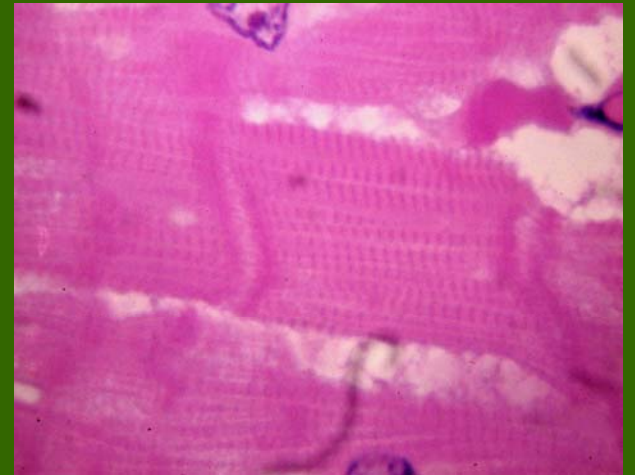
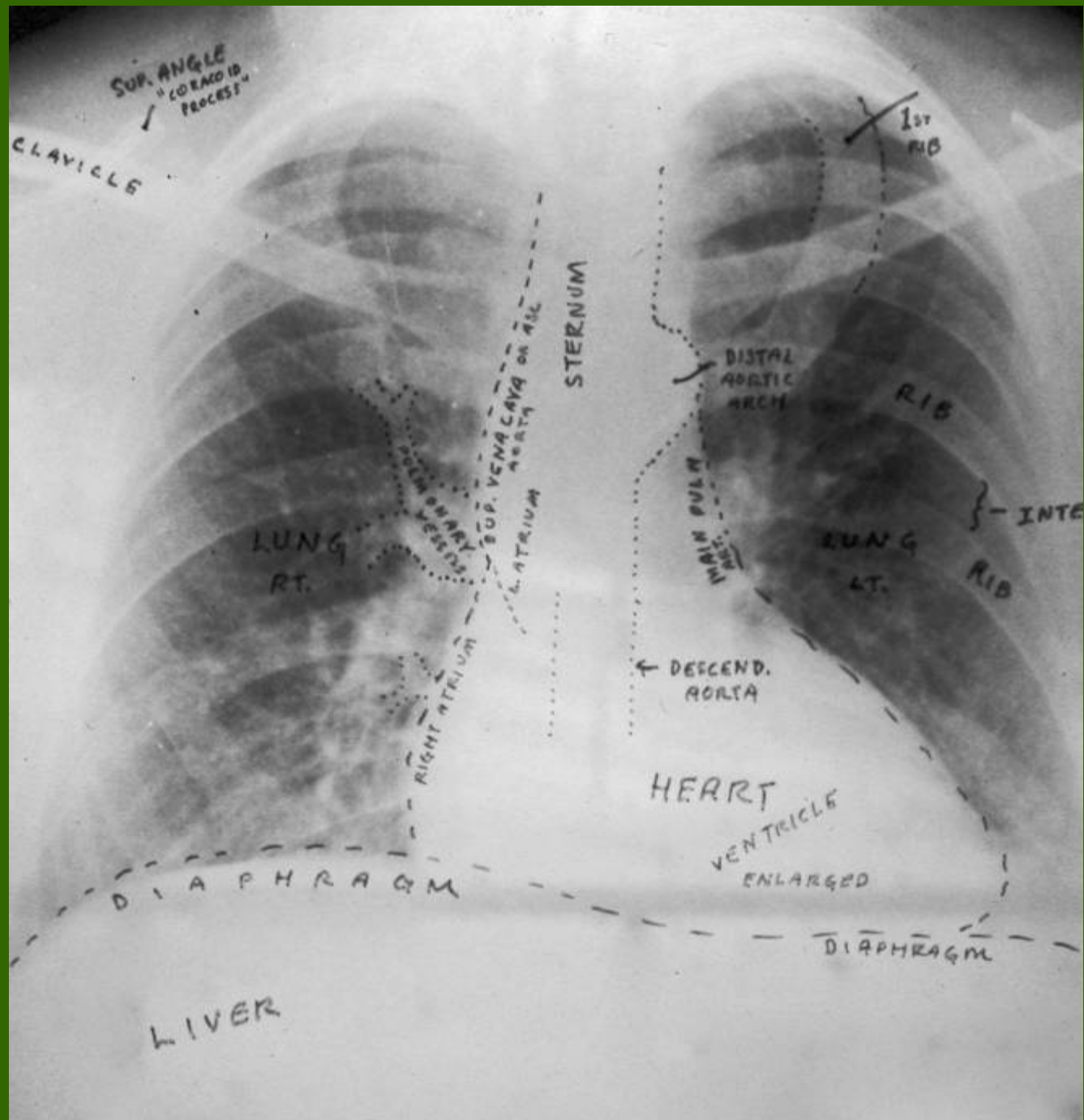
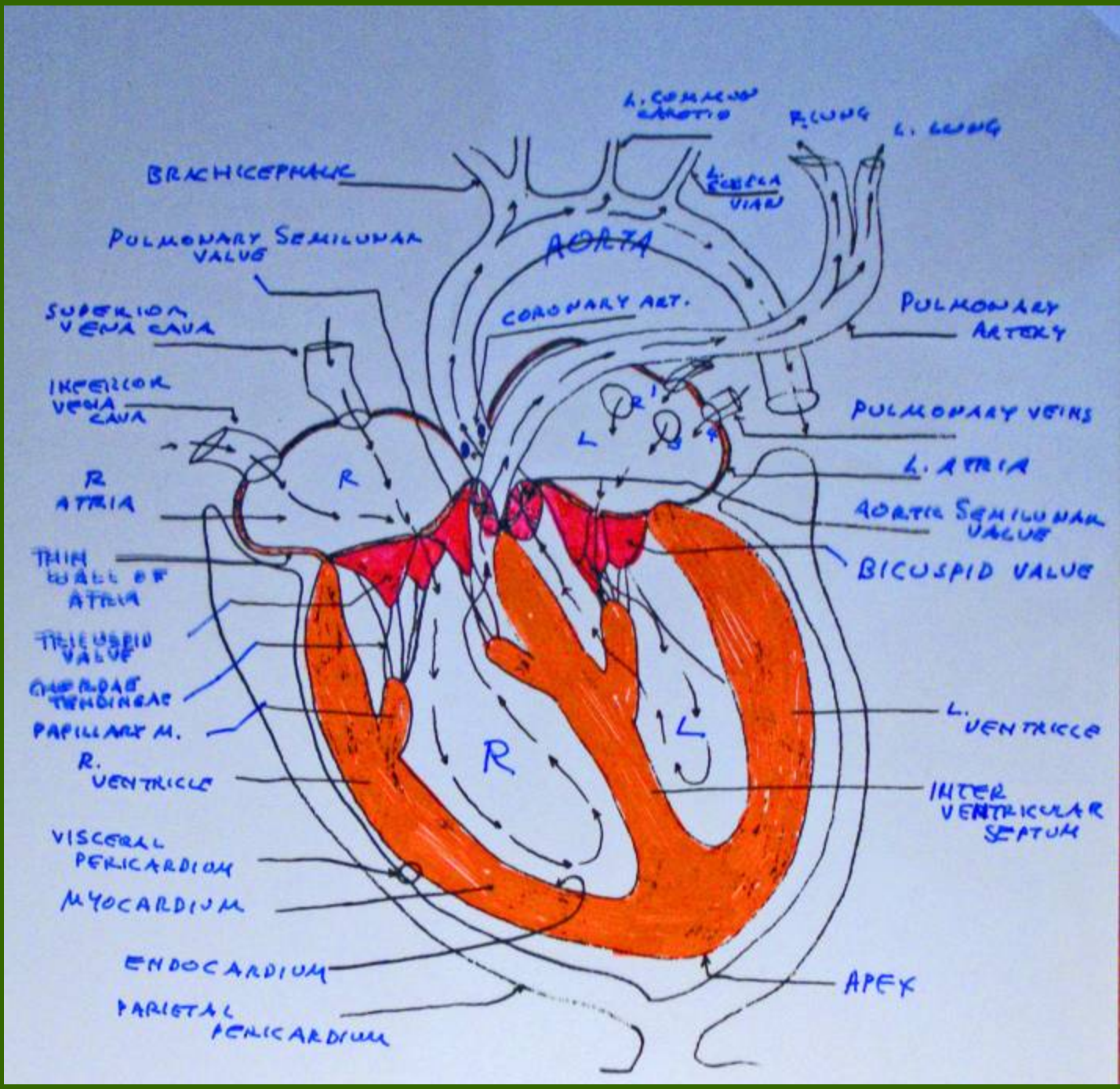


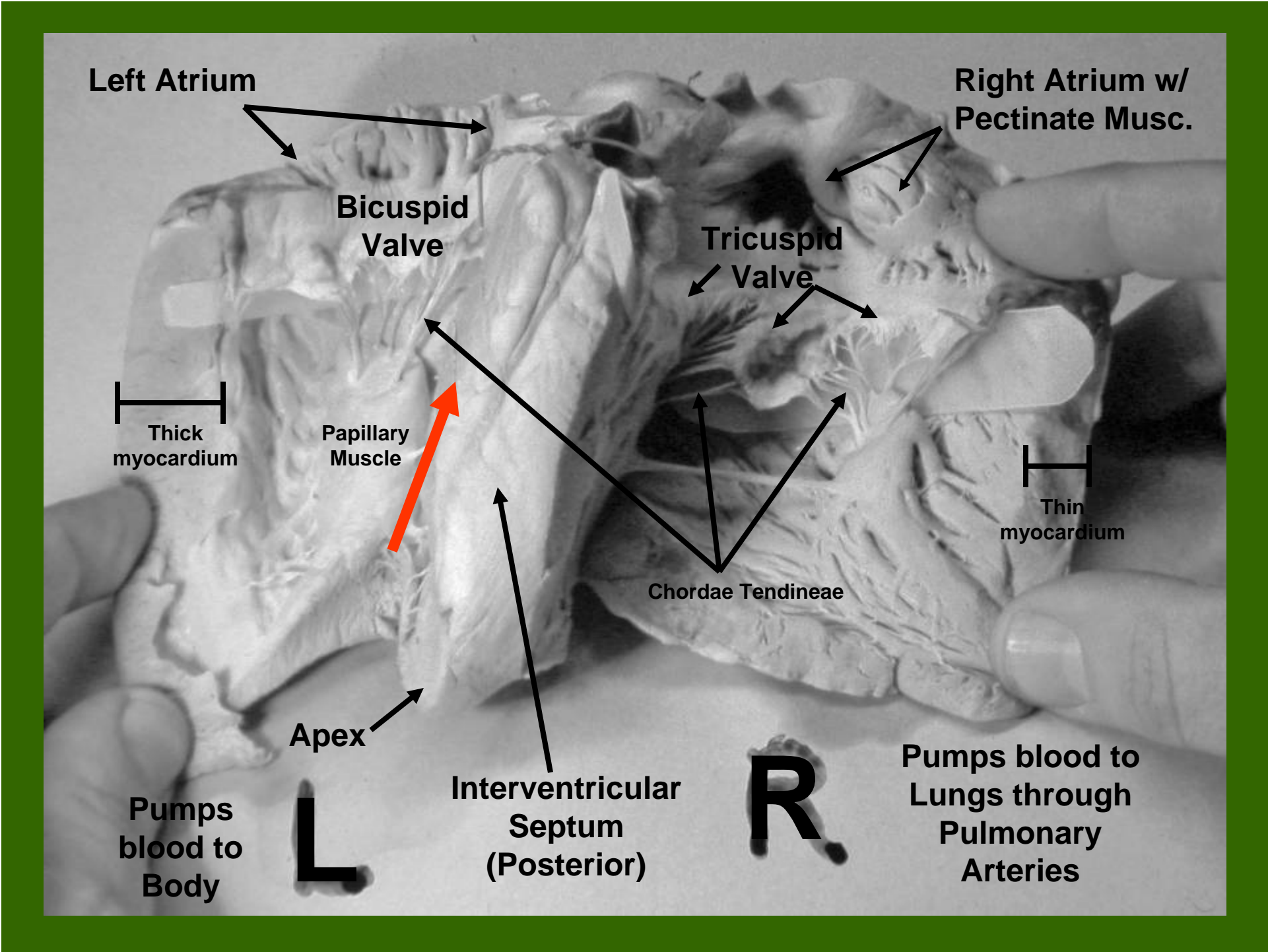
The Heart, Arteries & Veins: Histology and Anatomy of the Circulatory System



John E.B. Baker,
mikrogeo.com







Left Atrium

Right Atrium w/
Pectinate Musc.

