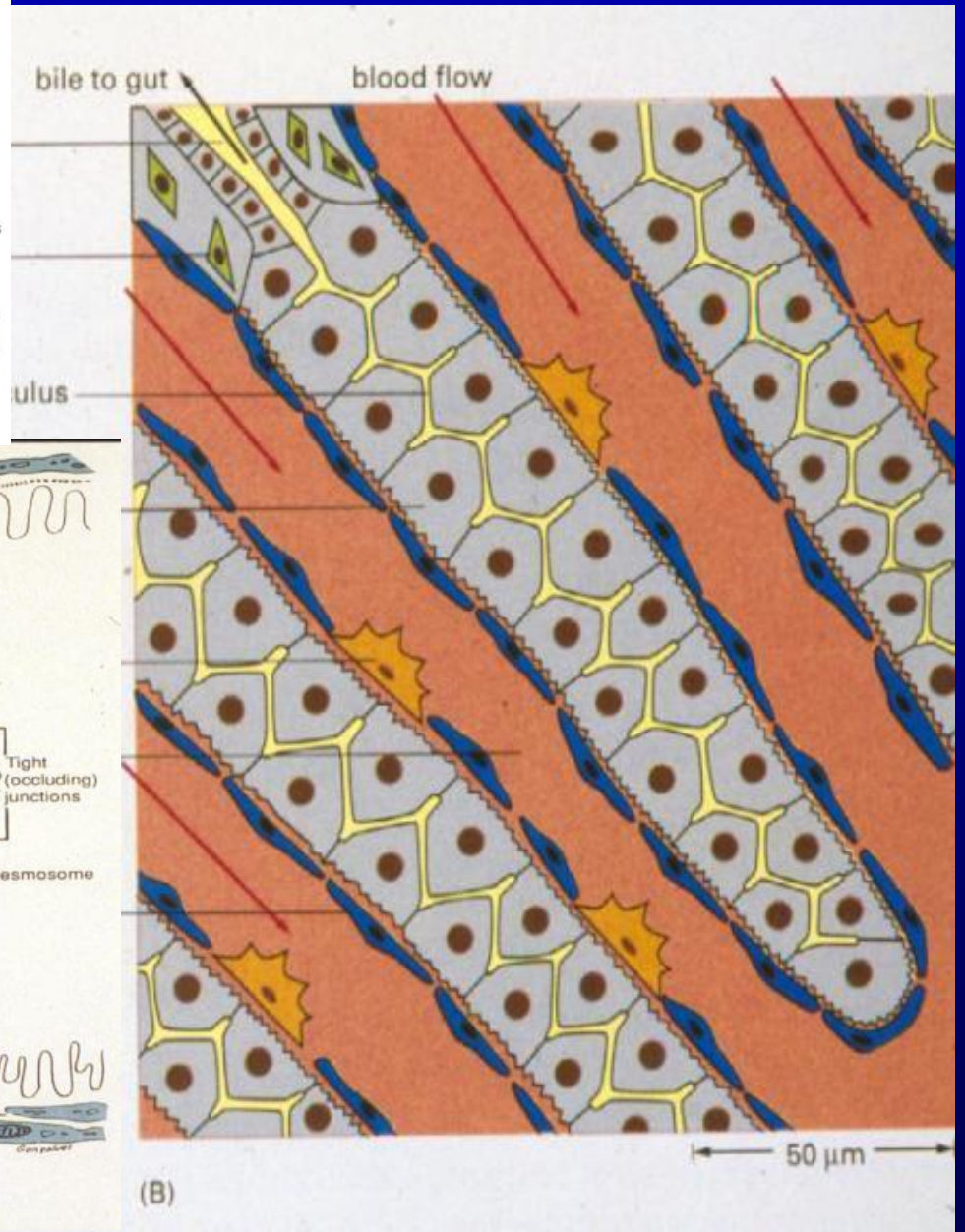


118

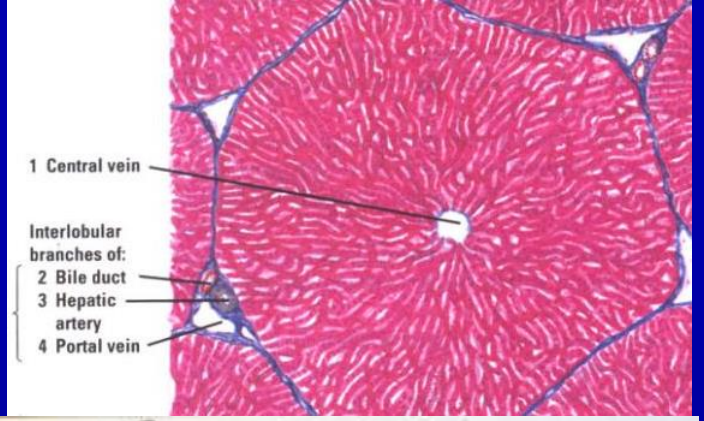
Liver


8 Central vein
9 Interlobular septum
10 Hepatic sinusoids
Interlobular branches of:
11 Portal vein
12 Bile duct
13 Hepatic artery
Portal area


RER
RER
Lipids
Mitochondria
SER
Lysosomes
Tight (occluding) junctions
Bile canaliculus
Golgi
Nucleus
SER
Golgi
Desmosome
SER
RER
Glycogen
Microvilli
Space of Disse
Endothelium
Endothelial fenestration
Reticular fibers
Lumen of sinusoidal capillary


bile to gut
blood flow
50 µm
(B)

Liver Lobule



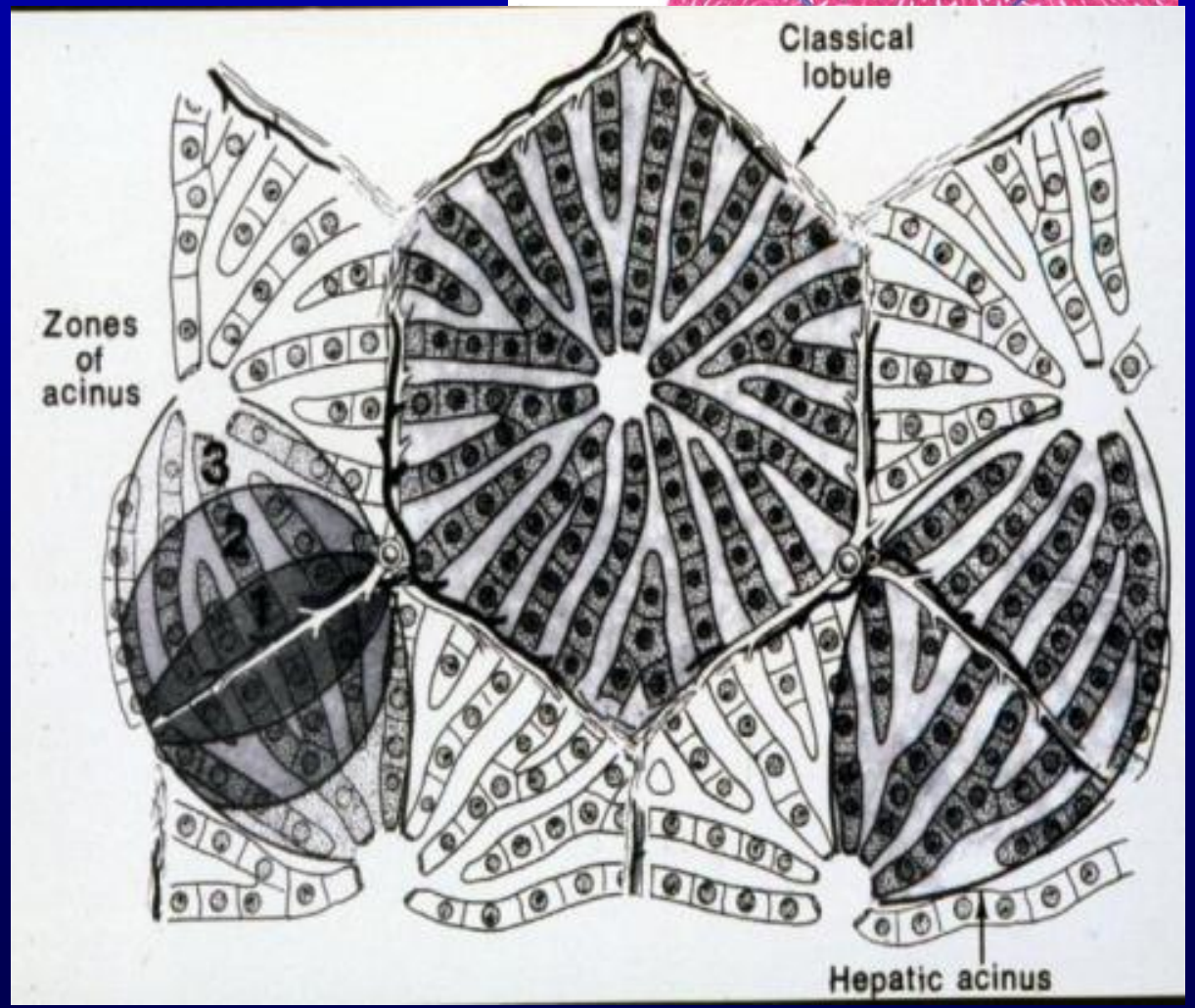
Portal triad

Blood supply

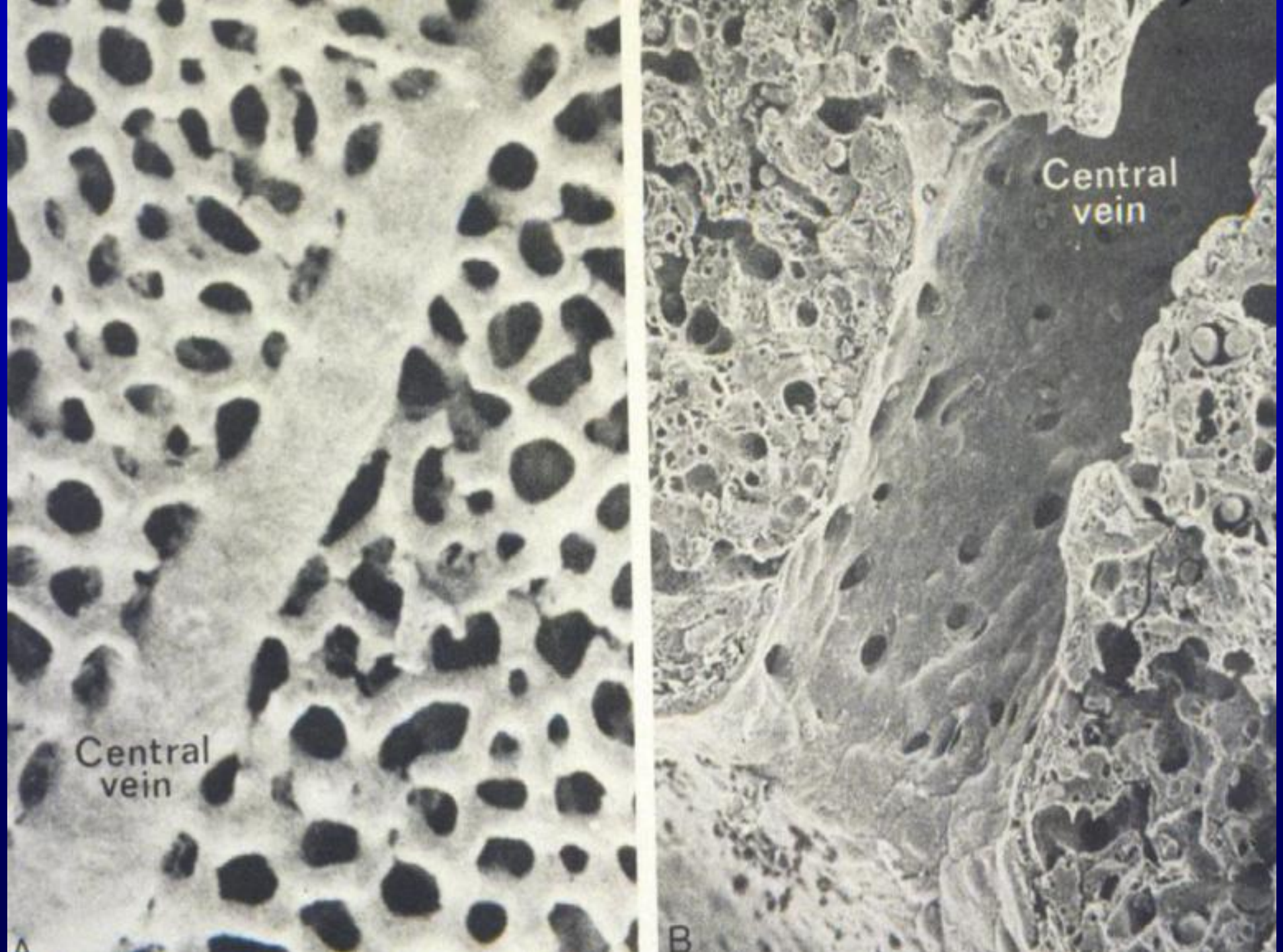
Central vein

Hepatic sinusoids

Zonation of the liver




Artery
Vein
Sinusoids


Central vein
Central vein
A
B

Acinus with portal vein and artery in center

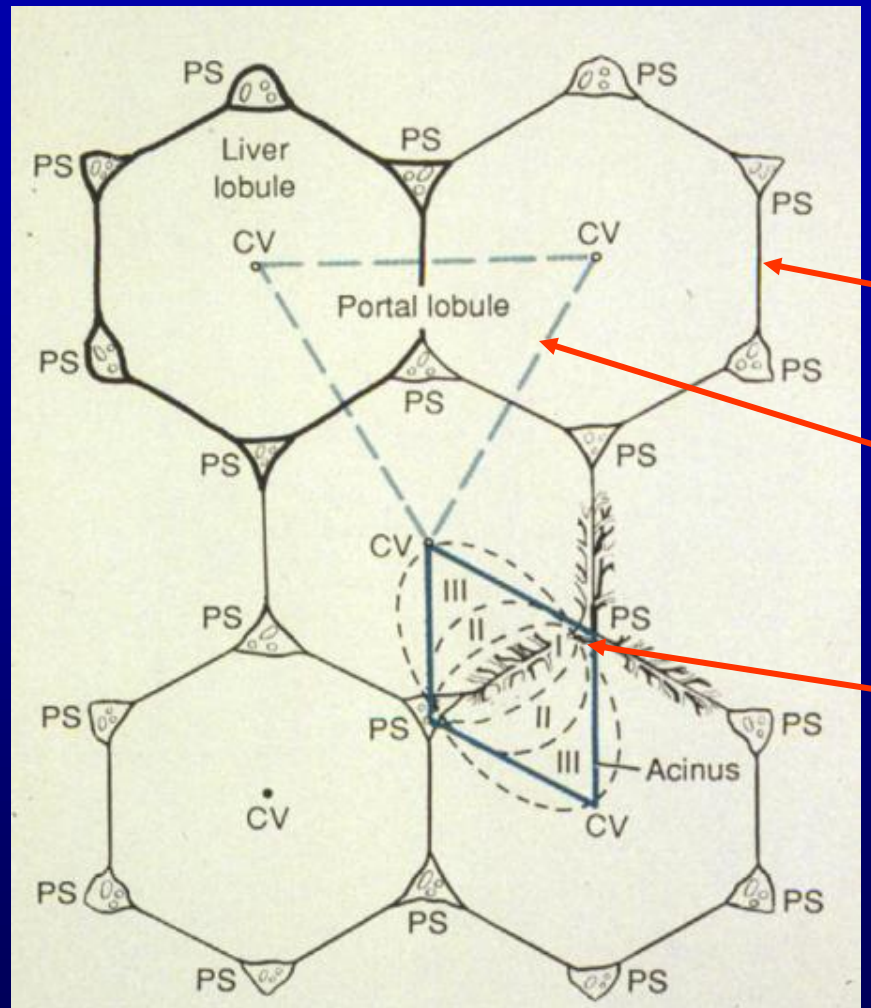
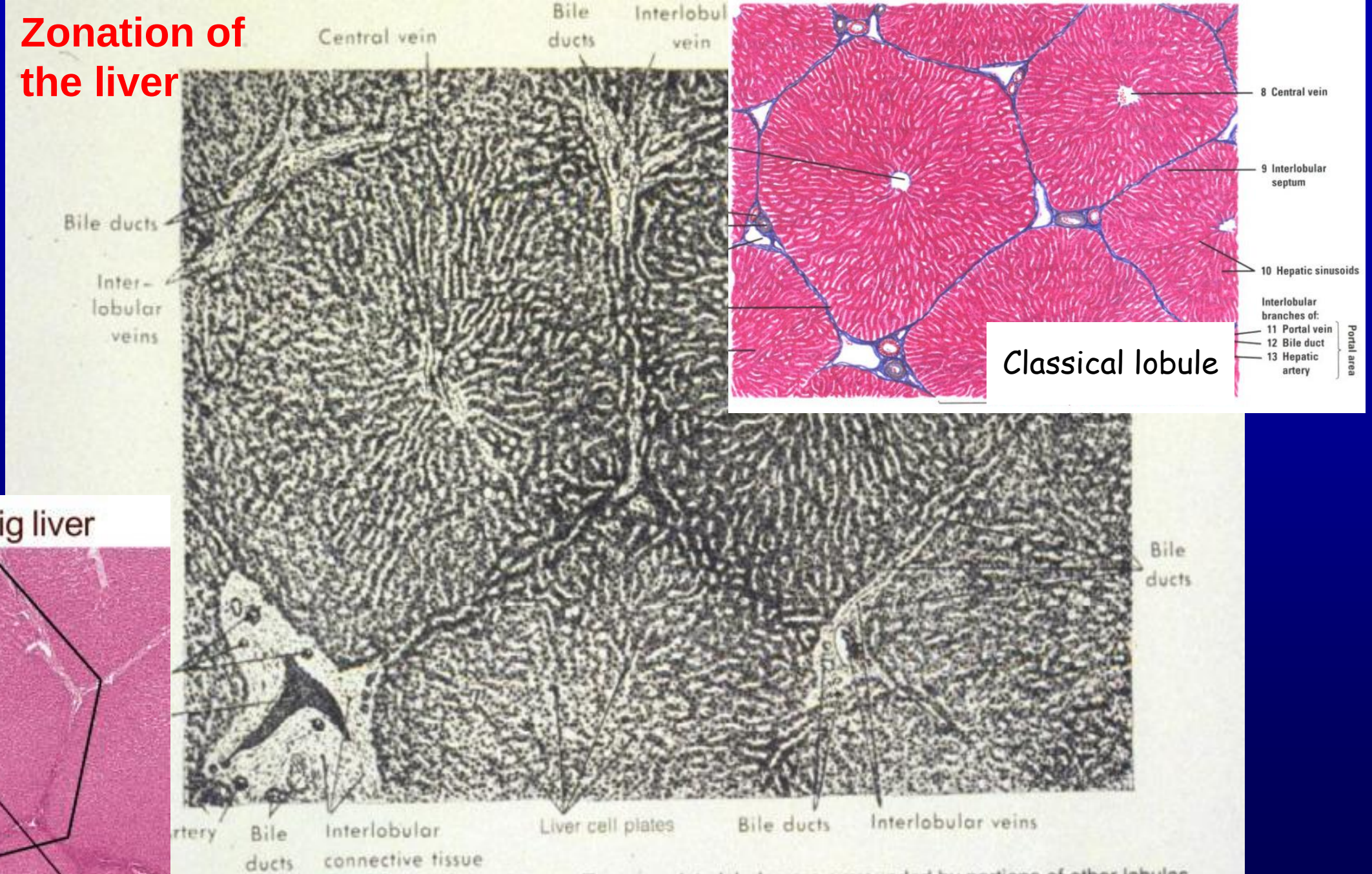


Figure 16–16. Schematic drawing illustrating the territories of the classic liver lobules, hepatic acini, and portal lobules. The classic lobule has a central vein (CV) and is outlined by the solid lines that connect the portal spaces

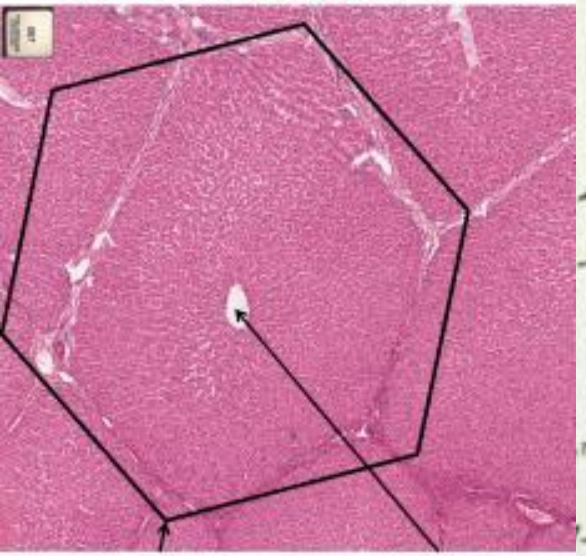
Zonation of The Liver

1. Classical lobule
2. Portal lobule with triad in center
3. Acinus layers between two central veins

Zonation of the liver



Slide 67: Pig liver



–2. Portion of liver from a 22-year-old man. Two complete lobules are surrounded by portions of other lobules.
ter Sobotta.)

Portal Lobule
with Triad in Center

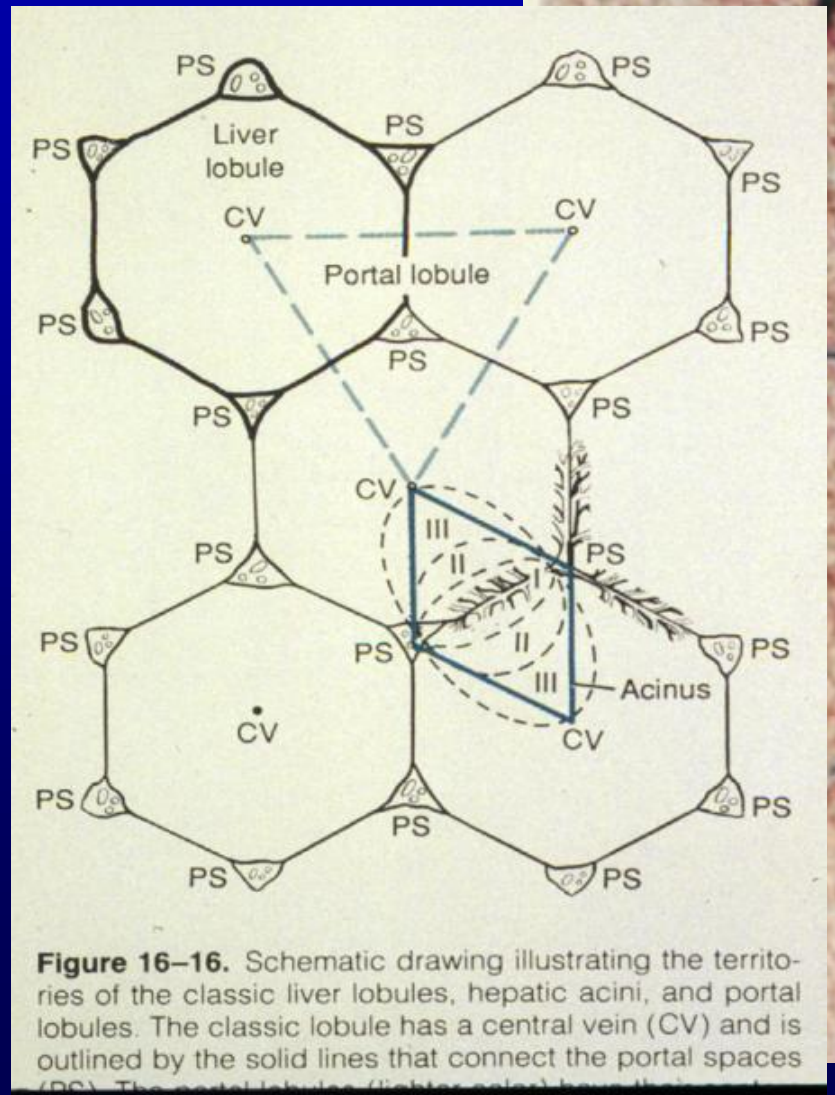
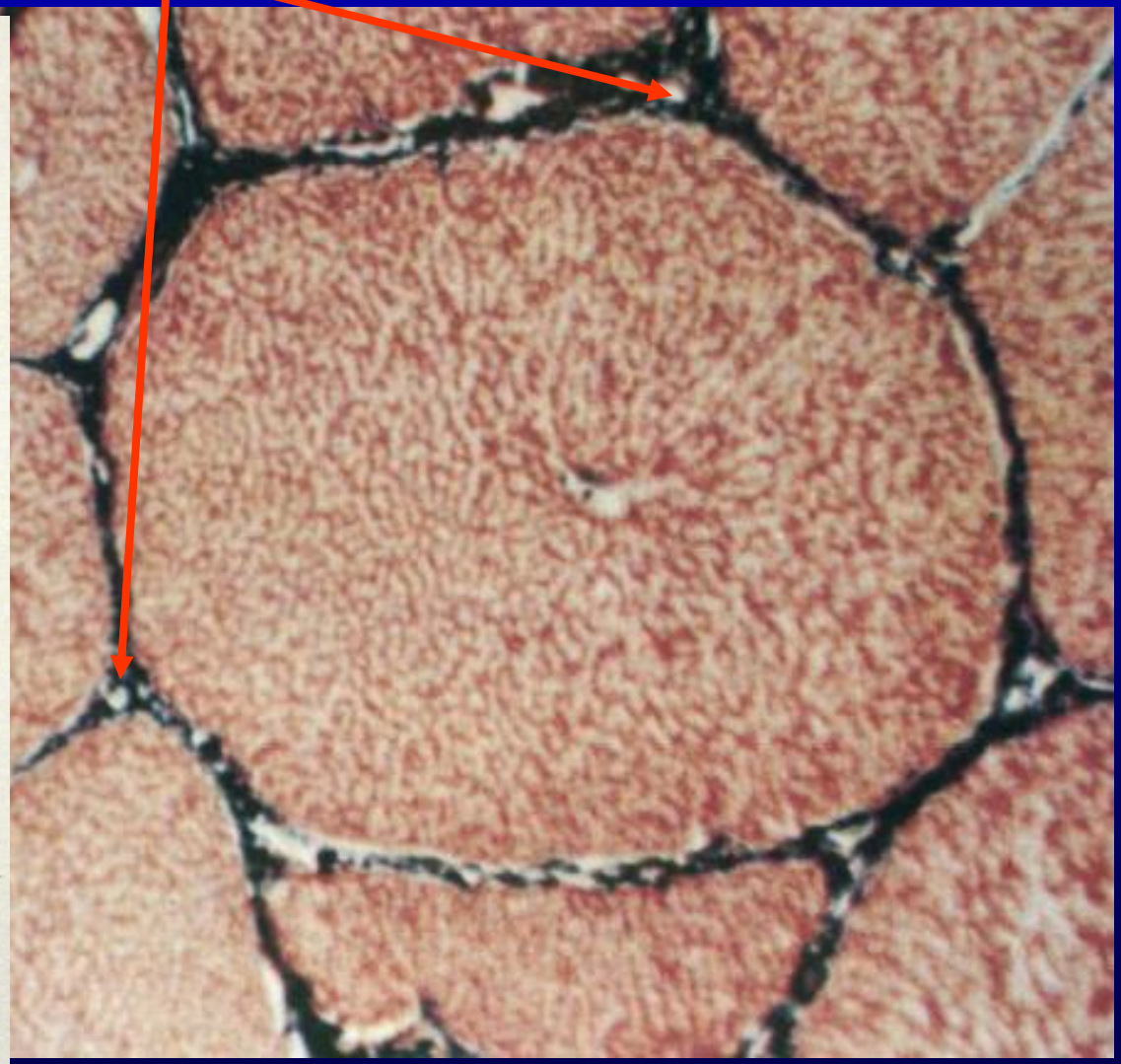


Figure 16–16. Schematic drawing illustrating the territories of the classic liver lobules, hepatic acini, and portal lobules. The classic lobule has a central vein (CV) and is outlined by the solid lines that connect the portal spaces



Acinus with portal vein and artery in center

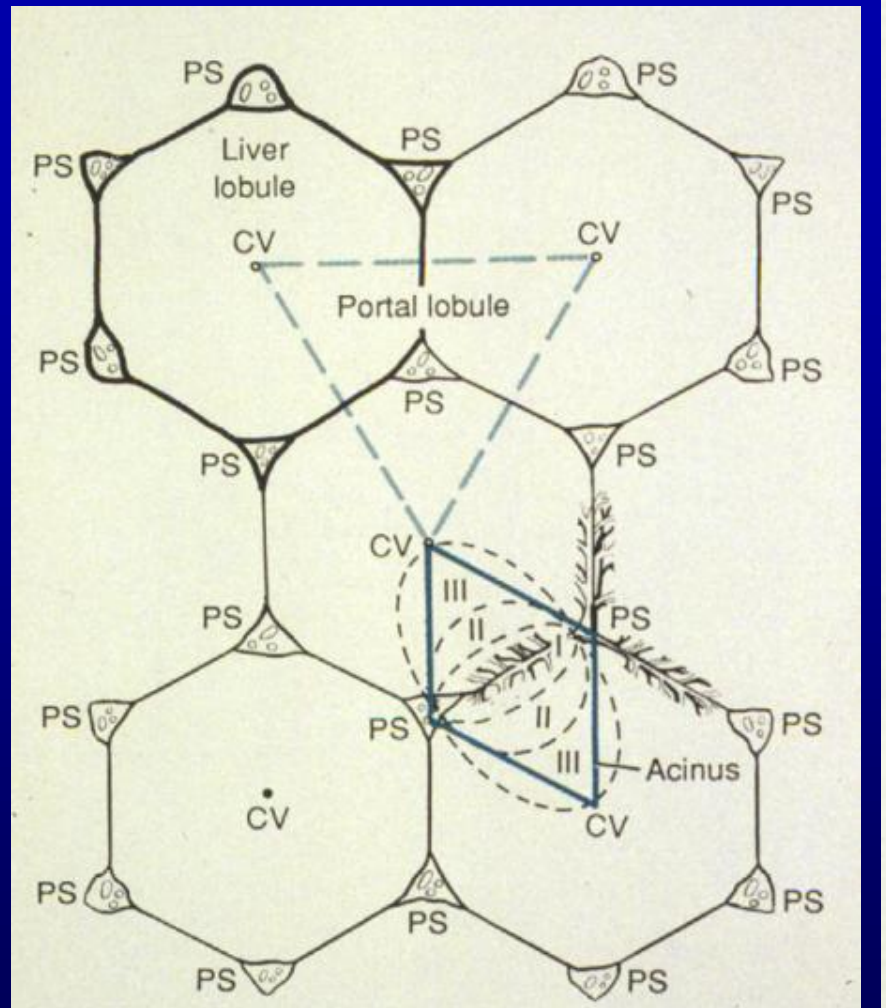


Figure 16–16. Schematic drawing illustrating the territories of the classic liver lobules, hepatic acini, and portal lobules. The classic lobule has a central vein (CV) and is outlined by the solid lines that connect the portal spaces

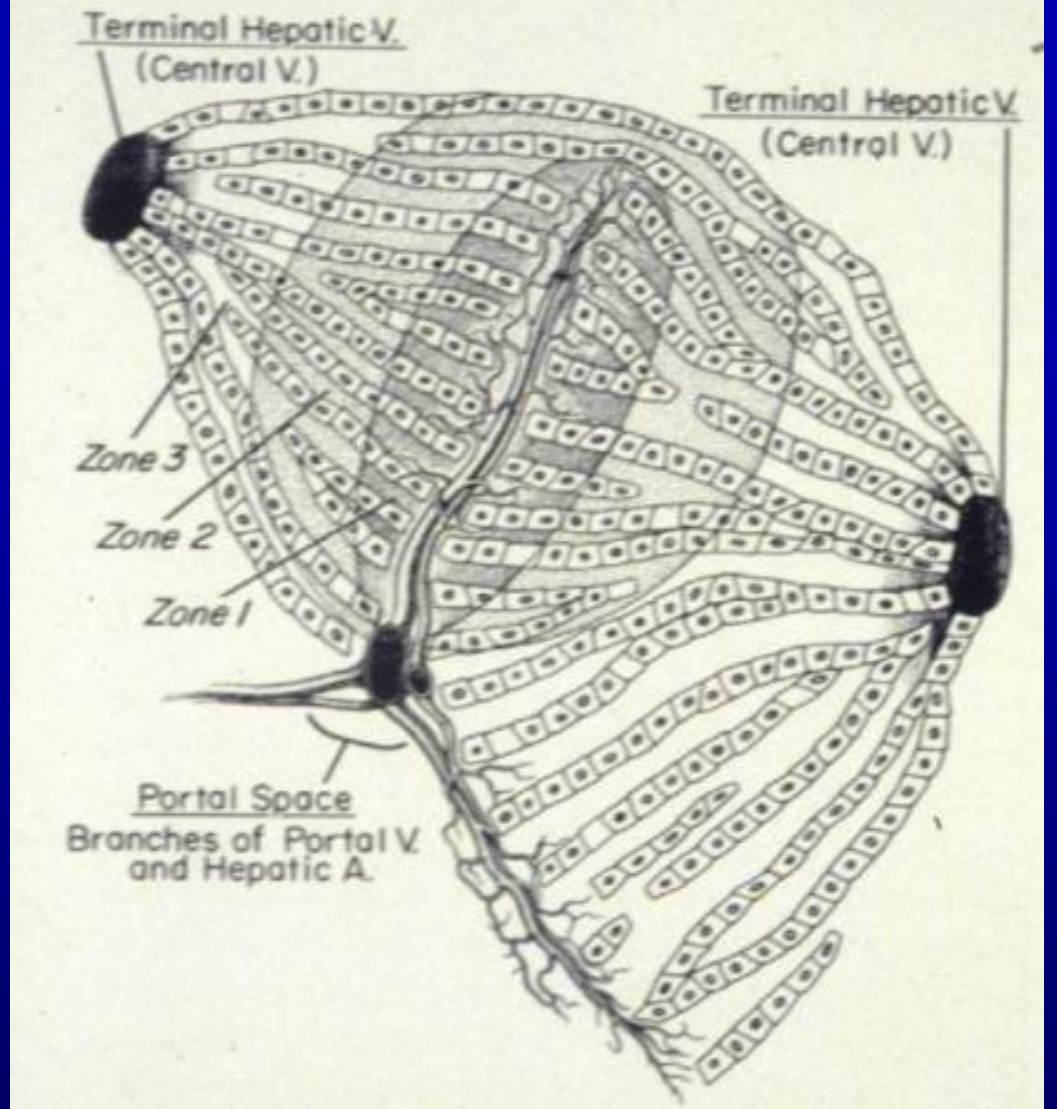
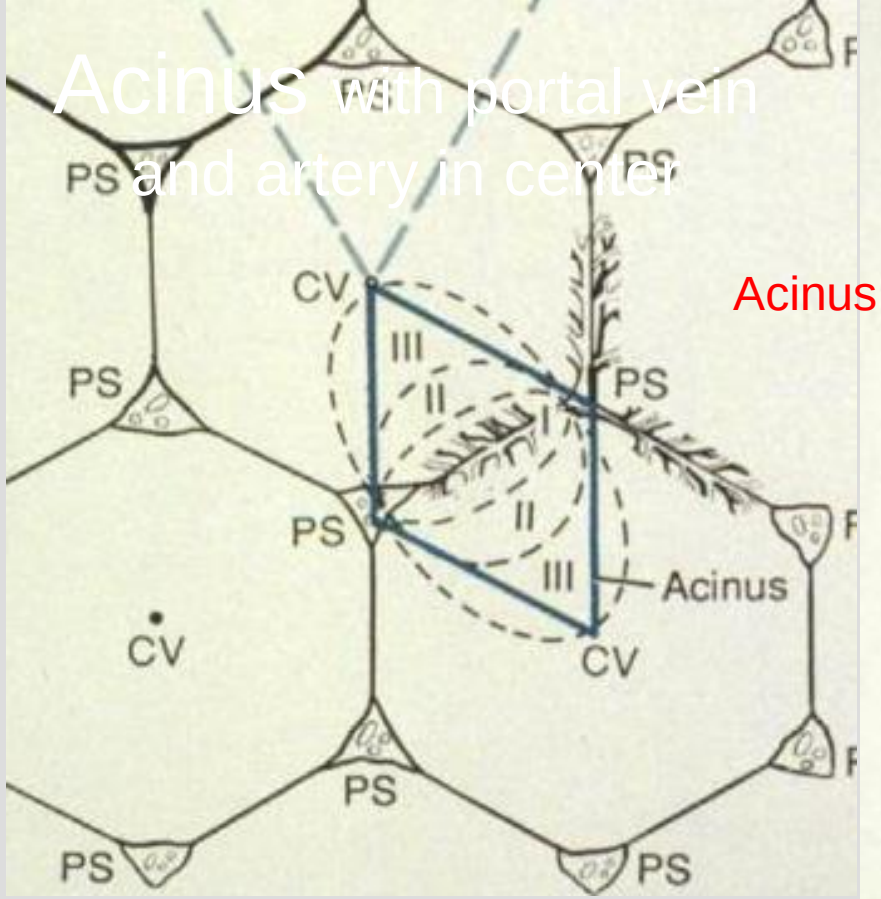


Figure 27–13. Diagram of the acinus, consisting of parenchyma centered around the terminal branches of the hepatic artery and portal vein. The cells in zone-1 have first call on the incoming oxygen and nutrients. The cells of zone-2 are less favored, and those of zone-3 are least favorably situated. (Redrawn after Rappaport, A.M. et al. 1954. Anat. Rec. 119:11.)

