

Mammalian Circulatory System

Functions:

- Transport gasses
- Transport food
- Transport metabolic wastes
- Transport hormones
- Maintain osmotic homeostasis
- Thermal regulation
- Fight disease and injury

Blood Composition:

Plasma (55% by volume)

Water - 90% volume

Albumin - makes blood hyperosmotic to tissue

Globulin - makes blood hyperosmotic, fights disease

Fibrinogen - clotting

Lipoproteins - osmoregulation

Organic nutrients - glucose, amino acids, fatty acids, respiratory intermediates

Waste products - acetone, ammonia, urea, uric acid

Inorganic ions - bicarbonate, Ca^{++} , Fe^{+++} , Mg^{++} , K^+ , Na^+ , Cl^-

Vitamins - A, B, C, D, E, riboflavin

Formed elements (45% by volume)

Erythrocytes - RBCs; carry hemoglobin

Leukocytes - WBCs

Granulocytes - form in bone marrow, have cytoplasmic bodies

Neutrophils - ingest bacteria and dead cells

Eosinophils - increase during allergic reactions

Basophils - release histamine and heparin

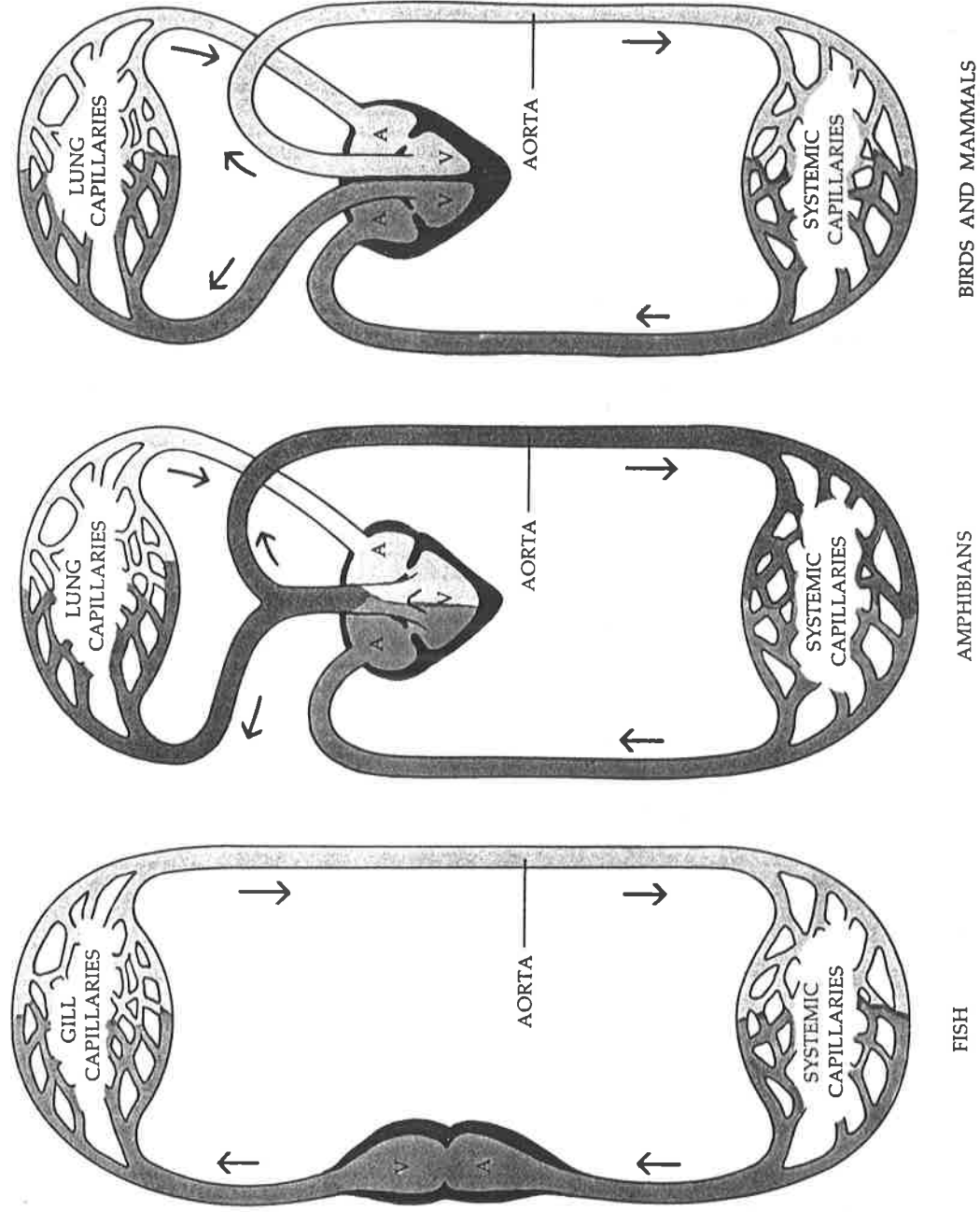
Agranulocytes - lack cytoplasmic bodies

Lymphocytes - form in lymph, produce antibodies or ingest bacteria and viruses

Monocytes - form in bone marrow, scavengers in tissues

Platelets - bits of cells formed in marrow, clotting

Figure 36-4, page 707
Vertebrate circulatory systems



19 Major Blood Vessels

(Fig. 10.13)