Bicuspid
Valve

Tricuspid
Valve

Thick
myocardium

Papillary
Muscle

Thin
myocardium

Chordae Tendineae

Apex

Interventricular
Septum
(Posterior)

Pumps
blood to
Body

L

Pumps blood to
Lungs through
Pulmonary
Arteries

R

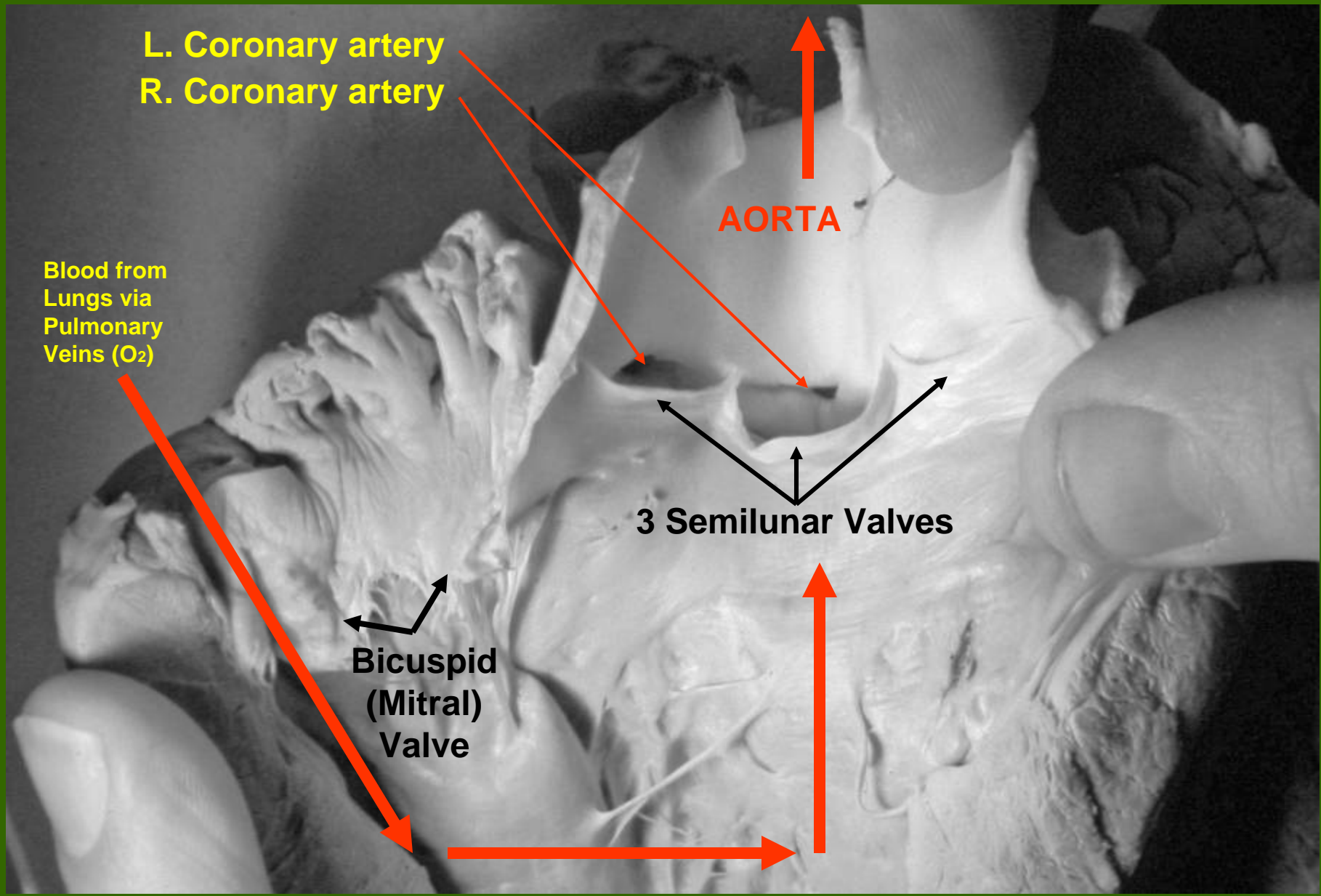
L. Coronary artery
R. Coronary artery

AORTA

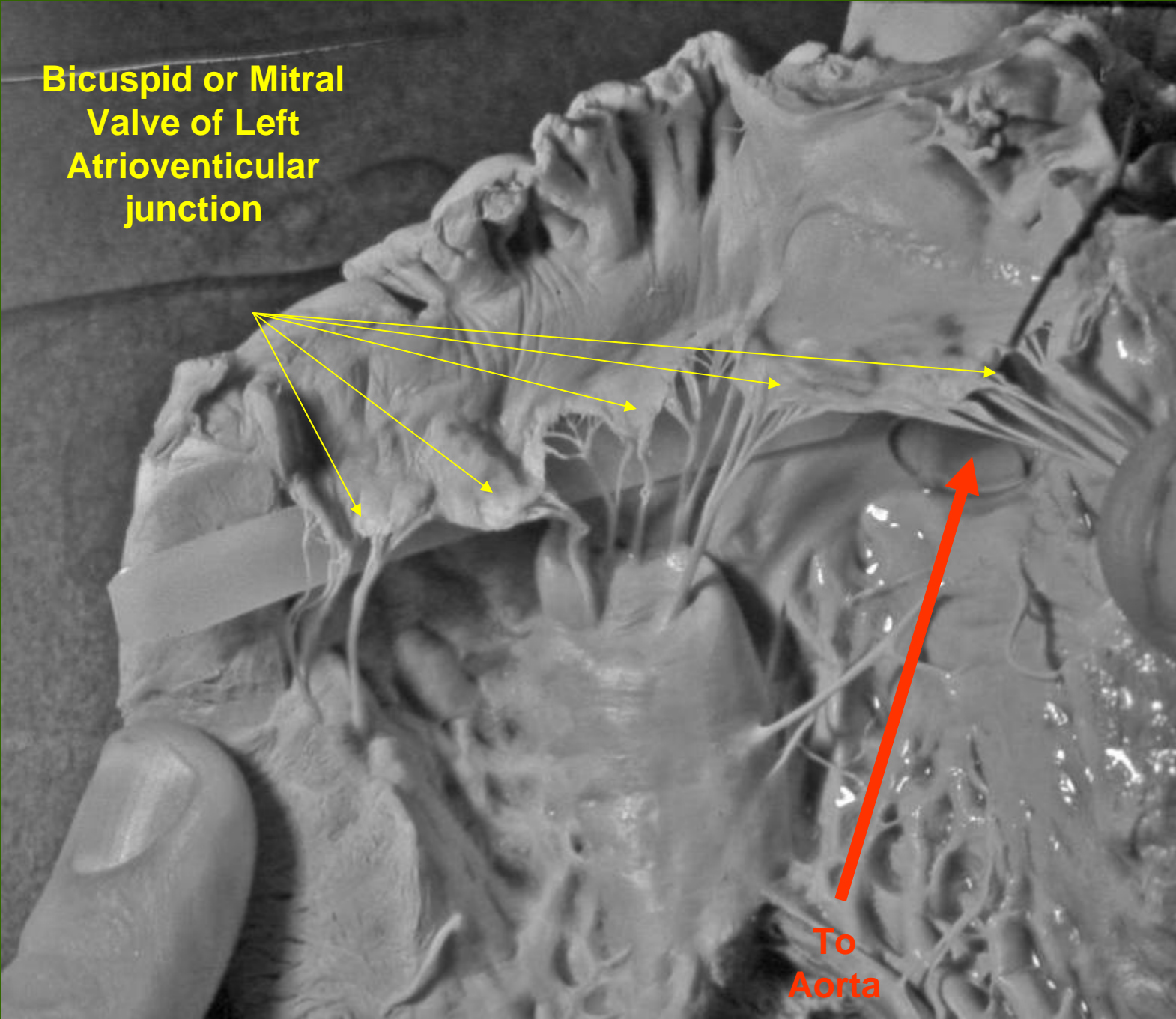
Blood from
Lungs via
Pulmonary
Veins (O₂)