Acinus with portal vein and artery in center



Acinus

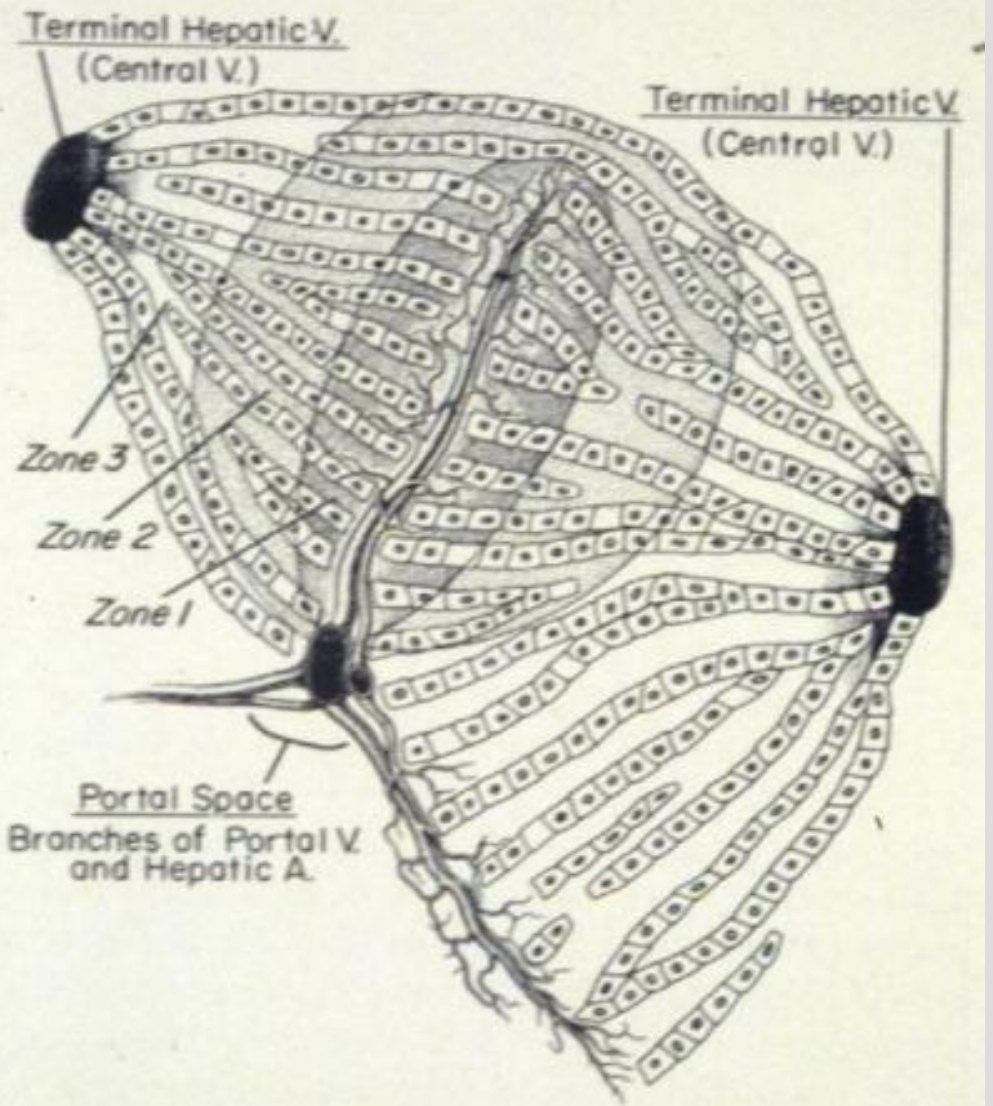
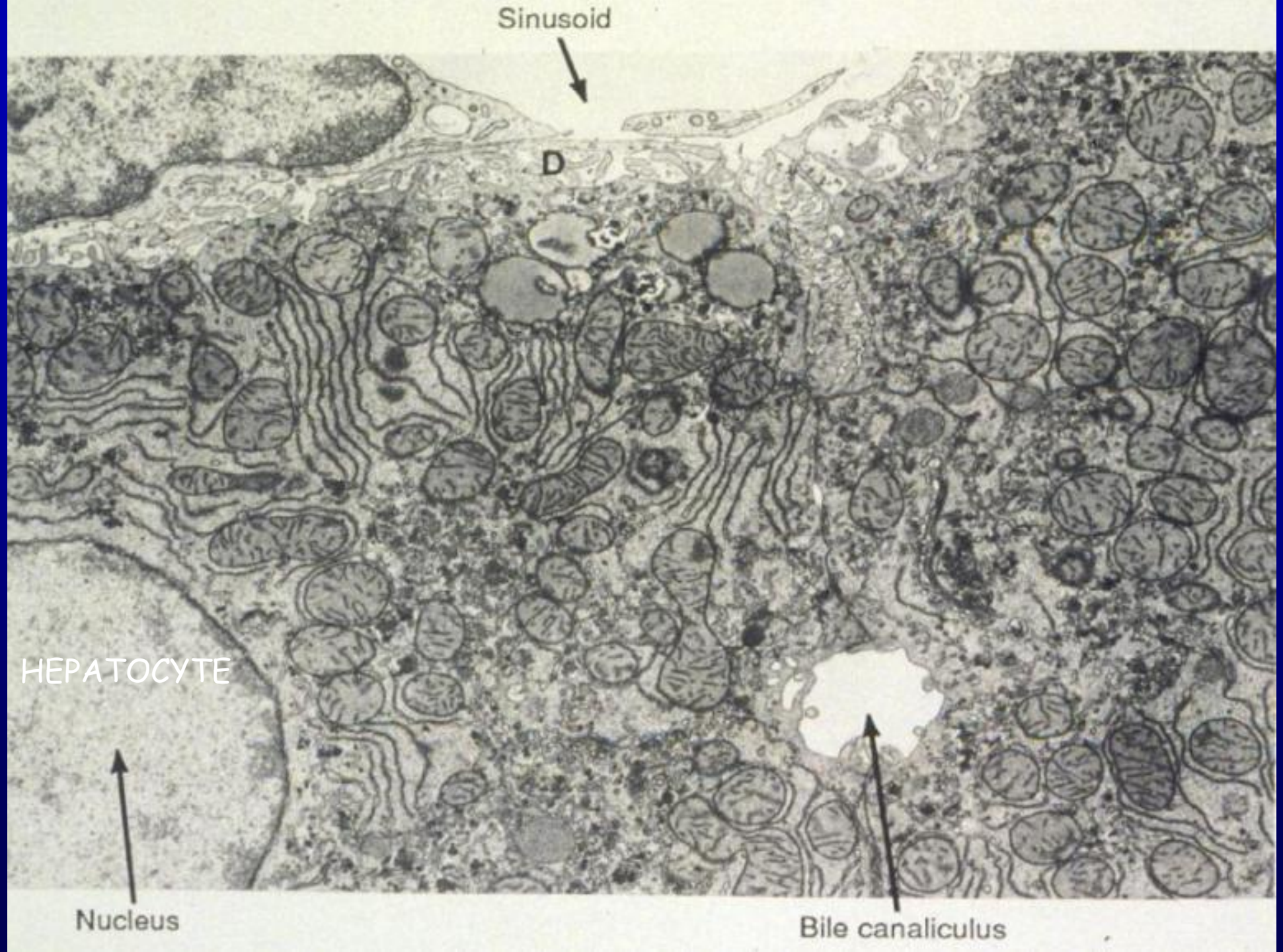


Figure 27–13. Diagram of the acinus, consisting of parenchyma centered around the terminal branches of the hepatic artery and portal vein. The cells in zone-1 have first call on the incoming oxygen and nutrients. The cells of zone-2 are less favored, and those of zone-3 are least favorably situated. (Redrawn after Rappaport, A.M. et al. 1954. Anat. Rec. 119:11.)

If liver damage is due to a toxicant, it kills hepatocytes in Zone I first.

If liver damage is due to a oxygen deprivation, it will kill the hepatocytes in Zone III first.


Sinusoid
D
HEPATOCYTE
Nucleus
Bile canaliculus

Hepatocyte

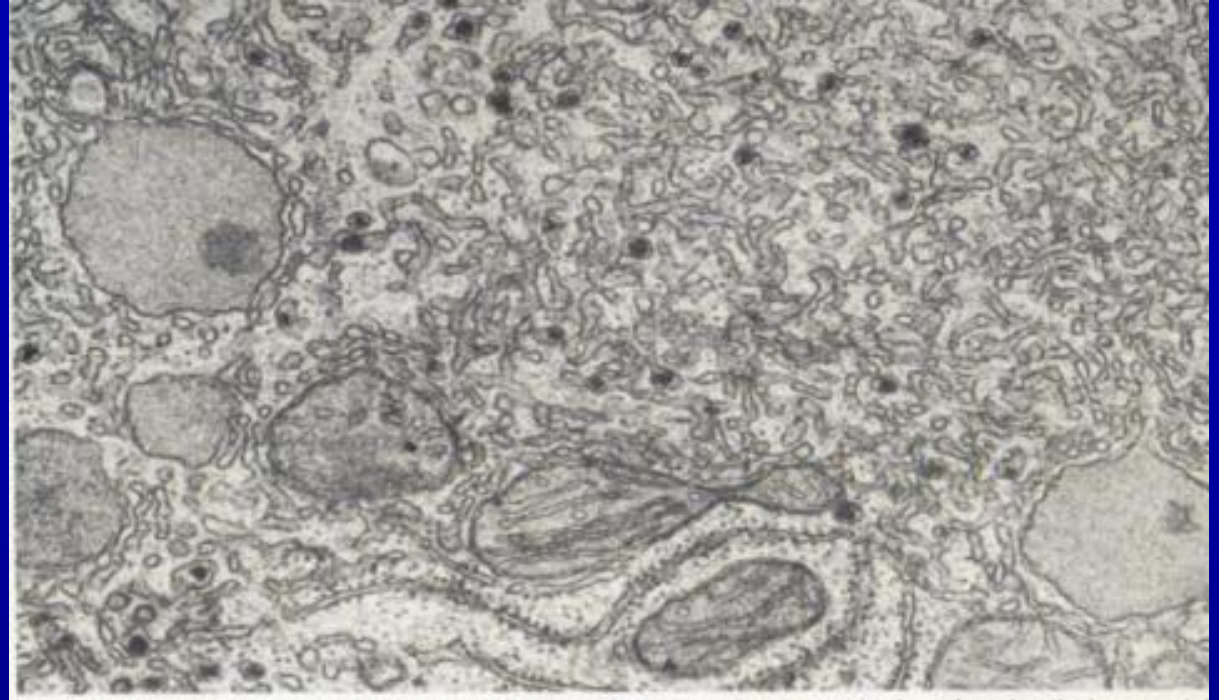
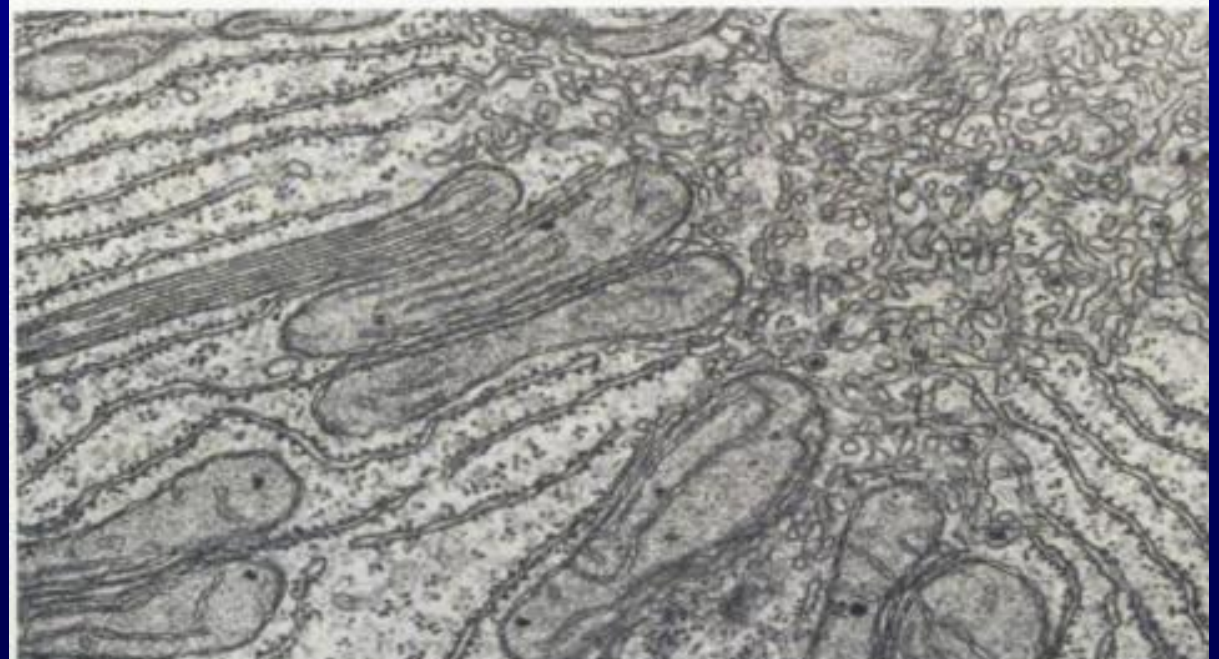
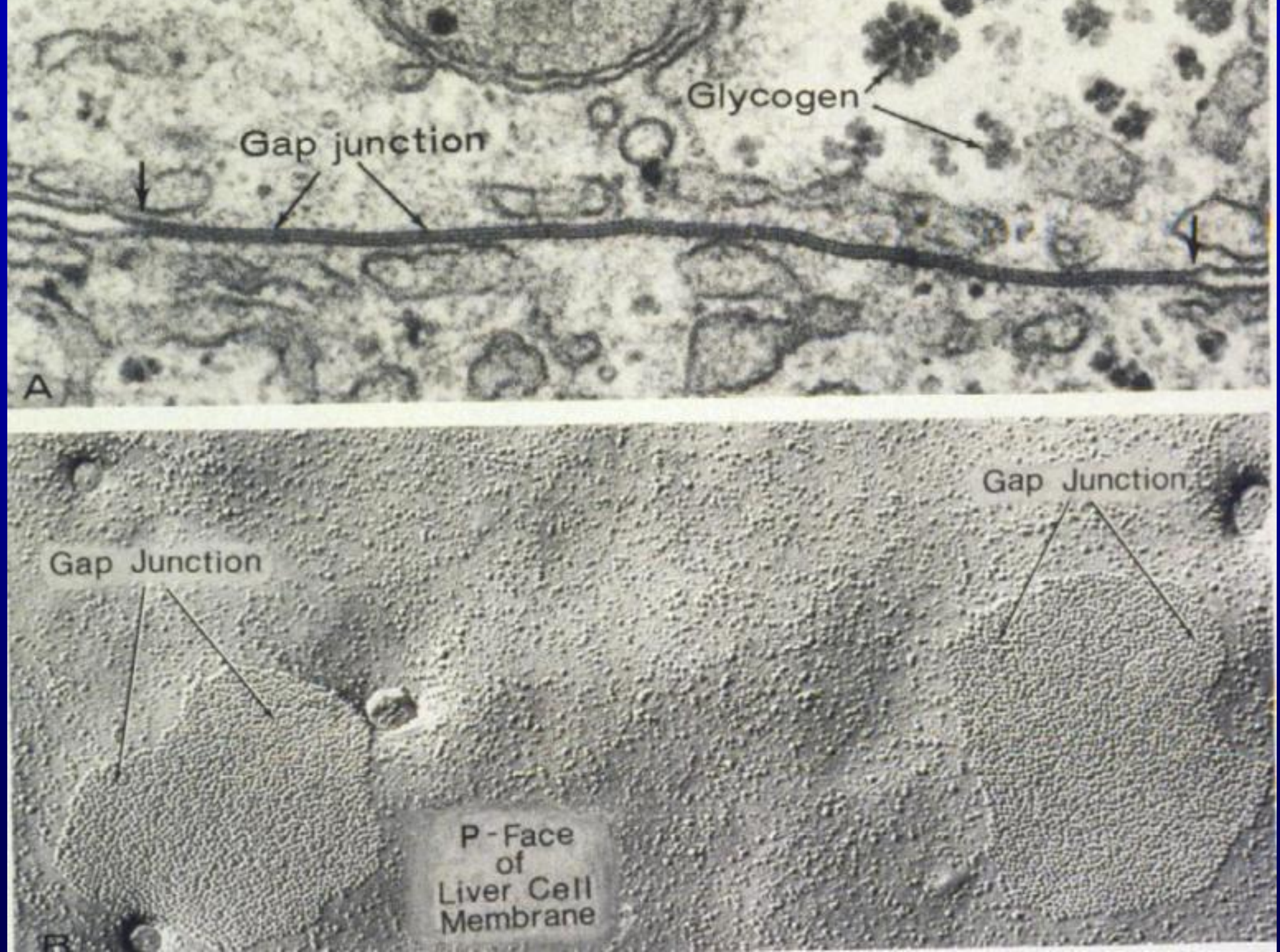
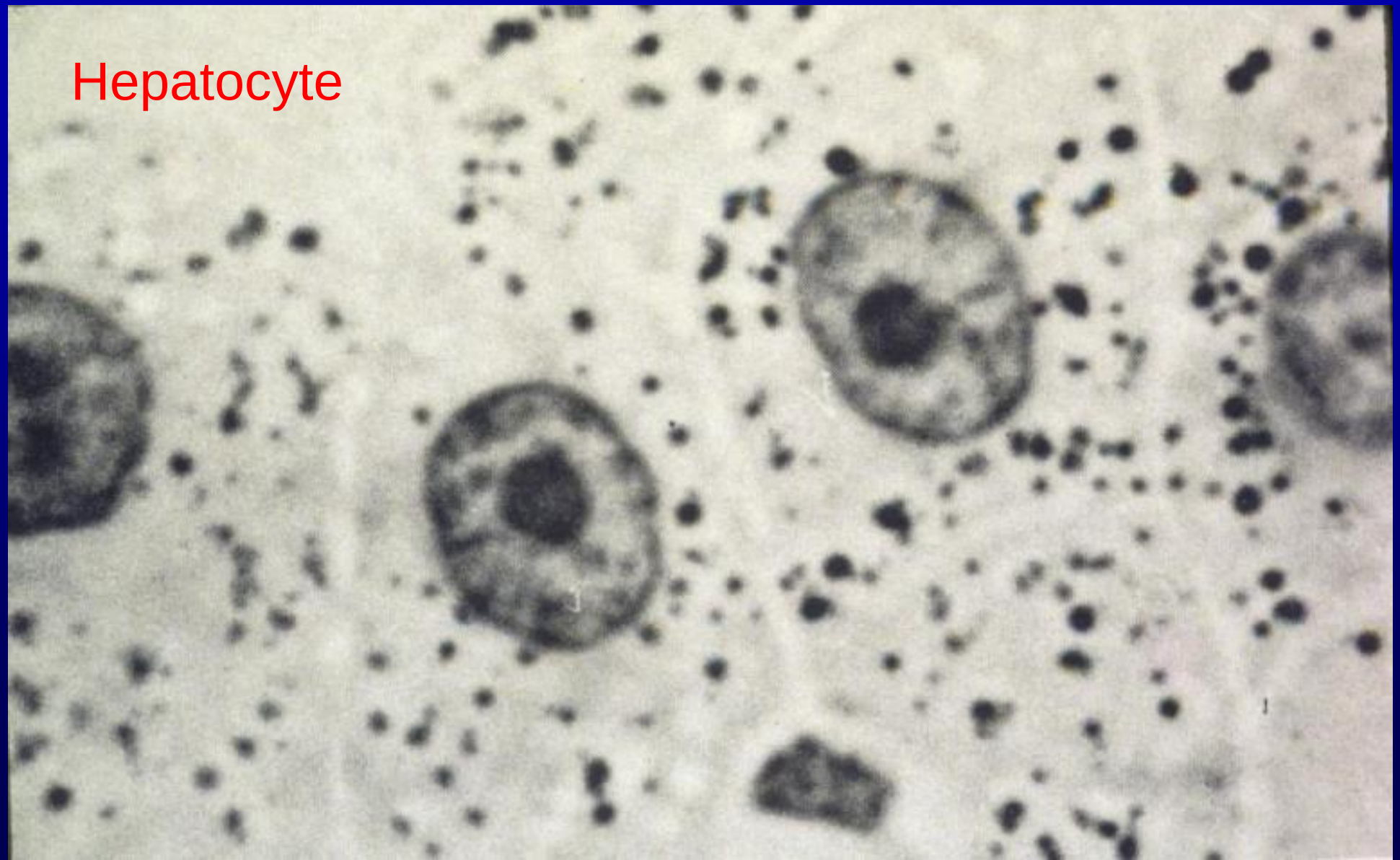


Figure 27–23. Electron micrograph of hepatocyte cytoplasm showing smooth-surfaced reticulum contai
pherical dense particles representing newly synthesized, very-low-density serum lipoprotein. Also prese
icrobodies or peroxisomes with eccentrically placed nucleoids. (Micrograph by R. Bolender.)




Glycogen
Gap junction
A
Gap Junction
Gap Junction
P-Face
of
Liver Cell
Membrane
B

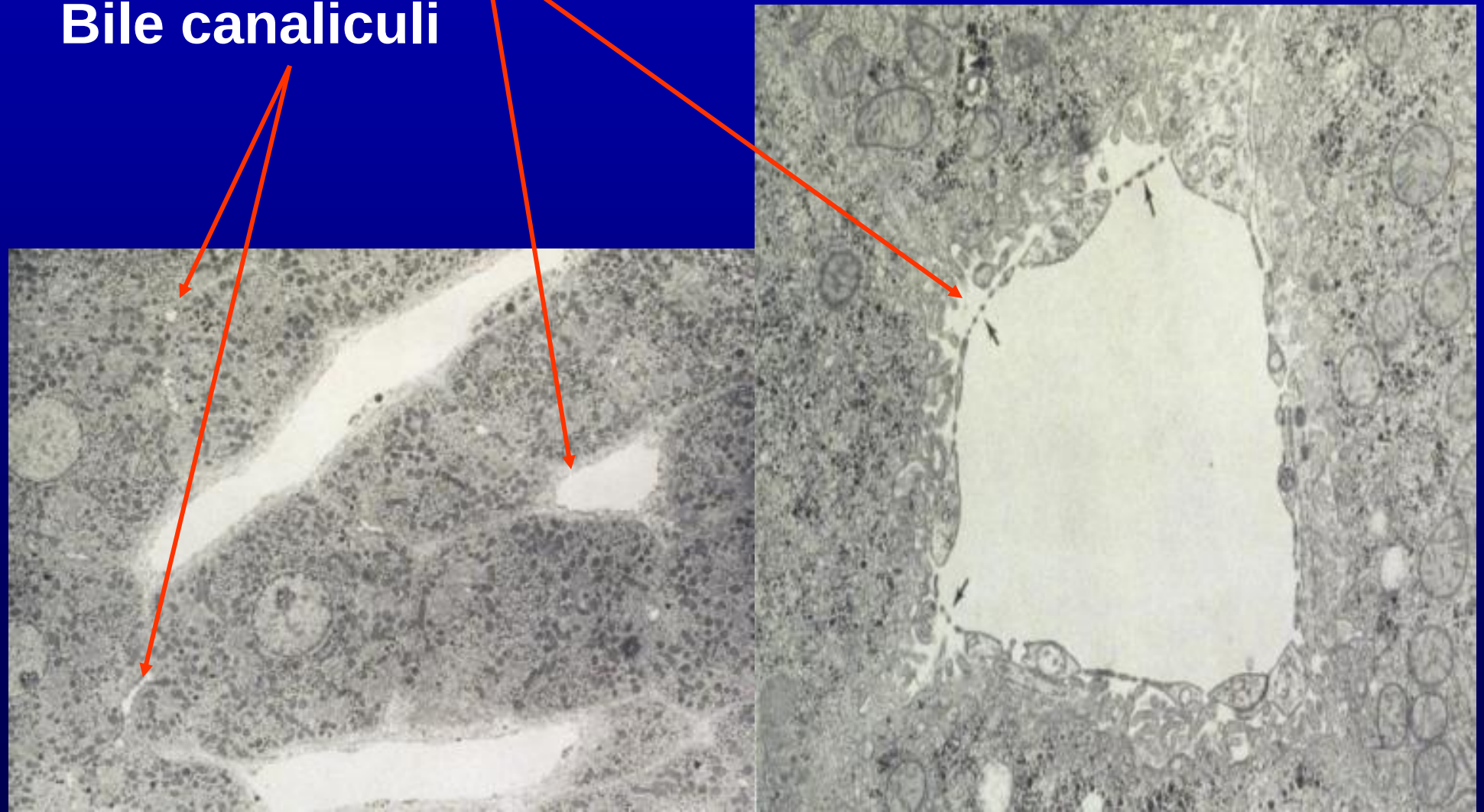
Histological Reaction for Peroxidase



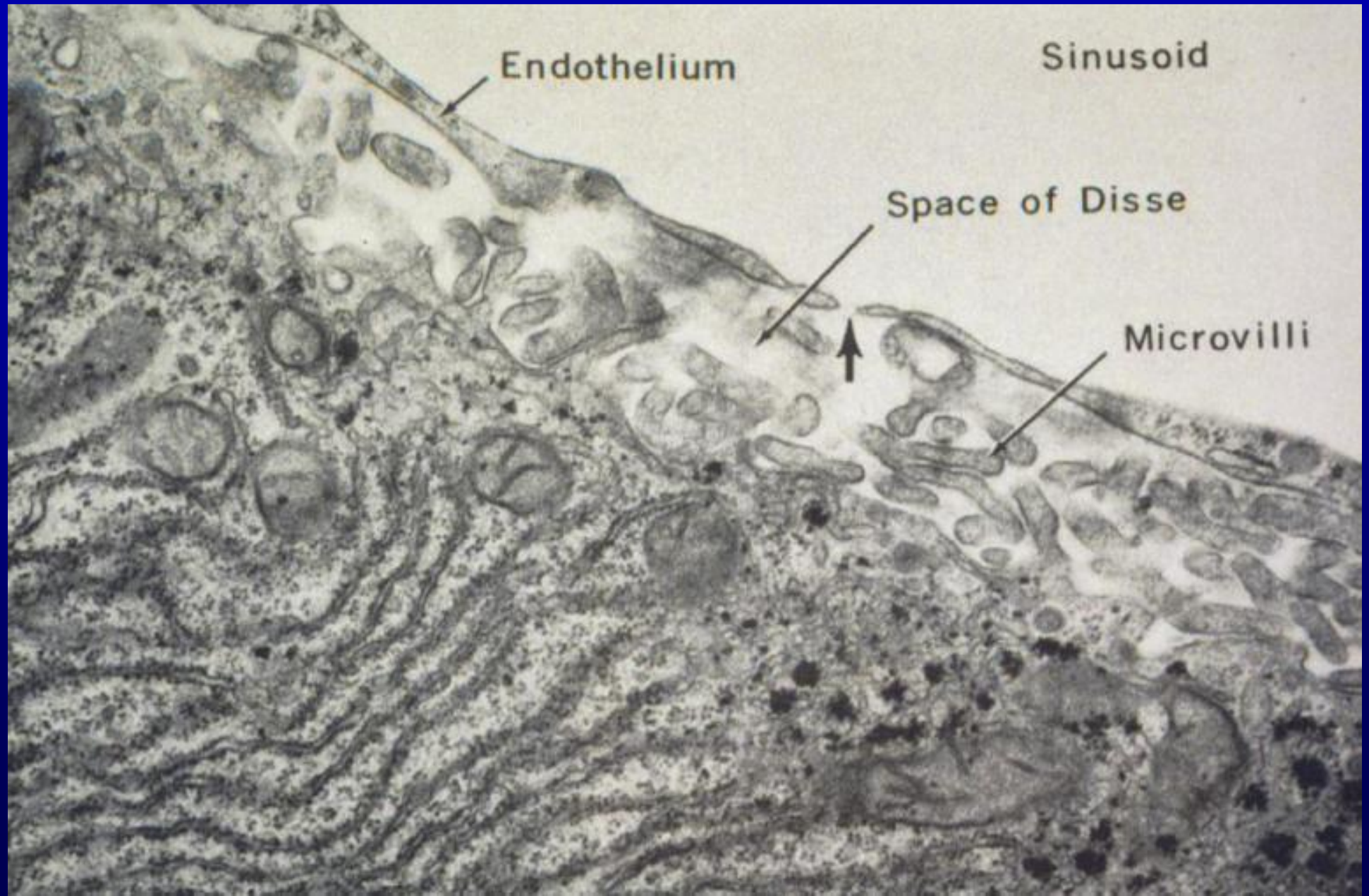
Hepatocyte

Space of Disse

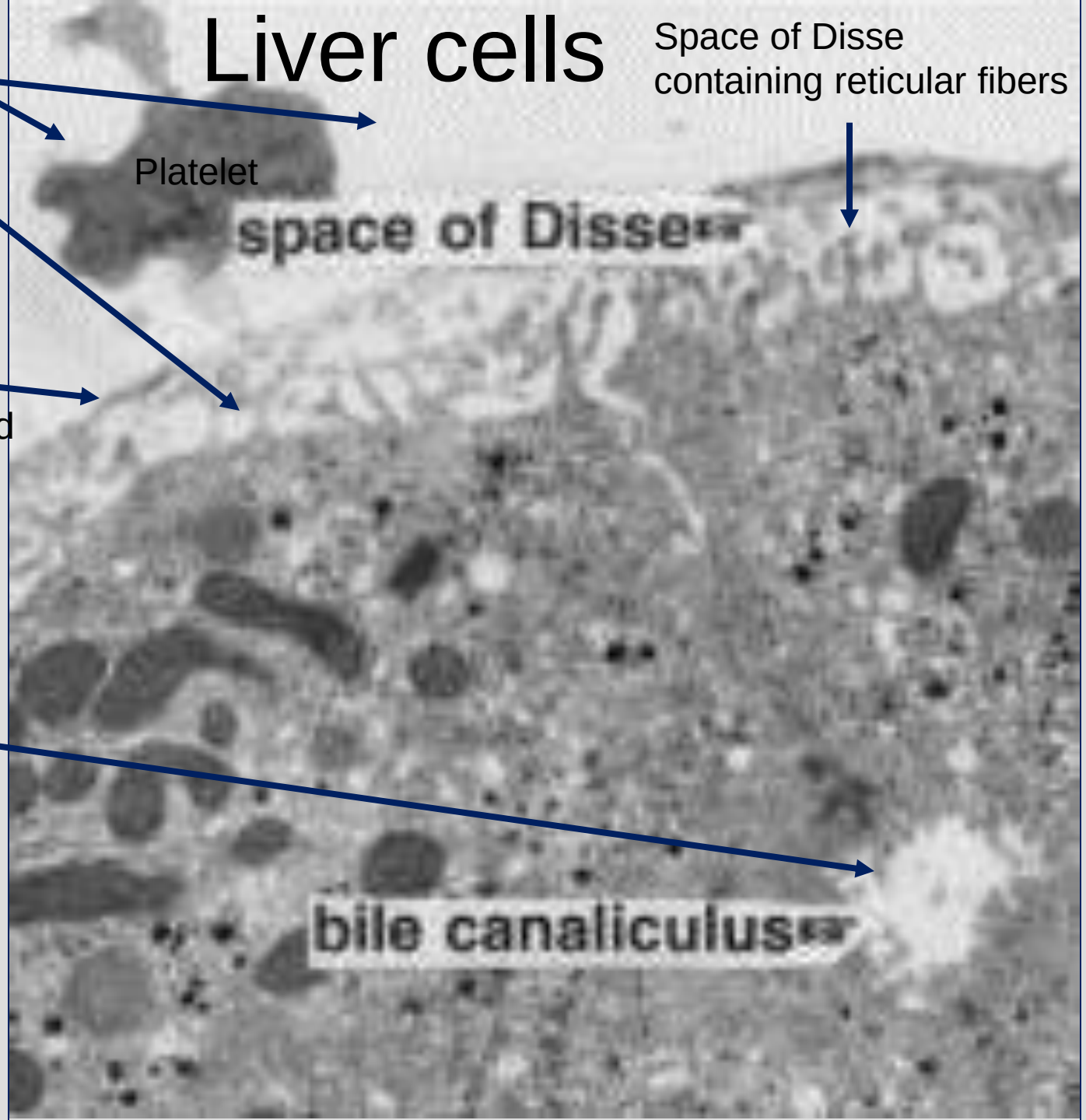
Bile canaliculi



Space of Disse



Liver cells



Hepatic sinusoid

Space of Disse
containing reticular fibers

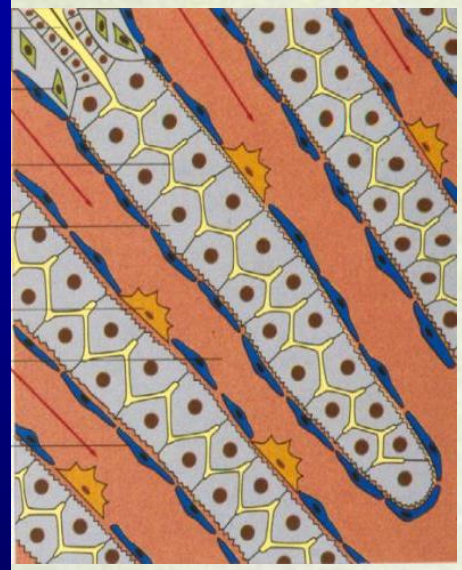
Platelet

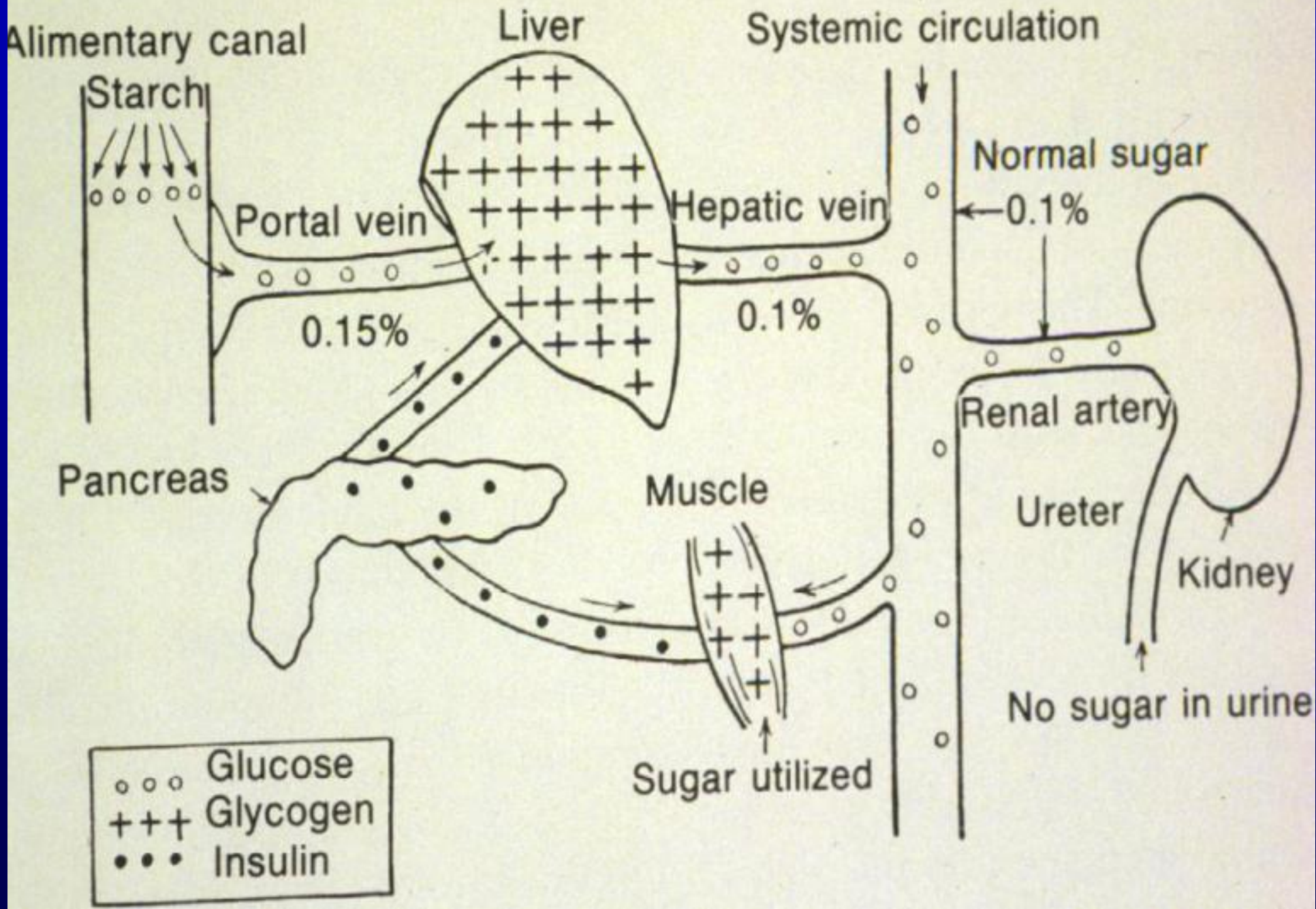
Hepatic parenchymal
cells with microvilli

Endothelial cell
projecting into sinusoid

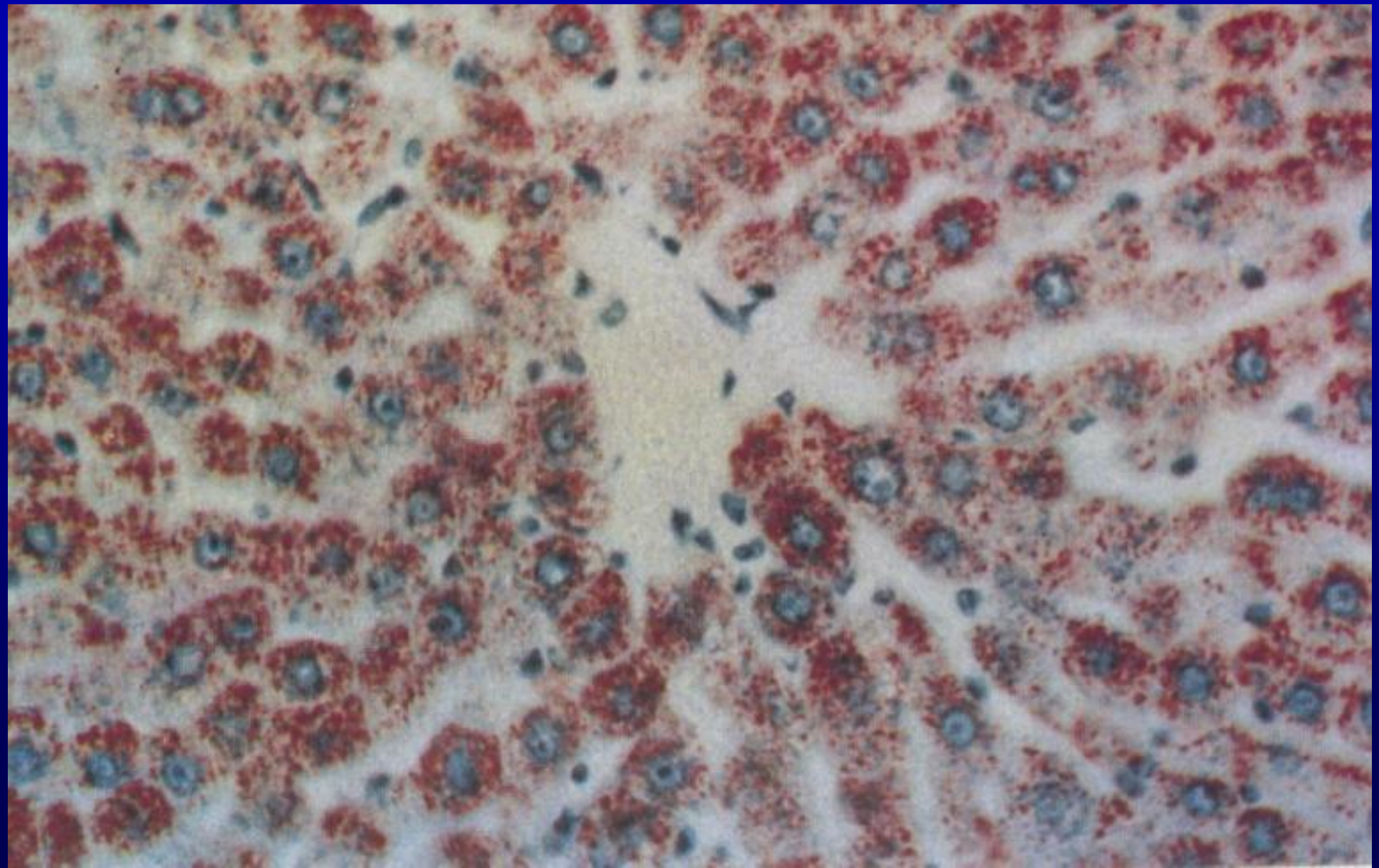
Bile canaliculi
with lysosomes close
by the canaliculi