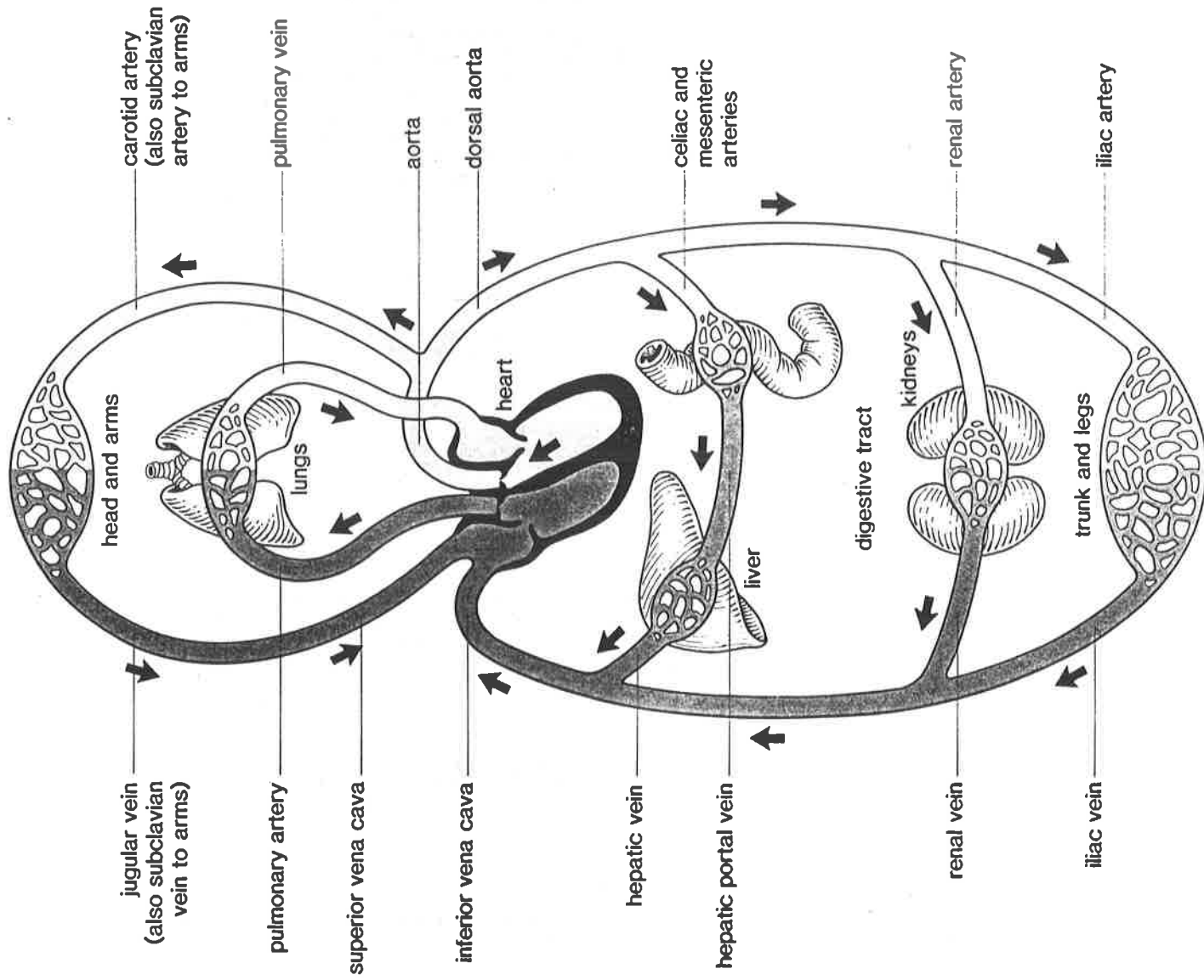
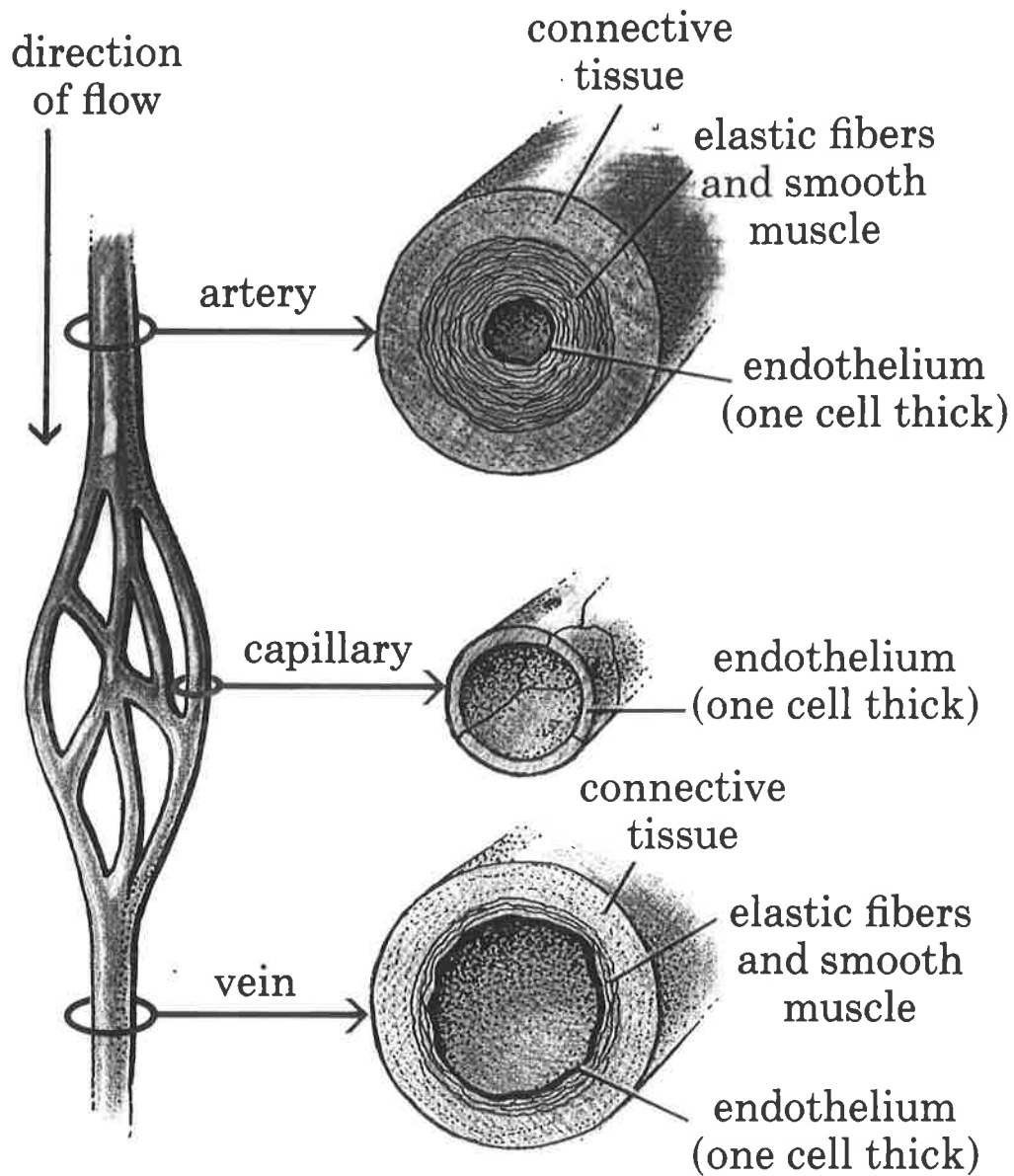