3 Semilunar Valves

Bicuspid
(Mitral)
Valve

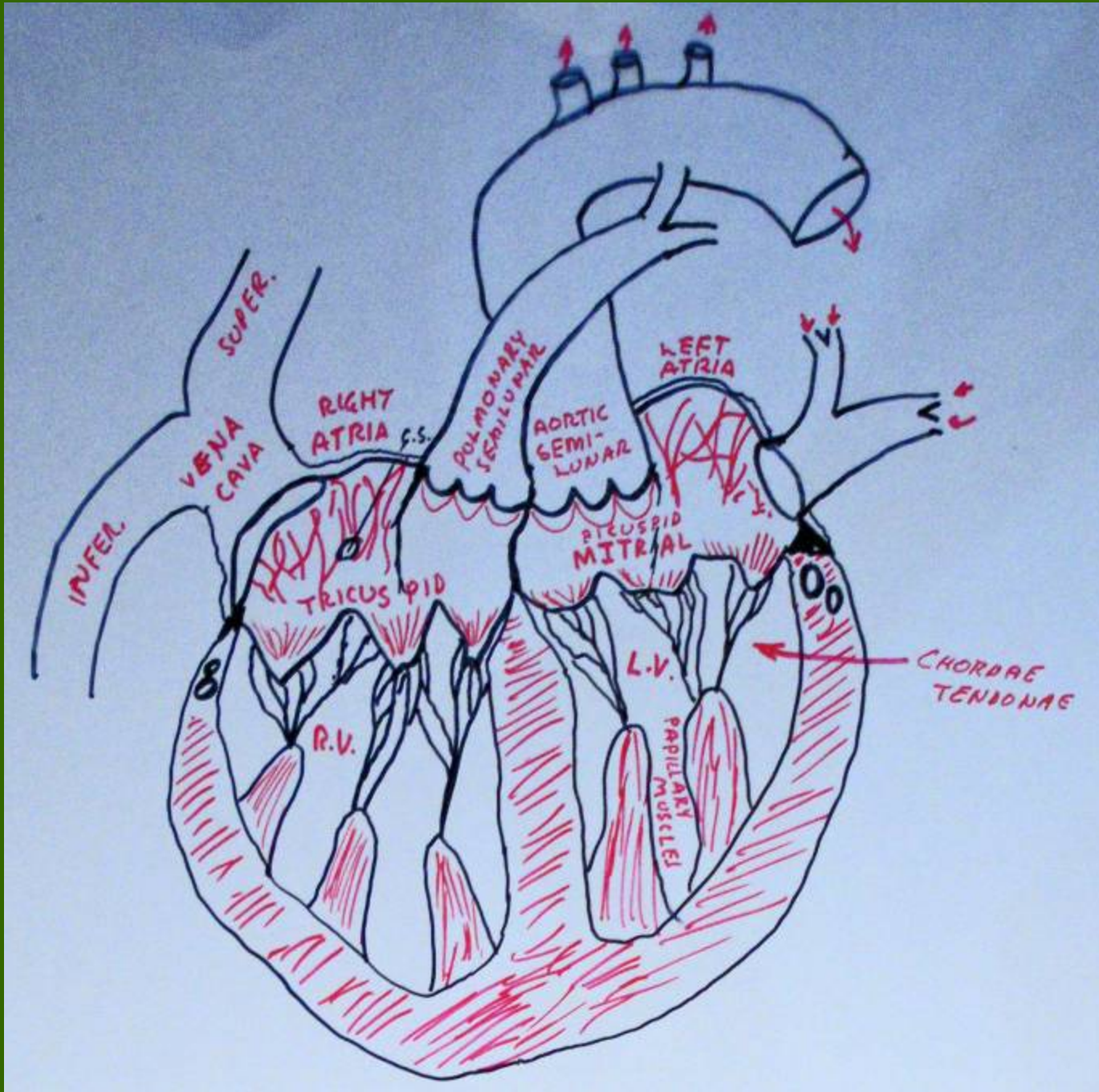


**Bicuspid or Mitral
Valve of Left
Atrioventricular
junction**



**To
Aorta**

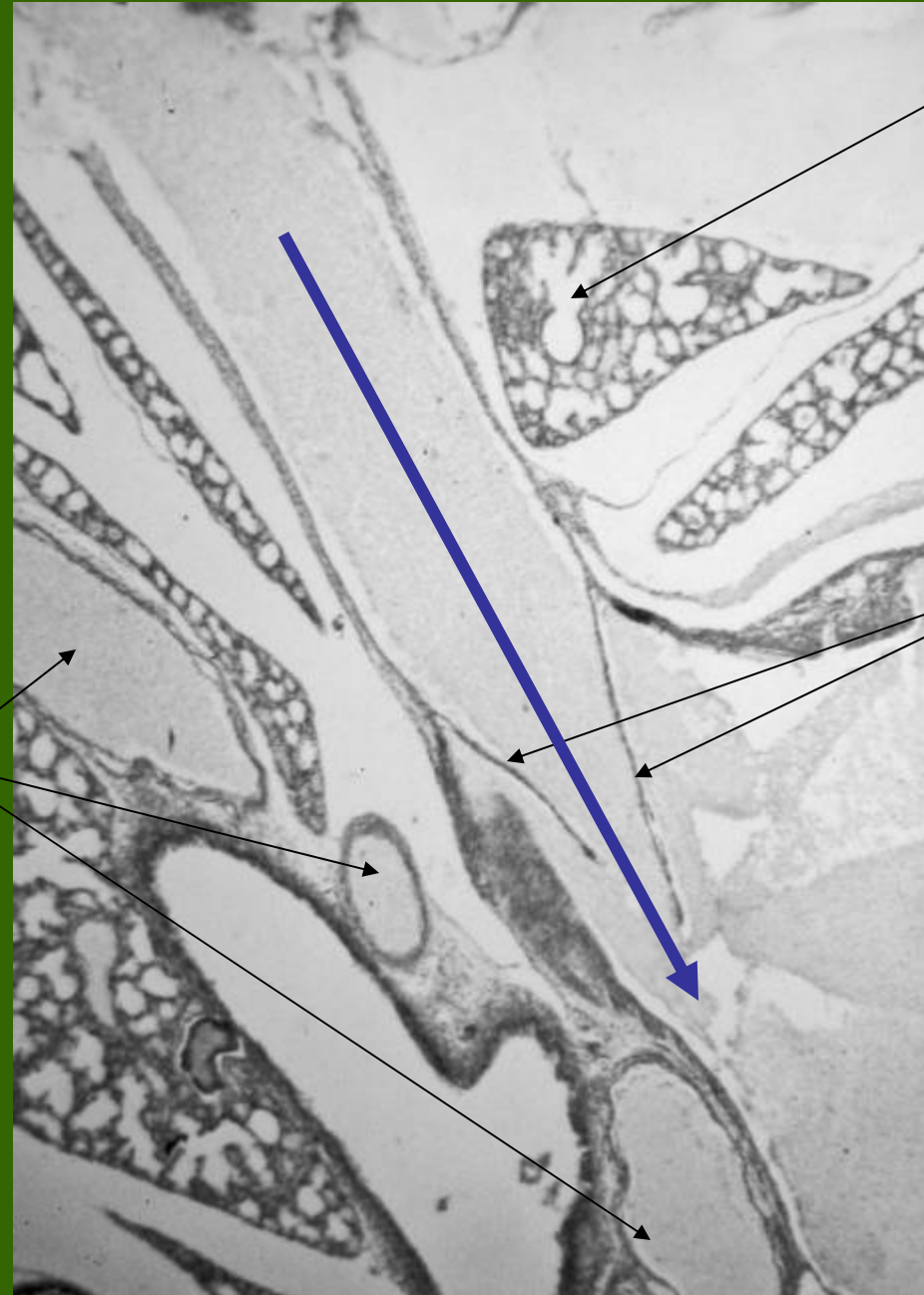
R



L

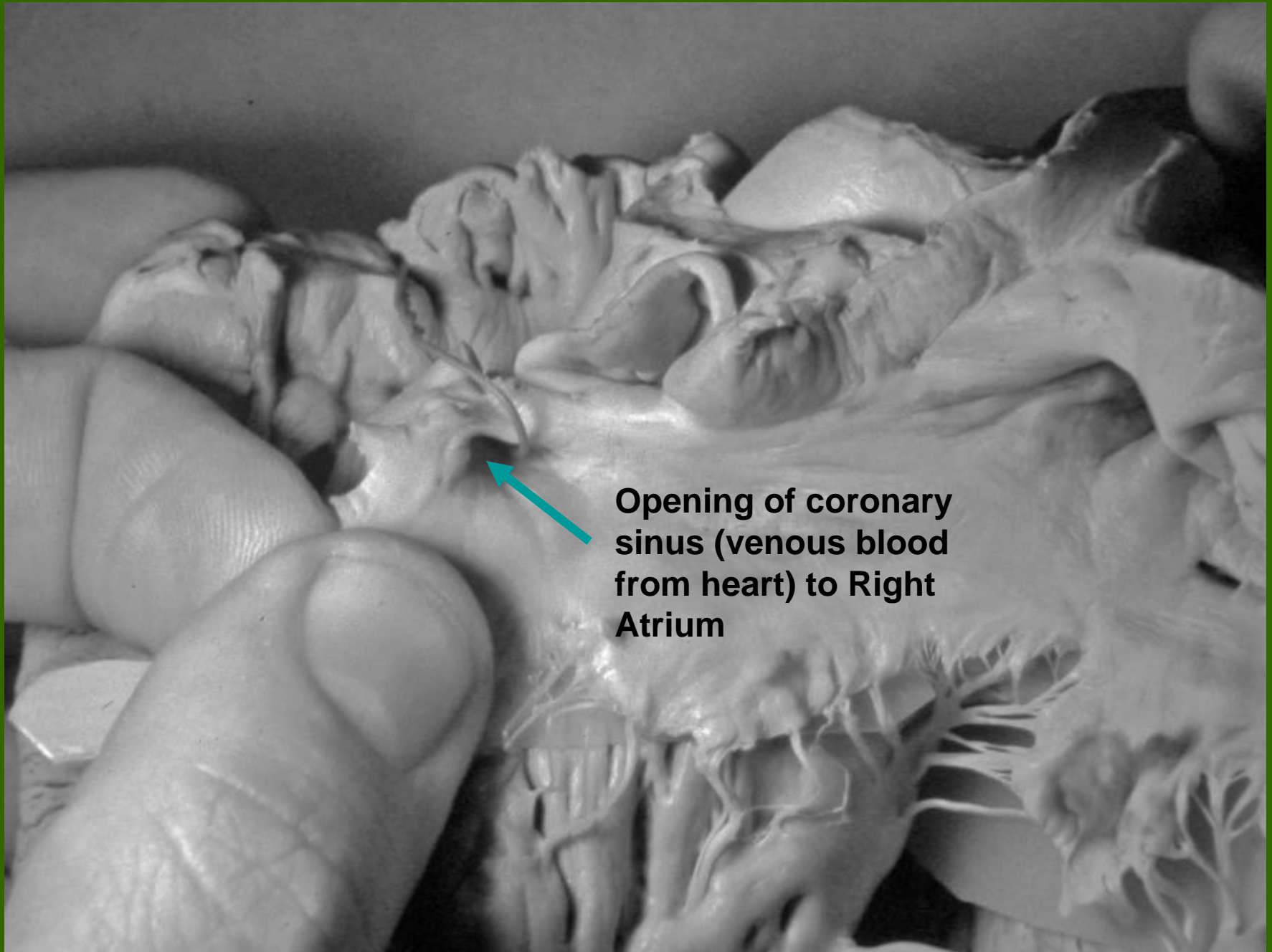
**Newborn
Mouse**

**Pulmonary
Vessels**



**Terminal
Bronchiole and
alveoli: lung**

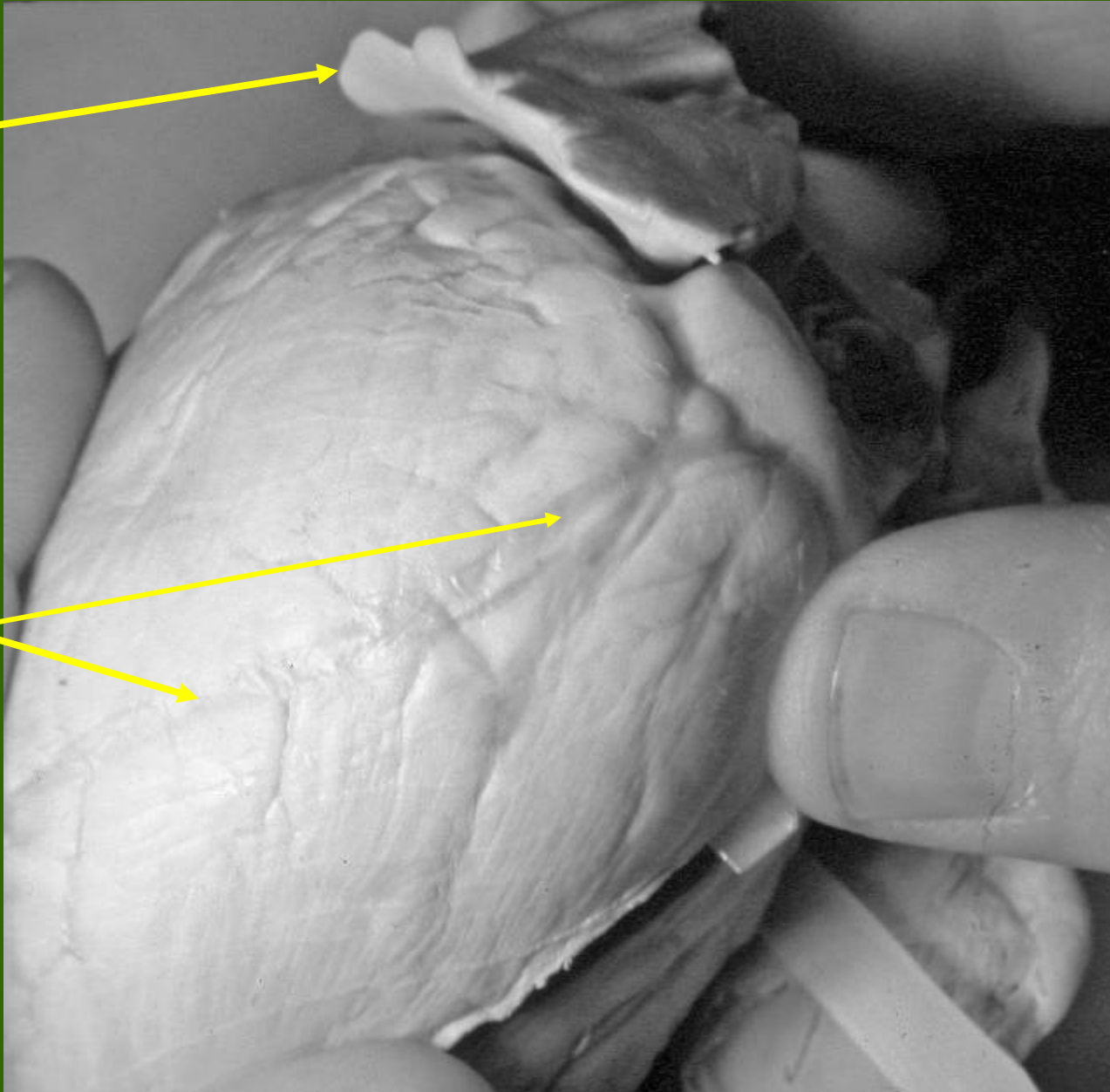
Valve



**Opening of coronary
sinus (venous blood
from heart) to Right
Atrium**

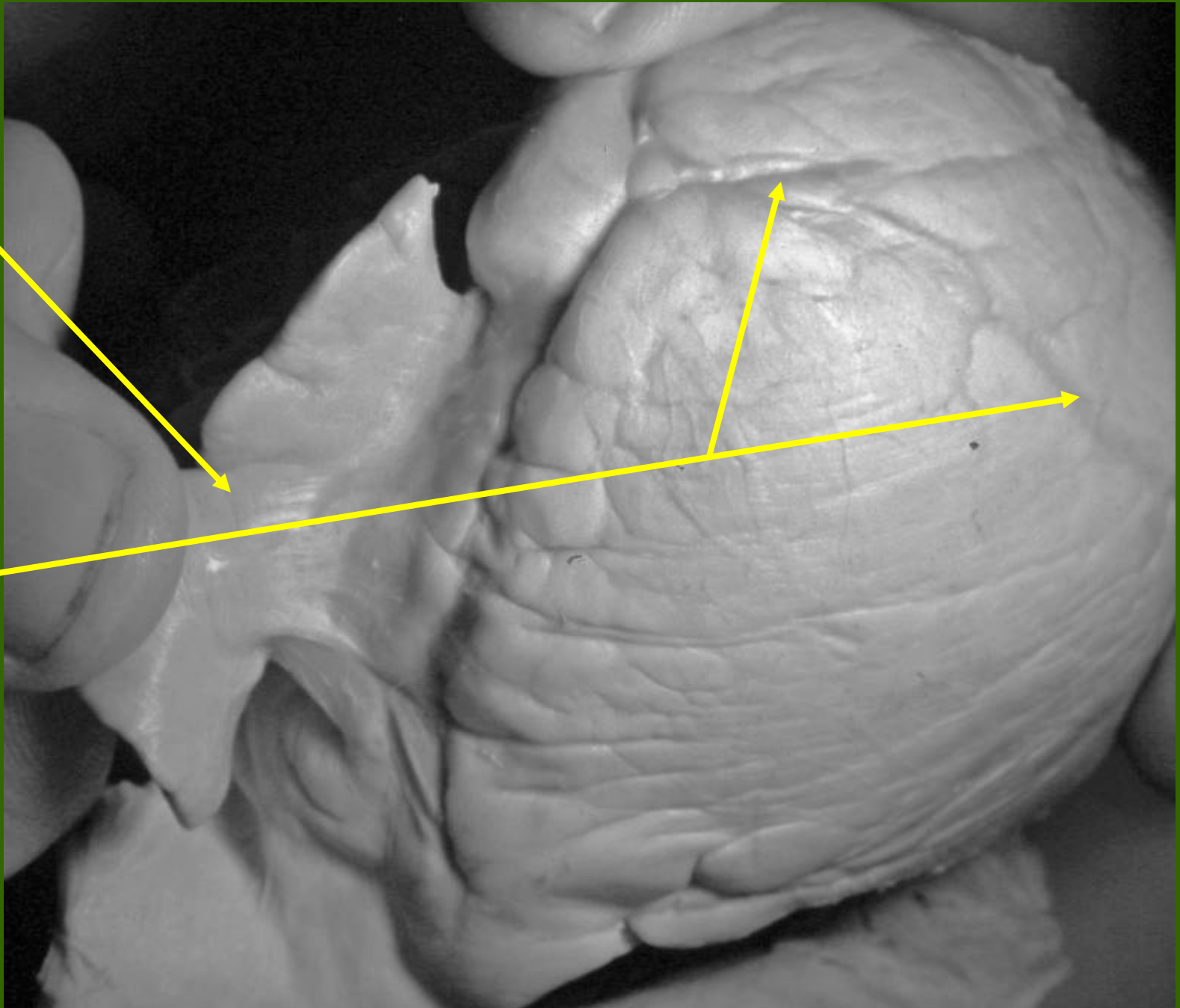