Sugar and protein




Alimentary canal
Starch
Liver
Systemic circulation
Portal vein
Hepatic vein
Normal sugar
0.1%
0.15%
0.1%
Pancreas
Muscle
Renal artery
Ureter
Kidney
No sugar in urine
Sugar utilized
Glucose
Glycogen
Insulin

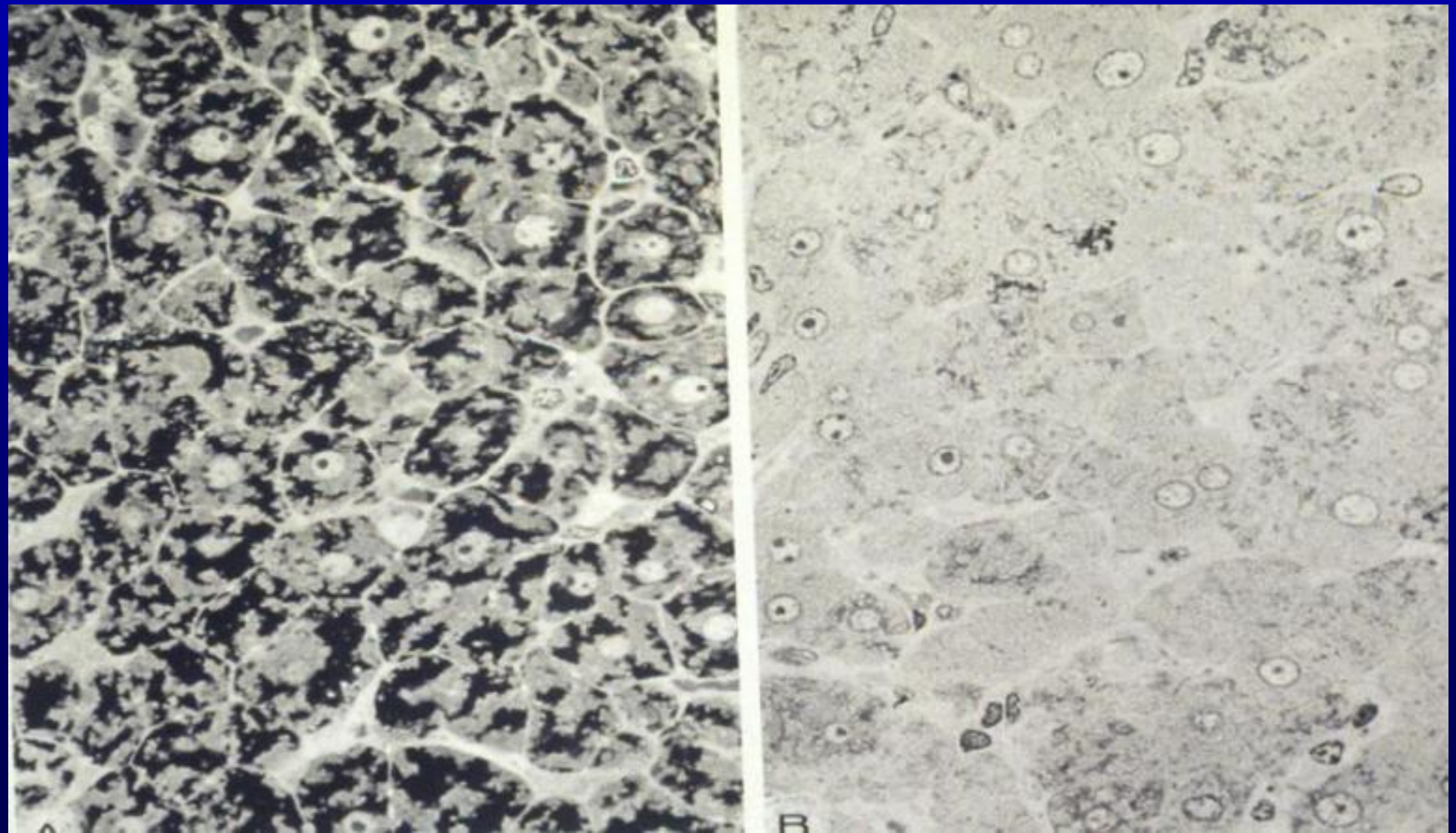
Glycogen in Hepatocytes

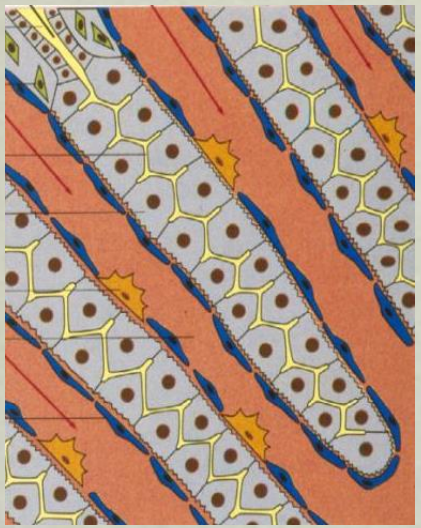


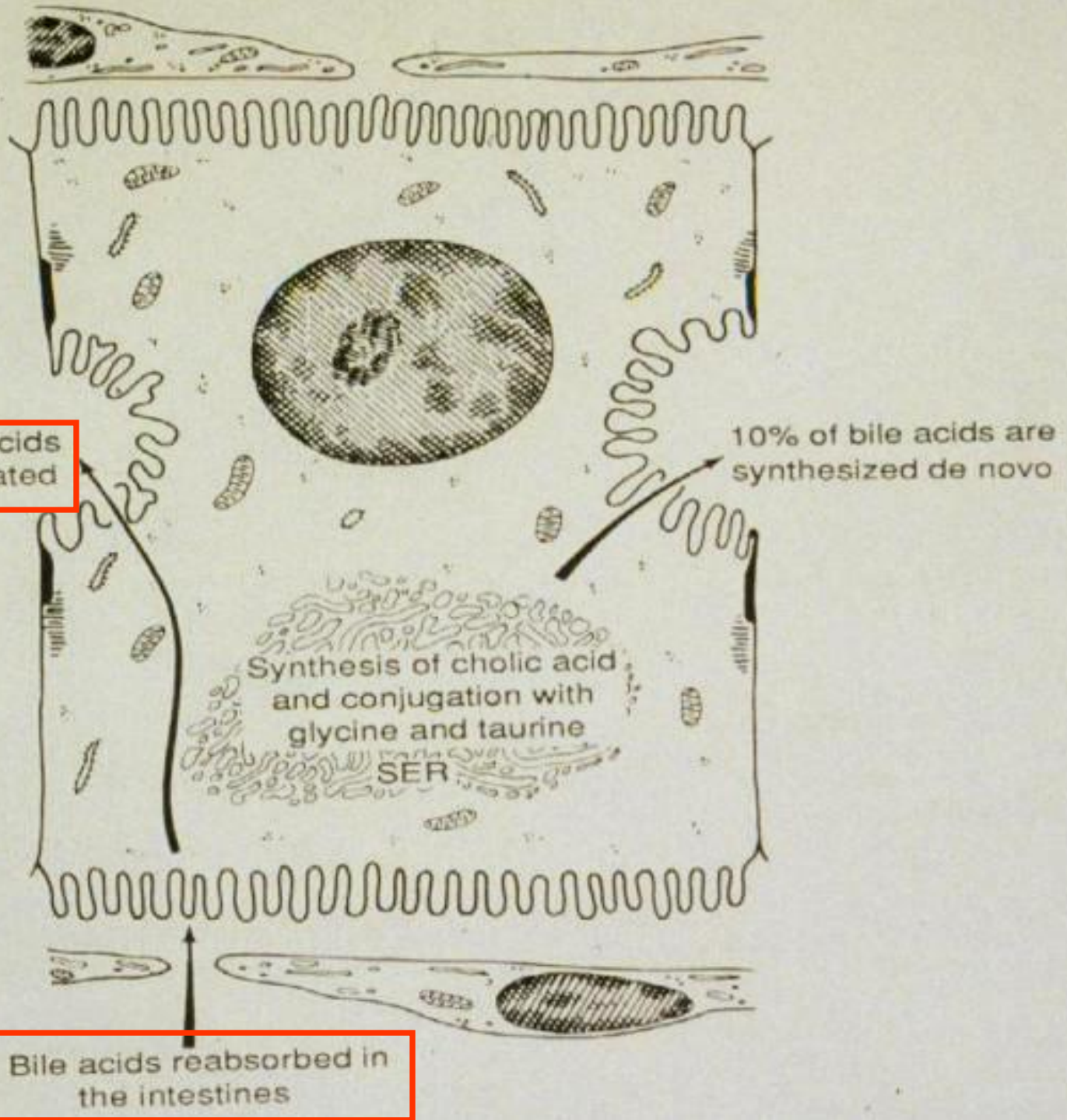
Dietary Differences In Amount Of Glycogen In Hepatocytes

2-hour Fast (8.2% Glycogen)

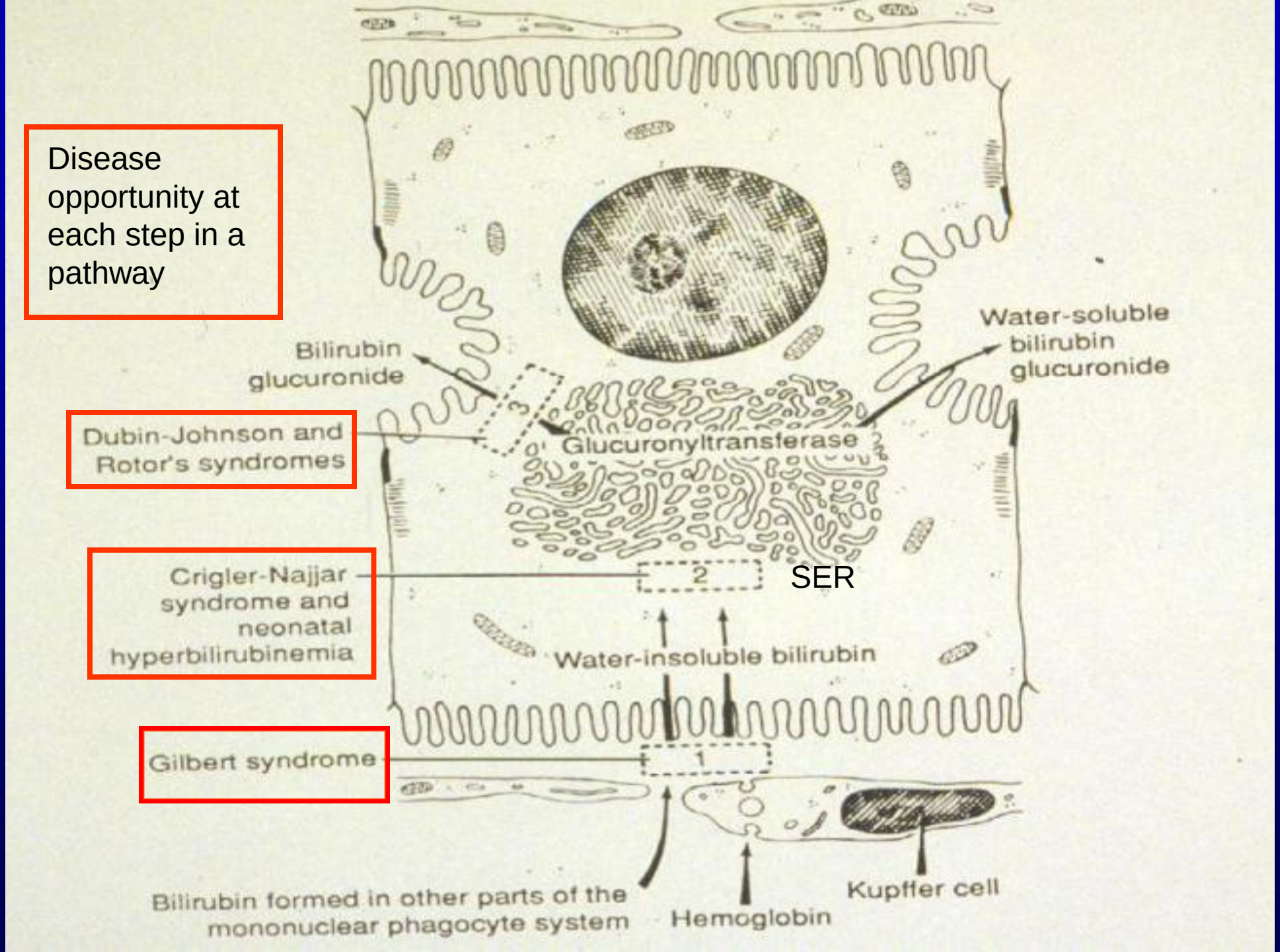
24-hour Fast (0.9% Glycogen)





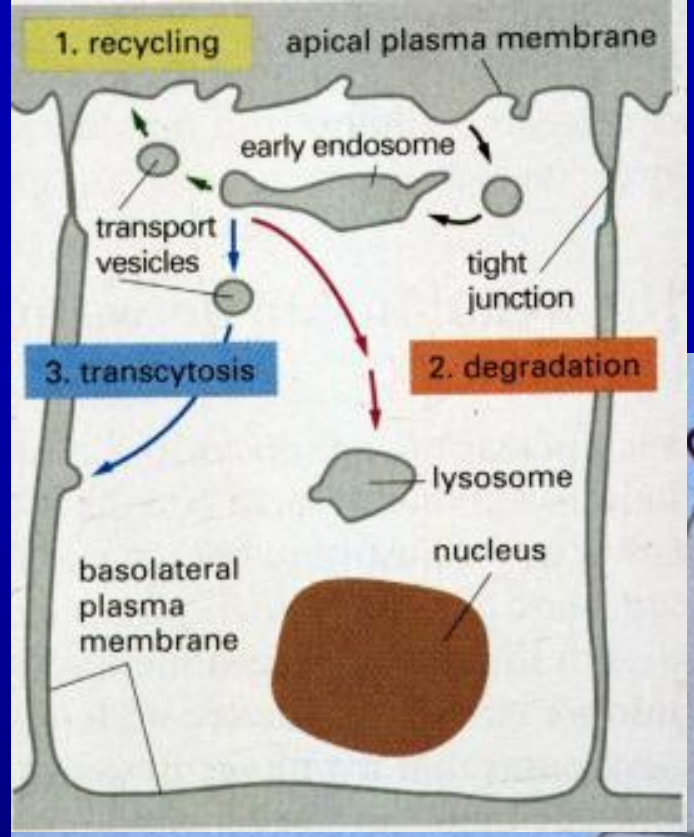

90% of bile acids are recirculated
10% of bile acids are synthesized de novo
Synthesis of cholic acid and conjugation with glycine and taurine
SER
Bile acids reabsorbed in the intestines

Disease opportunity at each step in a pathway



Surface Specializations of Epithelia

Transcytosis to get antibodies into secretions



Bile canaliculus

Four + compounds that are deposited/secreted into this space.

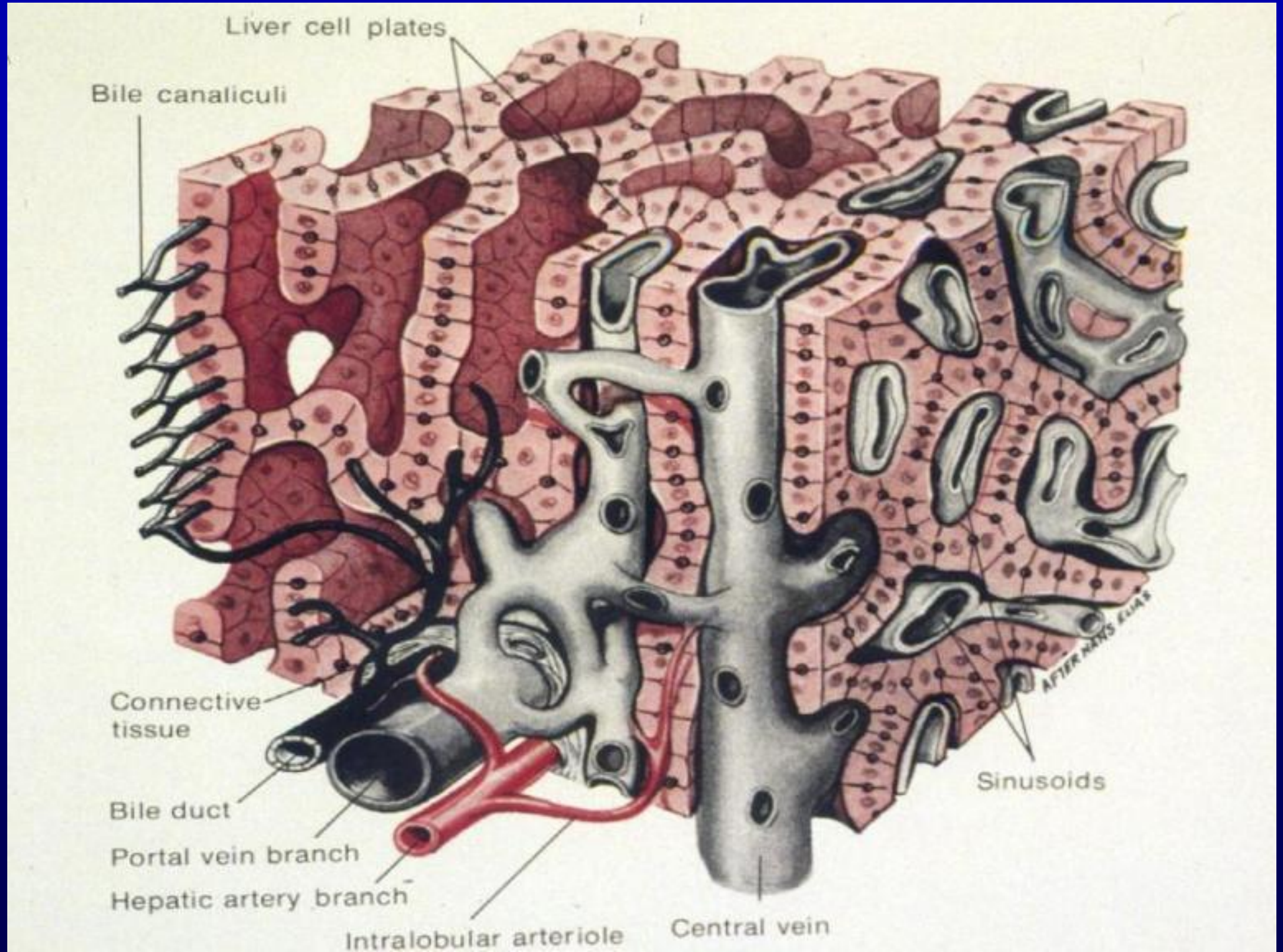
a. Cholesterol

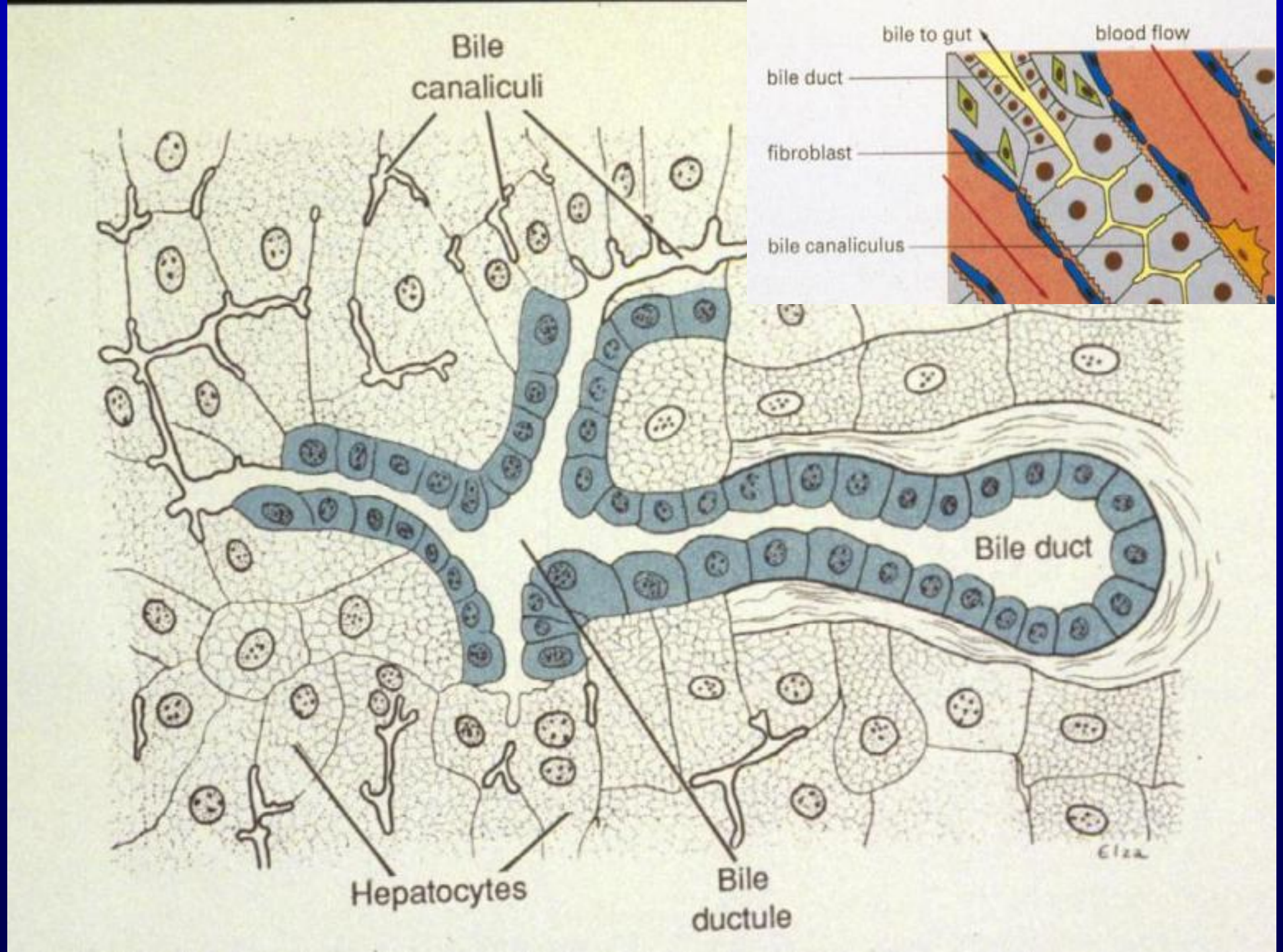
b. EGF

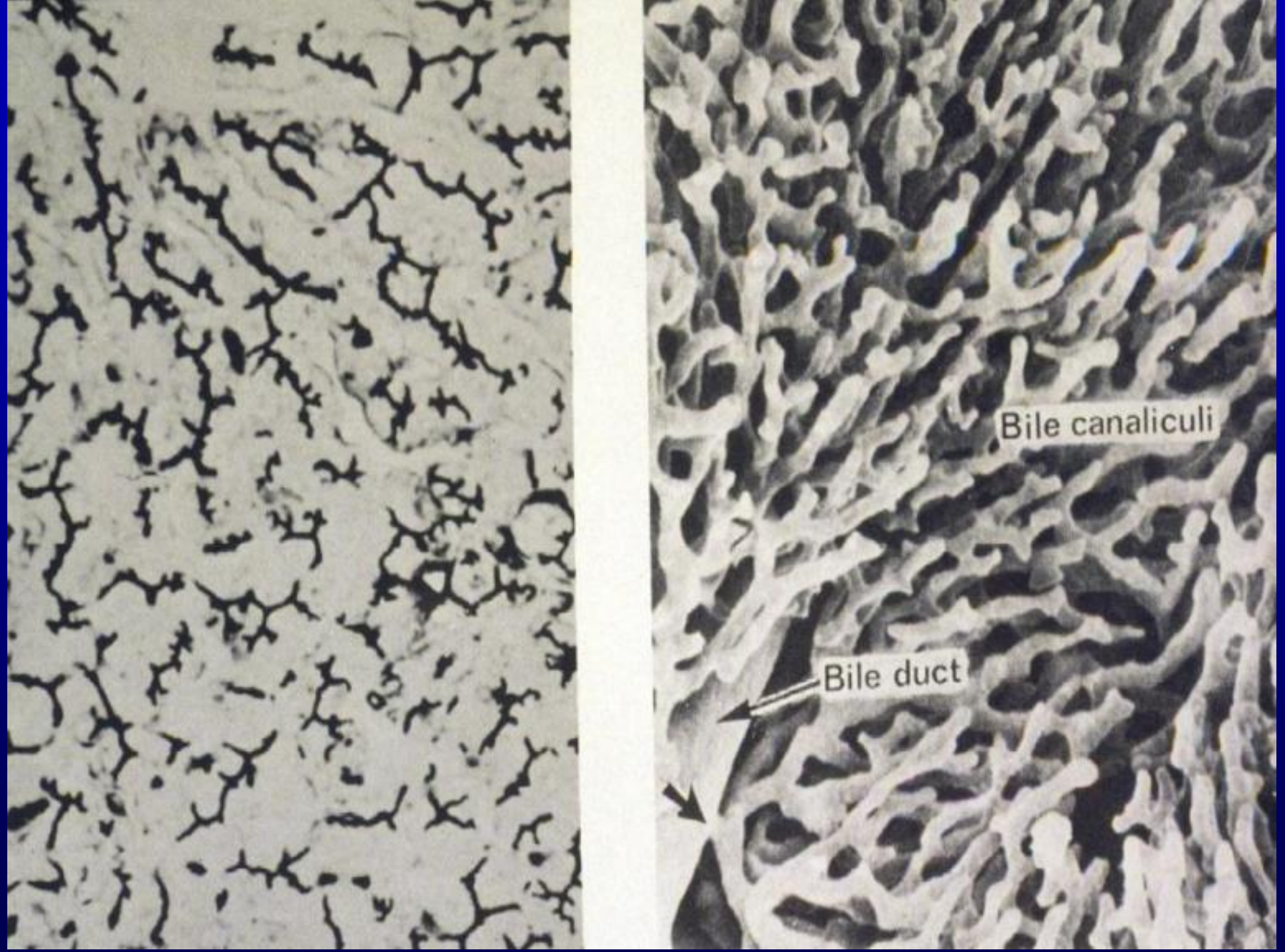
c. insulin

d. IgA

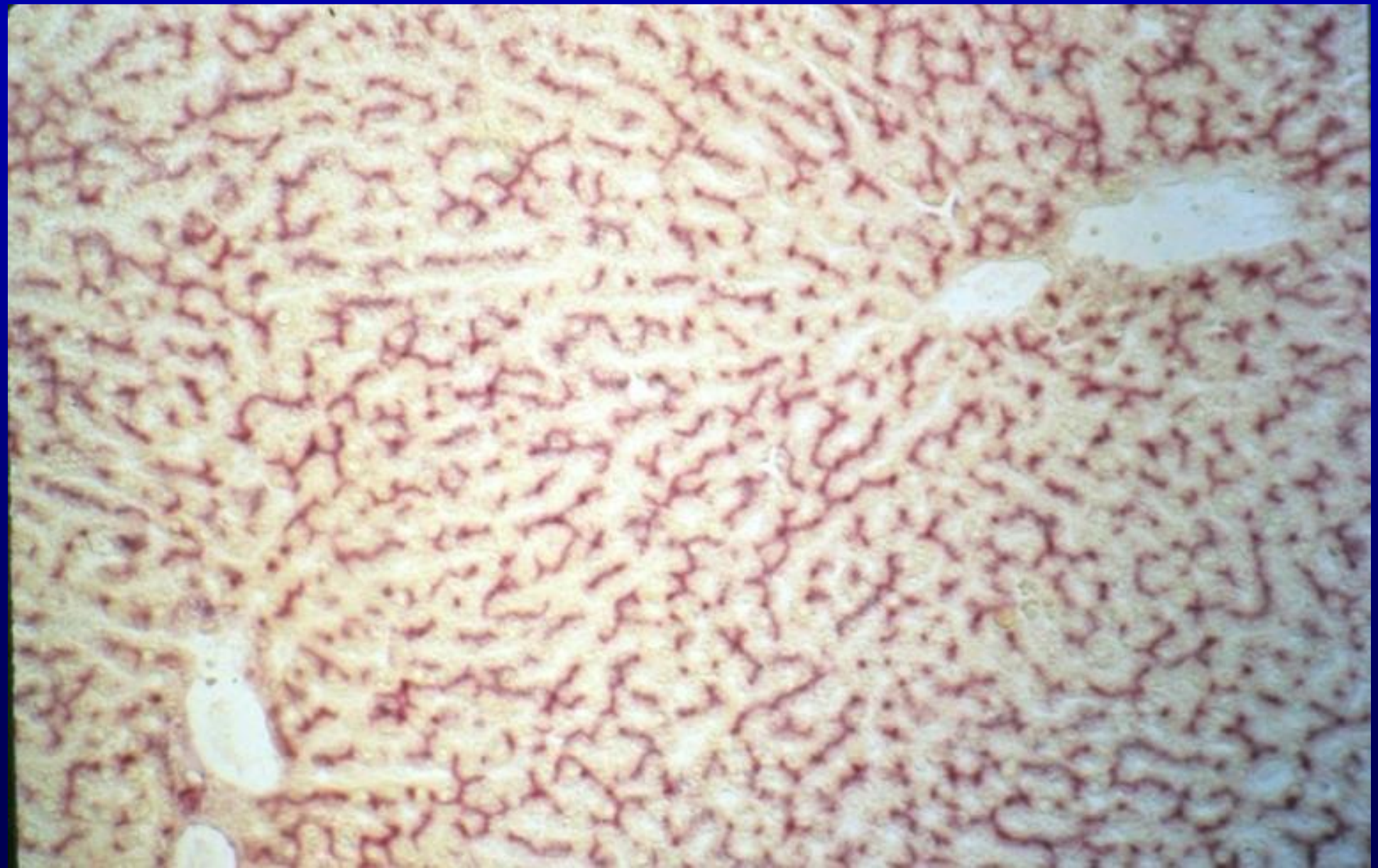
also bile salts and BILIRUBIN


Liver cell plates
Bile canaliculi
Connective tissue
Bile duct
Portal vein branch
Hepatic artery branch
Intralobular arteriole
Central vein
Sinusoids

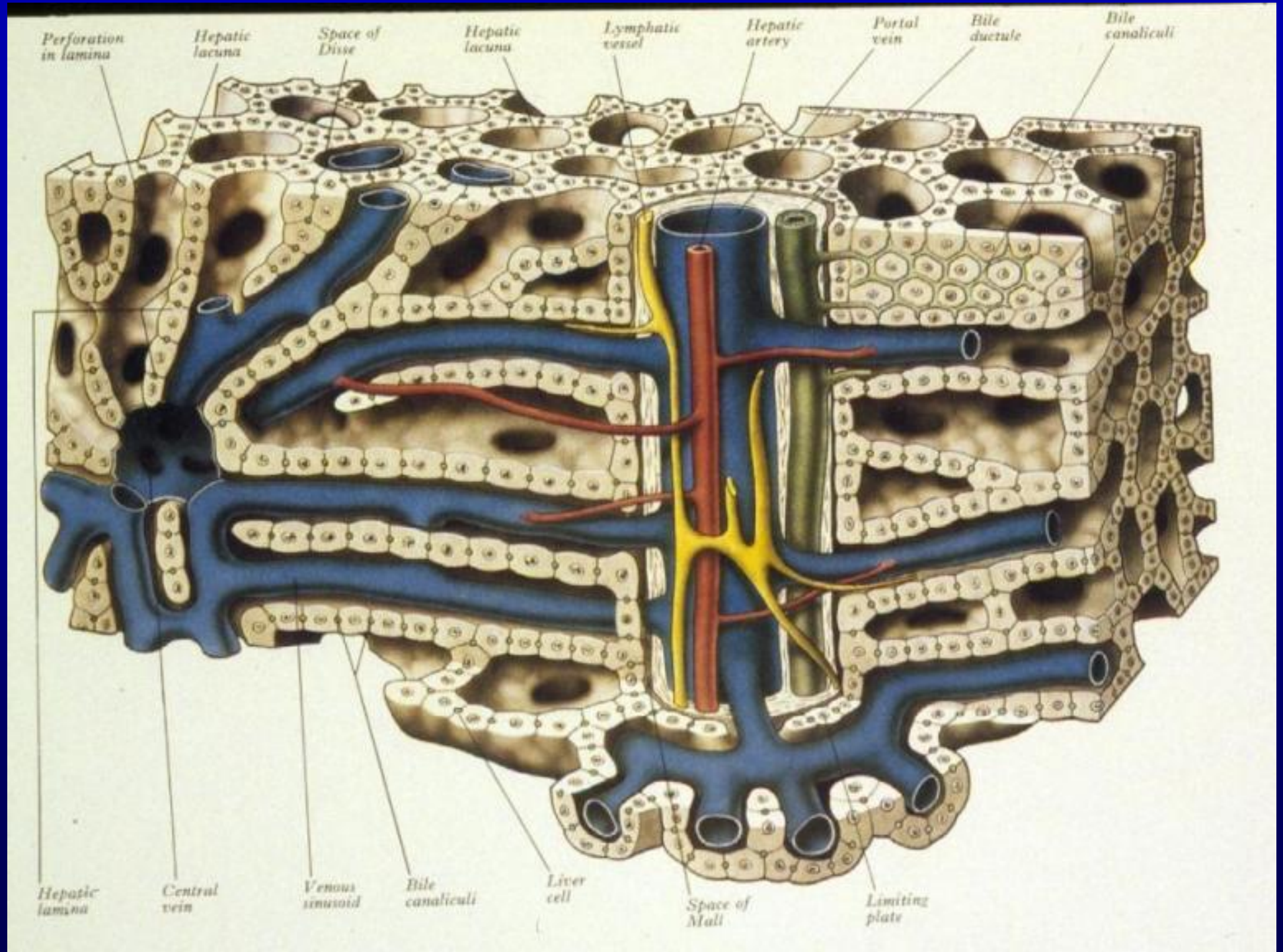

Bile canaliculi
Bile duct
Hepatocytes
Bile ductule
bile to gut
blood flow
bile duct
fibroblast
bile canaliculus


Bile canaliculi
Bile duct

Bile Canaliculi

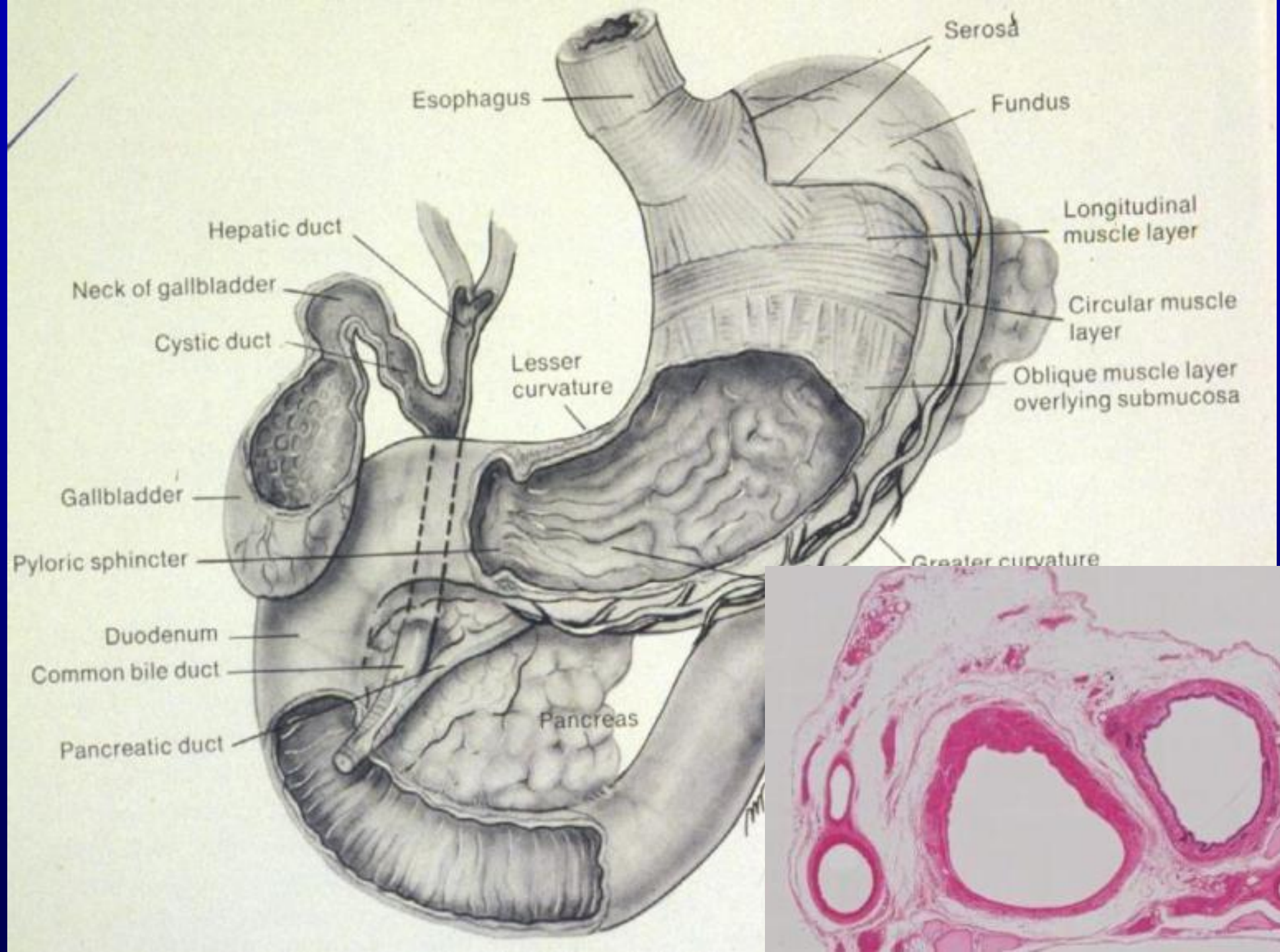


Bile Duct

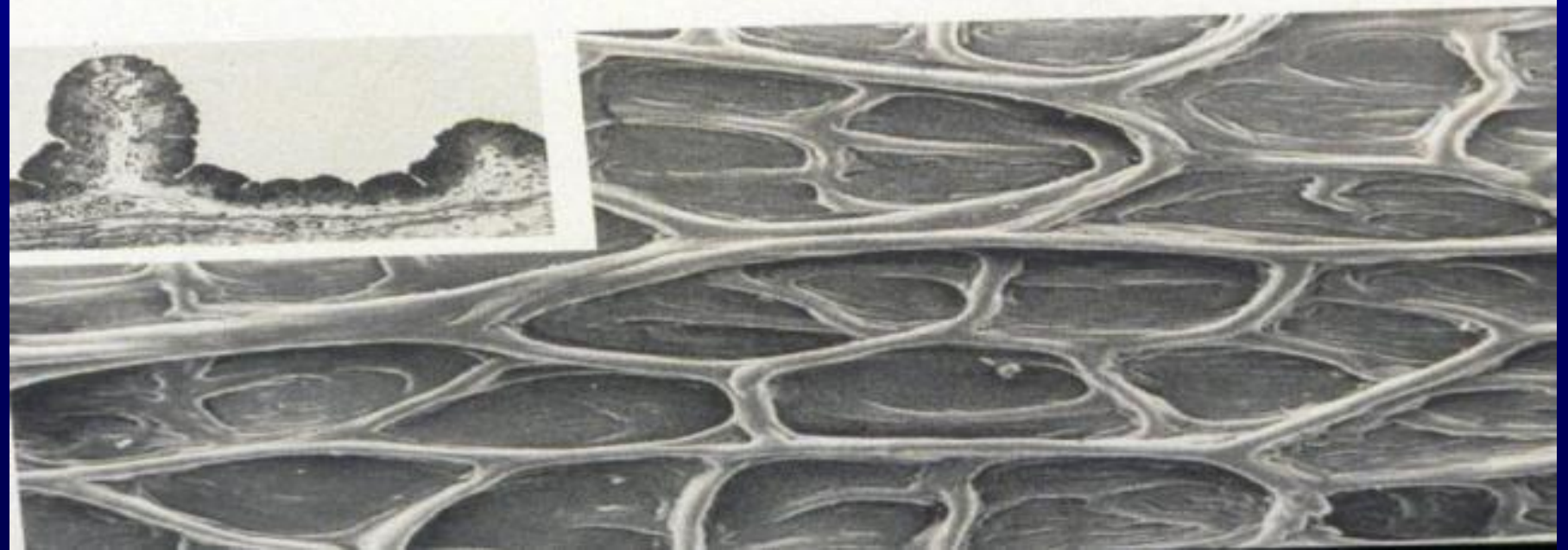

Perforation in lamina
Hepatic lacuna
Space of Disse
Hepatic lacuna
Lymphatic vessel
Hepatic artery
Portal vein
Bile ductule
Bile canaliculi
Hepatic lamina
Central vein
Venous sinusoid
Bile canaliculi
Liver cell
Space of Mall
Limiting plate

Gallbladder & Bile Ducts

- Function
- Biliary tract
- Organization of gallbladder
  - Epithelium
  - Connective tissue
- Histophysiology


Serosa
Esophagus
Fundus
Longitudinal muscle layer
Hepatic duct
Neck of gallbladder
Cystic duct
Circular muscle layer
Lesser curvature
Oblique muscle layer overlying submucosa
Gallbladder
Pyloric sphincter
Greater curvature
Duodenum
Common bile duct
Pancreas
Pancreatic duct

re 27–36. Scanning micrograph of the contracted gallbladder. The mucosa is thrown up into
A histological section through these has the appearance shown in the inset. Compare
ographs from Castellucci, M. J. Submicrosc. Cytol. 12:375, 1980.)