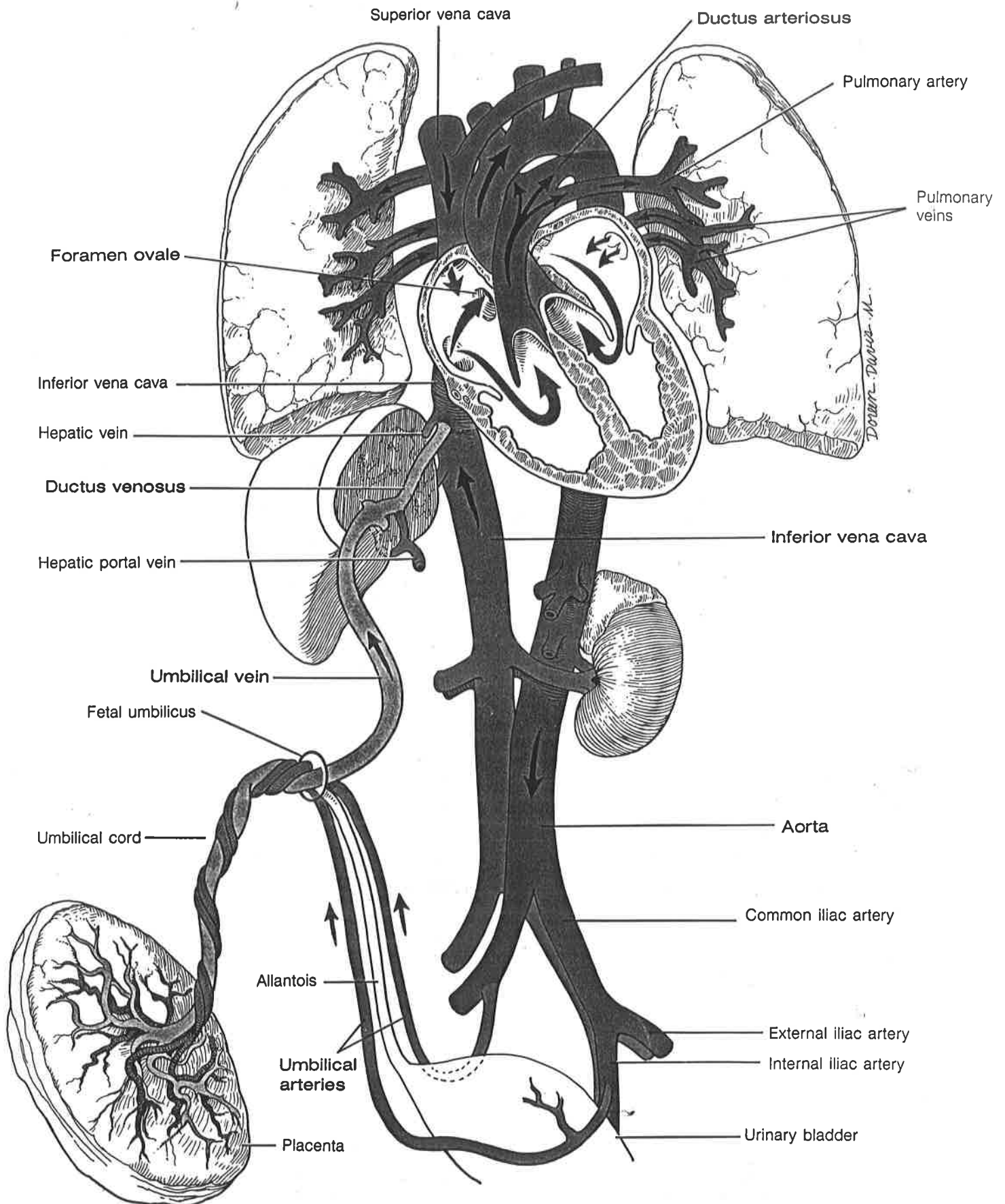