**Auricle
of Atrium**

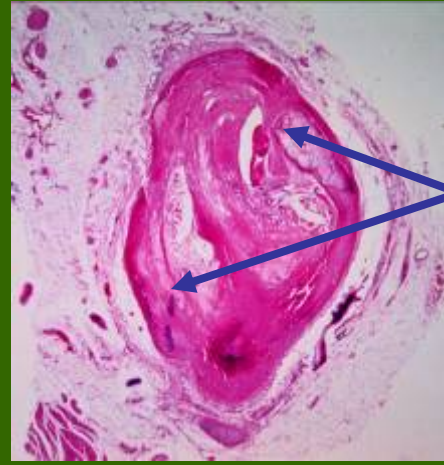
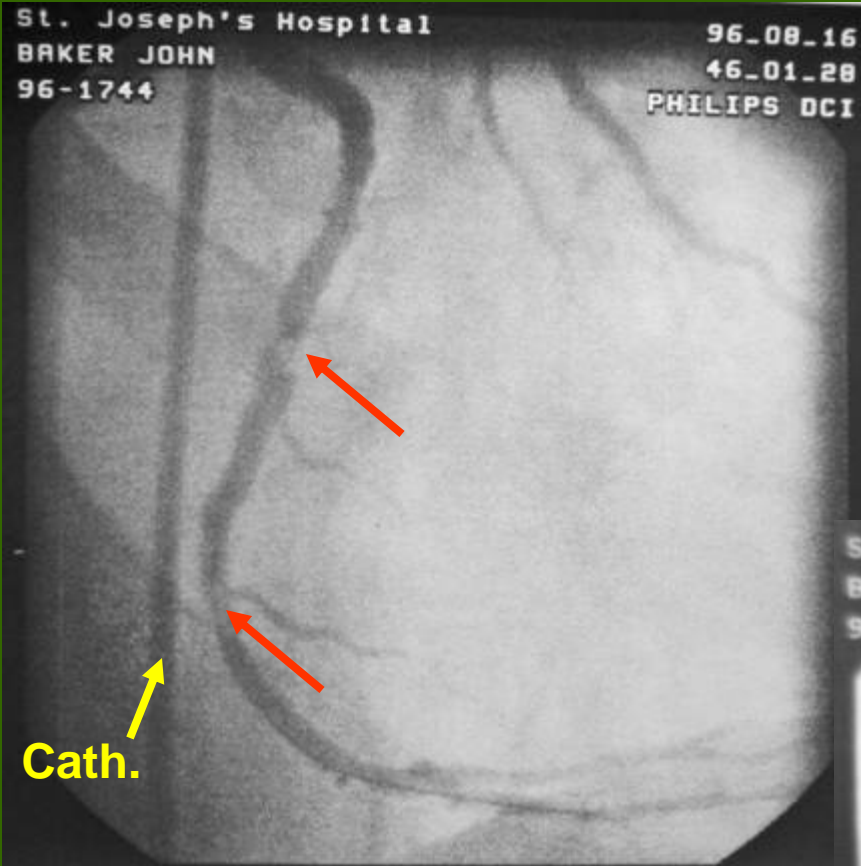
**Coronary
Artery (&
Vein)**



**Auricle
of Atrium**

**Coronary
artery**



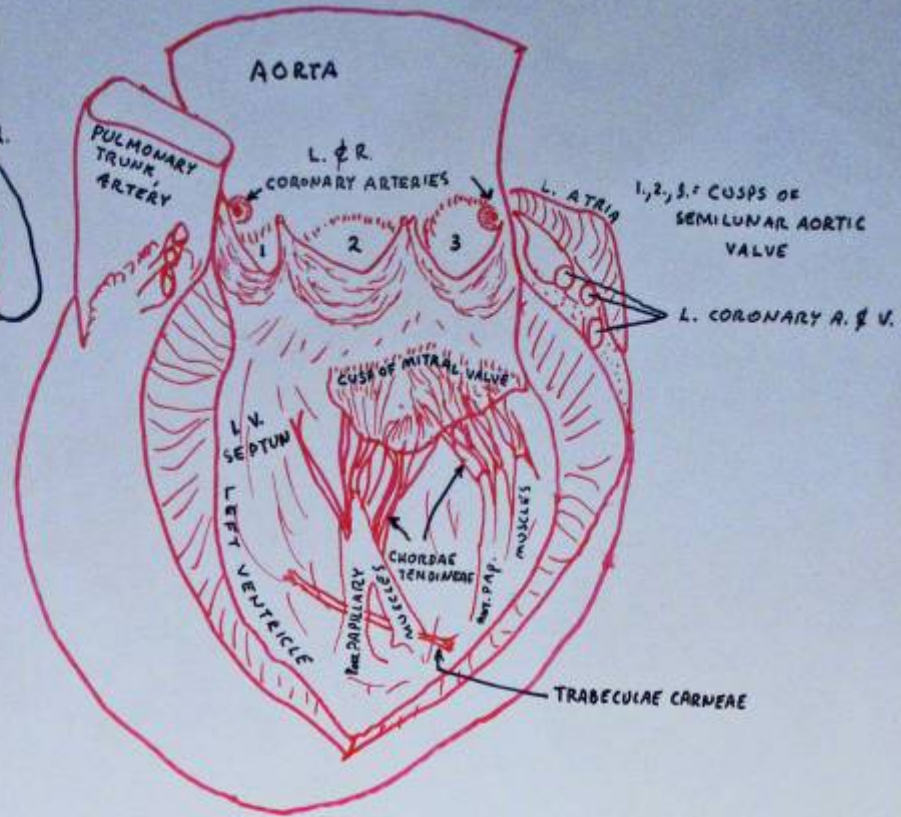
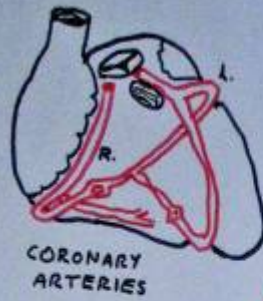


**Plaques –
occluding
Coronary
artery= Death**

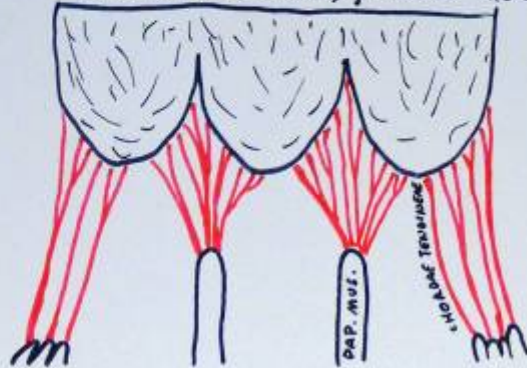
**Dye filled Coronary
Arteries and
cholesterol (LDL)
Plaques = Cardiac
Catheterization
through Femoral
Artery**