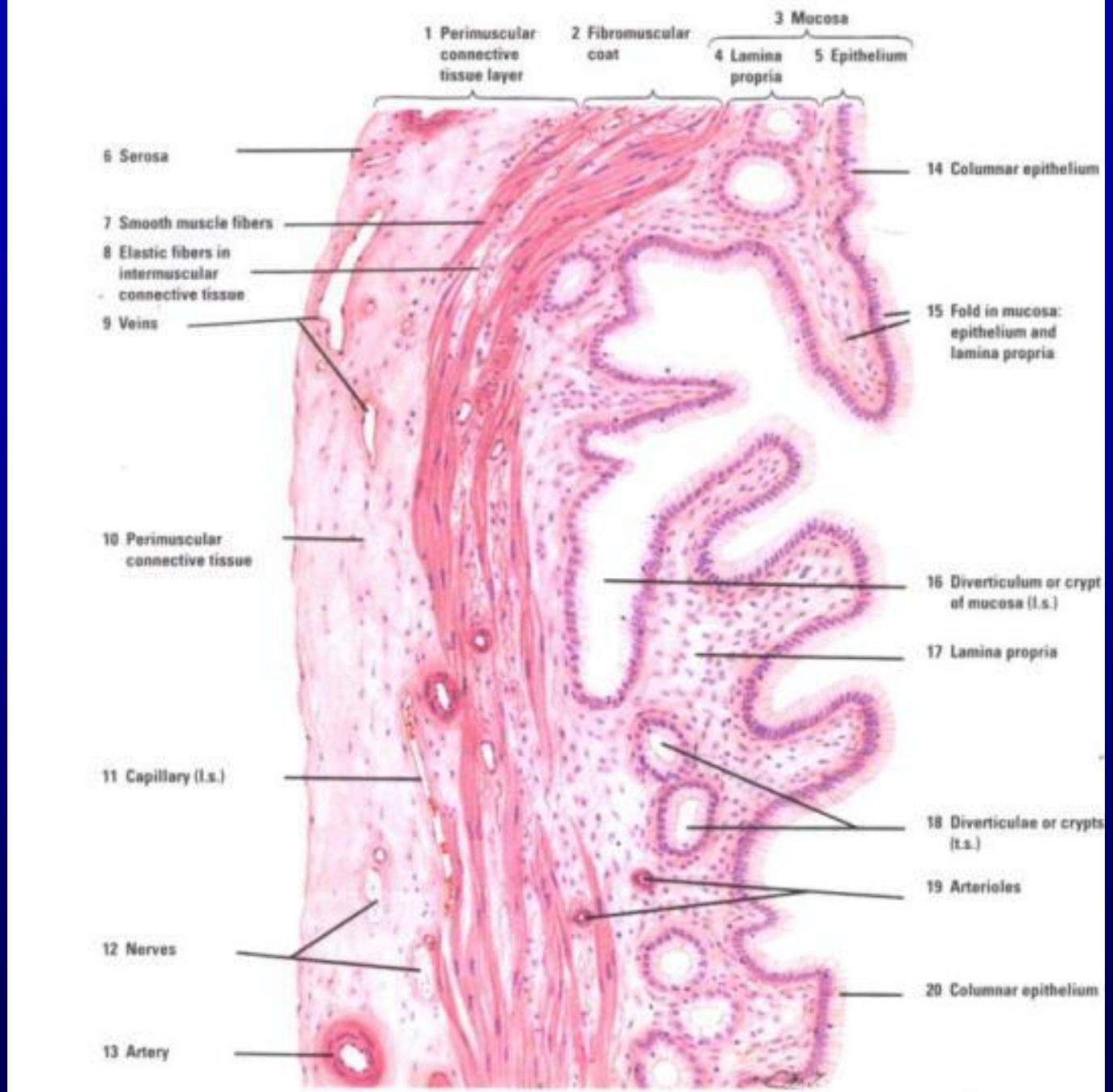


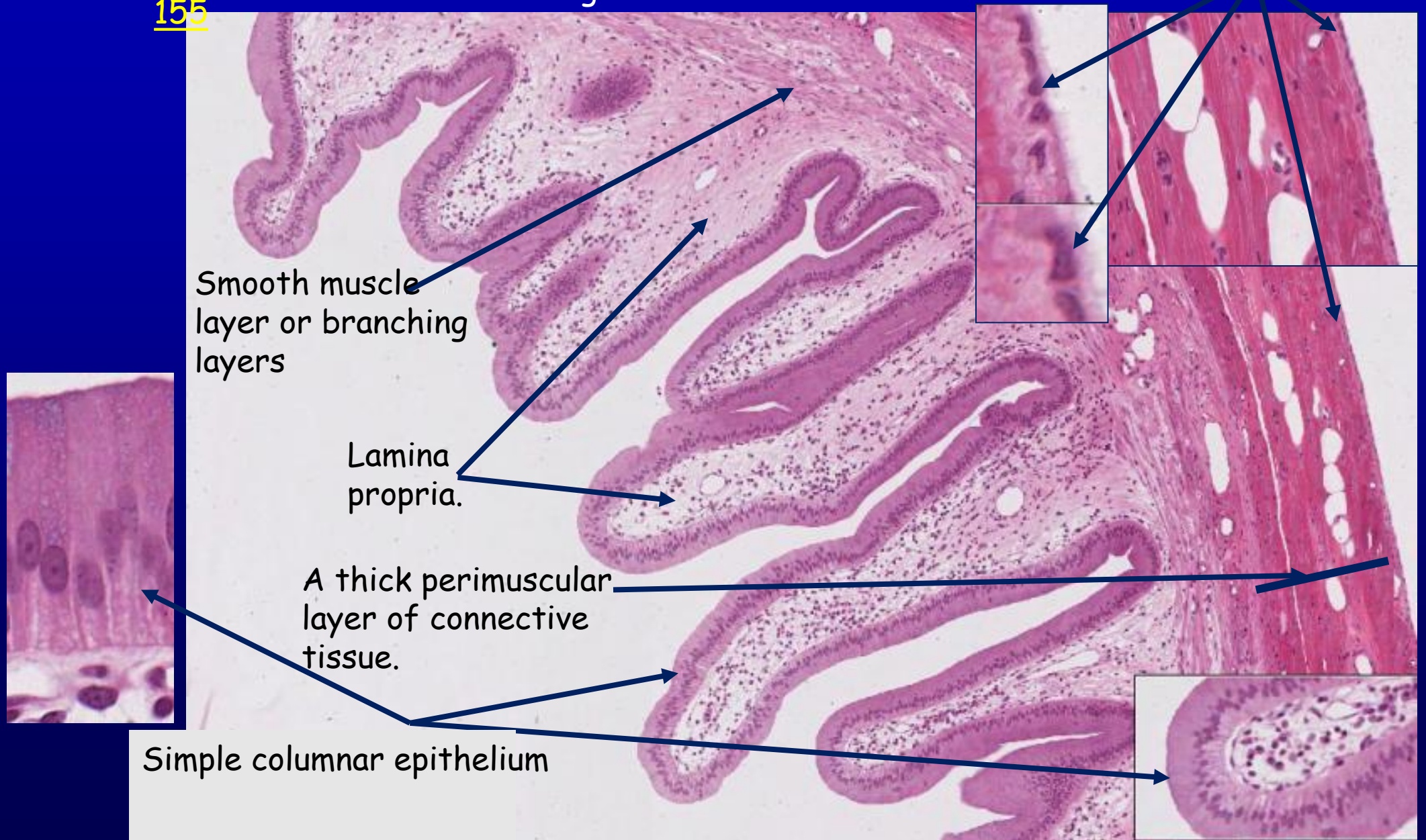
Fig. 12.8 Gallbladder (panoramic view). Stain: hematoxylin-eosin. Medium magnification.

Gallbladder

The mucosa is thrown into folds which project into the lumen of the gallbladder.

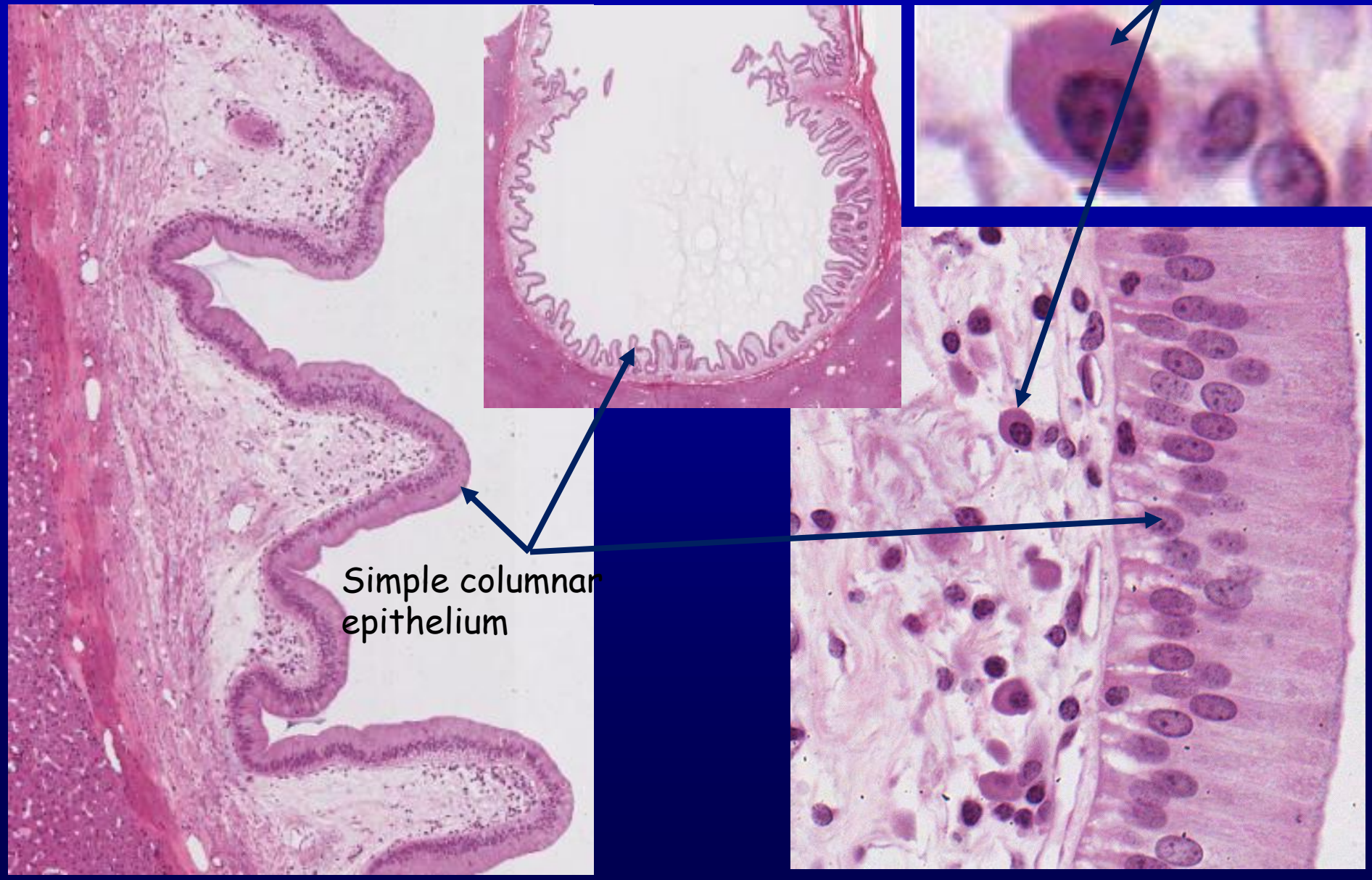
Peritoneal serosal layer

155



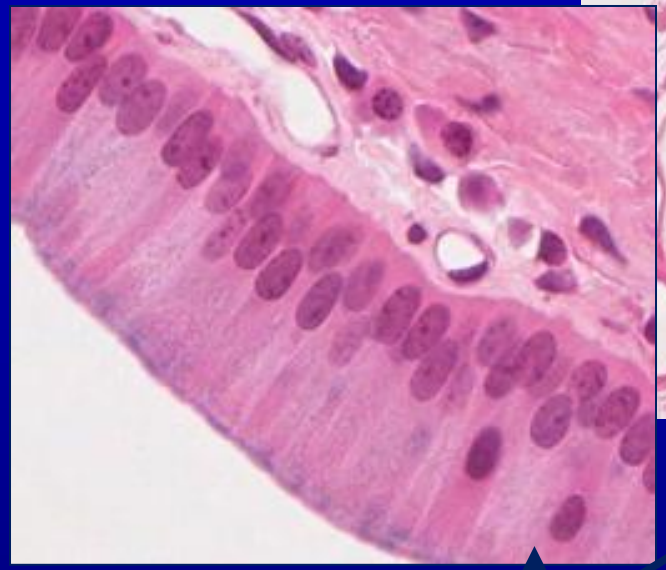
The gallbladder stores and concentrates the bile elaborated by the liver

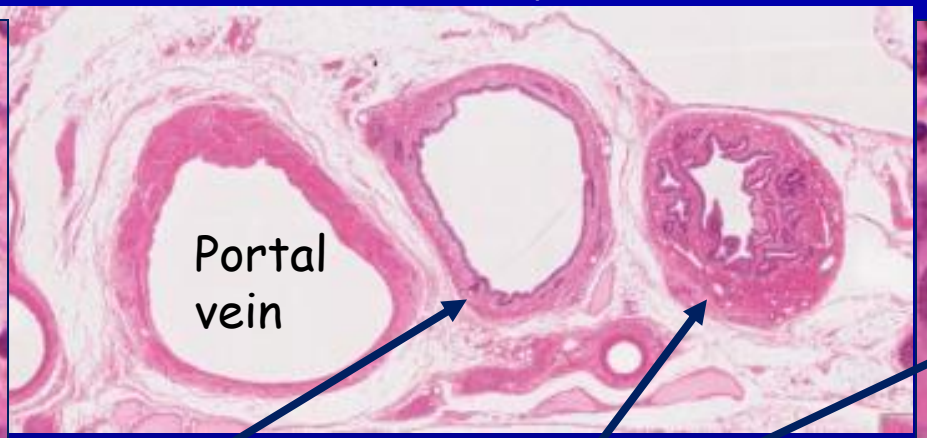
155 Mucosa

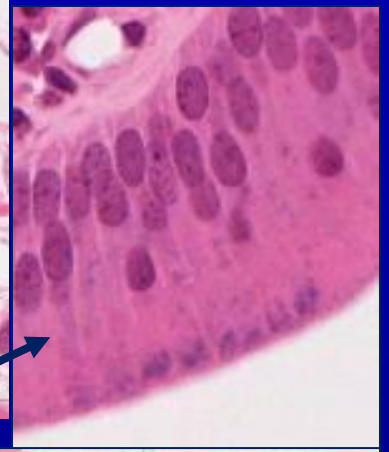


126

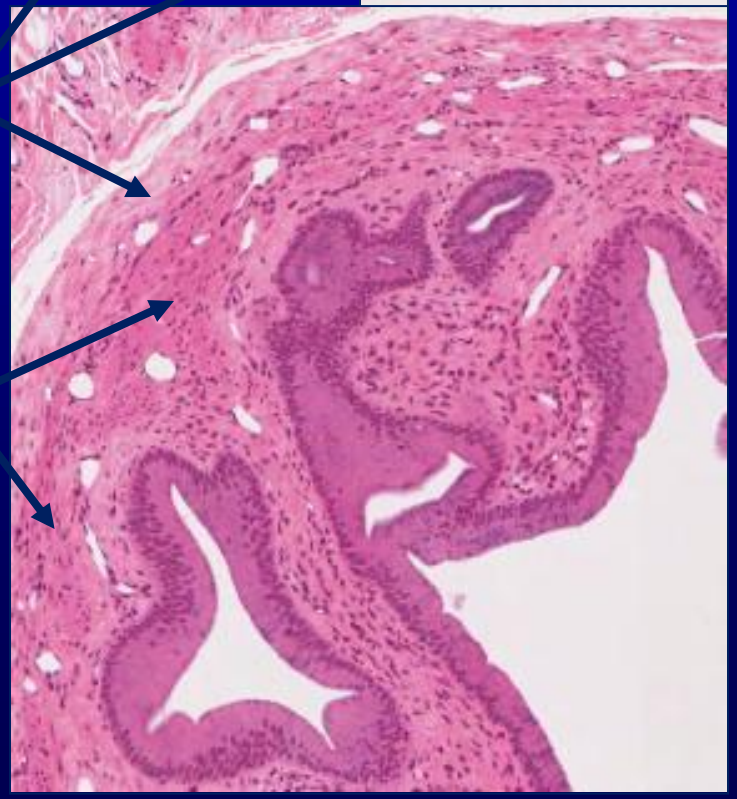
Bile duct with portal vein,



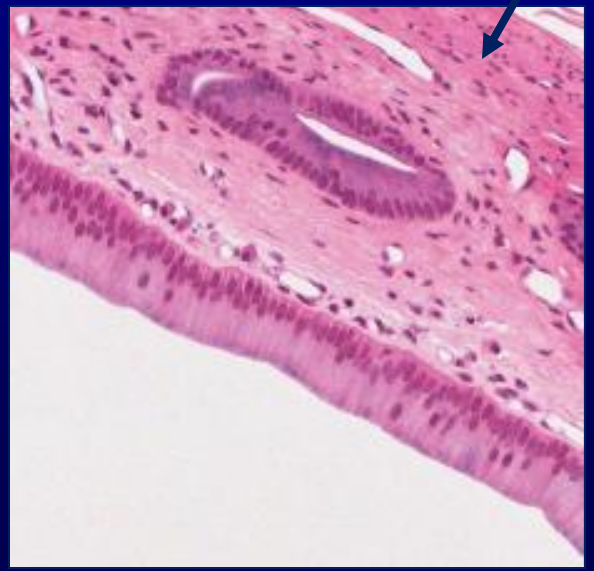




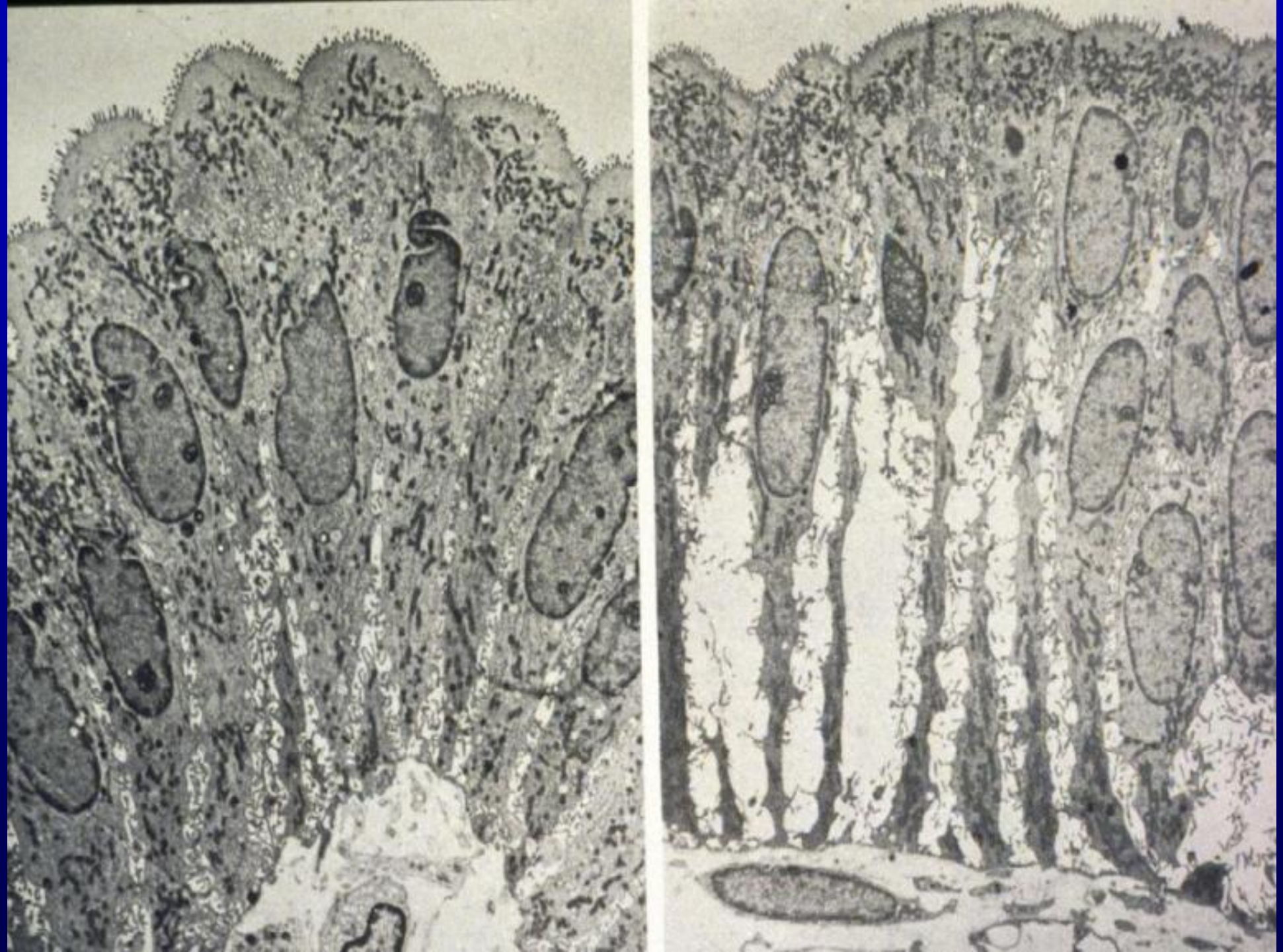
Cystic duct

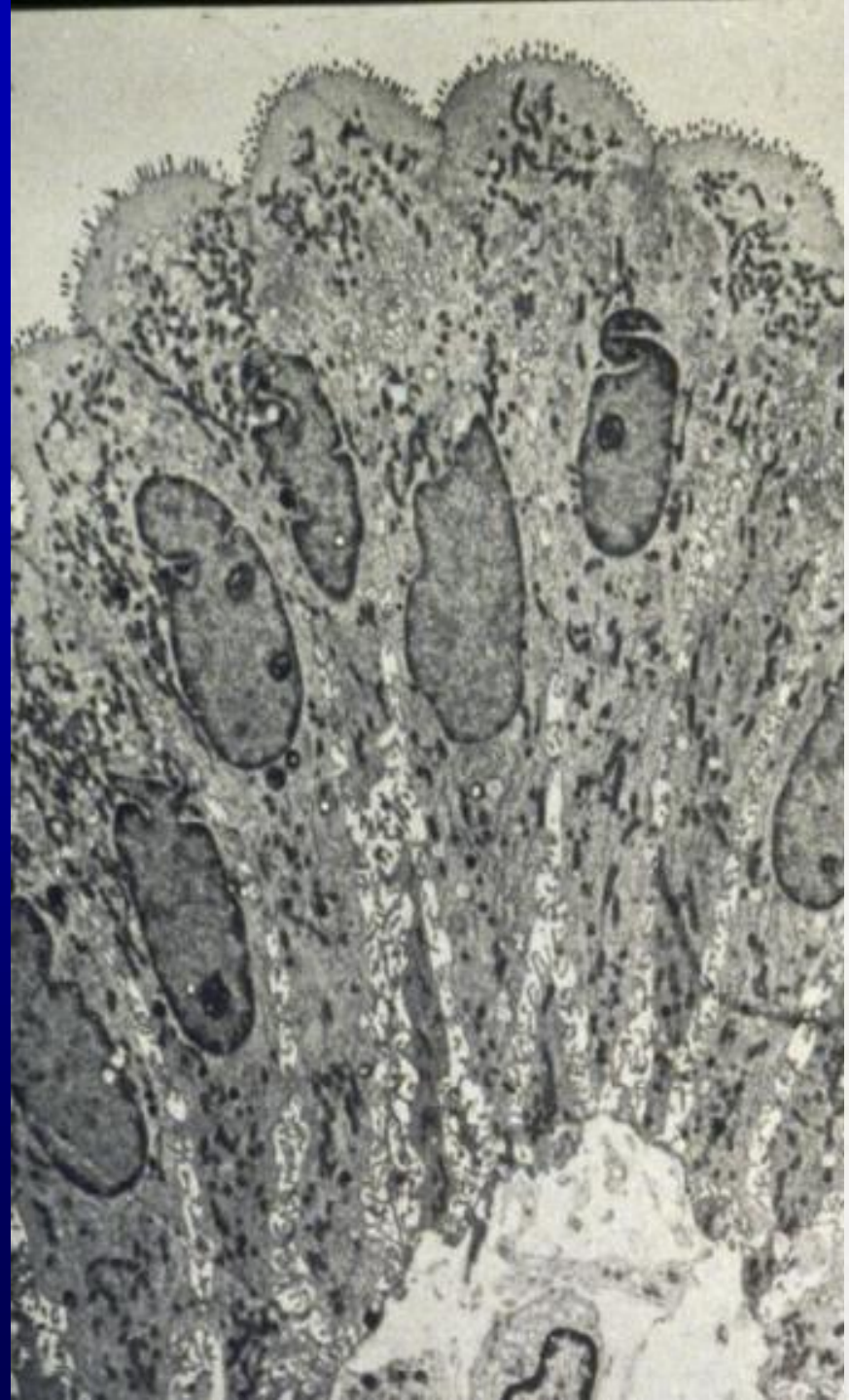


Common hepatic duct



The wall of the cystic duct is convoluted and contains abundant smooth muscle fibers which represent the spiral valve preventing distention or collapse of the cystic duct when the latter is subject to sudden changes of pressure.





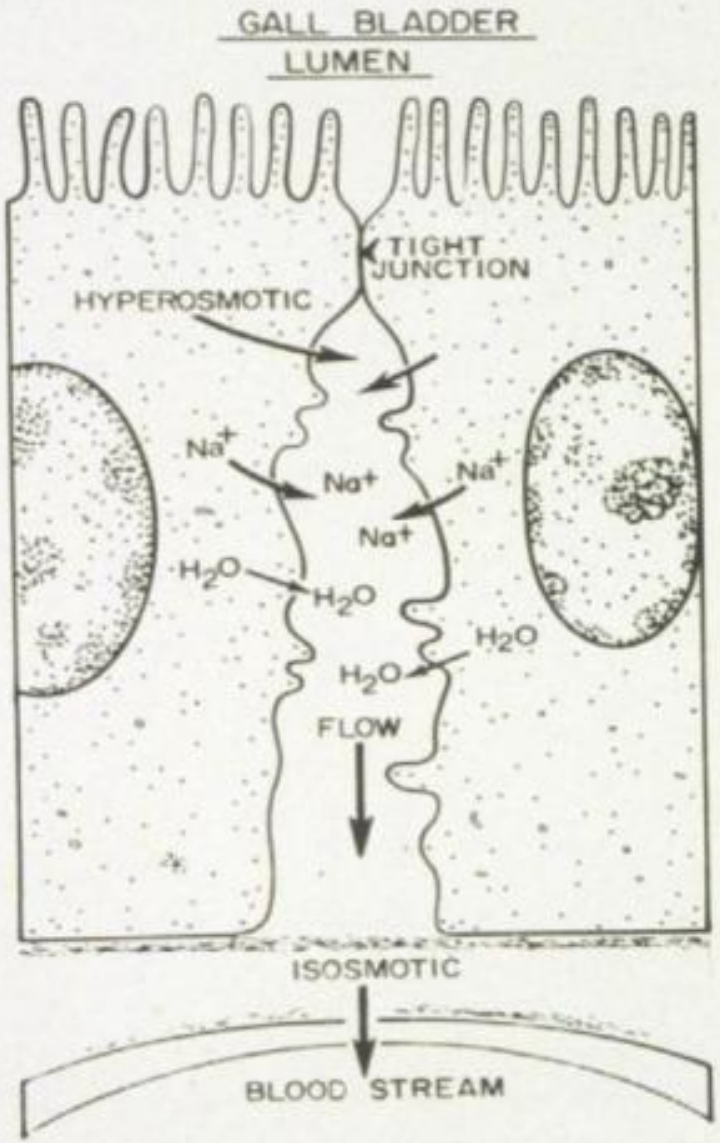
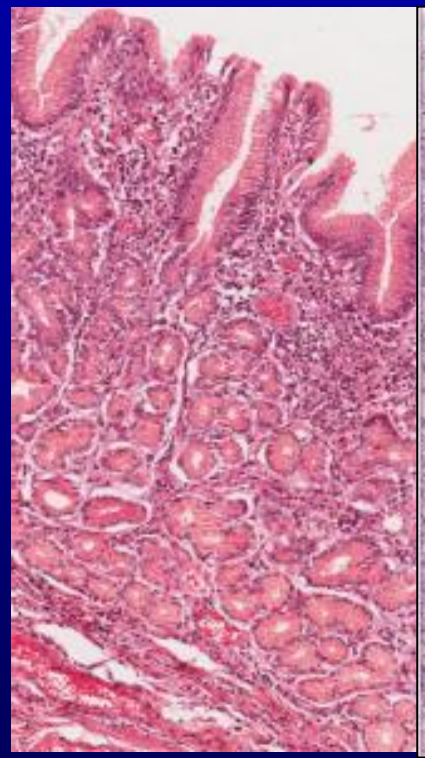


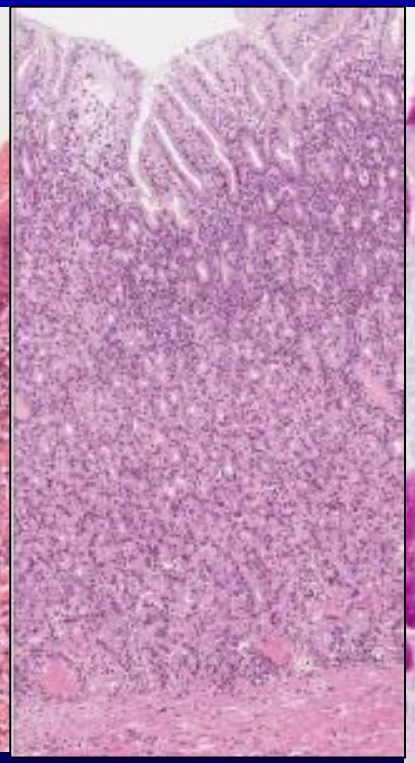
Figure 27–37. Diagram illustrating the mechanism of concentration of the bile. Sodium is actively pumped into the intercellular cleft below the occluding junction, creating a standing gradient that moves water from the lumen to blood vessels in the lamina propria.

Distinguishing characteristics between the mucosa of the various parts of the stomach, intestines, and gallbladder.