Figure 36-5, page 753

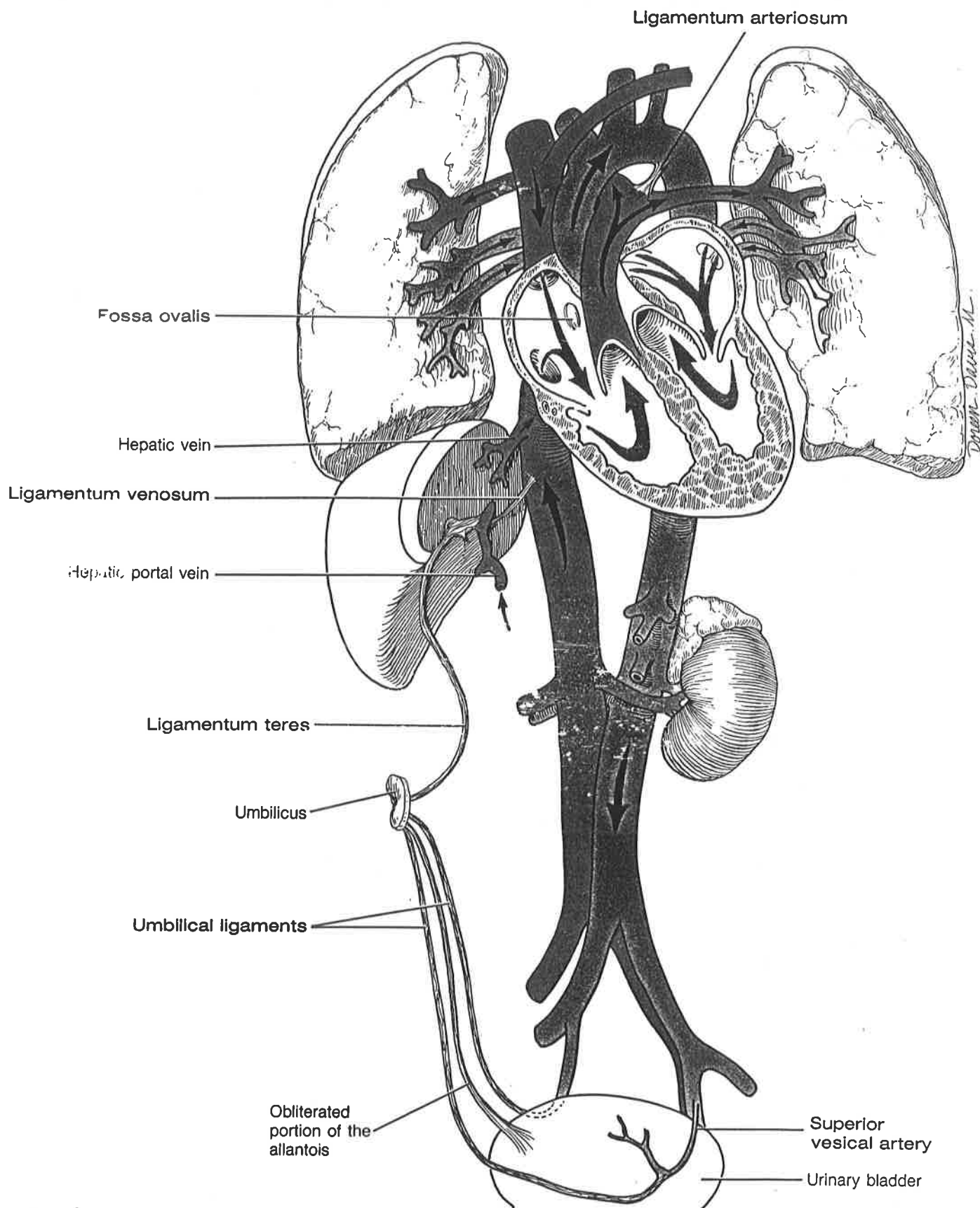
Structure of blood vessels



Fetal circulation (Figure 28.11, page 776)



Changes in circulation following birth (Figure 28.12, page 778)



Heartbeat Function:

Contraction of heart muscle is stimulated by membrane depolarization.

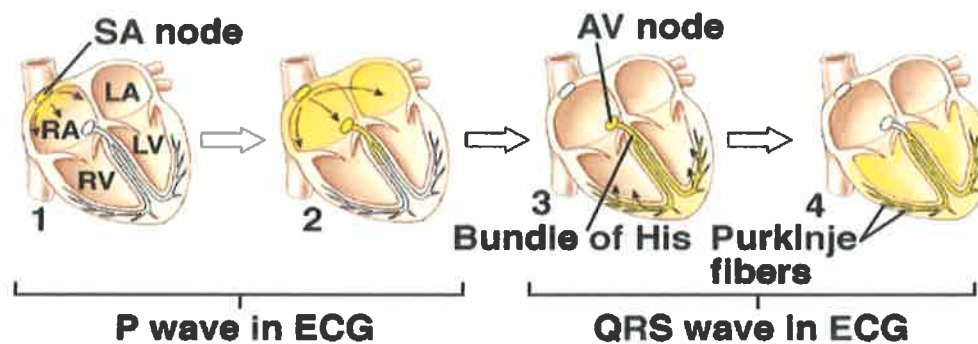
Depolarization triggered by sinoatrial (SA) node.

Acts as pacemaker for rest of the heart by producing depolarization impulses spontaneously at a particular rate.