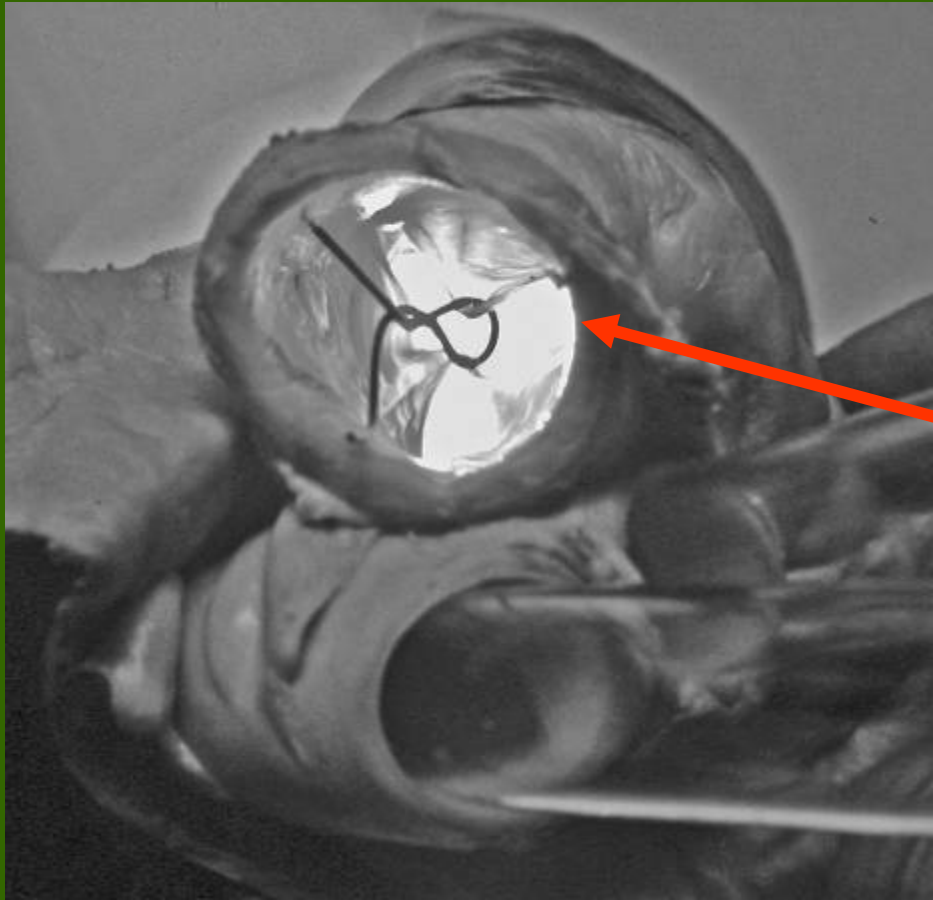


RIGHT TRICUSPID OR LEFT MITRAL (BICUSPID) } "ATRIO-VENTRICULAR" VALVES

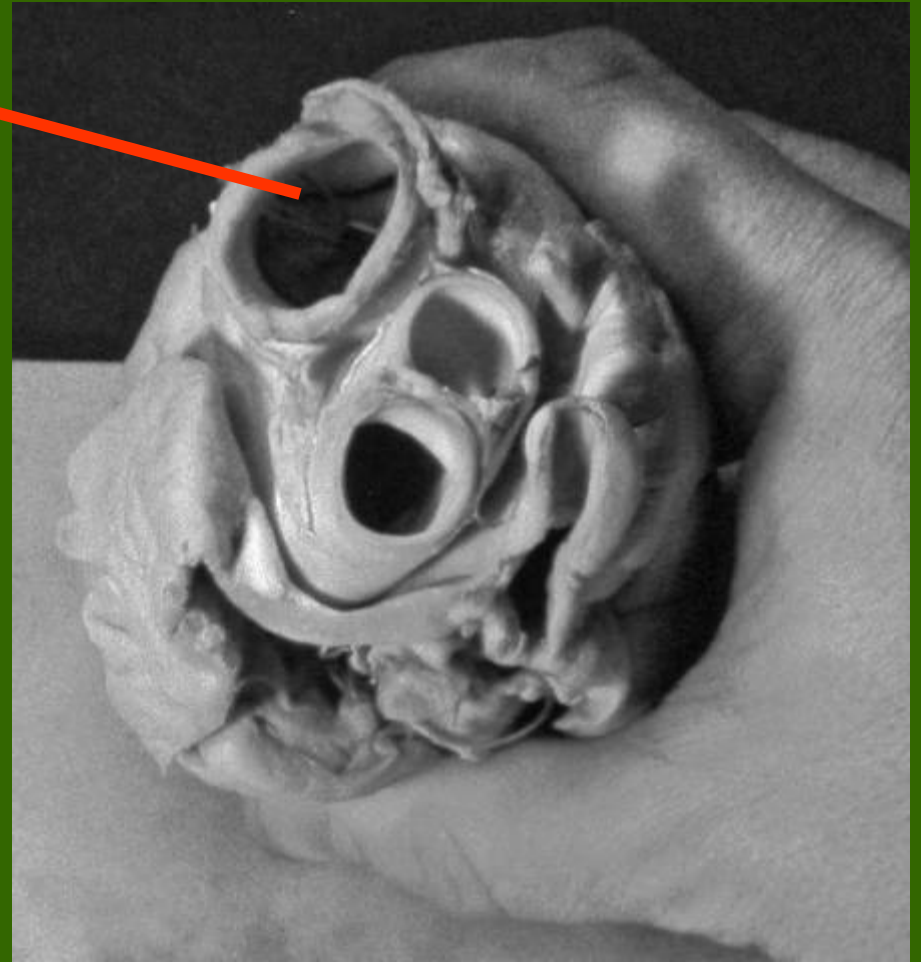


AORTIC AND PULMONARY SEMILUNAR VALVES

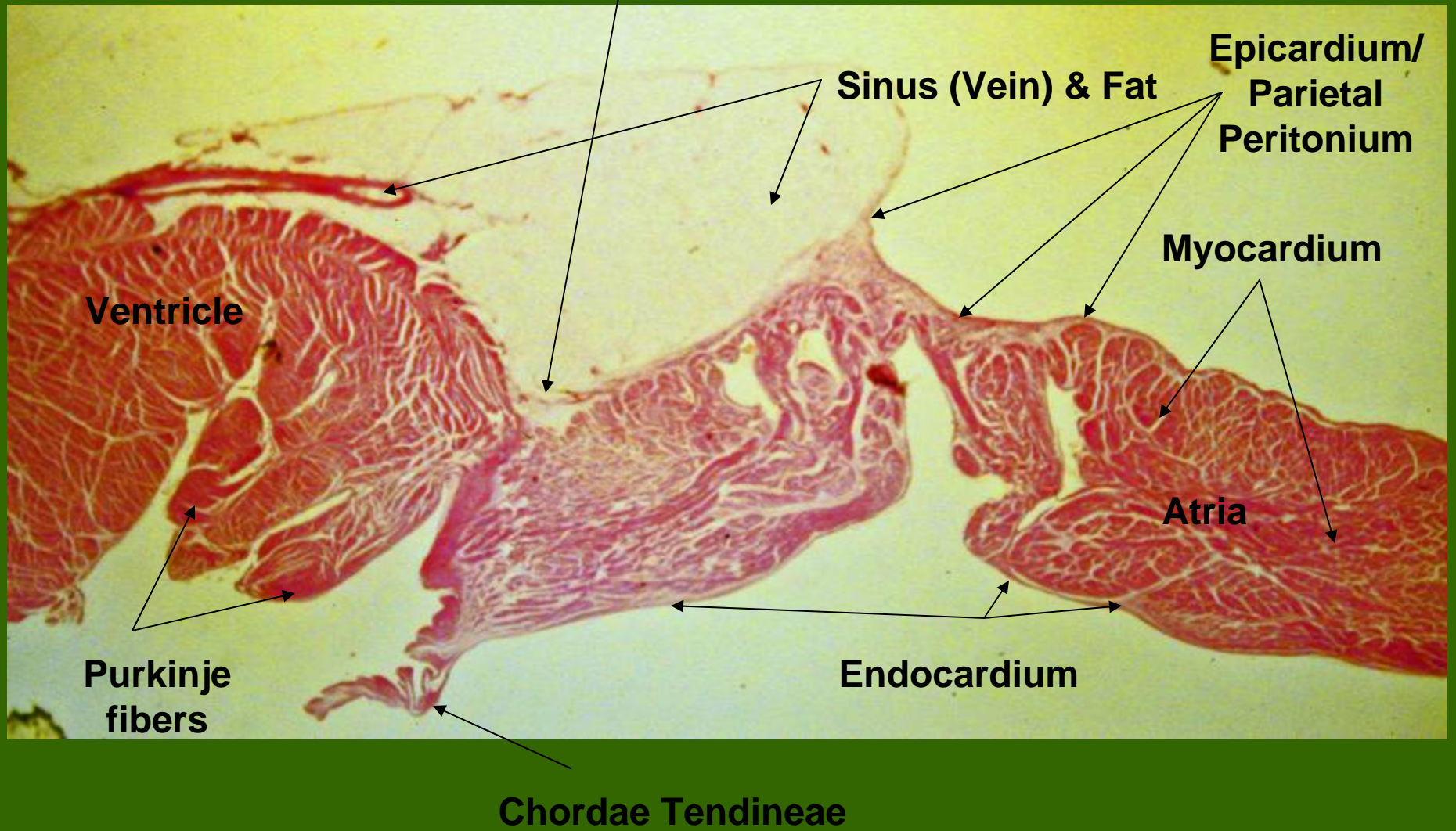
Top view of Heart showing Major Vessels

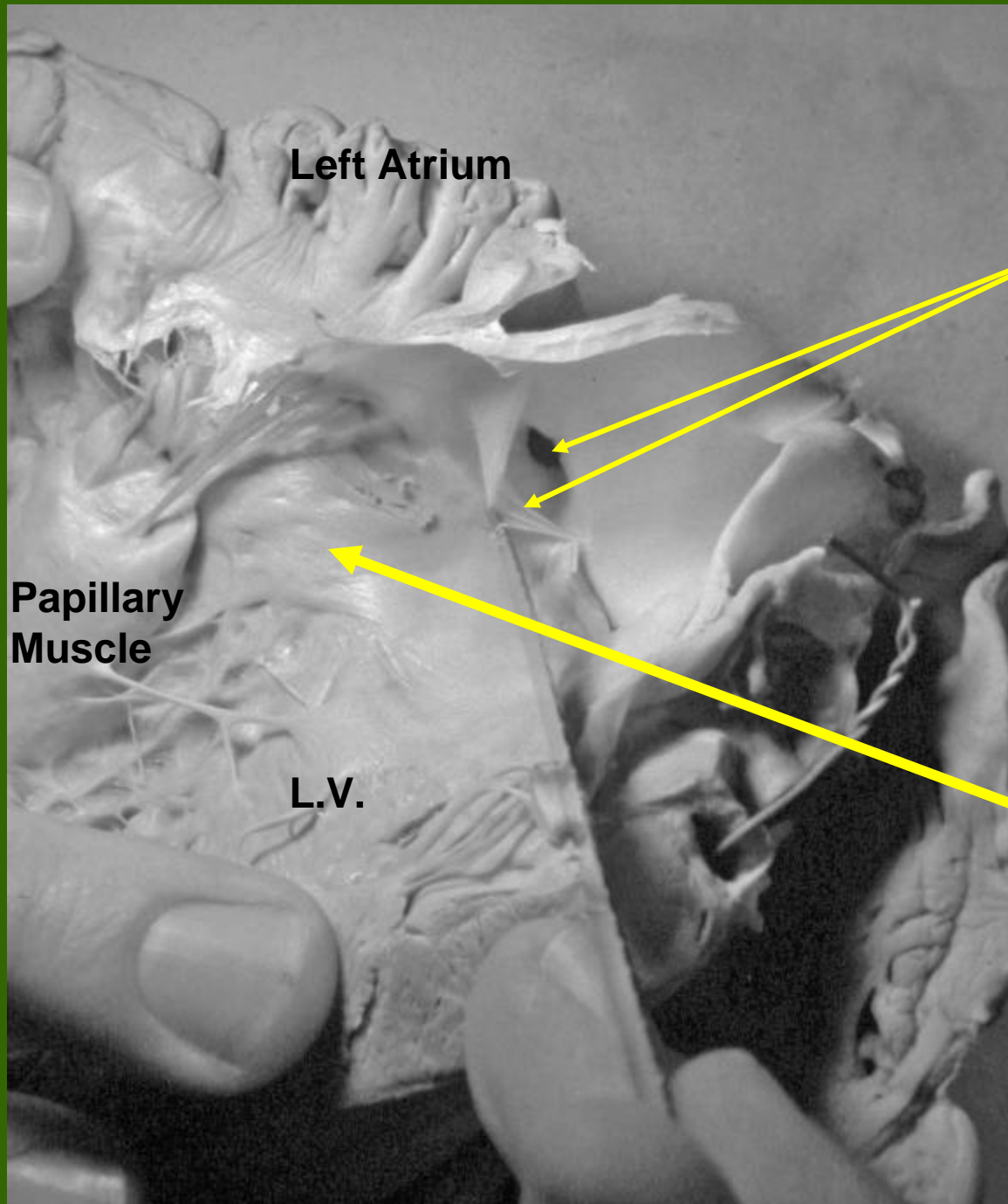


**Note 3 Aortic
Semilunar Valves
tied together with
wire**



Section through Atrioventricular Sulcus





Left Atrium

**Papillary
Muscle**

L.V.

**Knife blade reflecting
Left Semilunar Valve to
show opening of L.
Coronary Artery**

**Left Branch of
Atrioventricular Bundle
(made of Purkinje cells –
just under Endocardium of
Endothelium= Tunica
Intima)**



**Apex
of LV**

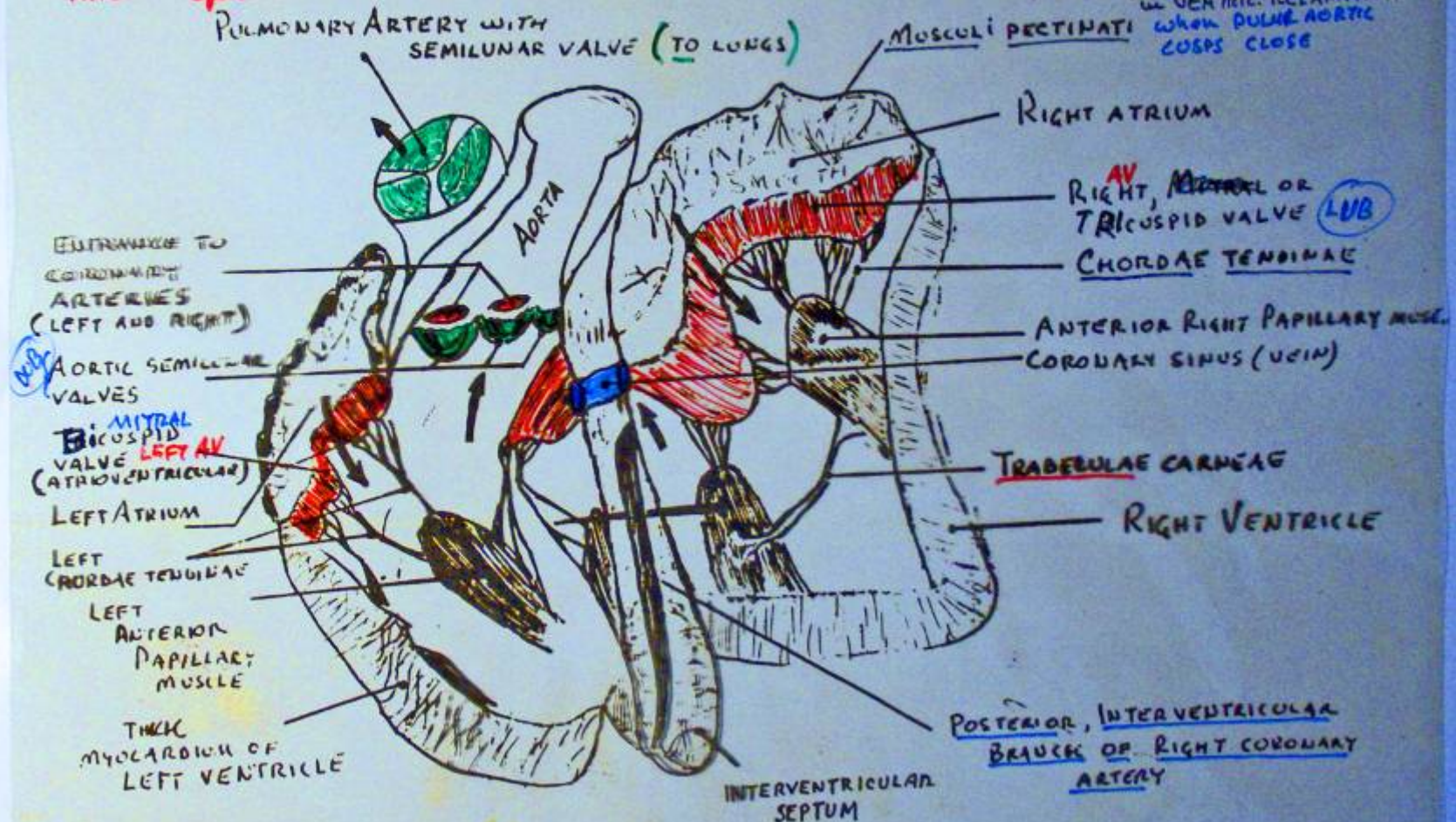
* VALVULAR STENOSIS (OBSTRUCTION) usually LEFT/
 MITRAL STENOSIS from ENDOCARDITIS attacking
 'LEAVES' of BICUSPID = MURMUR (e.g. Arnold Schwarzenegger)