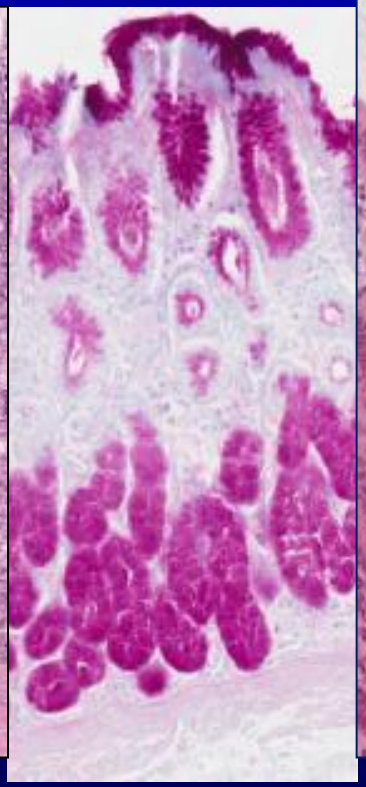
Mucosa = surface epithelium, lamina propera, and muscularis mucosa



Cardiac stomach
437

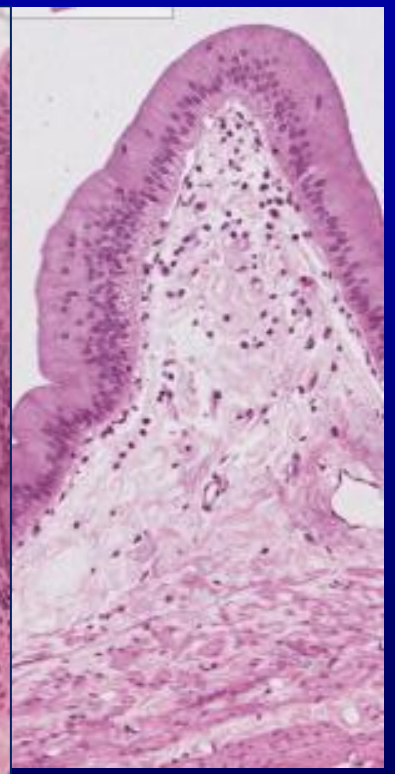


Fundic stomach
145



Pyloric stomach
141

Intestines
148



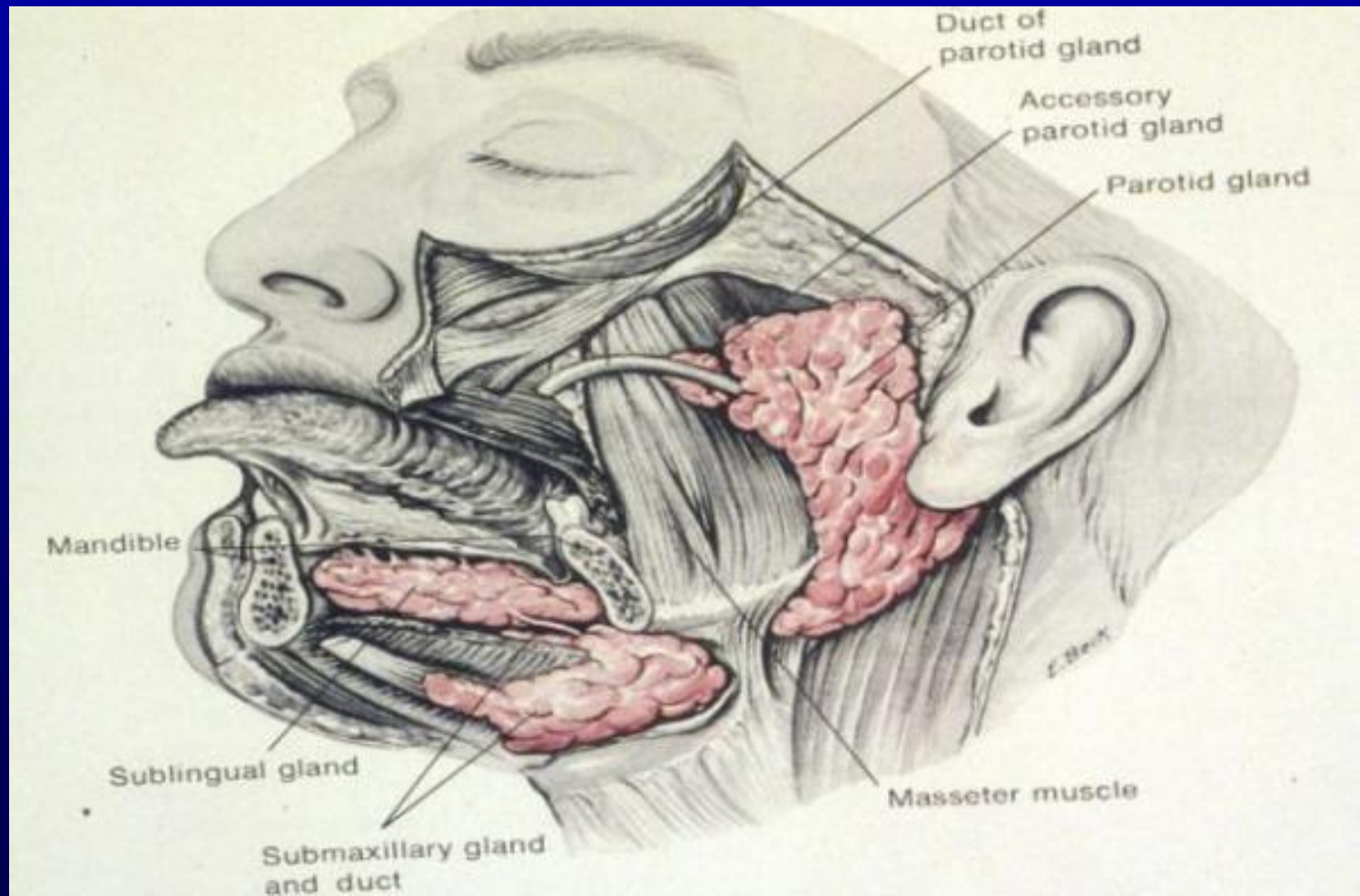
Gallbladder
155

Salivary Glands

Function

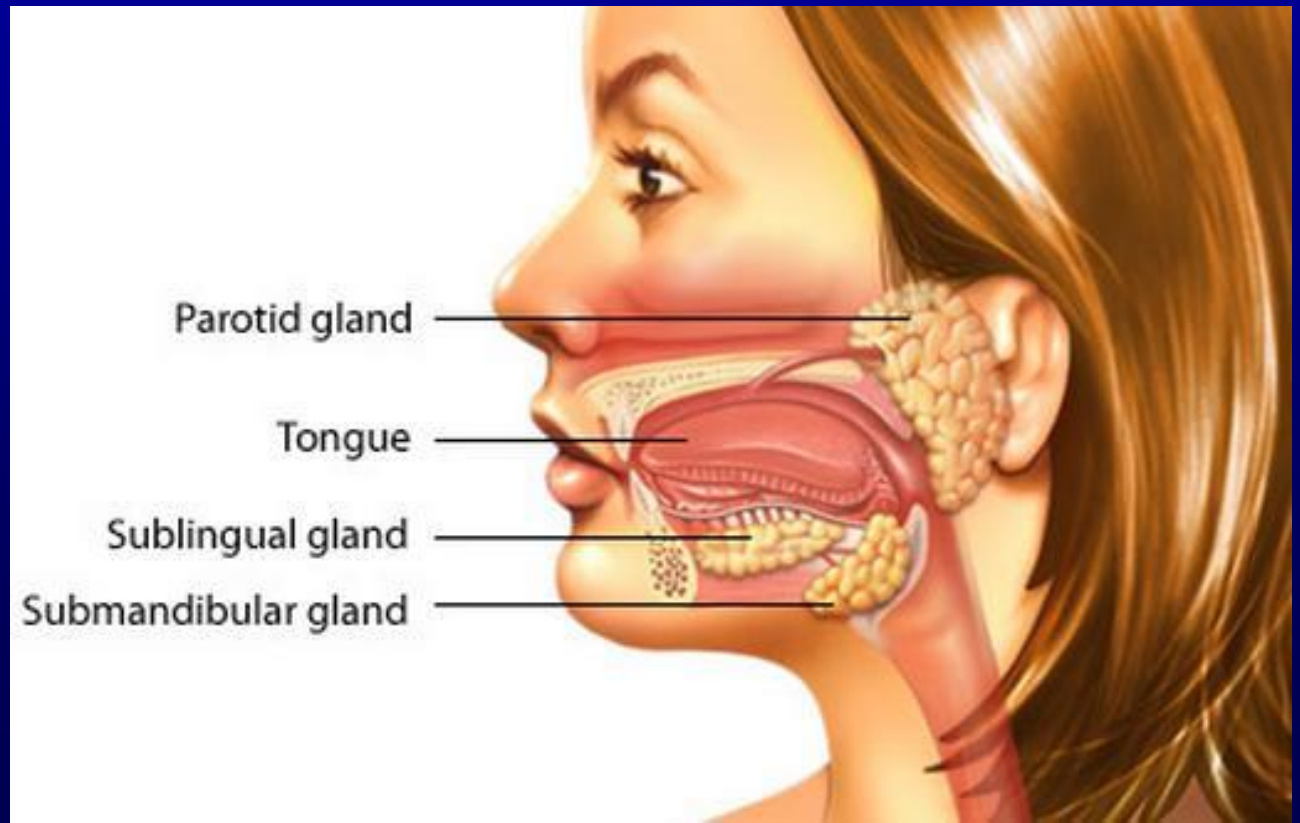
Histological organization

- **Acinus = functional unit**
  - **Serous**
  - **Mucous**
  - **Mixed**



Origin of Salivary Glands?

- Ectoderm - oral ectoderm
  epithelial sheet
- Endoderm - alimentary tract



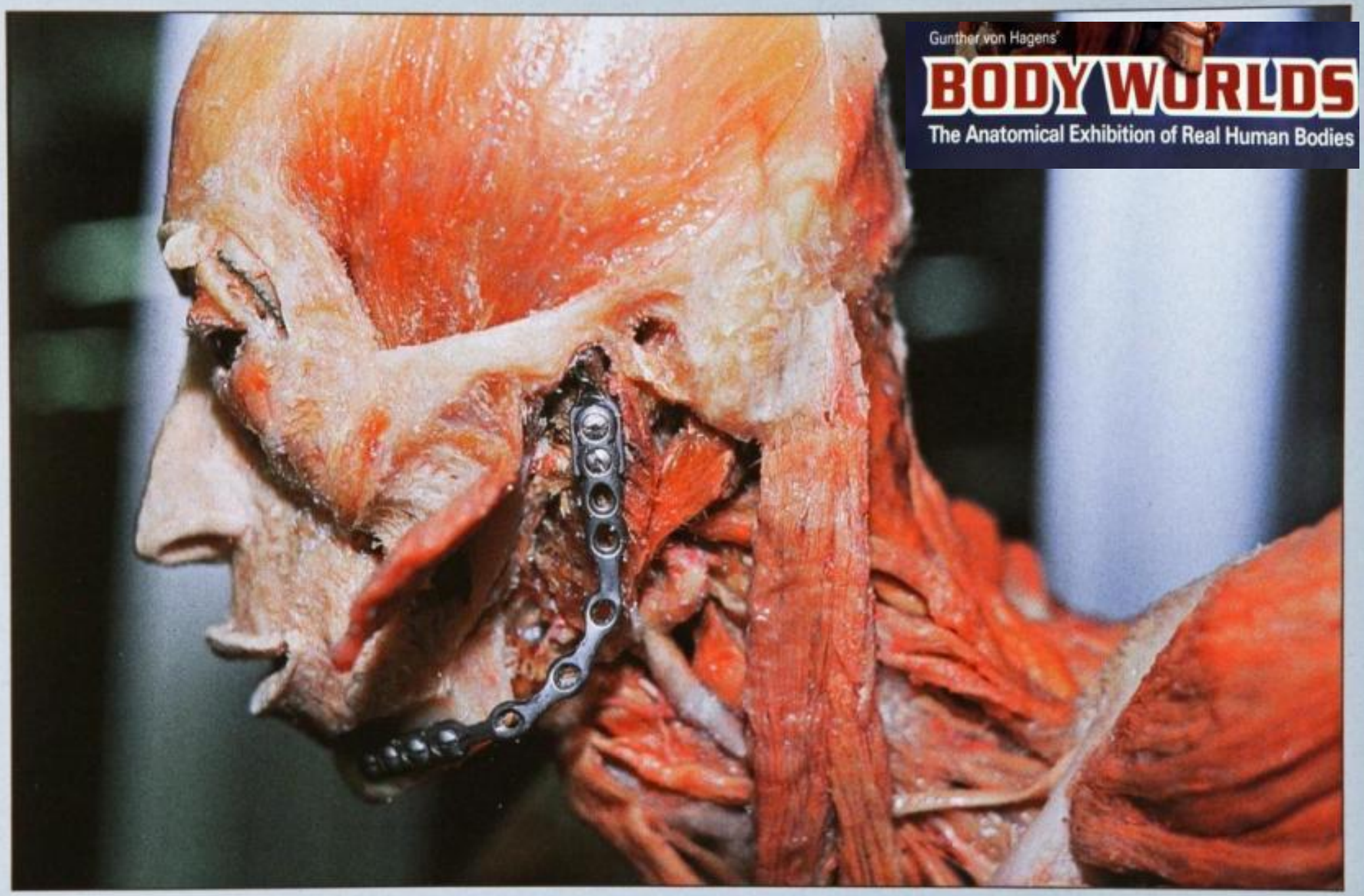
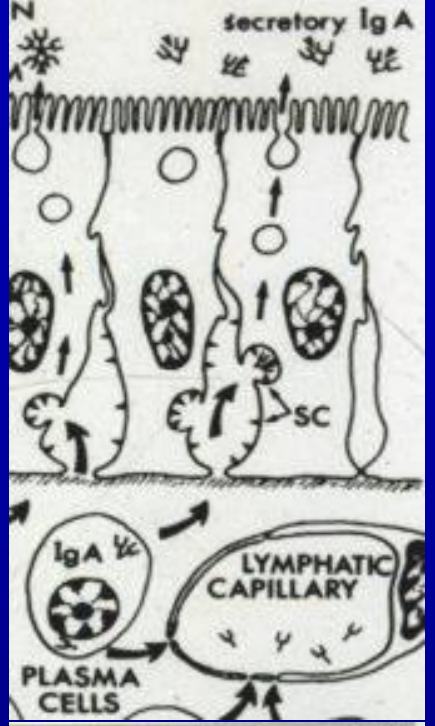
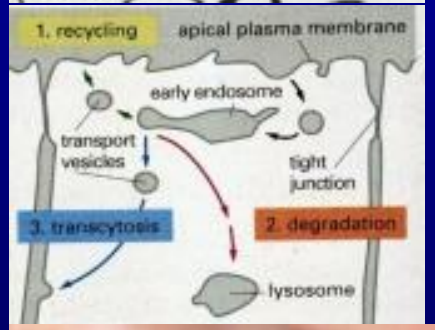


Fig. 9.22: Jawbone prosthesis after partial resection of the jawbone.

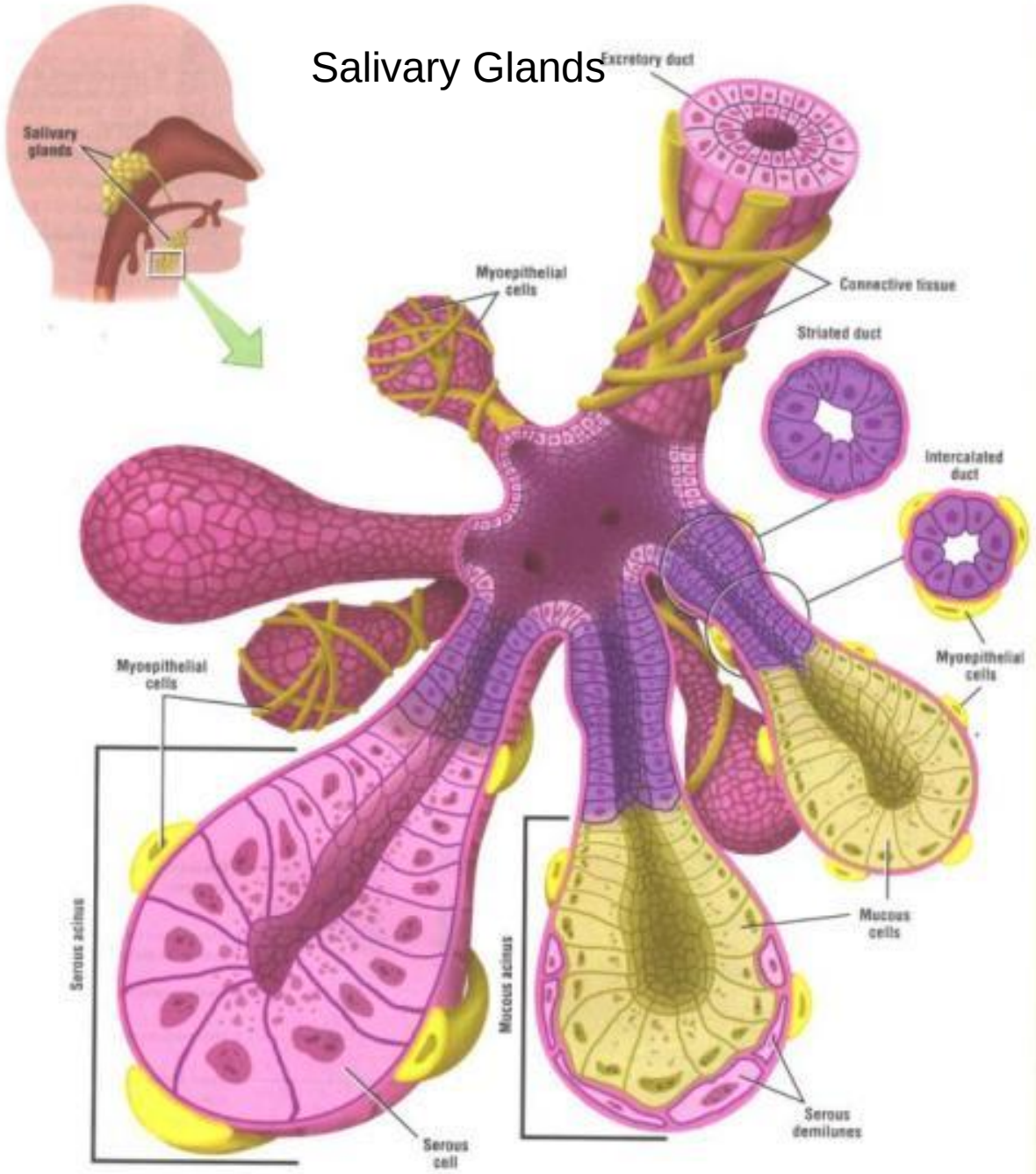
Saliva Helps Prevents Infections

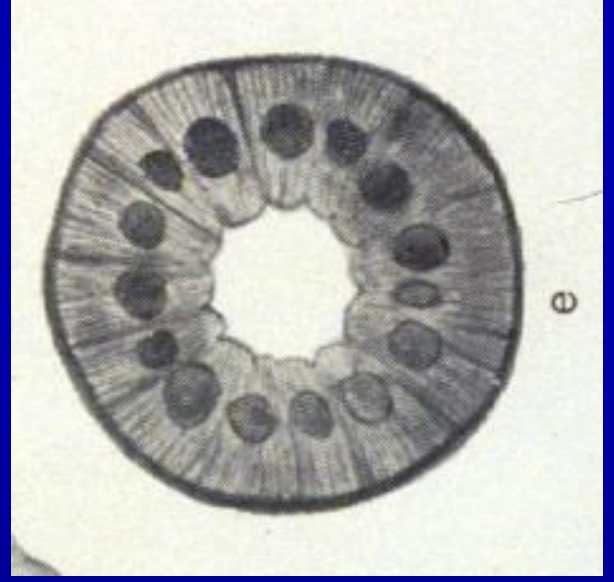
- Contains secreted IgA
- Contains Lactoferin - bind up iron needed for bacteria division
- Contains lysosome that kills bacteria
- Constantly washes mouth to dislodge and sweep bacteria down GI tract

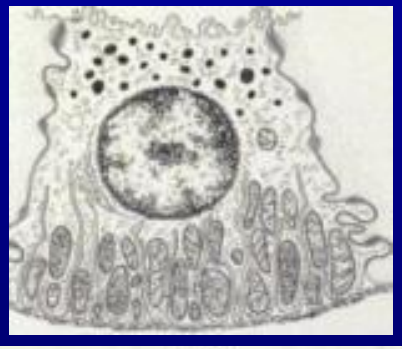


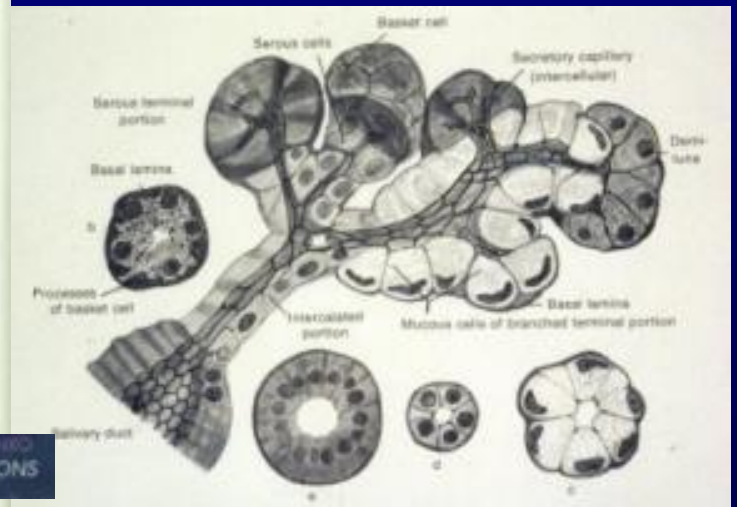


Salivary Glands



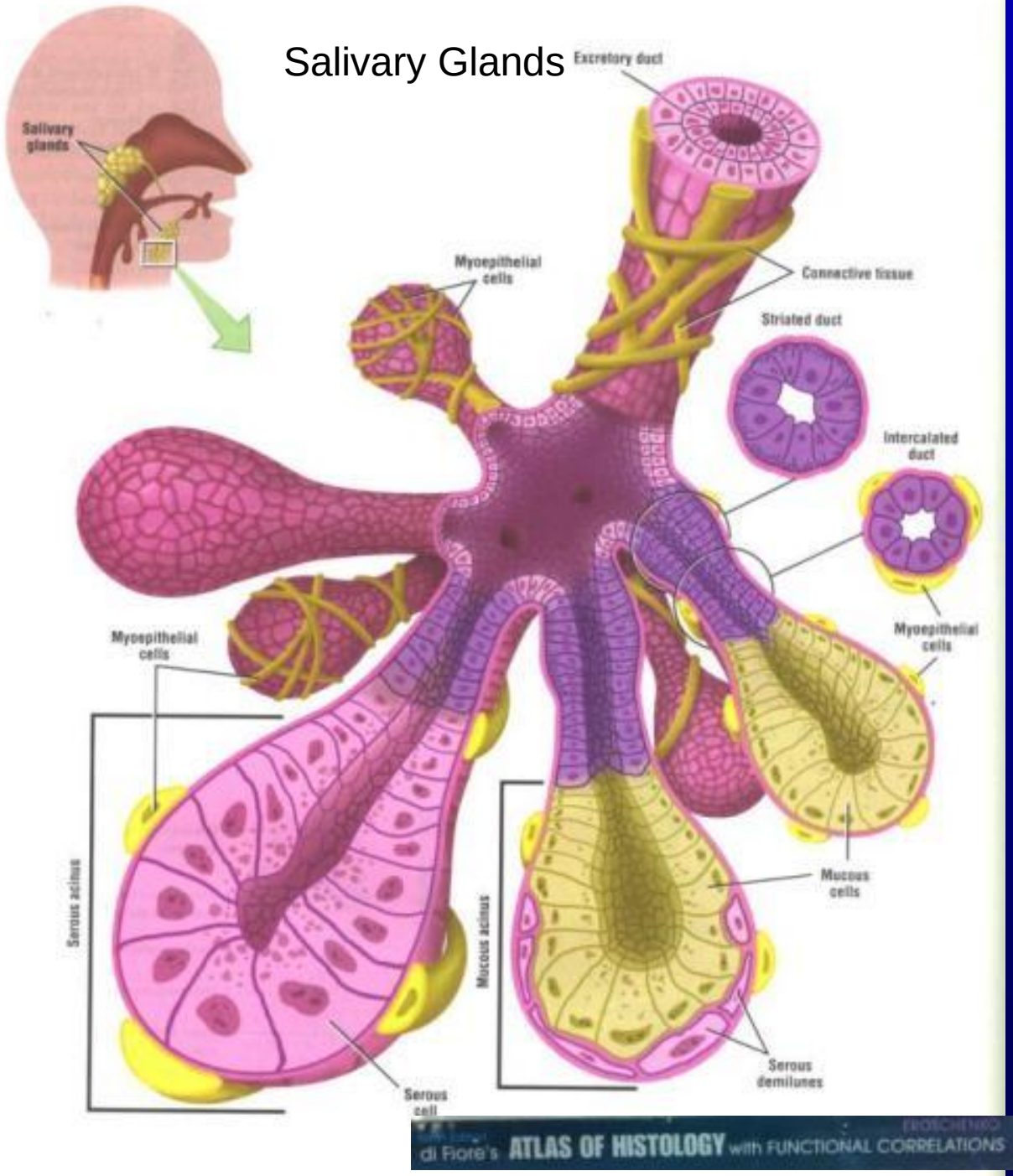


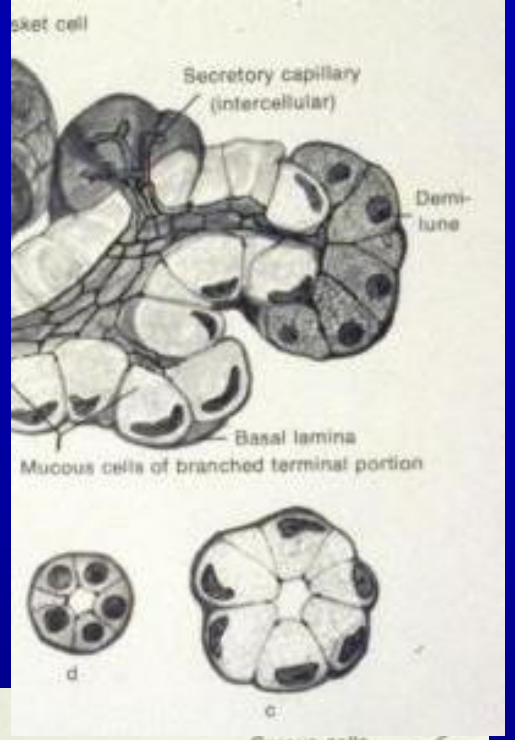


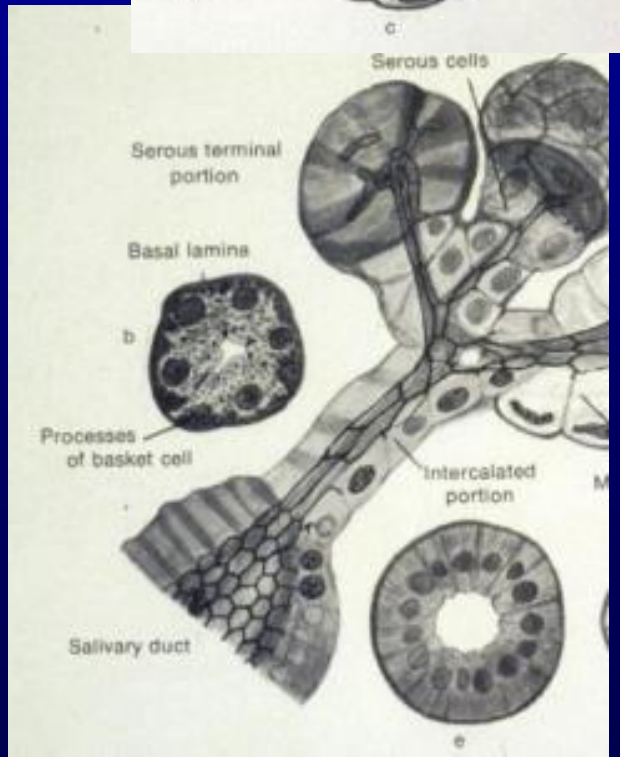


di Fiore's ATLAS OF HISTOLOGY with FUNCTIONAL CORRELATIONS

Salivary Glands



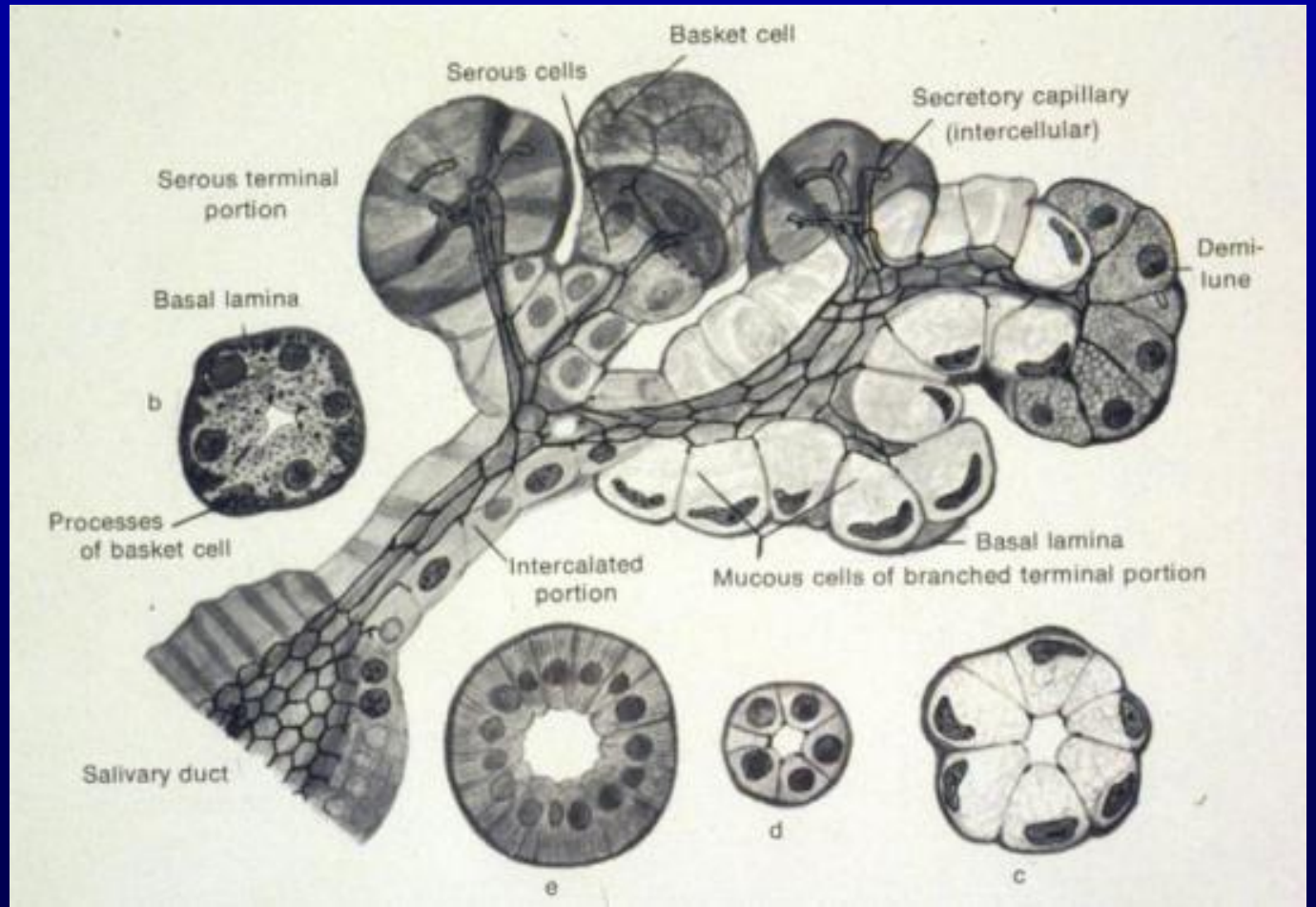




Ducts of Salivary Glands

Intercalated

Striated



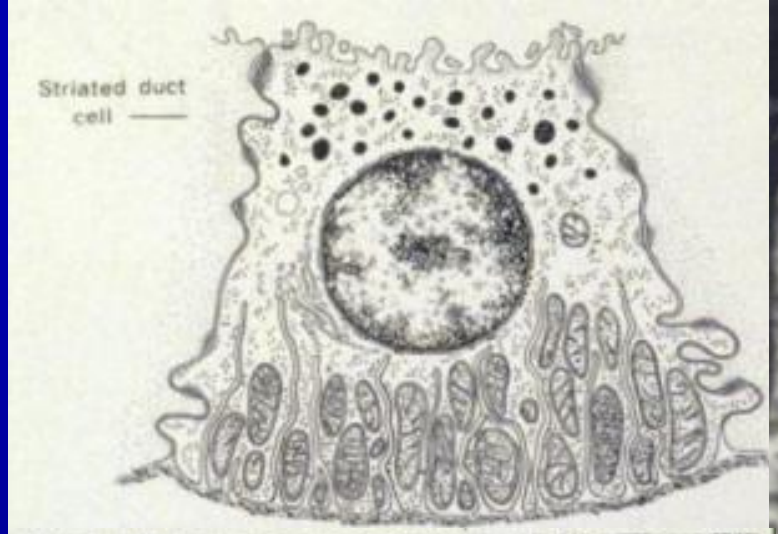
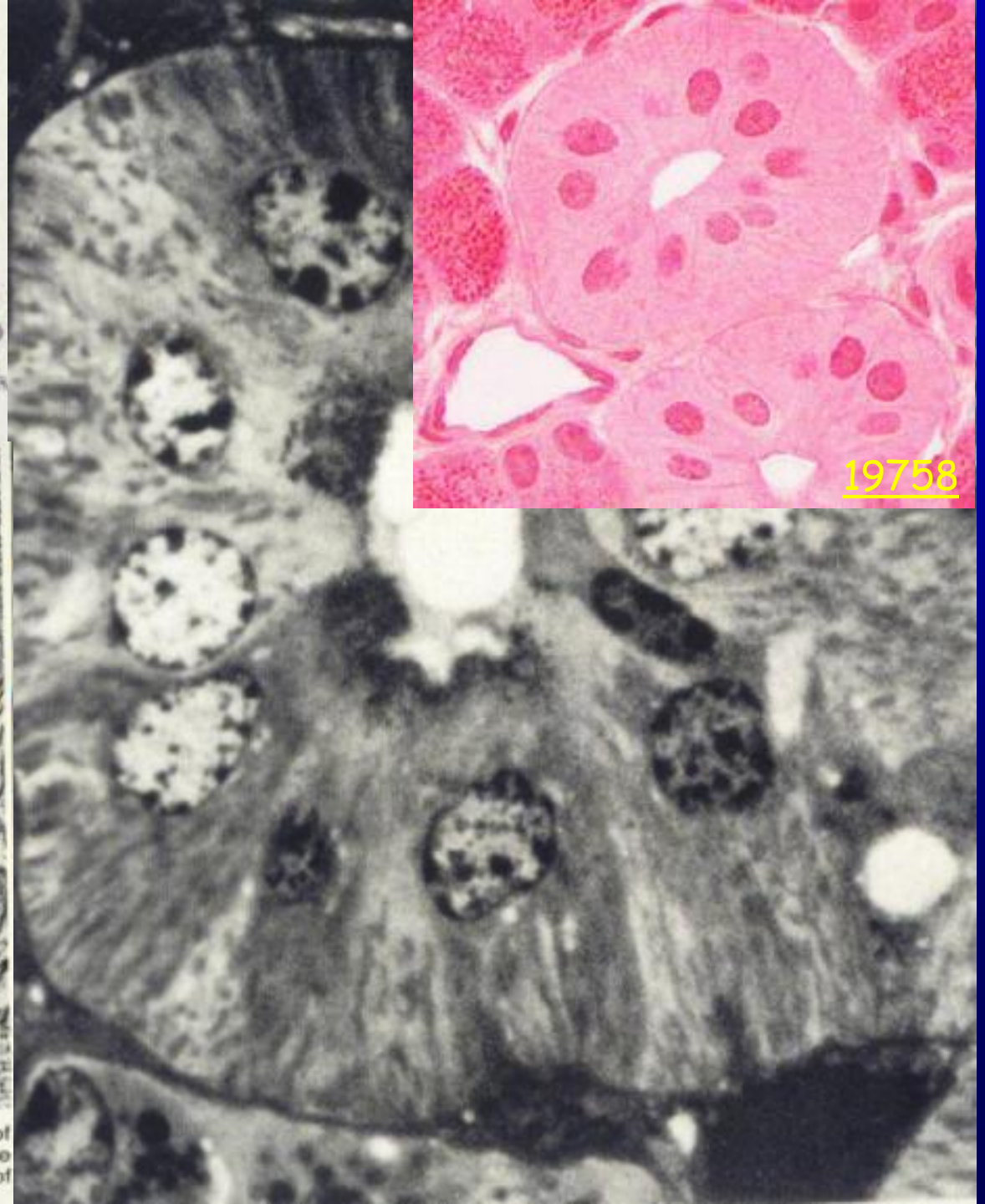
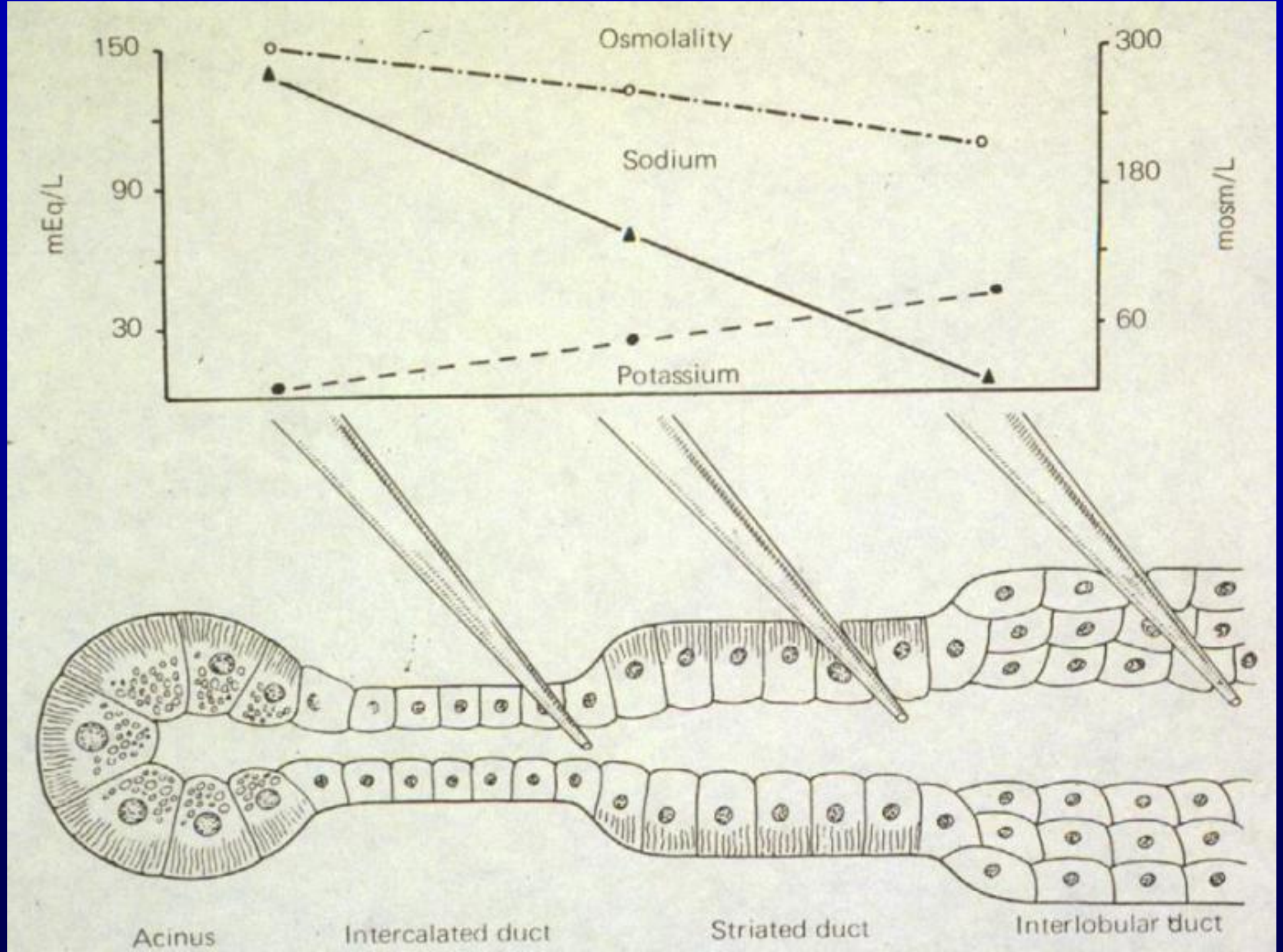
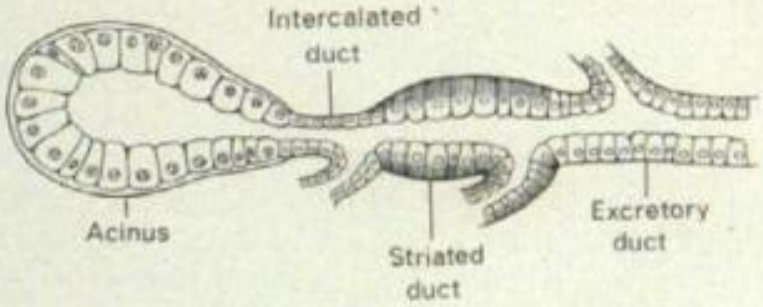