Atrioventricular (AV) node allows depolarization to pass to the ventricles.

Depolarization is conducted rapidly over both ventricles by atrioventricular bundle (Bundle of His).

Transmitted by Purkinje Fibers.



From Raven & Johnson 2002

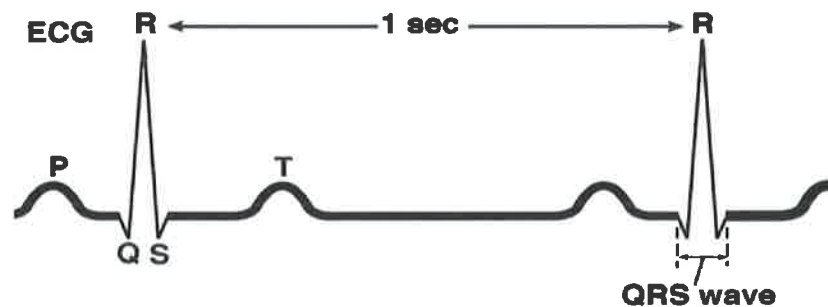
Measuring Heartbeat

Electrical activity recorded on an electrocardiogram (EKG or ECG).

First peak (P) is produced by depolarization of atria (Atrial Systole).

Second peak (QRS) produced by ventricular depolarization (Ventricular systole).

Last peak (T) produces by ventricular repolarization.