CALF HEART

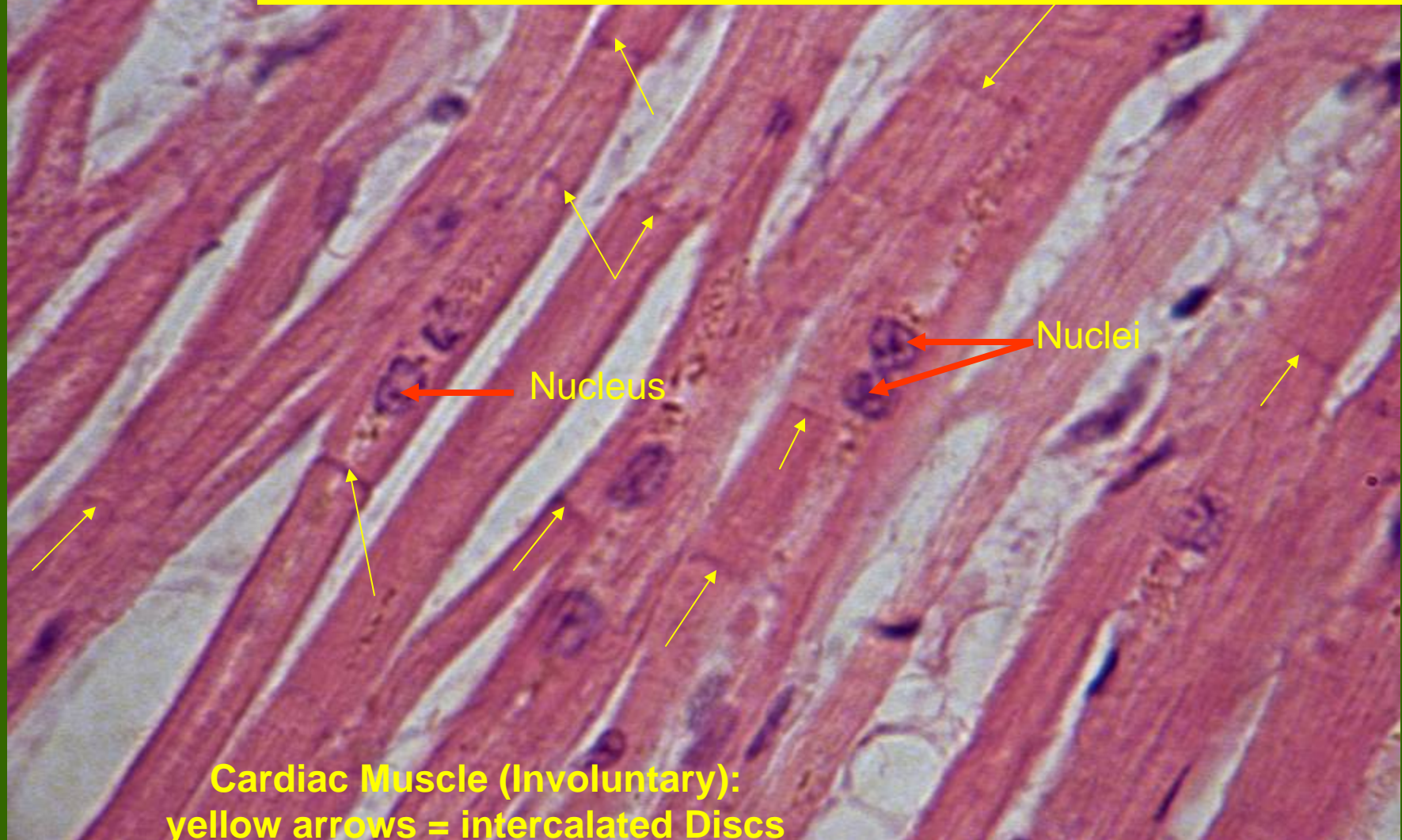
HEART SOUNDS STETHOSCOPE
 vibrations created by speeding up / slowing down
 of blood flow as contraction
 & relaxation of CHAMBERS:
 1) LUB → in VENTRIC. CONTRACTION:
 when TRI & BI-CUSPIDS
 CLOSE
 2) DUB → in VENTRIC. RELAXATION:
 when PULVE AORTIC
 CUSPS CLOSE

POSTERIOR DISSECTION
 OF HEART

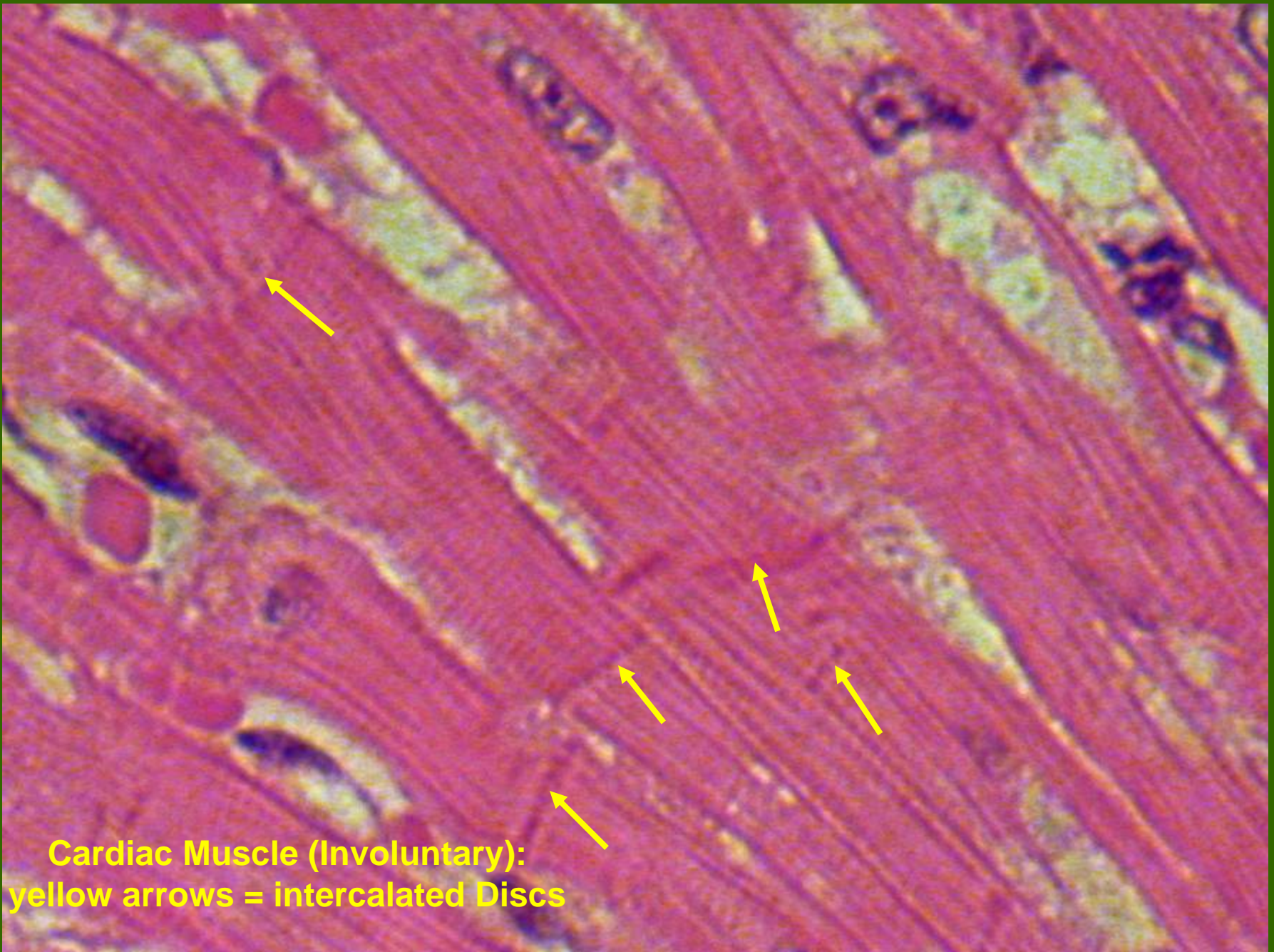
"PATEKT" = open



Cardiac Muscle Tissue: Striated, Involuntary; Nucleus in center of branching & anastomosing cells and cells connected by intercalated discs cells (desmosomes and gaps); specialized cells conduct messages to contract (Purkinje Cells)

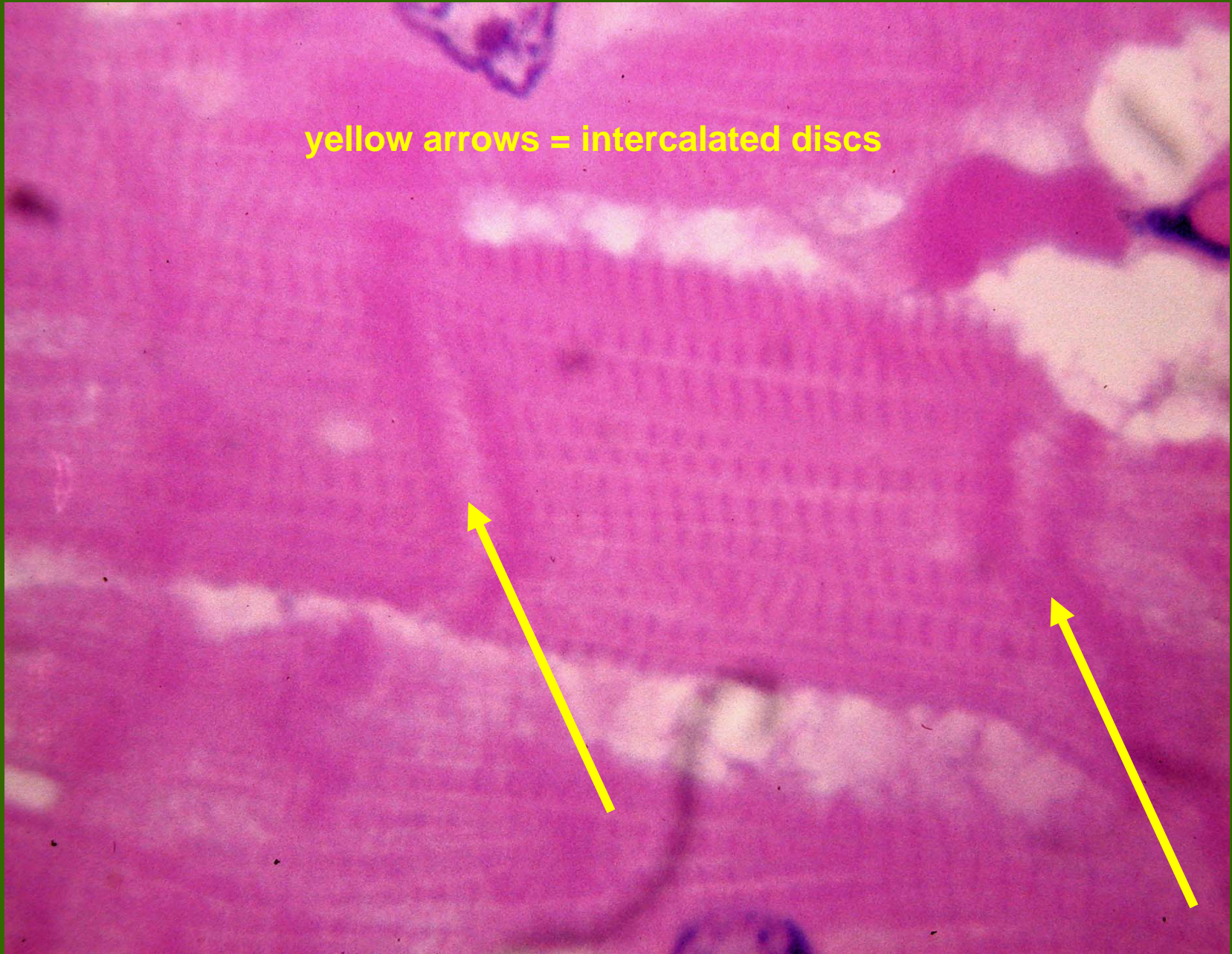


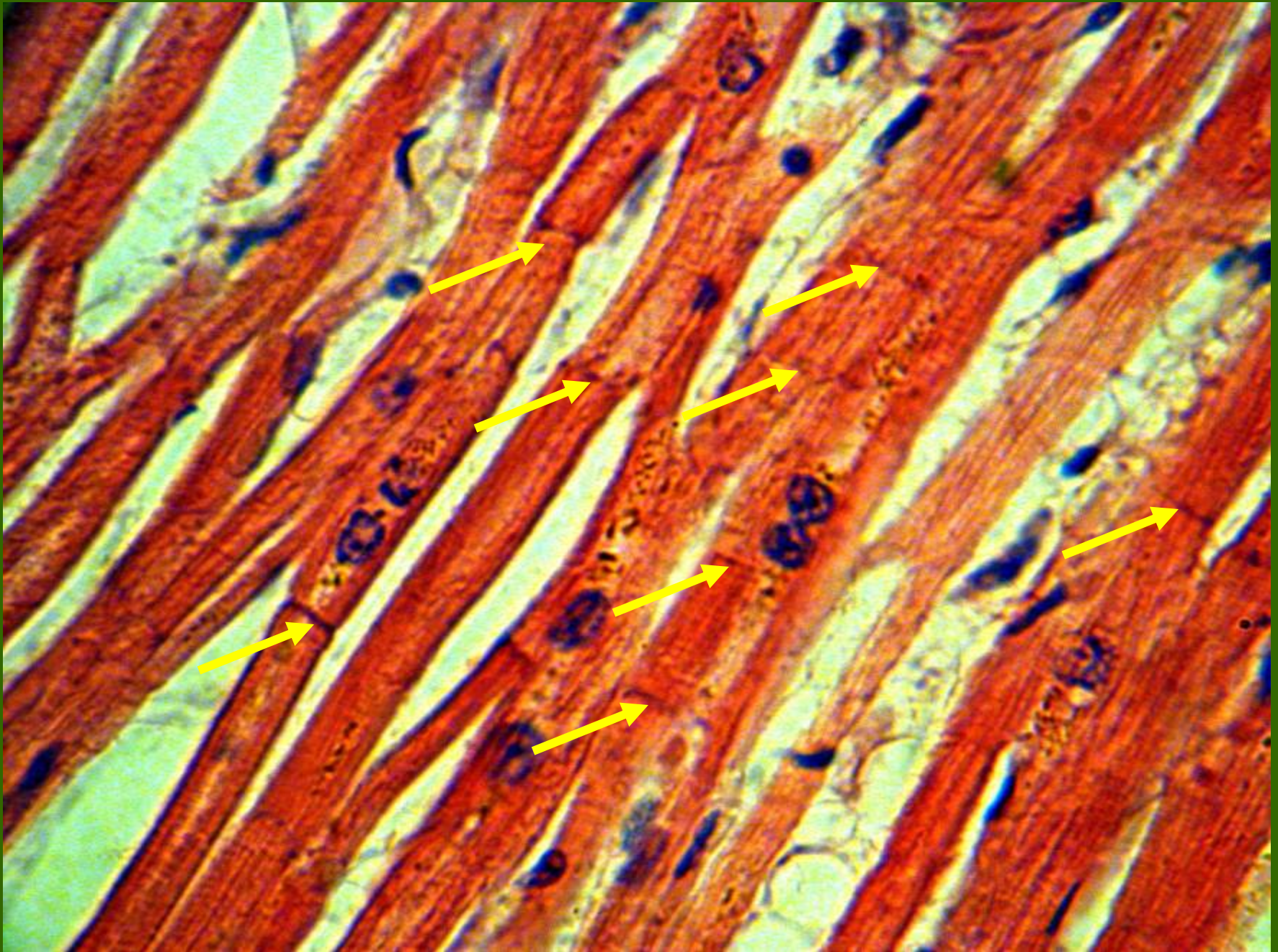
Cardiac Muscle (Involuntary):
yellow arrows = intercalated Discs