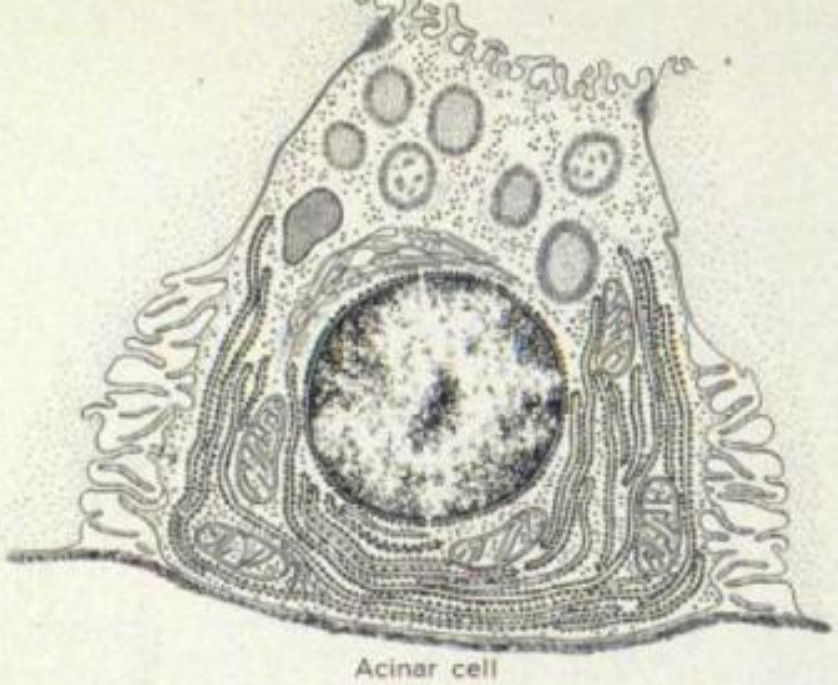
Figure 23–21. Electron micrograph of basal region of striated duct cells from cat submandibular gland. Notice the desmosomes joining the interdigitating processes of

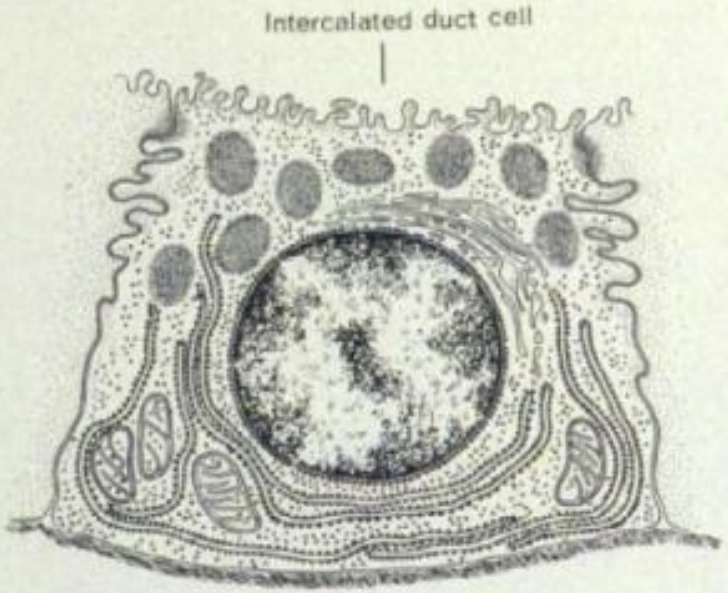


19758


Osmolality
Sodium
Potassium
150
90
30
300
180
60
mEq/L
mosm/L
Acinus
Intercalated duct
Striated duct
Interlobular duct







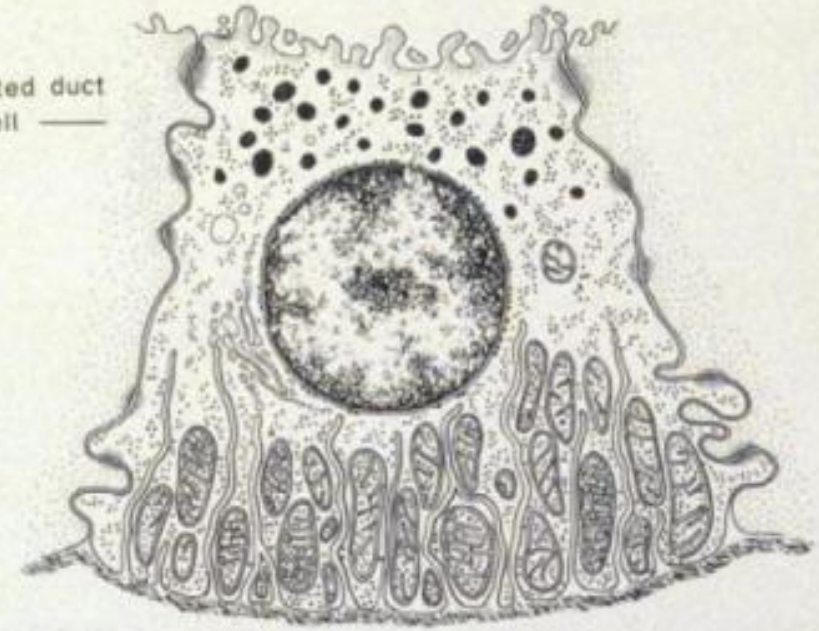
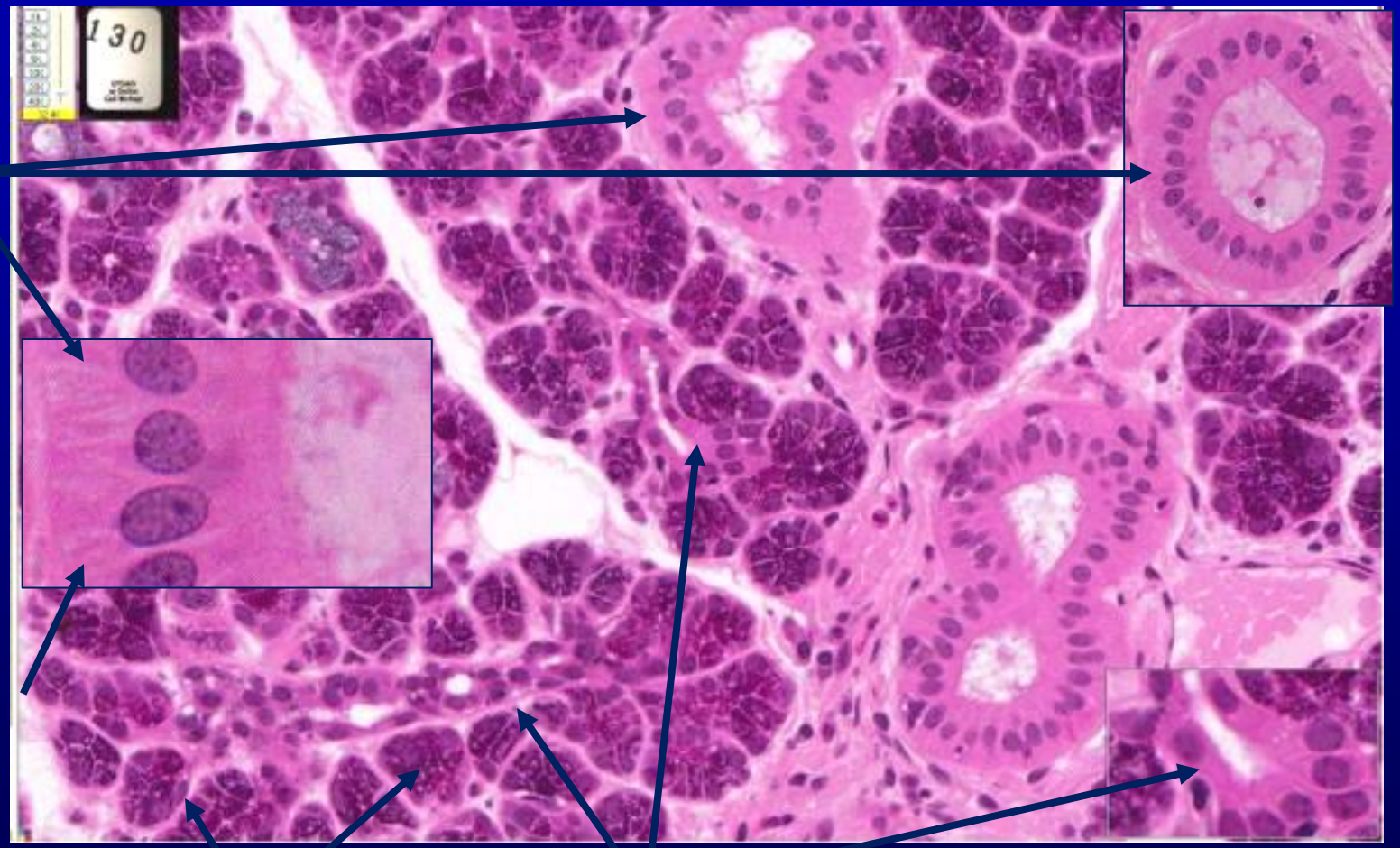


Figure 23–19. Diagrammatic representation of the fine structural characteristics of the various cell types in the mouse submandibular gland. (Redrawn after U. Rutberg.)

Submandibular gland - intercalated duct runs into Striated duct of salivary gland

The salivary gland is a compound, tubuloacinar gland.

Striated Ducts
These striations reflect vertically arranged mitochondria associated with deep enfolding of the basal plasma membrane

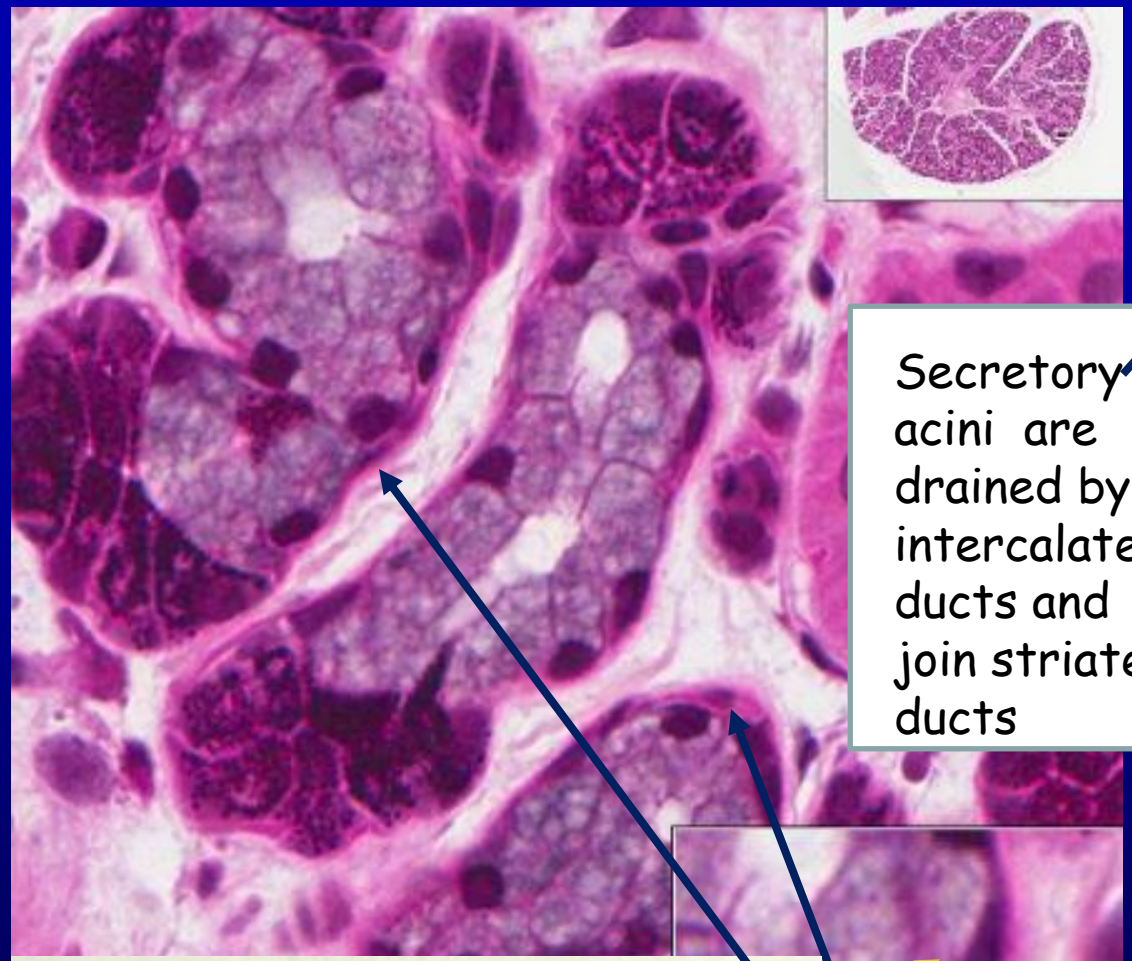


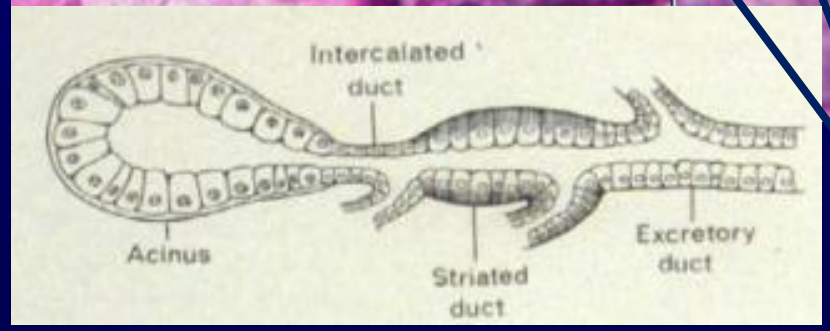
130

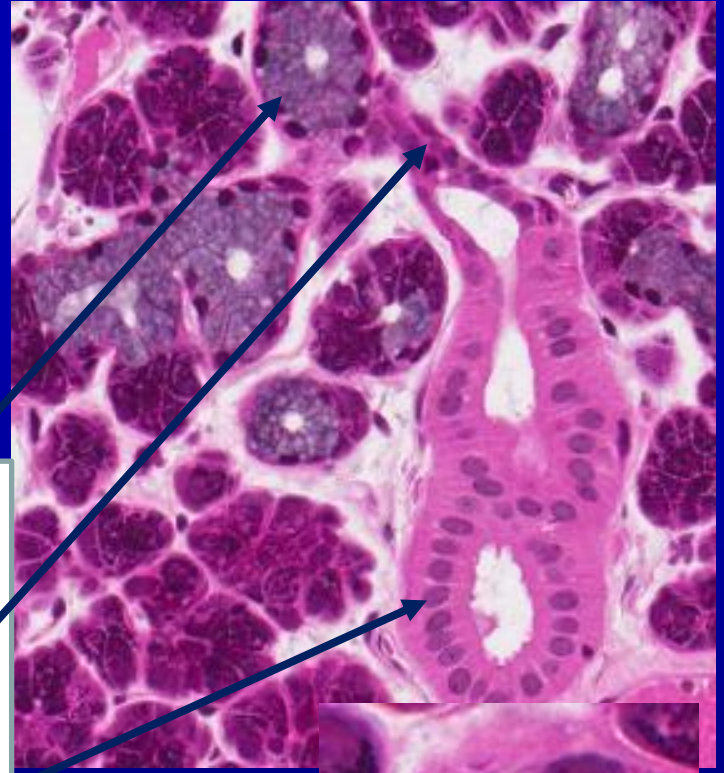
Secretory acini

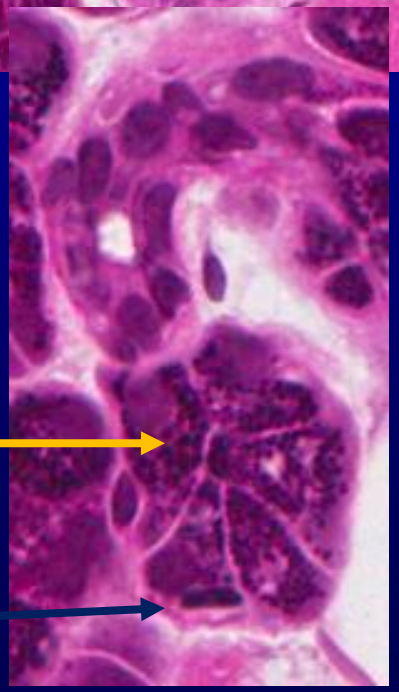
Intercalated ducts

130 Salivary gland







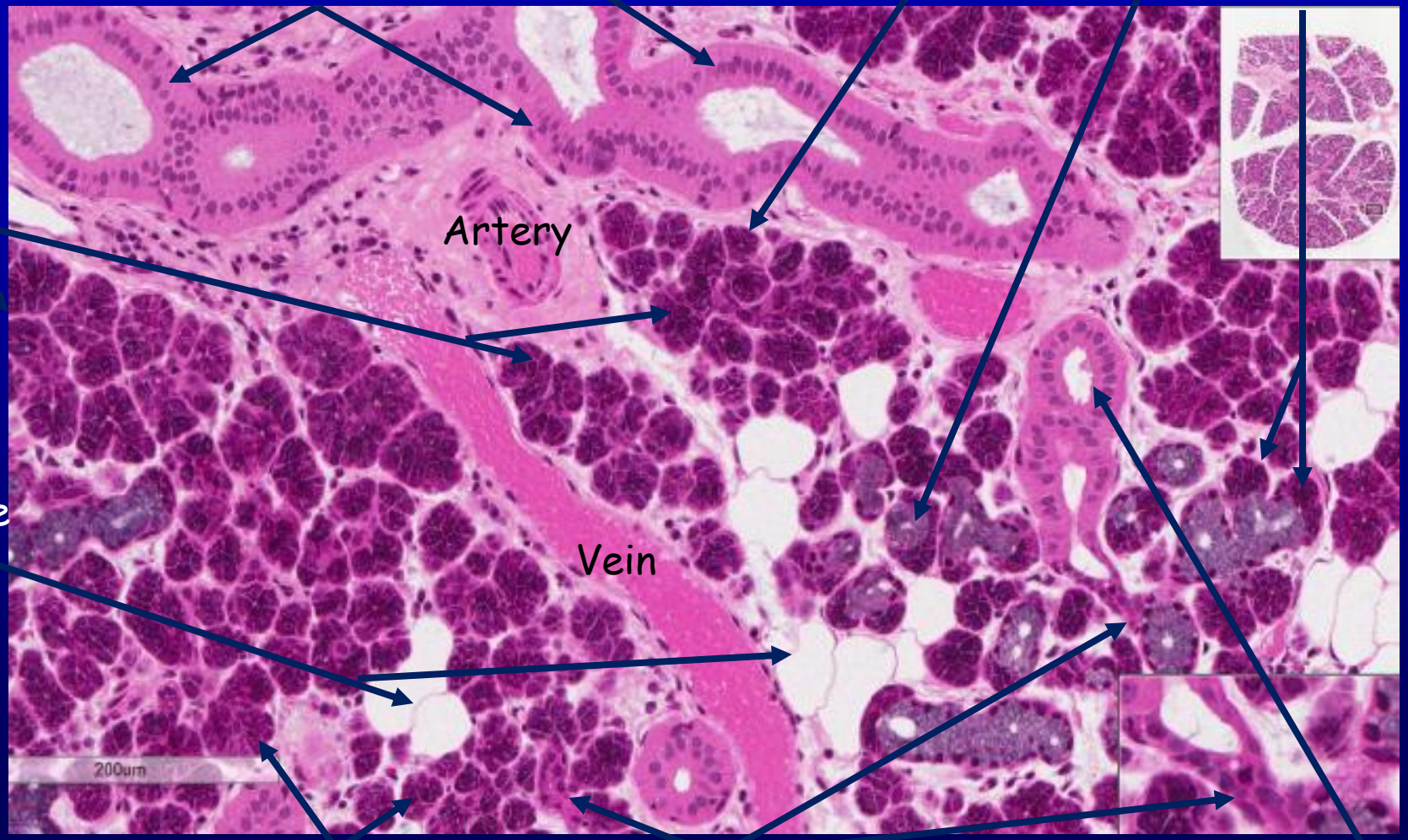


Secretory acini are drained by intercalated ducts and join striated ducts

Serous and mucous acini

Myoepithelial cells

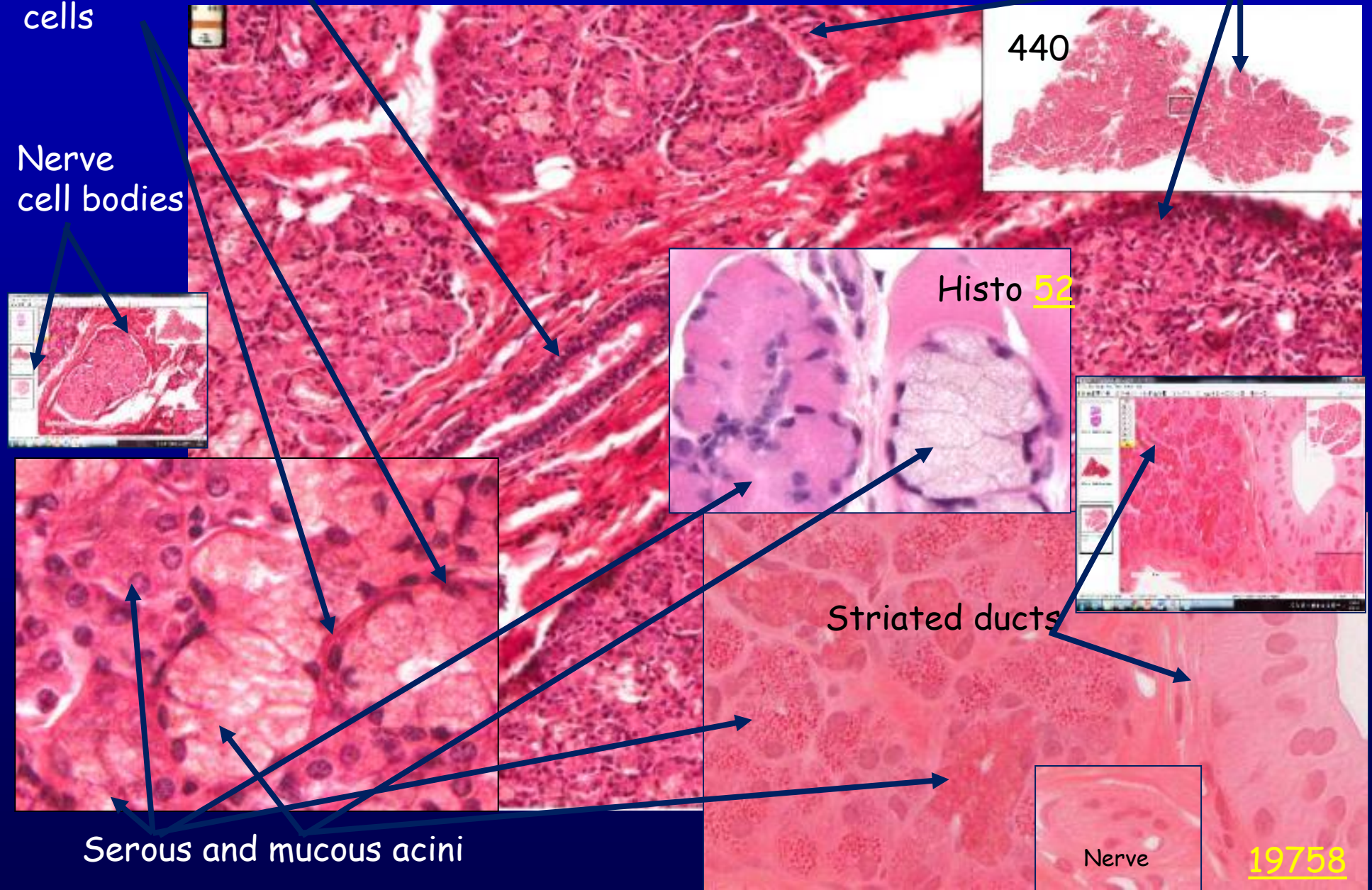
Salivary gland

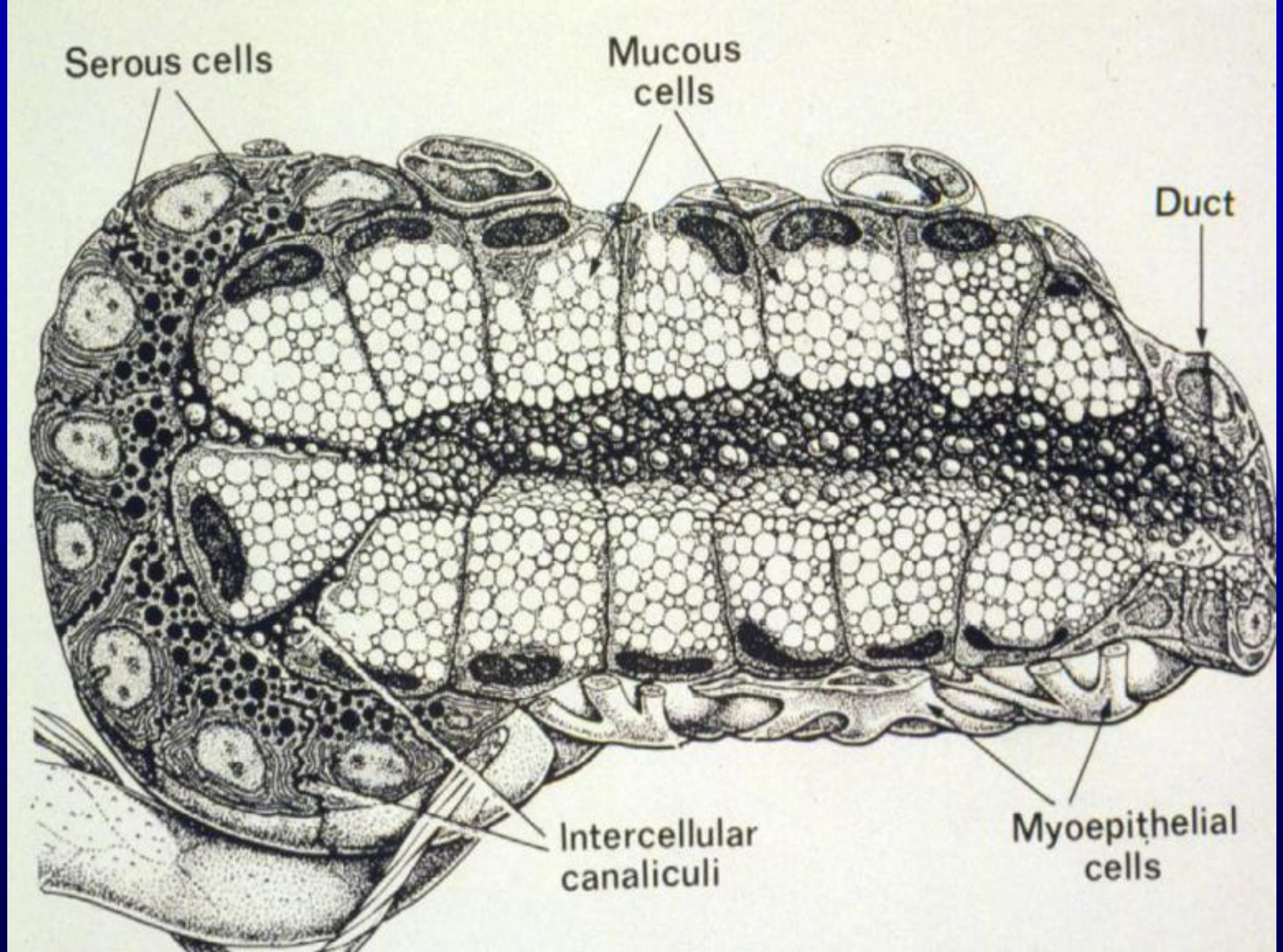


130

Individual secretory acini are drained by intercalated ducts and join striated ducts

Salivary glands 440




Serous cells
Mucous cells
Duct
Intercellular canaliculi
Myoepithelial cells

Pancreas

Function

1. Exocrine
2. Endocrine

Histological organization,

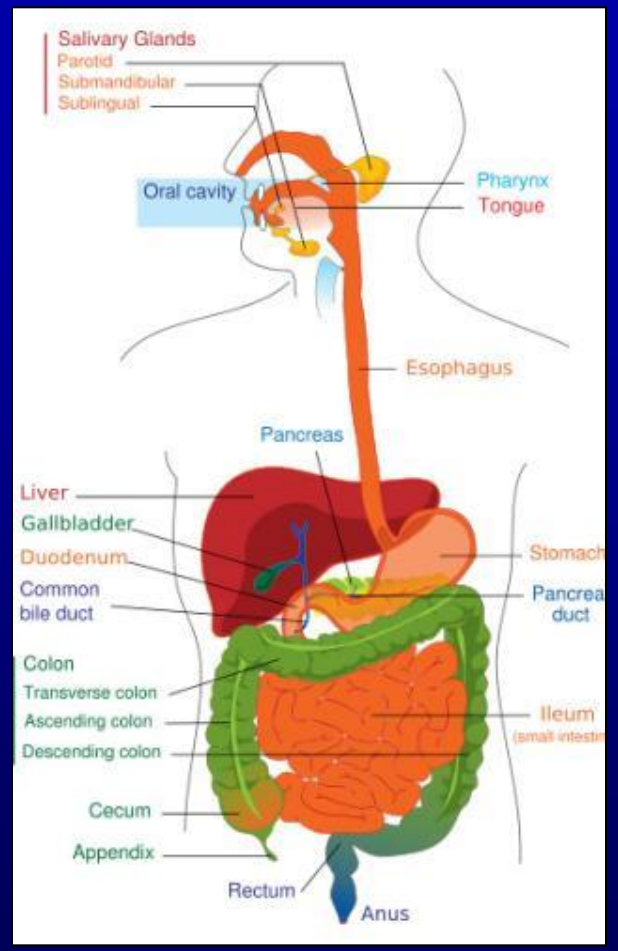
Exocrine portion

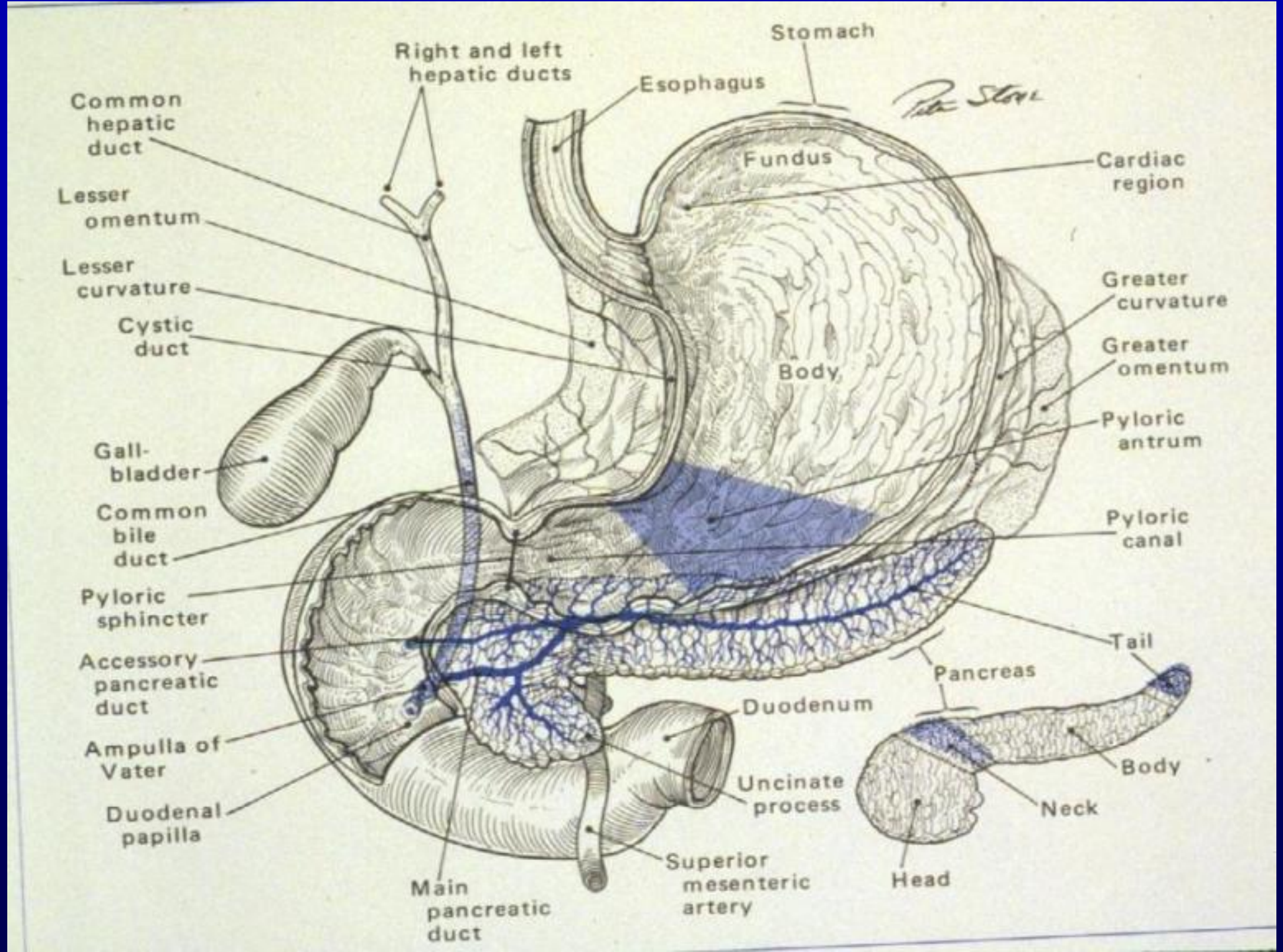
1. Acini
2. Ducts

Endocrine portion

- Islets of Langerhans

Histophysiology




Stomach
Right and left hepatic ducts
Esophagus
Common hepatic duct
Fundus
Cardiac region
Lesser omentum
Lesser curvature
Greater curvature
Cystic duct
Body
Greater omentum
Pyloric antrum
Gall-bladder
Common bile duct
Pyloric canal
Pyloric sphincter
Tail
Accessory pancreatic duct
Pancreas
Duodenum
Ampulla of Vater
Body
Uncinate process
Duodenal papilla
Neck
Superior mesenteric artery
Head
Main pancreatic duct