From Raven & Johnson 2002

18 Human Heart (Figs. 10.5, 10.6)

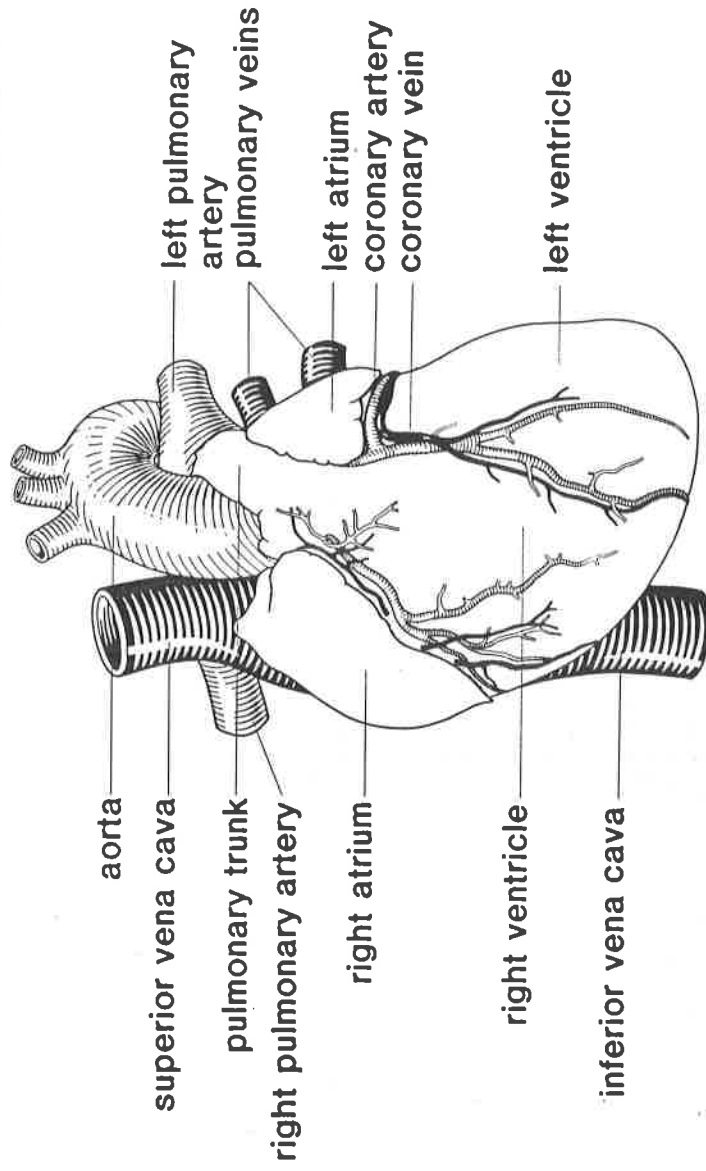


Fig. 10.5

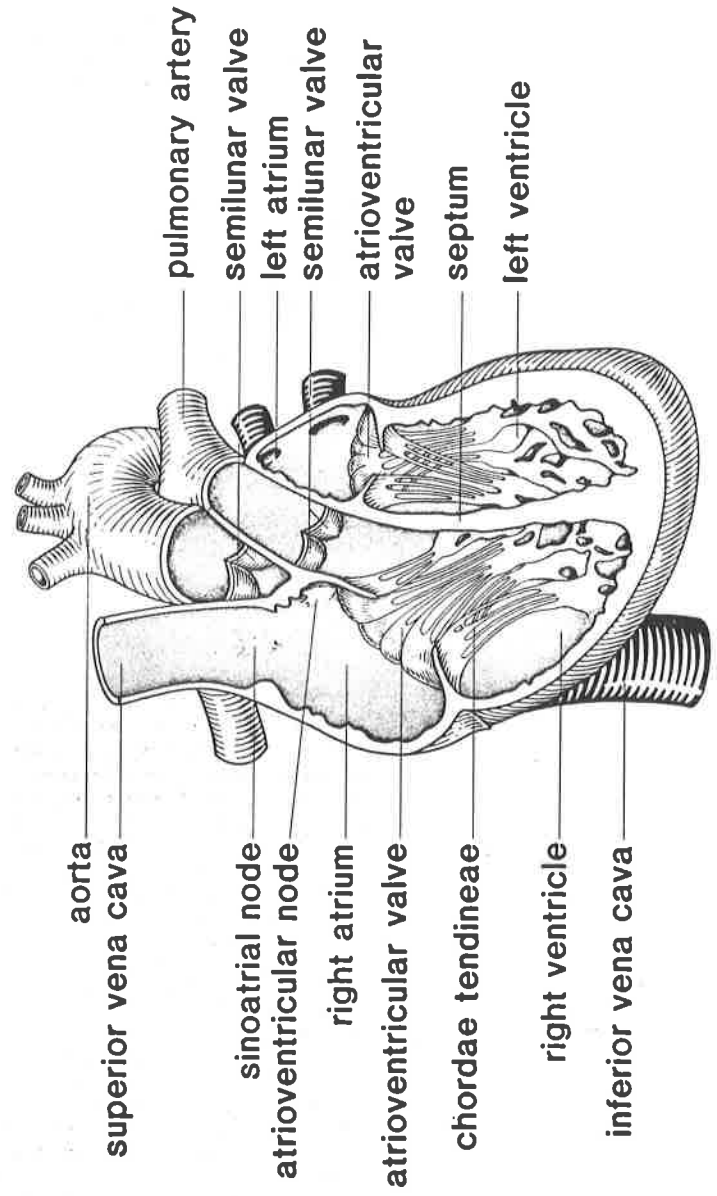


Fig. 10.6

24 Human Kidney

(Figs. 14.4, 14.5)