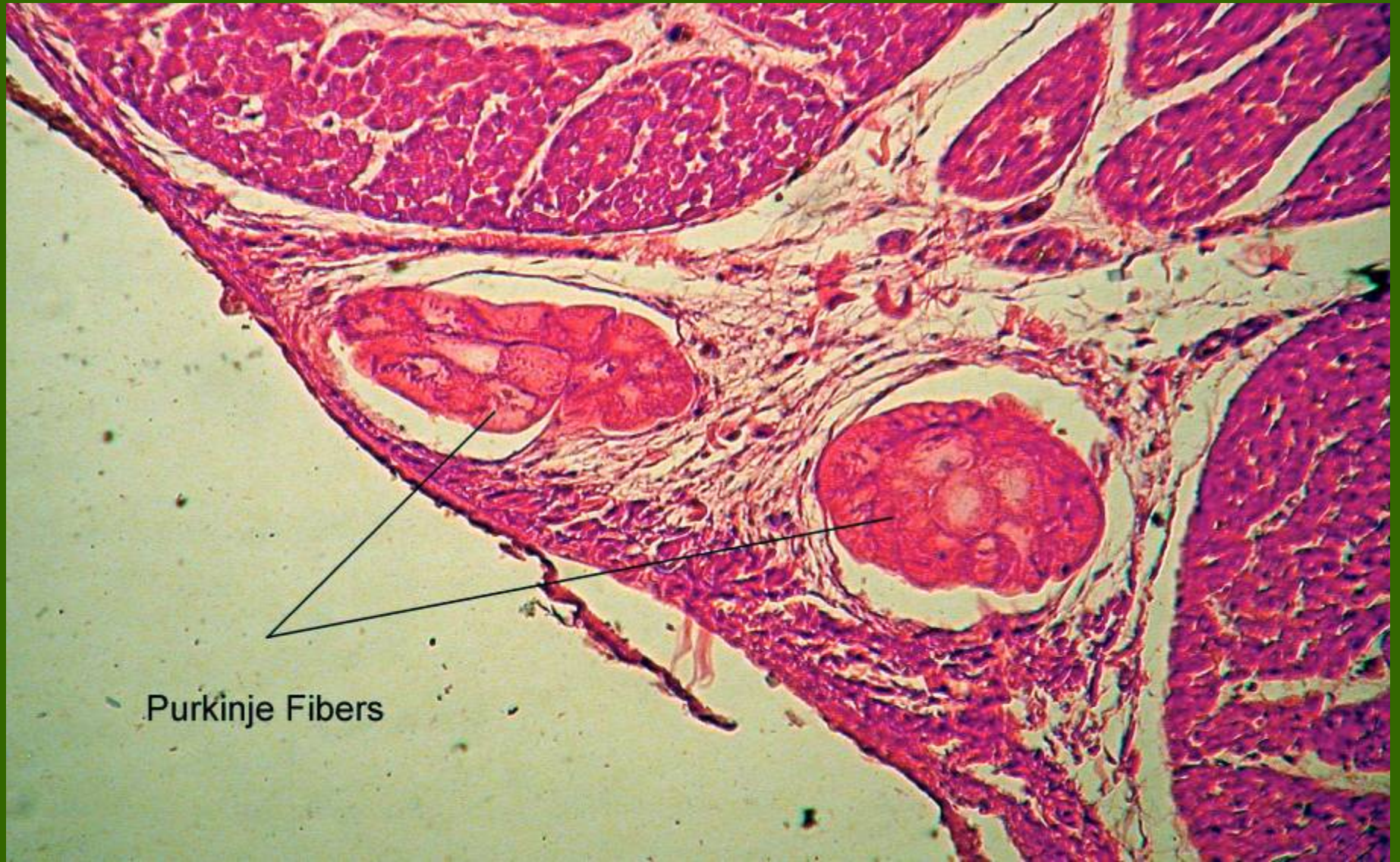


Cardiac Muscle (Involuntary):
yellow arrows = intercalated Discs

yellow arrows = intercalated discs

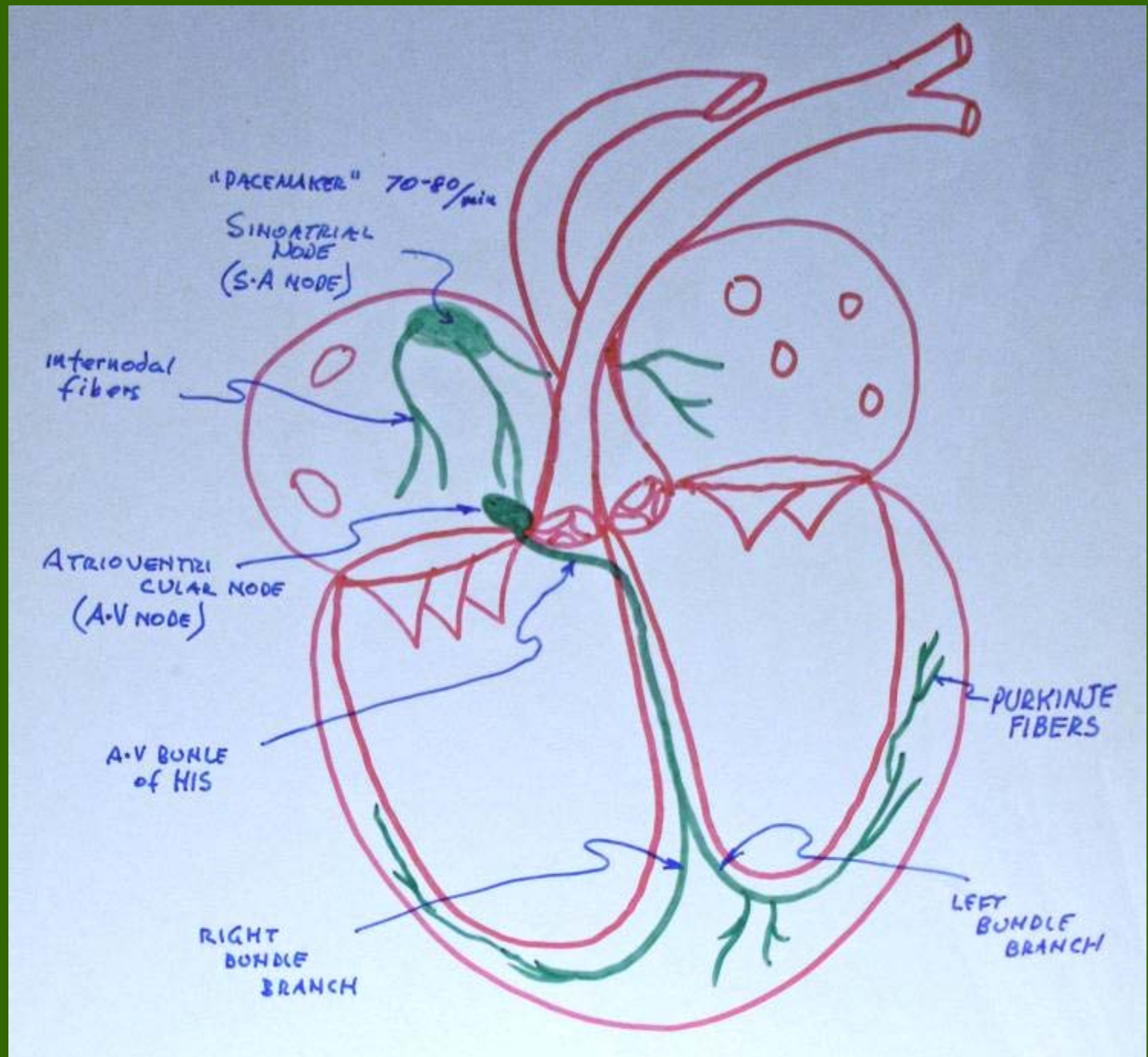


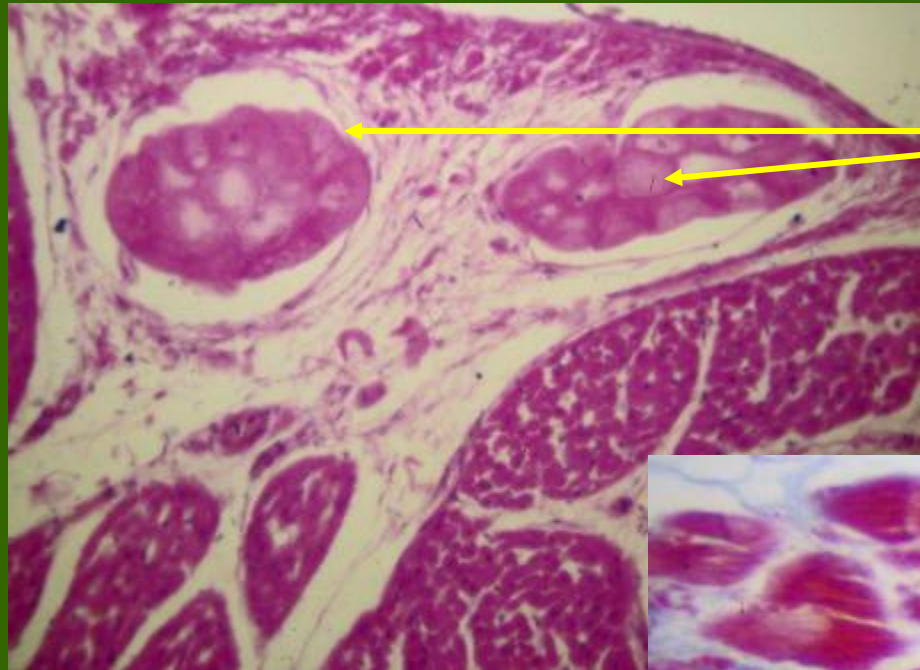




Purkinje Fibers

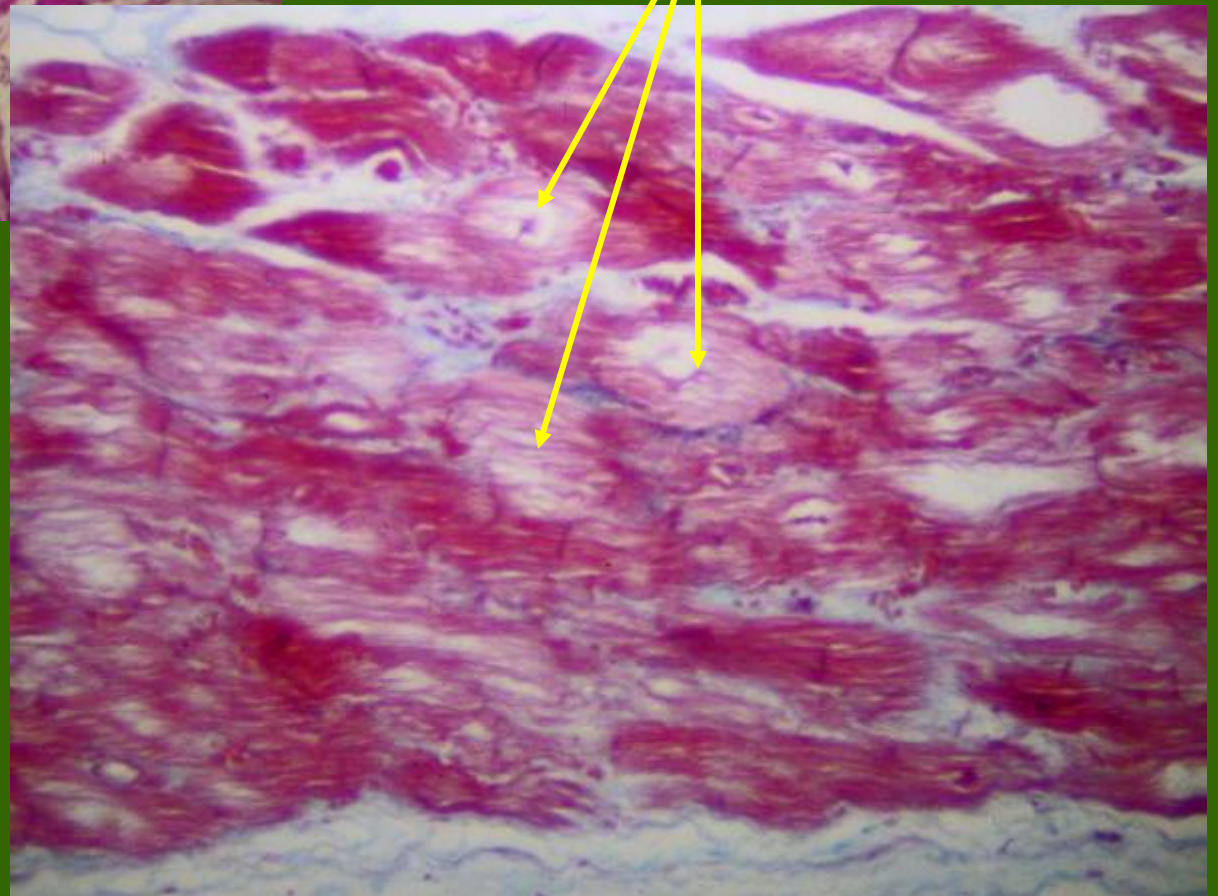
The Heart's
"Conducting System" to
maintain
heart rate