PANCREAS

FUNCTION

1. EXOCRINE
2. ENDOCRINE

HISTOLOGICAL ORGANIZATION,

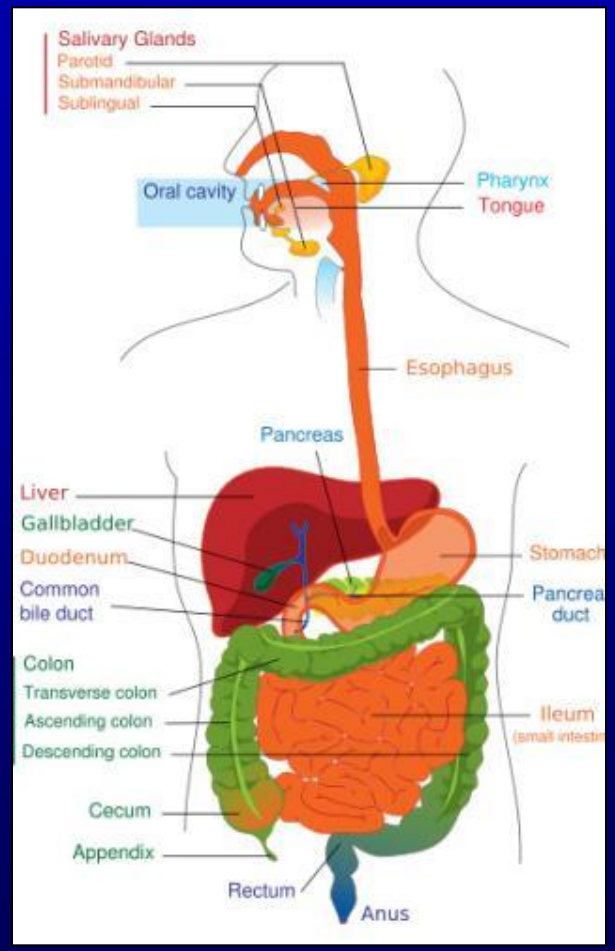
EXOCRINE PORTION

1. ACINI
2. DUCTS

ENDOCRINE PORTION

- ISLETS OF LANGERHANS

HISTOPHYSIOLOGY



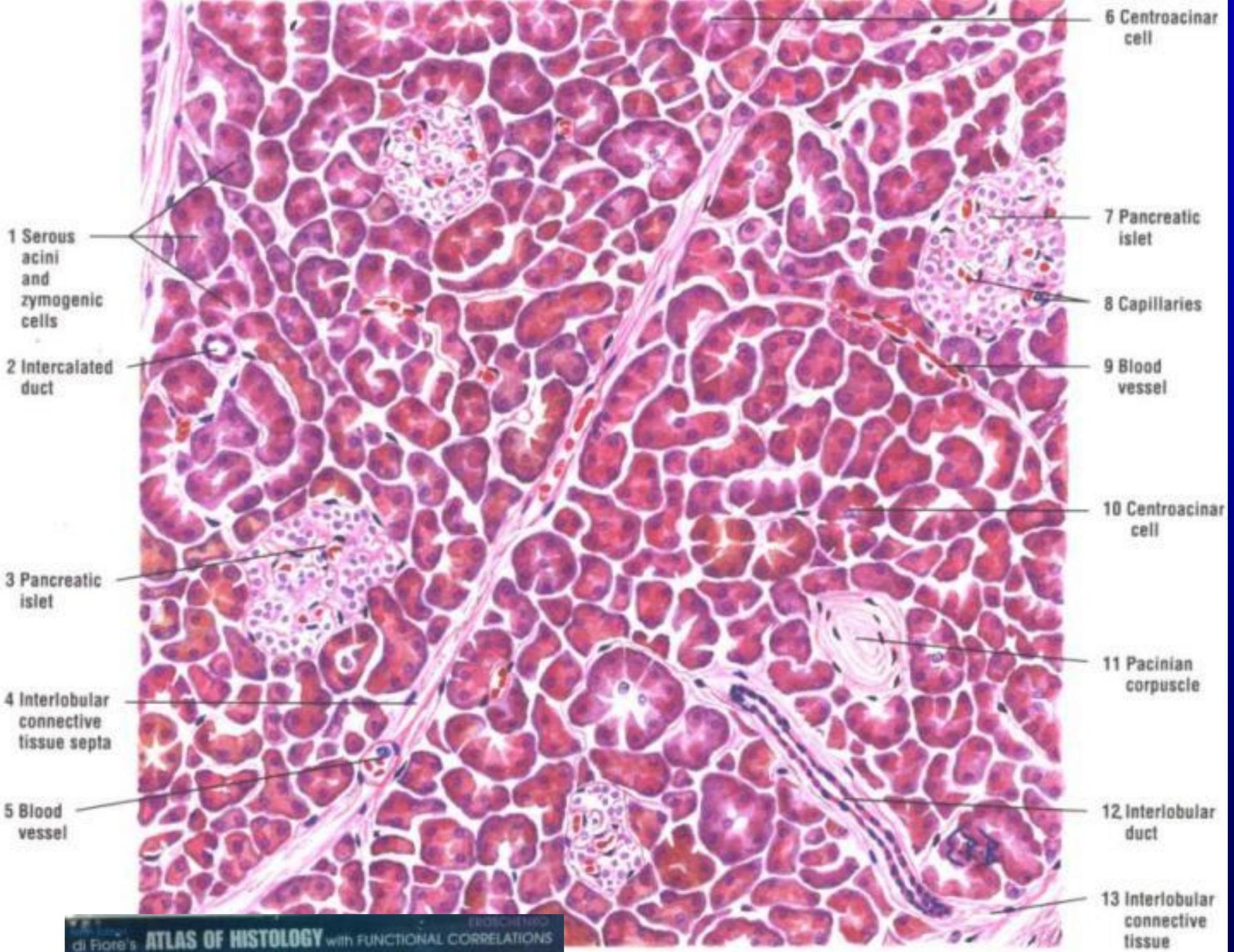
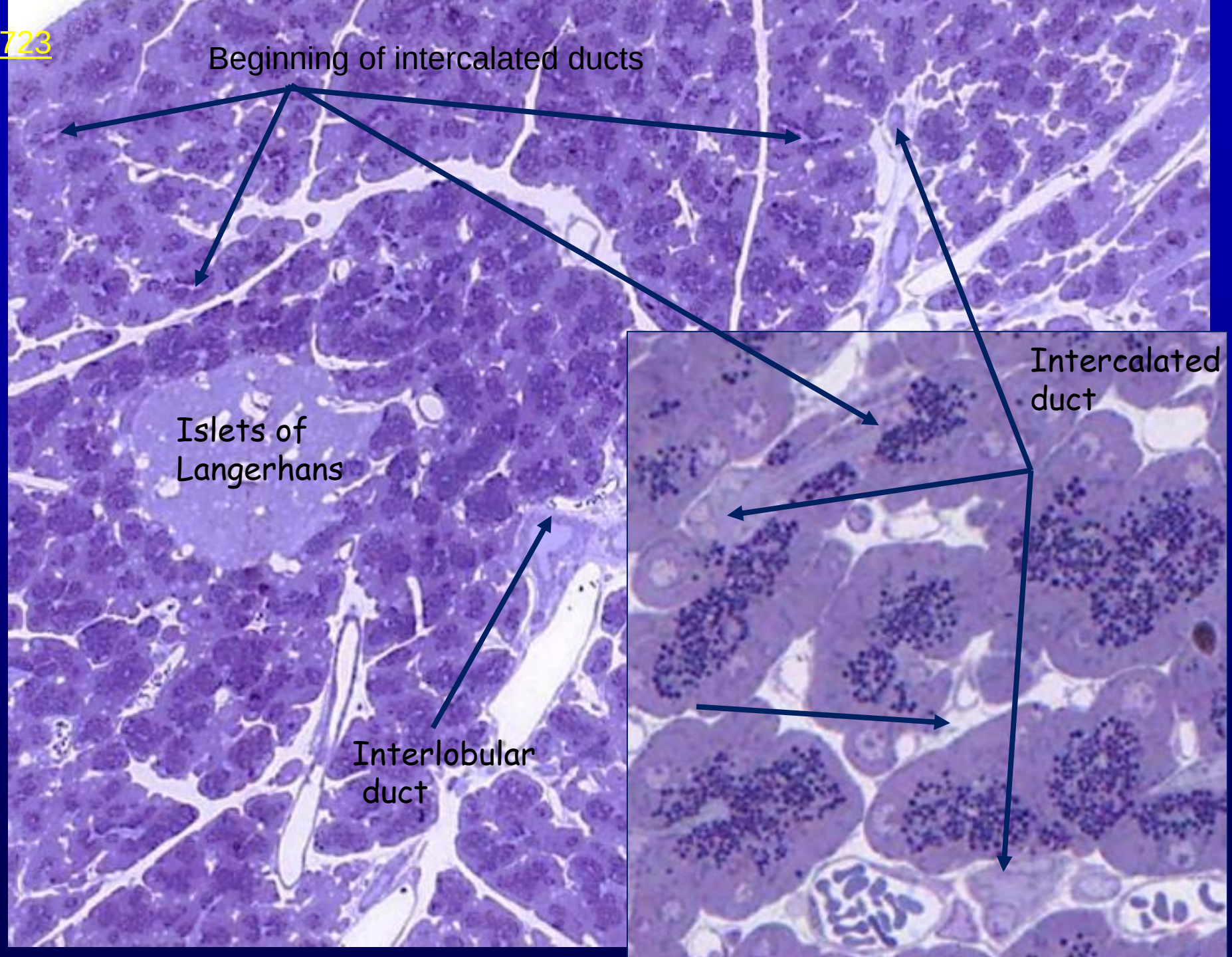


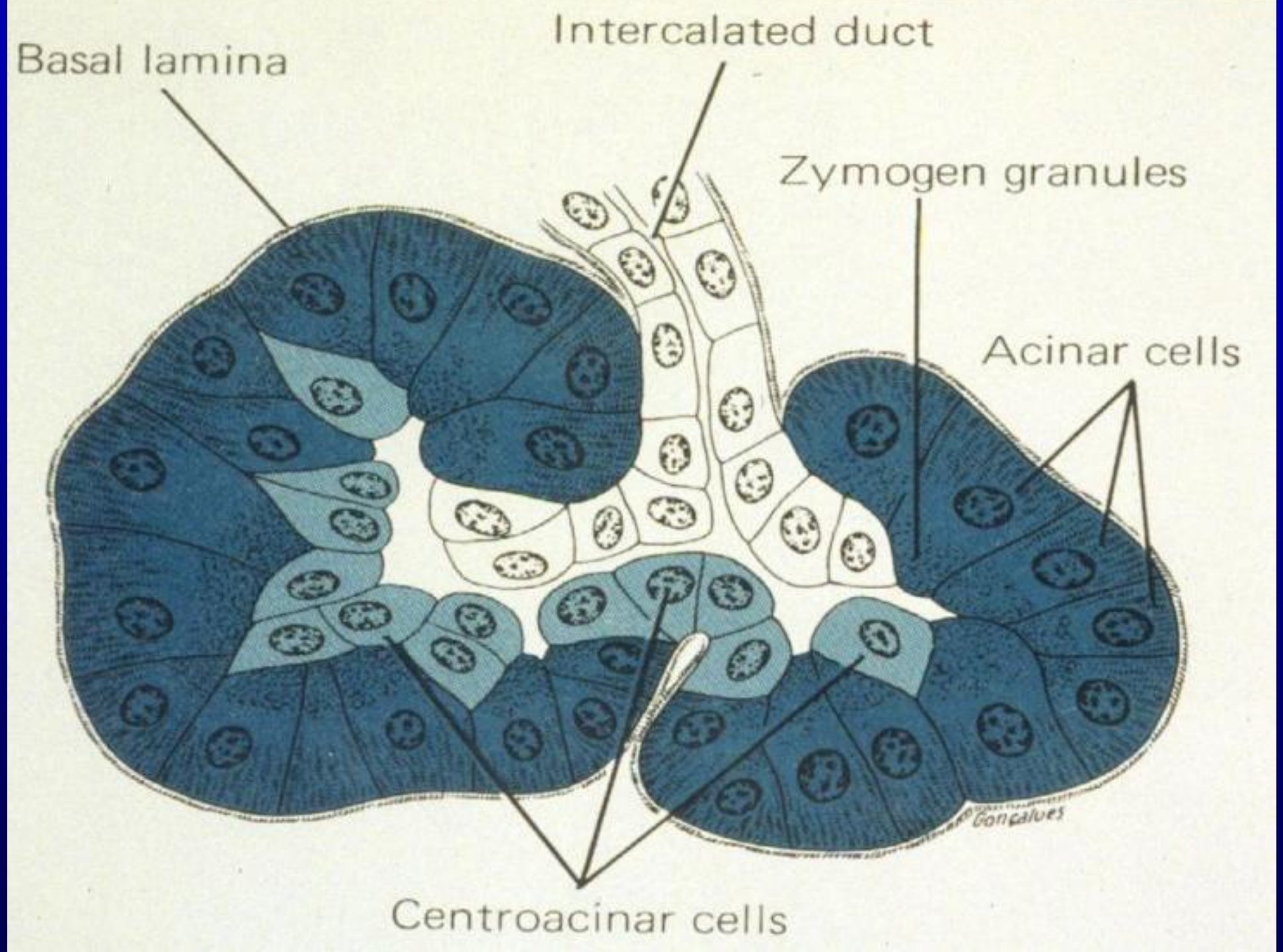
Fig. 13-10 Pancreas (sectional view). Stain: hematoxylin-eosin. Low magnification.

36723


Beginning of intercalated ducts
Islets of Langerhans
Interlobular duct
Intercalated duct

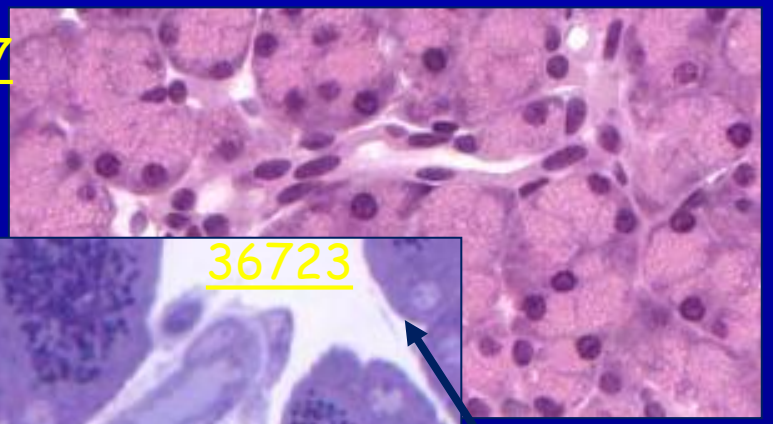

Centroacinar cells
Ergastoplasm
Zymogen granules
Golgi complex


Acinar cell
Lumen
Centroacinar
cell

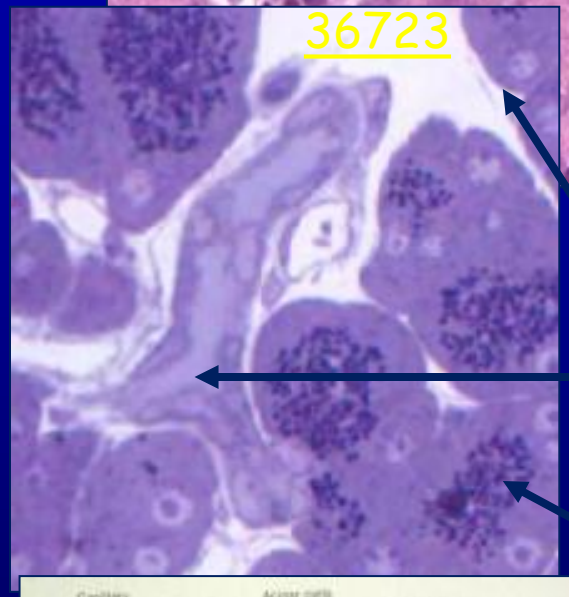

Basal lamina
Intercalated duct
Zymogen granules
Acinar cells
Centroacinar cells

156 and 157 Pancreas

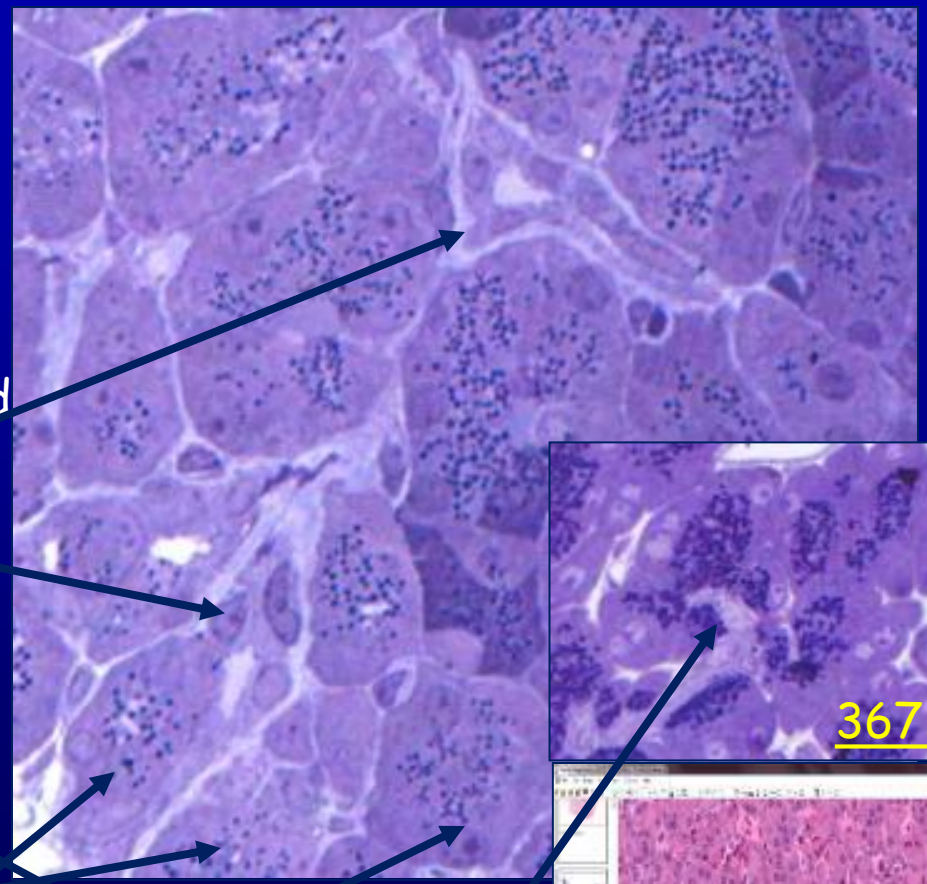
157



36723

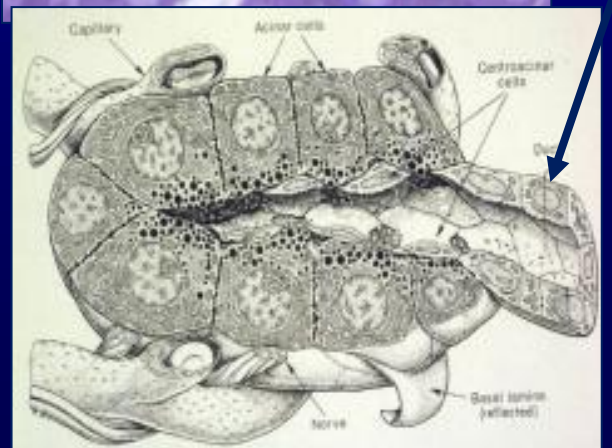


156



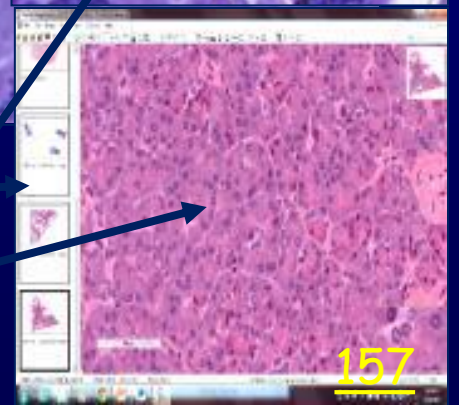
Intercalated duct

36723



Secretory granules

All acini are of the serous type and many contain centroacinar cells initiate the duct inside the acinus.

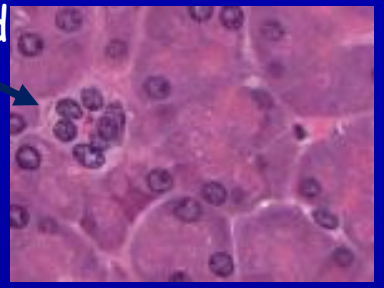


157

Pancreas - Islets of Langerhans

The pancreas is a compound tubuloalveolar (tubuloacinar) gland which functions in the digestion of food.

Intercalated duct



Islets of Langerhans

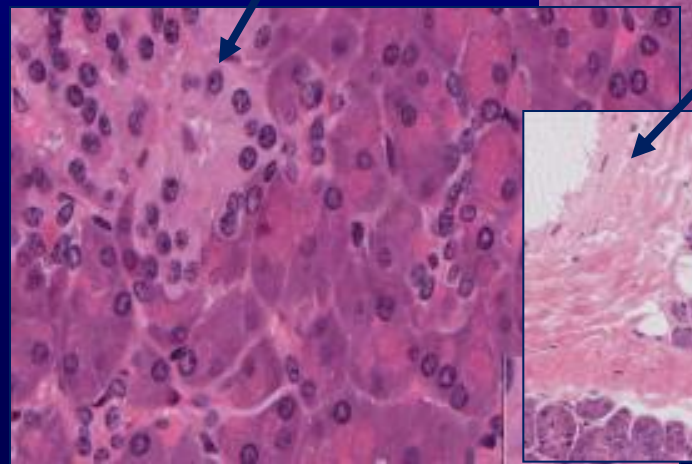
Insulin is secreted by the B cells which are most numerous and centrally located in the islets.

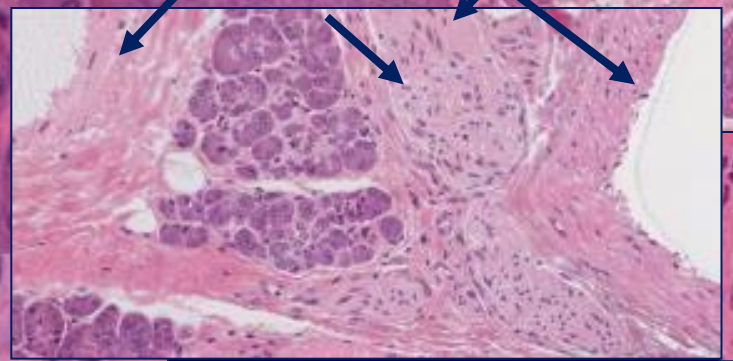
Lobes composed of lobules

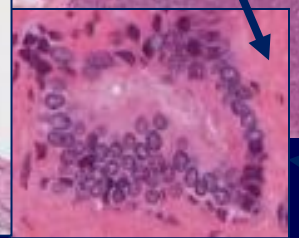
Connective tissue septa.

Blood vessels

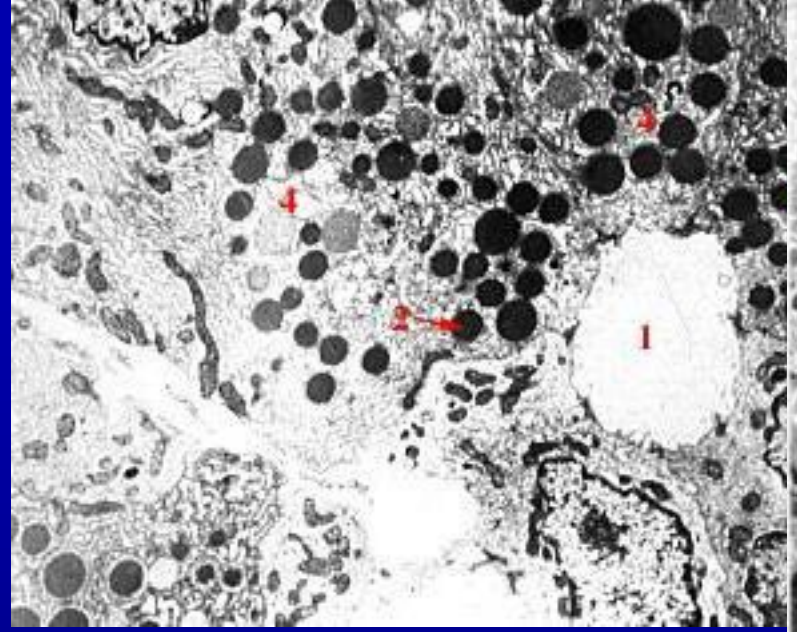
Nerve







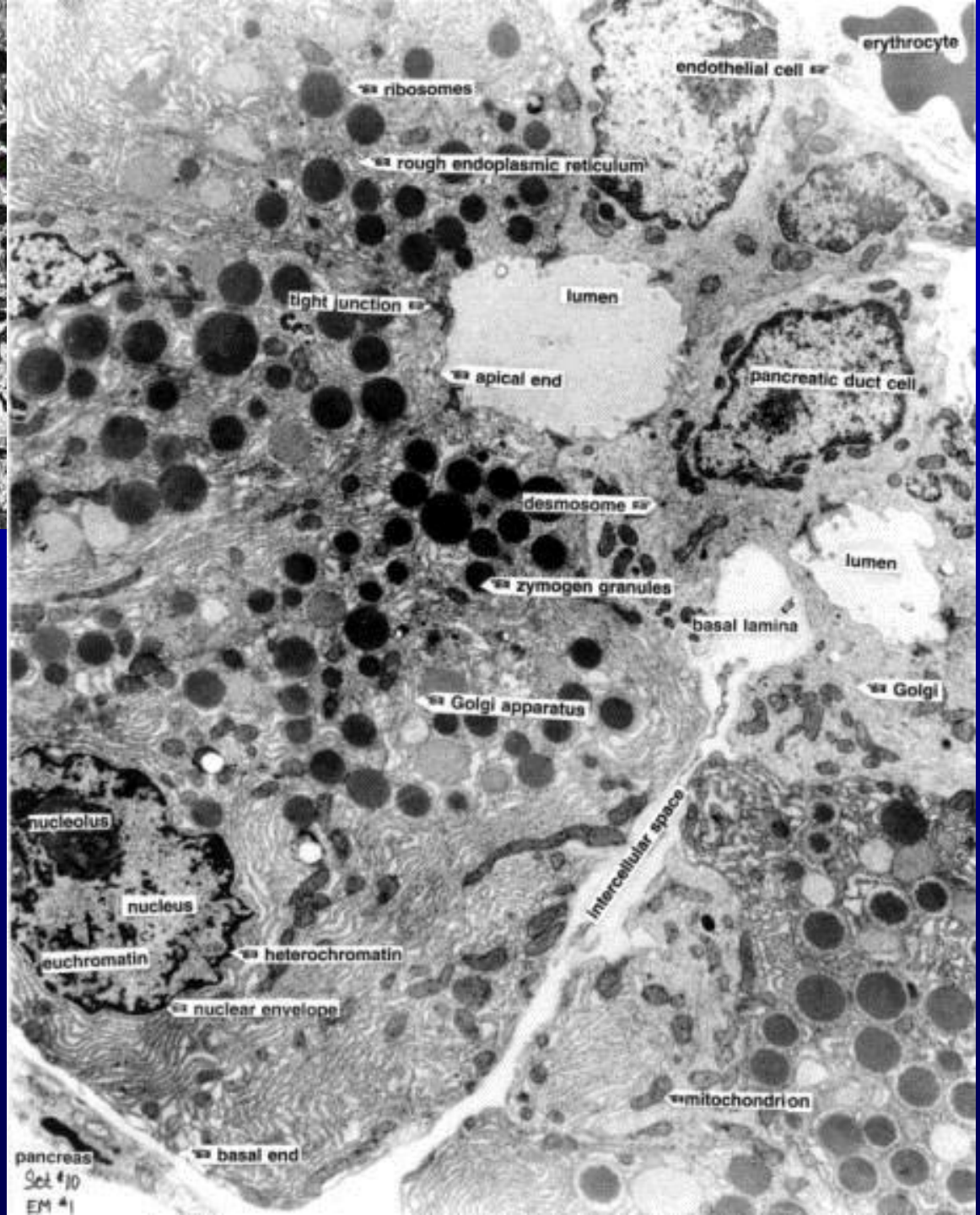
Interlobular duct

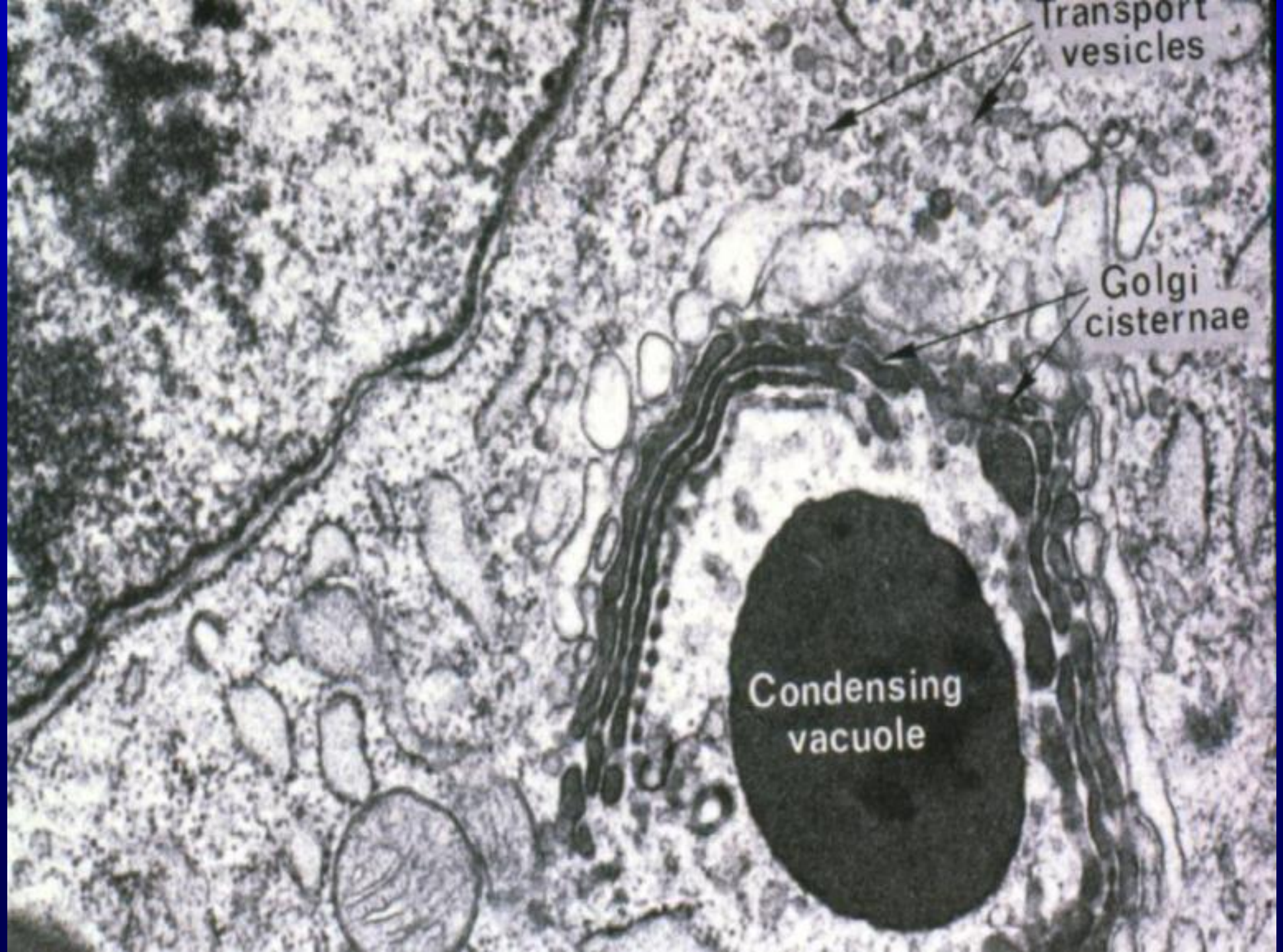


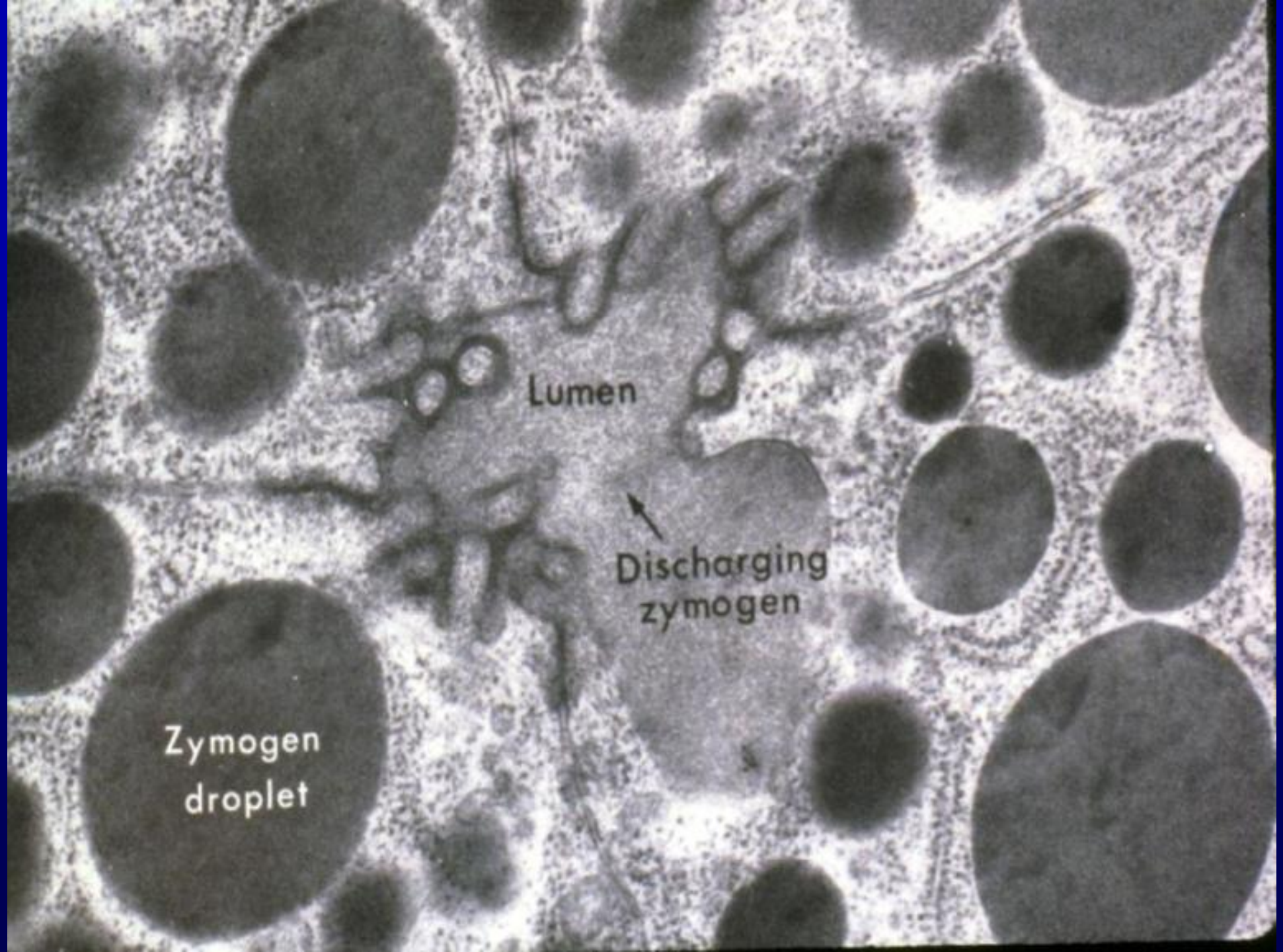
EM 1

Pancreatic acinar cell (EM 1)

1. Lumen
2. Zymogen granule
3. Vesicles
4. Central acinar cell




Transport vesicles
Golgi cisternae
Condensing vacuole


Lumen
Discharging zymogen
Zymogen droplet

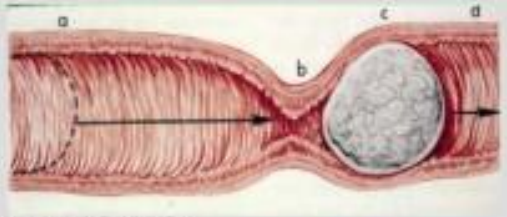
In summary

Function of the Digestive System

Role of liver, gall bladder, salivary glands, and pancreas

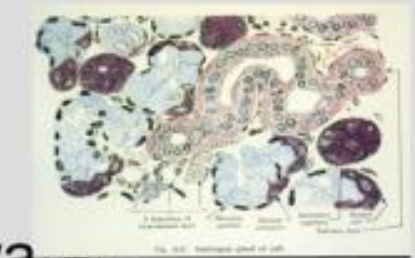
Movement of food

Salivary glands lubricates



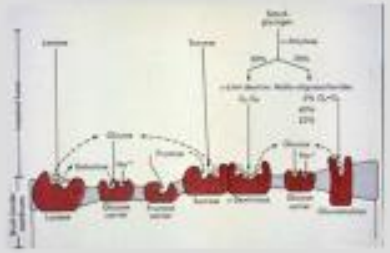
Secretion of digestive juices

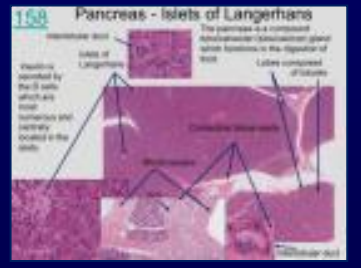
Salivary glands and pancreas secretes digestive juices and liver secretes bile

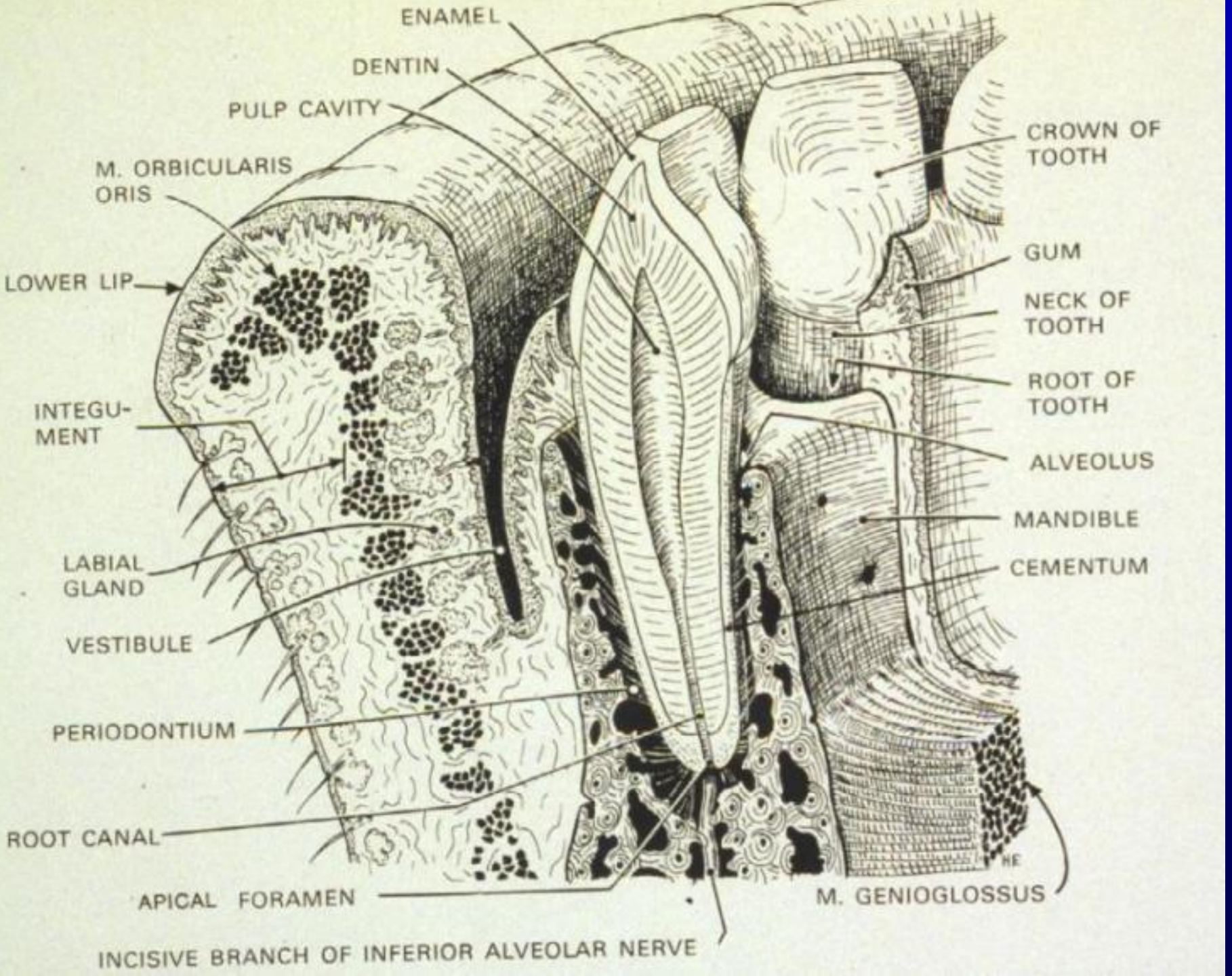


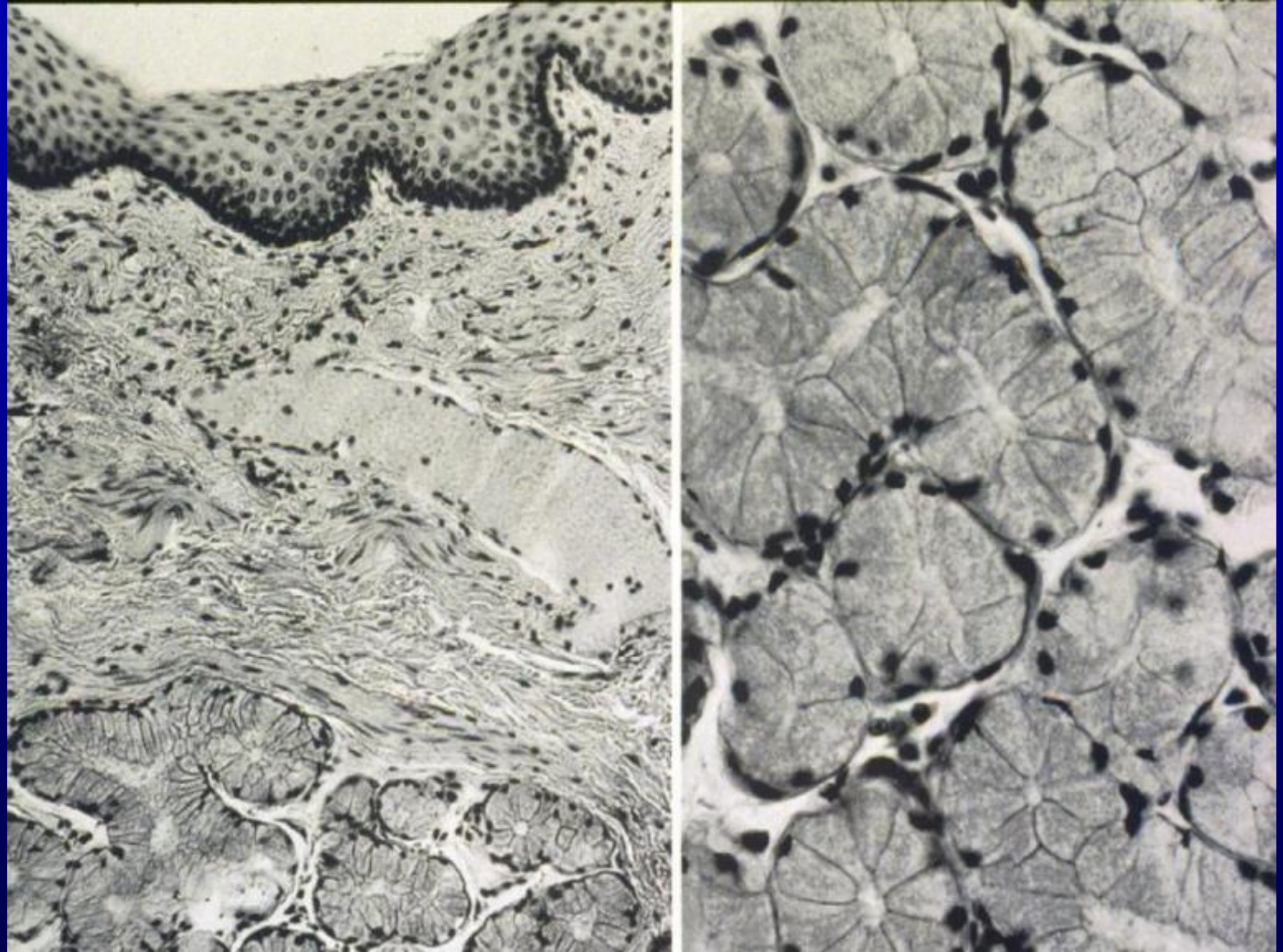
Absorption of digested foods, water, and electrolytes