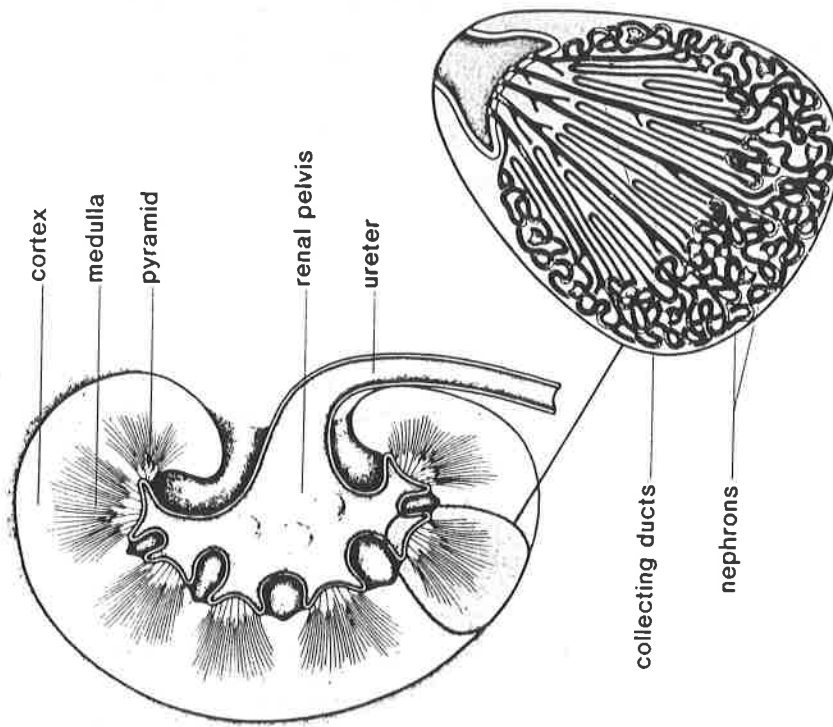


Fig. 14.4

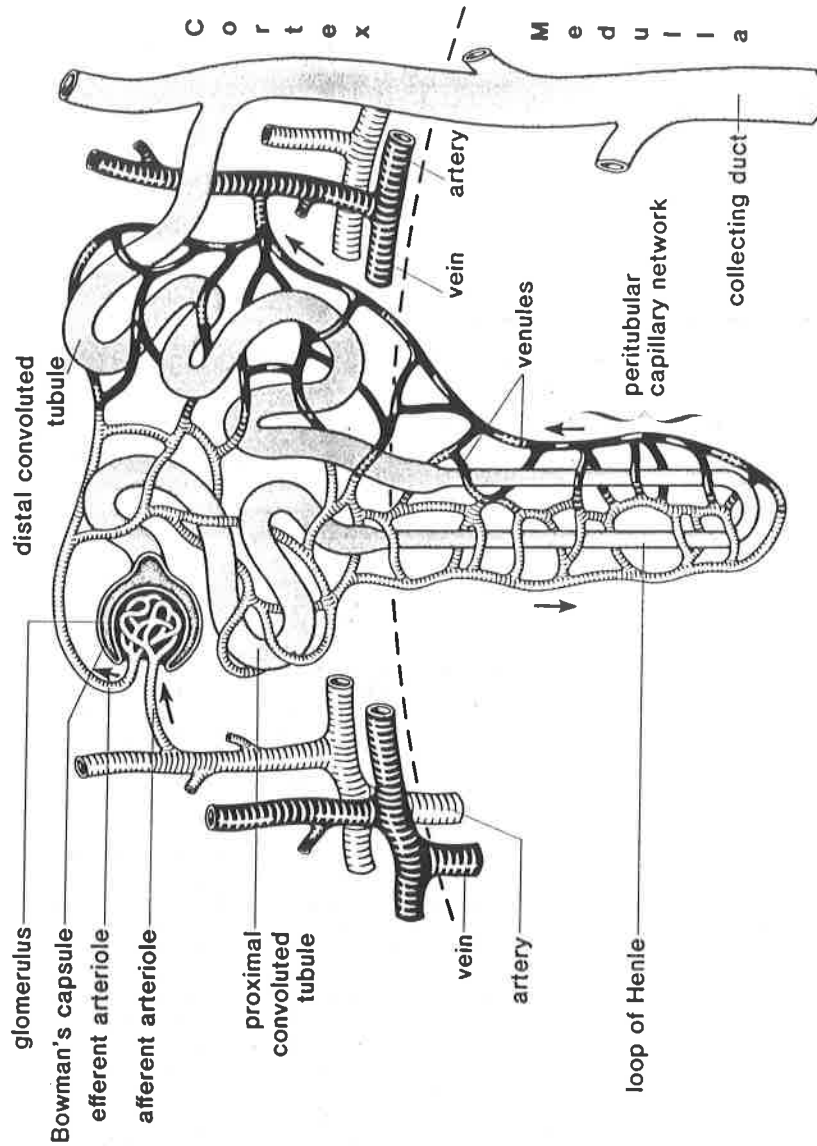
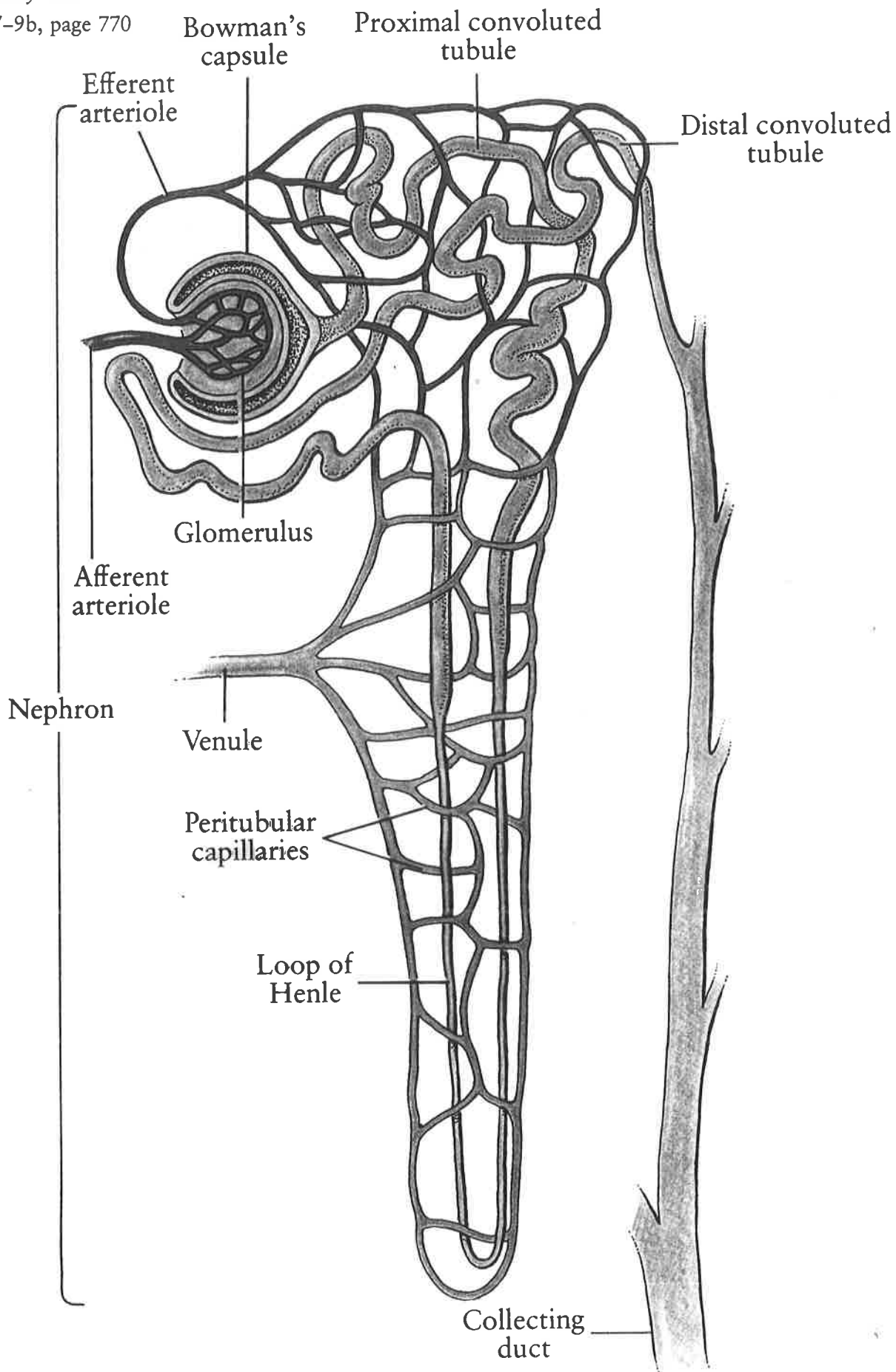


Fig. 14.5

Figure 37-9b, page 770
Nephron



The flow of materials in a human kidney (Figure 53-9)