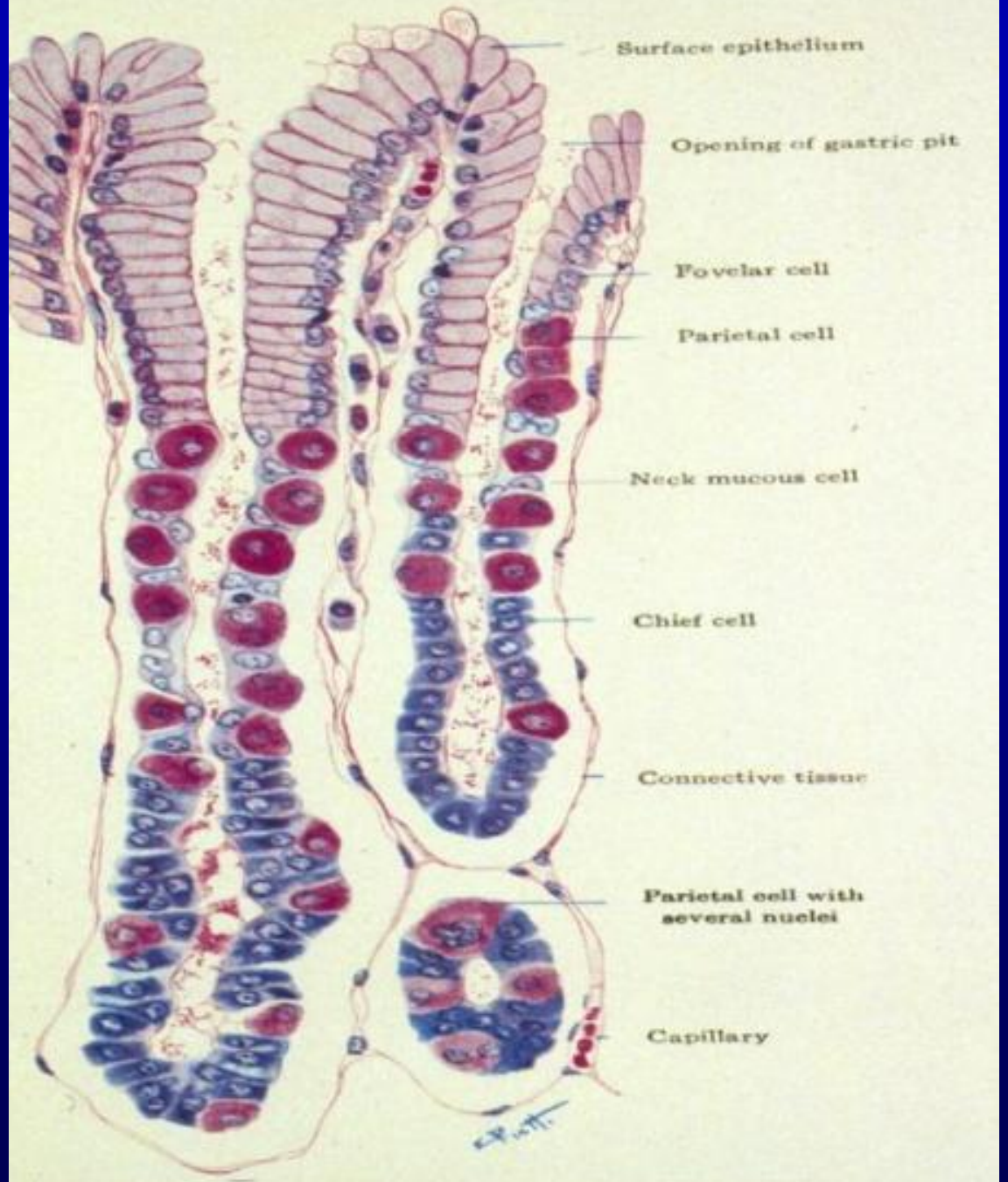
Liver stores nutrients and cleans the blood. Also, the accessory digestive organs contribute antibodies and antibacterial/viral growth substances.



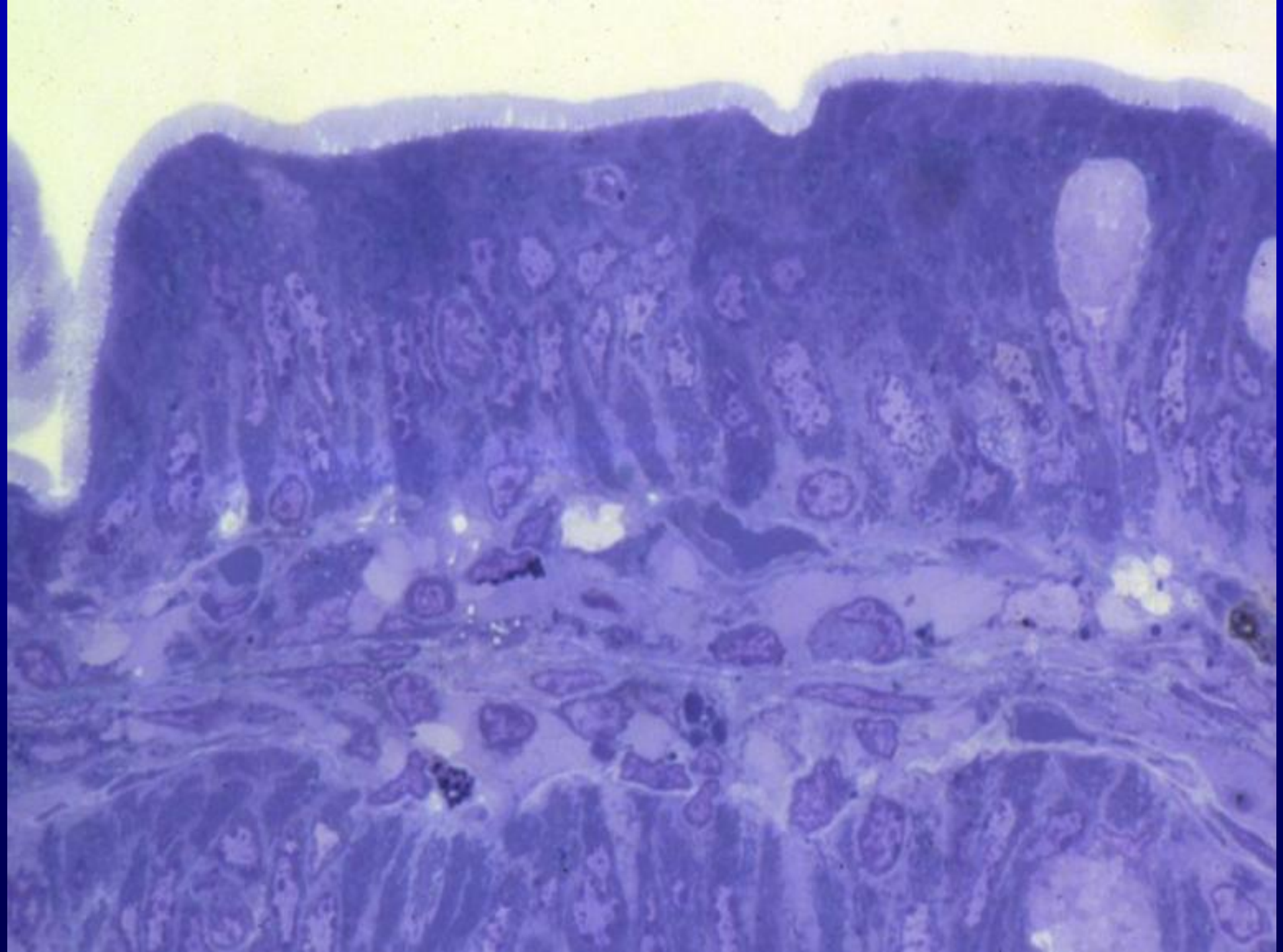


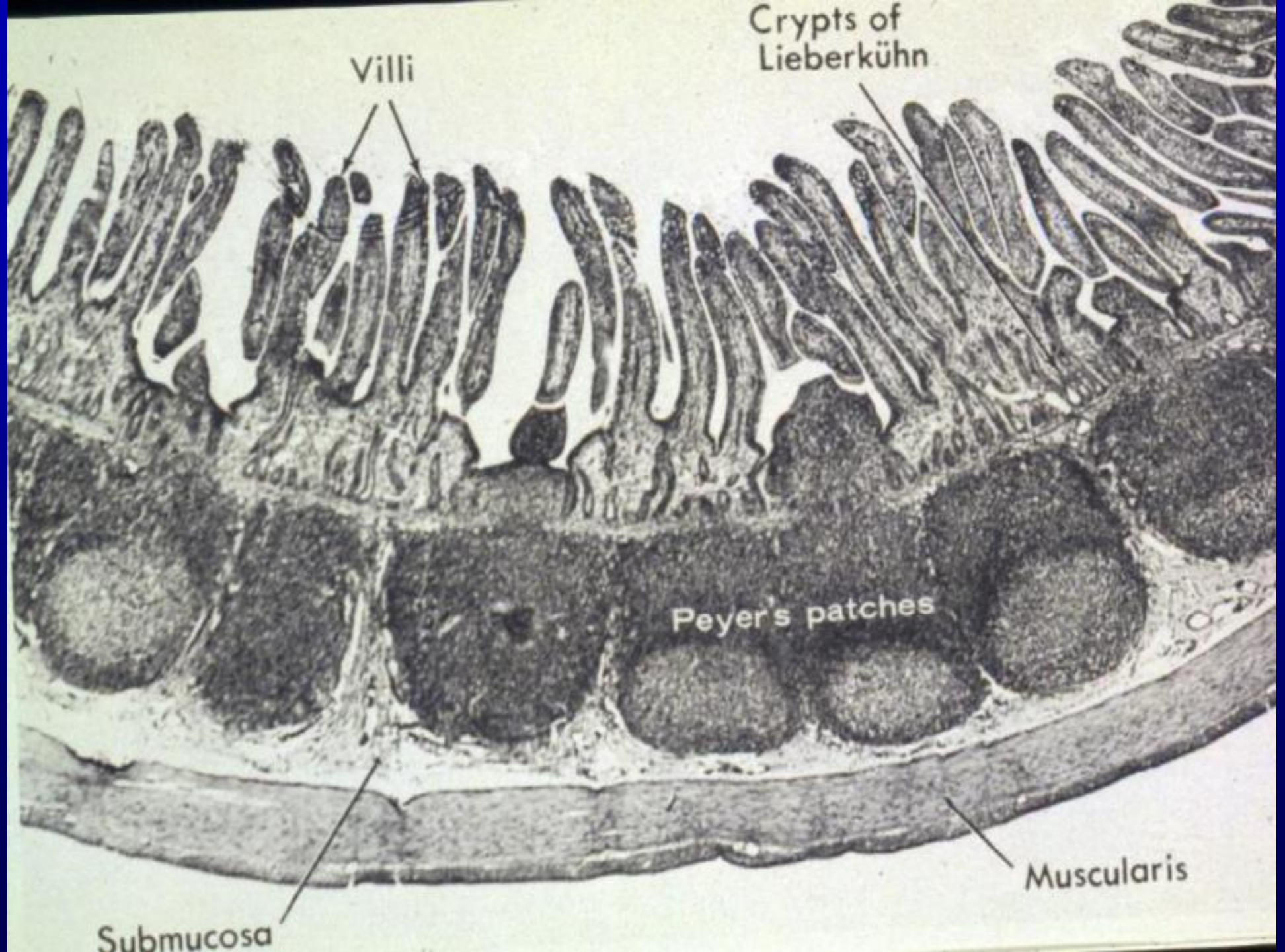

ENAMEL
DENTIN
PULP CAVITY
M. ORBICULARIS ORIS
LOWER LIP
INTEGU-MENT
LABIAL GLAND
VESTIBULE
PERIODONTIUM
ROOT CANAL
APICAL FORAMEN
INCISIVE BRANCH OF INFERIOR ALVEOLAR NERVE
CROWN OF TOOTH
GUM
NECK OF TOOTH
ROOT OF TOOTH
ALVEOLUS
MANDIBLE
CEMENTUM
M. GENIOGLOSSUS
HE

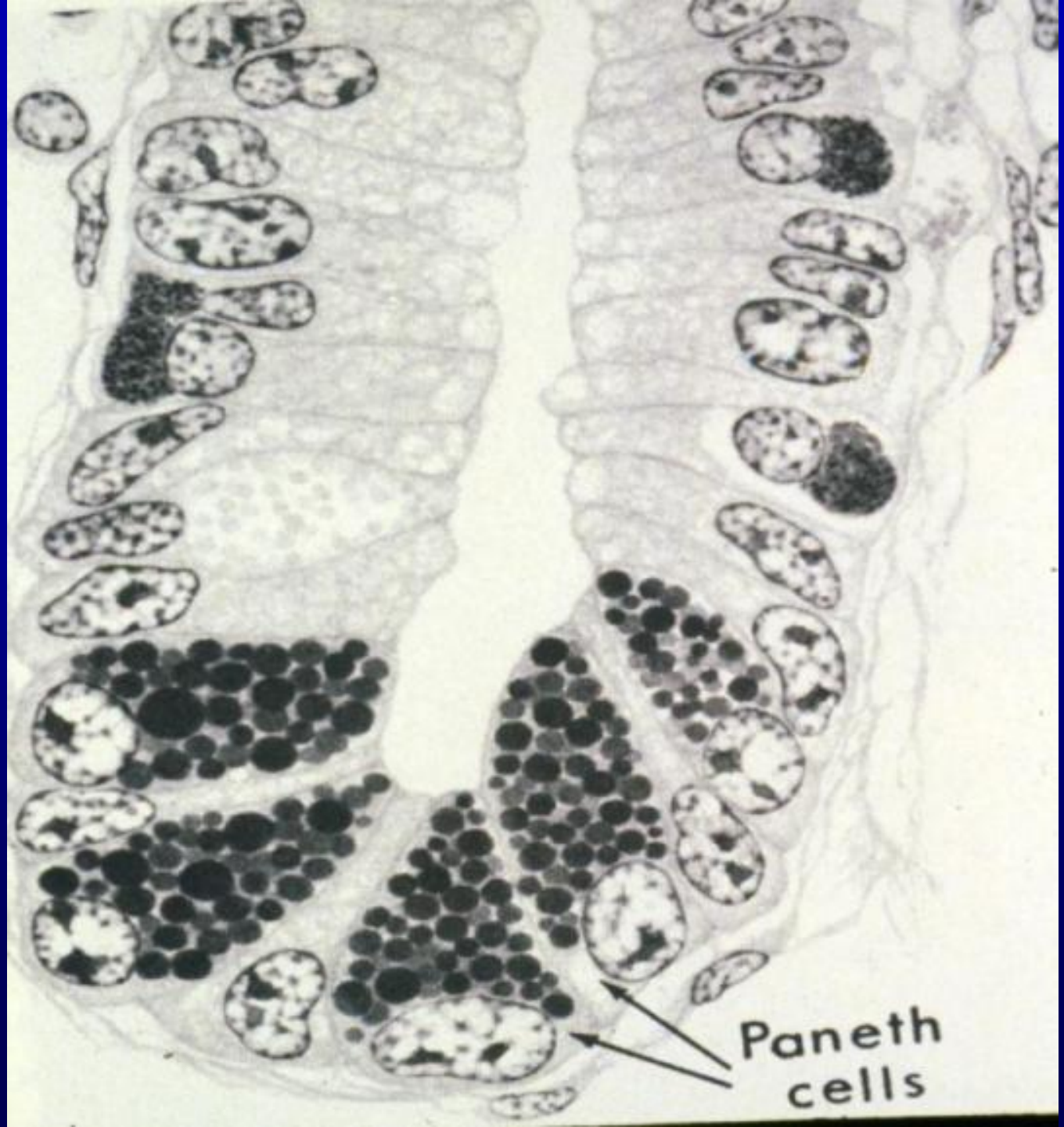


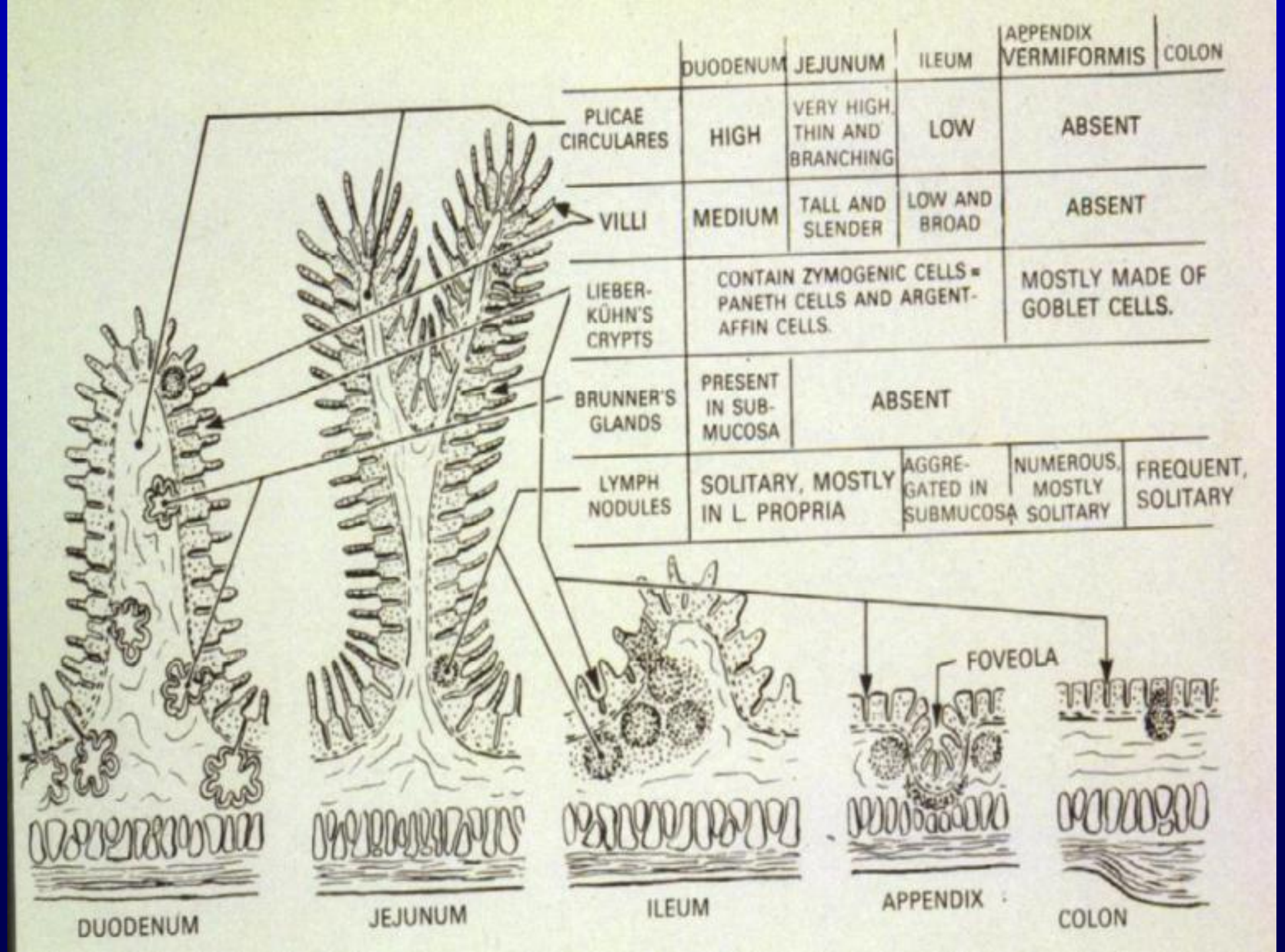


19–11 Drawing of two gastric glands of the adult human stomach. Four cell types are evident




Villi
Crypts of Lieberkühn
Peyer's patches
Submucosa
Muscularis


Paneth
cells



	DUODENUM	JEJUNUM	ILEUM	APPENDIX VERMIFORMIS	COLON
PLICAE CIRCULARES	HIGH	VERY HIGH, THIN AND BRANCHING	LOW	ABSENT	
VILLI	MEDIUM	TALL AND SLENDER	LOW AND BROAD	ABSENT	
LIEBER-KÜHN'S CRYPTS	CONTAIN ZYMOGENIC CELLS + PANETH CELLS AND ARGENT-AFFIN CELLS.			MOSTLY MADE OF GOBLET CELLS.	
BRUNNER'S GLANDS	PRESENT IN SUB-MUCOSA	ABSENT			
LYMPH NODULES	SOLITARY, MOSTLY IN L. PROPRIA		AGGRE-GATED IN SUBMUCOSA	NUMEROUS, MOSTLY SOLITARY	FREQUENT, SOLITARY

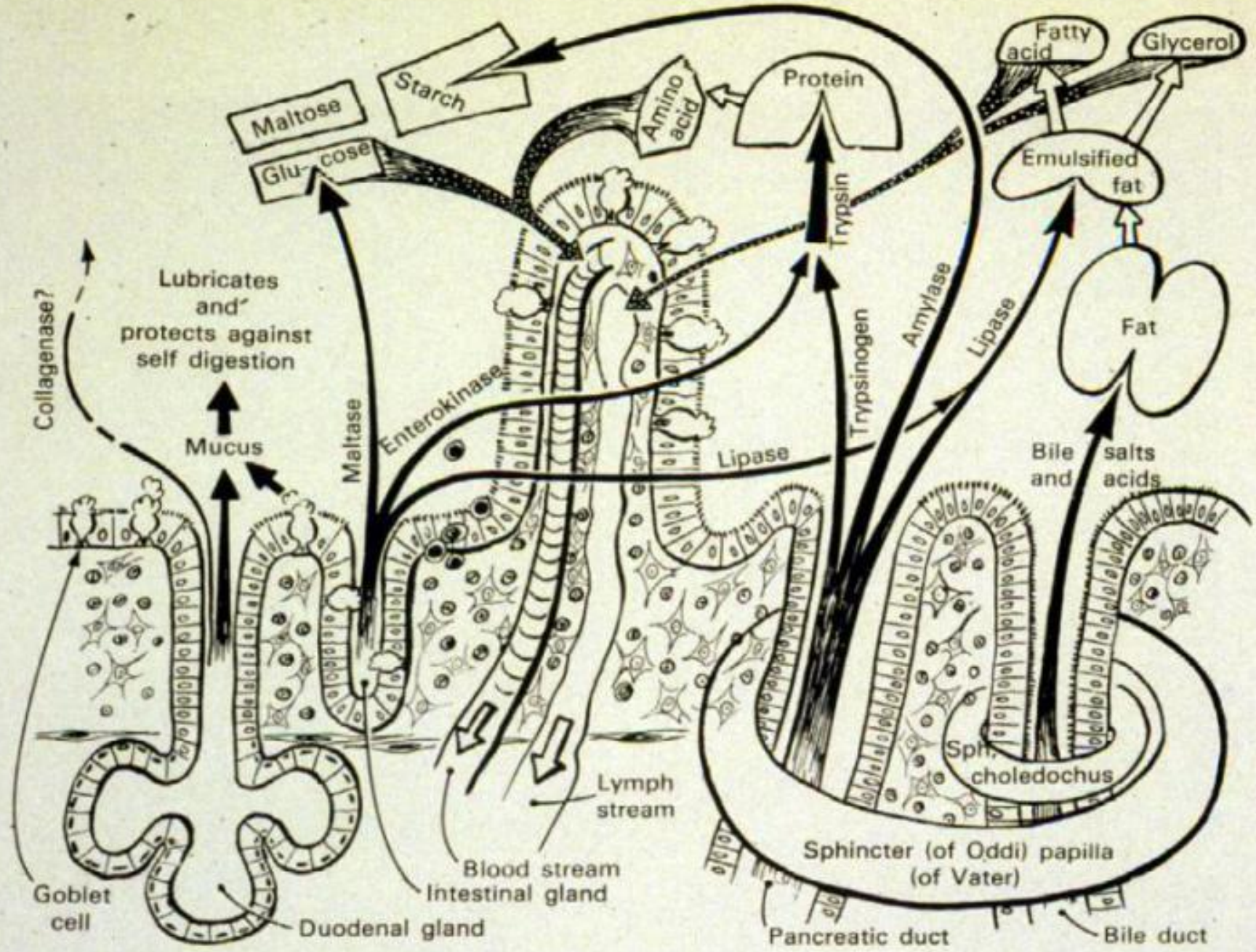


Fig. 12-49. Diagram of intestinal functions.

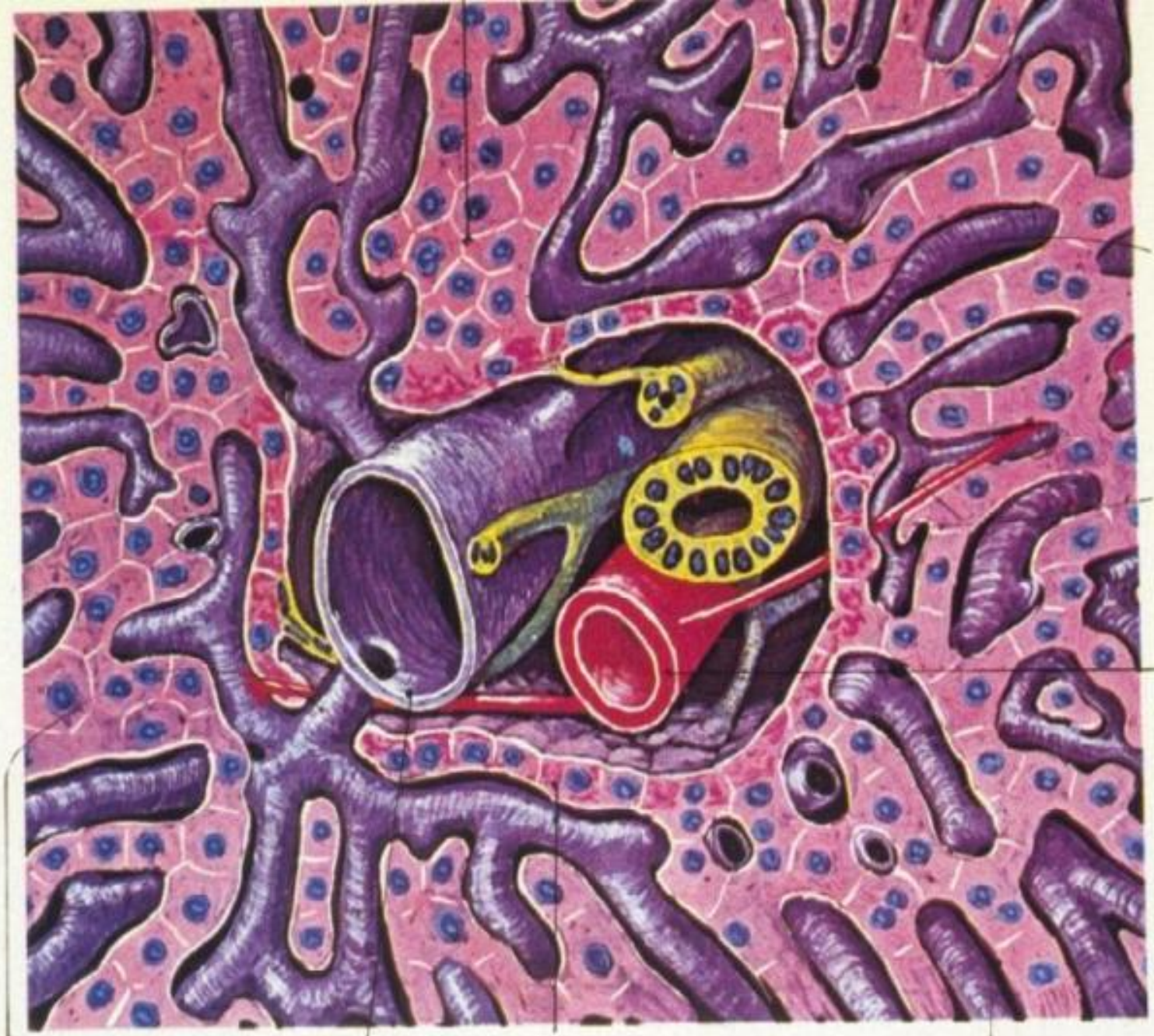

Bile ductule
Bile ducts
Hepatic artery branch
Inlet venule
Portal vein branch
Limiting plate
Sinusoid

Fig. 1
nal.

Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

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Questions on the Liver, pancreas, and salivary glands

The humoral activity of the immune system is illustrated by the transfer of IgA immunoglobin by epithelial cells into which of the following body fluids?

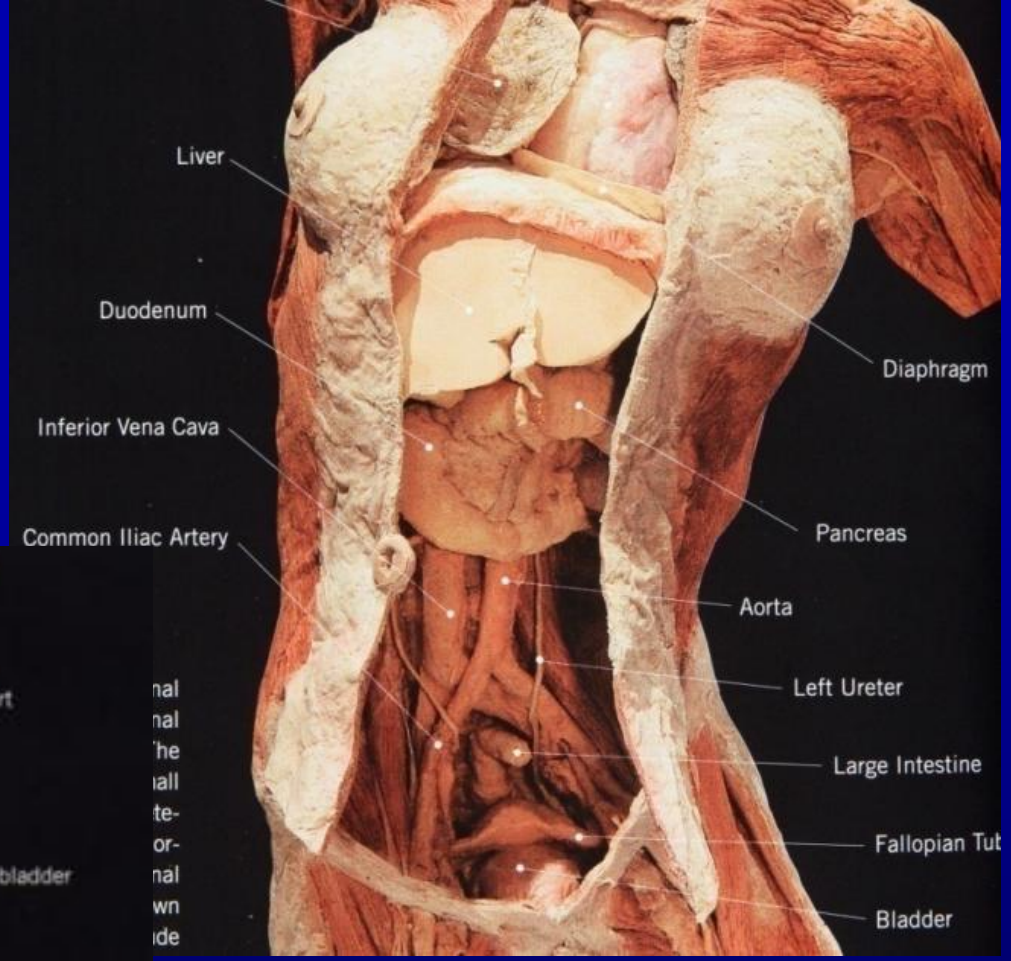
a. saliva
b. milk
c. bile
d. a and b
e. a, b, and c

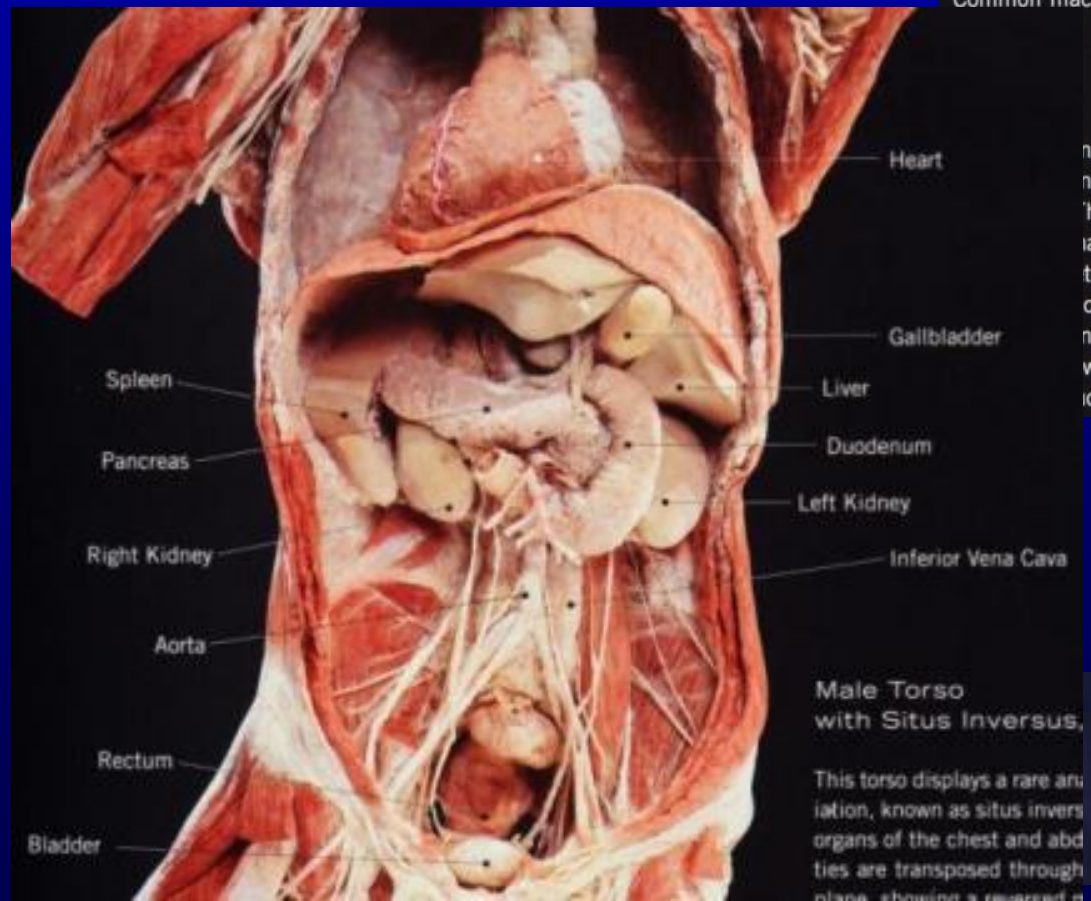
Which function(s) do the gallbladder and urinary bladder have in common?

a. temporary storage of waste products
b. concentration of their respective luminal contents
c. similar type of luminal epithelium
d. a and b
e. a, b, and c

Characteristics of the pancreas include:

a. a portal blood vascular system
b. endocrine cells of the islets of Langerhans
c. acinar cells and striated ducts
d. a and b
e. a, b, and c





Male Torso
with Situs Inversus,

This torso displays a rare ana
iation, known as situs invers
organs of the chest and abd
ties are transposed through

Gunther von Hagens'
BODY WORLDS
The Anatomical Exhibition of Real Human Bodies





GENERAL STORE
CANDLE SHOP
HITCHIN POST
HITCHIN POST