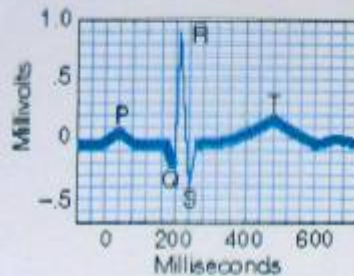
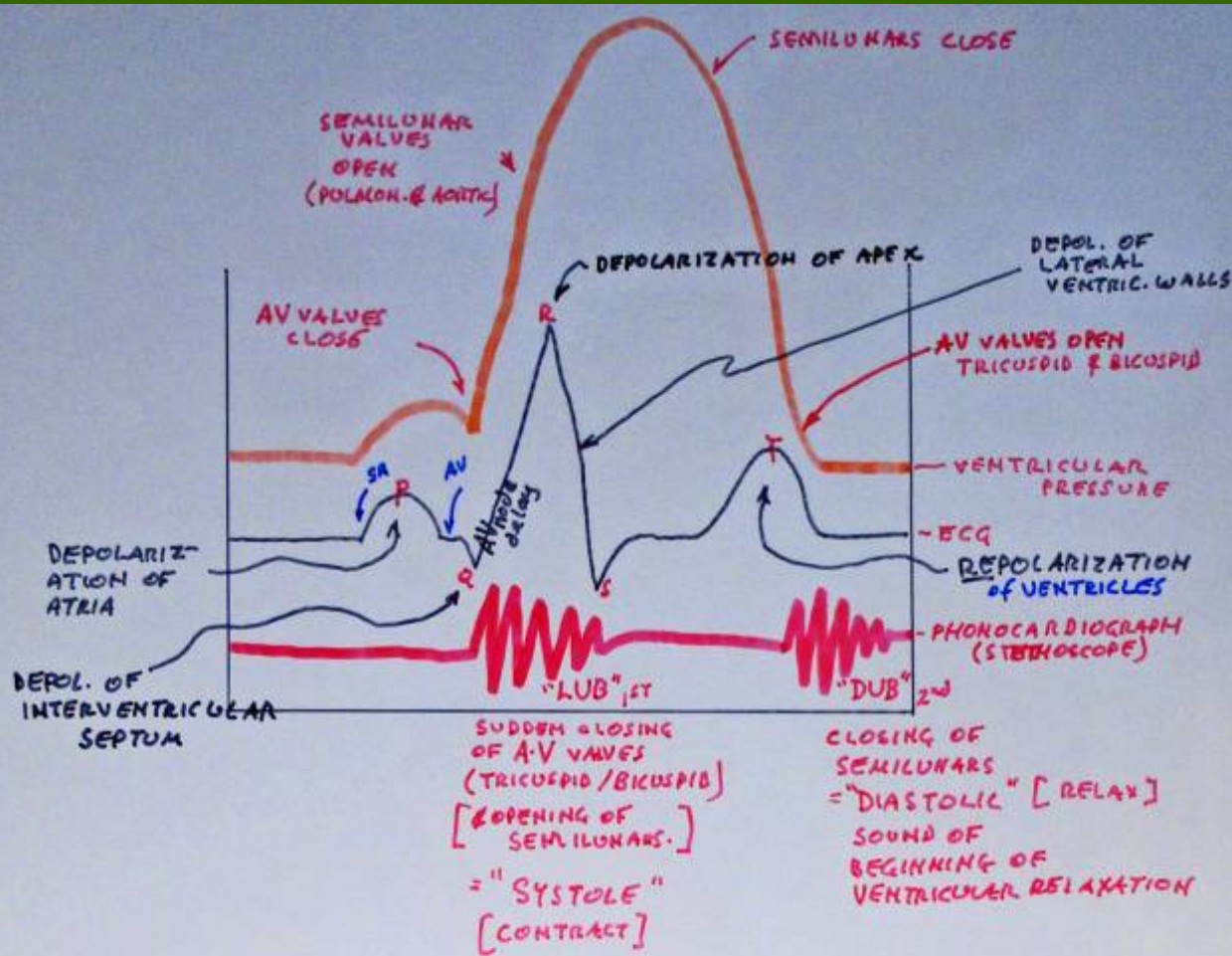


Cross section

Longitudinal section



**Purkinje Cells along
wall of Ventricle**



CARDIAC CYCLE:

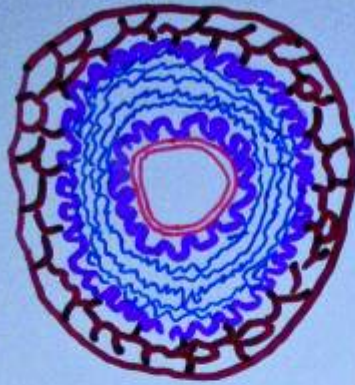
- 1) ATRIA RELAX AND BLOOD FLOWS FROM VEINS (^{+ CORONARY SIN.} VENAE CAVA, PULM. VEINS)
- 2) THUS: PRESSURE INCREASES IN ATRIA AND 70% OF BLOOD FREELY FLOWS THROUGH A-V (TRI/BICUSPIDS) VALVES
- 3) ATRIAL CONTRACTION OCCURS ("ATRIAL SYSTOLE") AND LAST 30% OF BLOOD IS FORCED INTO VENTRICLES.
- 4) IN VENTRICULAR SYSTOLE: A-V VALVES PASSIVELY MOVE UP AS VENTRICULAR PRESSURE RISES - THEY PUSH IN TOWARDS ATRIA & ATRIAL PRESSURE ALSO RISES.
- 5) PAPILLARY MUSCLES CONTRACT & CHORDAE TENDINEAE ATTACHED TO A-V VALVES PREVENT A-V VALVES FROM GOING TOO FAR UP.
- 6) ATRIAL PRESSURE FALLS.... AS BLOOD ENTERS ARTERIES (PULM. ART & ^{+ COR. AR.} AORTA) - AS VENTRICULAR PRESSURE RISES DURING VENTRICULAR SYSTOLE.
- 7) ATRIAL PRESSURE STARTS TO RISE AS MORE BLOOD ENTERS FROM VEINS & VENTRICULAR DIASTOLE OCCURS; BUT NOT BEFORE BLOOD ENTERS ARTERIES.
- 8) WHEN VENTRICLES EMPTY ^(RELAX) PRESSURE IS @ LOWEST - DIASTOLE COMPLETE. AS SOME BLOOD FALLS BACK IT CLOSES SEMILUNAR VALVES; VENTRICULAR PRESSURE NOW LOWER THAN ATRIA AND BLOOD ENTERS ATRIA

**Left Heart → Arteries →
Arterioles → Capillaries →
Venules → Veins → Right
Heart**

TUNICA:

inner INTIMA middle MEDIA outer ADVENTITIA

ARTERY



	CIRCULAR	LONGITUDINAL
inner & outer ELASTIC MEMBRANE SM. MUSCLE + elastic fibers		SMOOTH muscle
VASOCONSTRICTION/VASODILATION SMOOTH muscle control by ANS-SYMPATHETIC: VASOMOTOR		

simple squamous epithel.
= ENDOTHELIUM

inner & outer ELASTIC MEMBRANE
SM. MUSCLE + elastic fibers

SMOOTH muscle

VASOCONSTRICTION/VASODILATION
SMOOTH muscle control by ANS-SYMPATHETIC: VASOMOTOR

VEINS

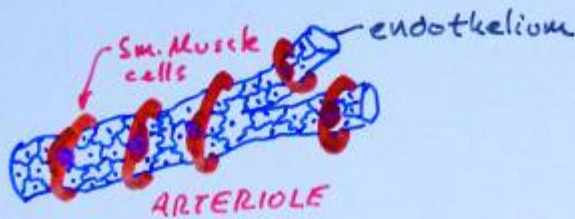


VALVES

SIMPLE SQUAMOUS EPITHEL.
= ENDOTHELIUM

SMOOTH muscle thin -

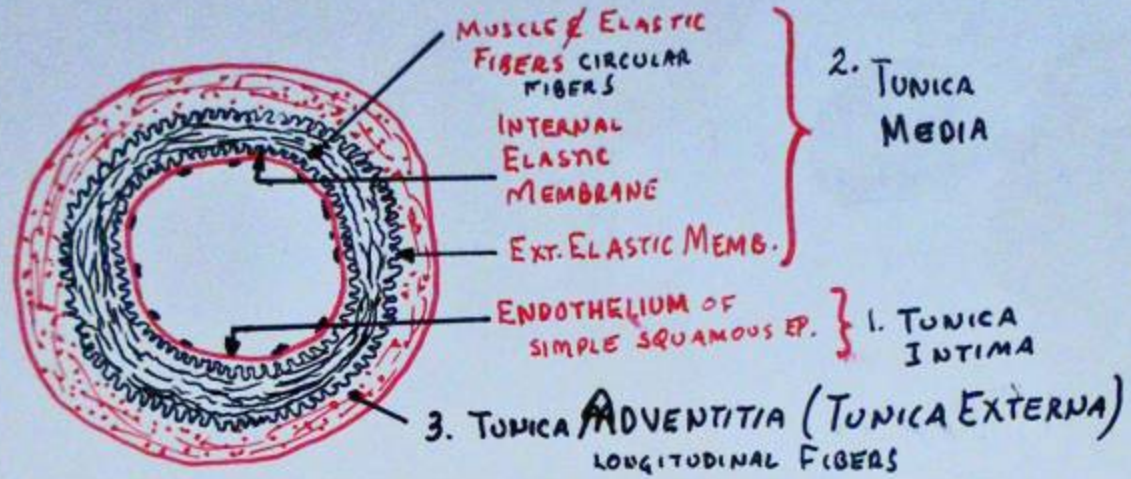
SMOOTH muscle thin -



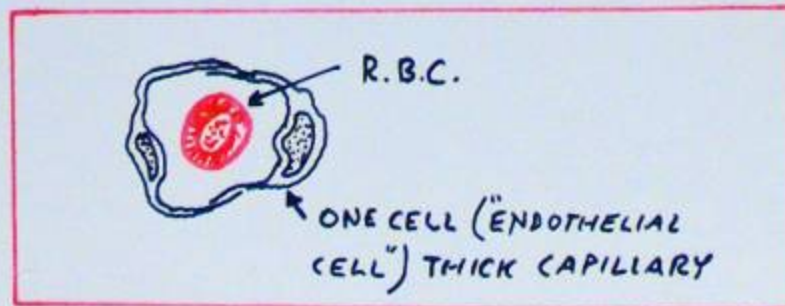
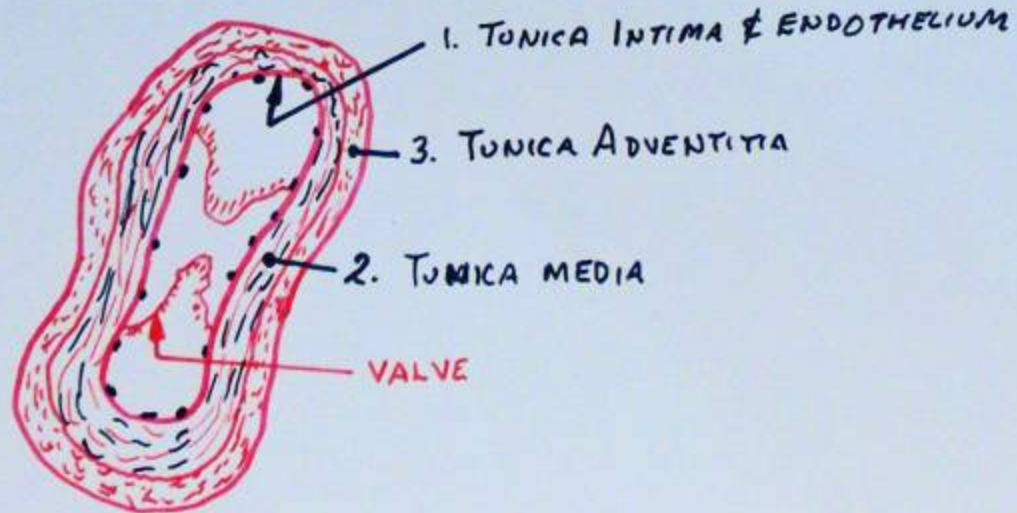
ARTERIOLE

ARTERY → ARTERIOLE → CAPILLARY → VENULE → VEIN

I: ROUND,
THICK WALLED
**ARTERY &
ARTERIOLE**



II: THINNER WALLED,
FLATTENED
**VEIN &
VEINULE**



MEAN BLOOD PRESSURE

AORTA

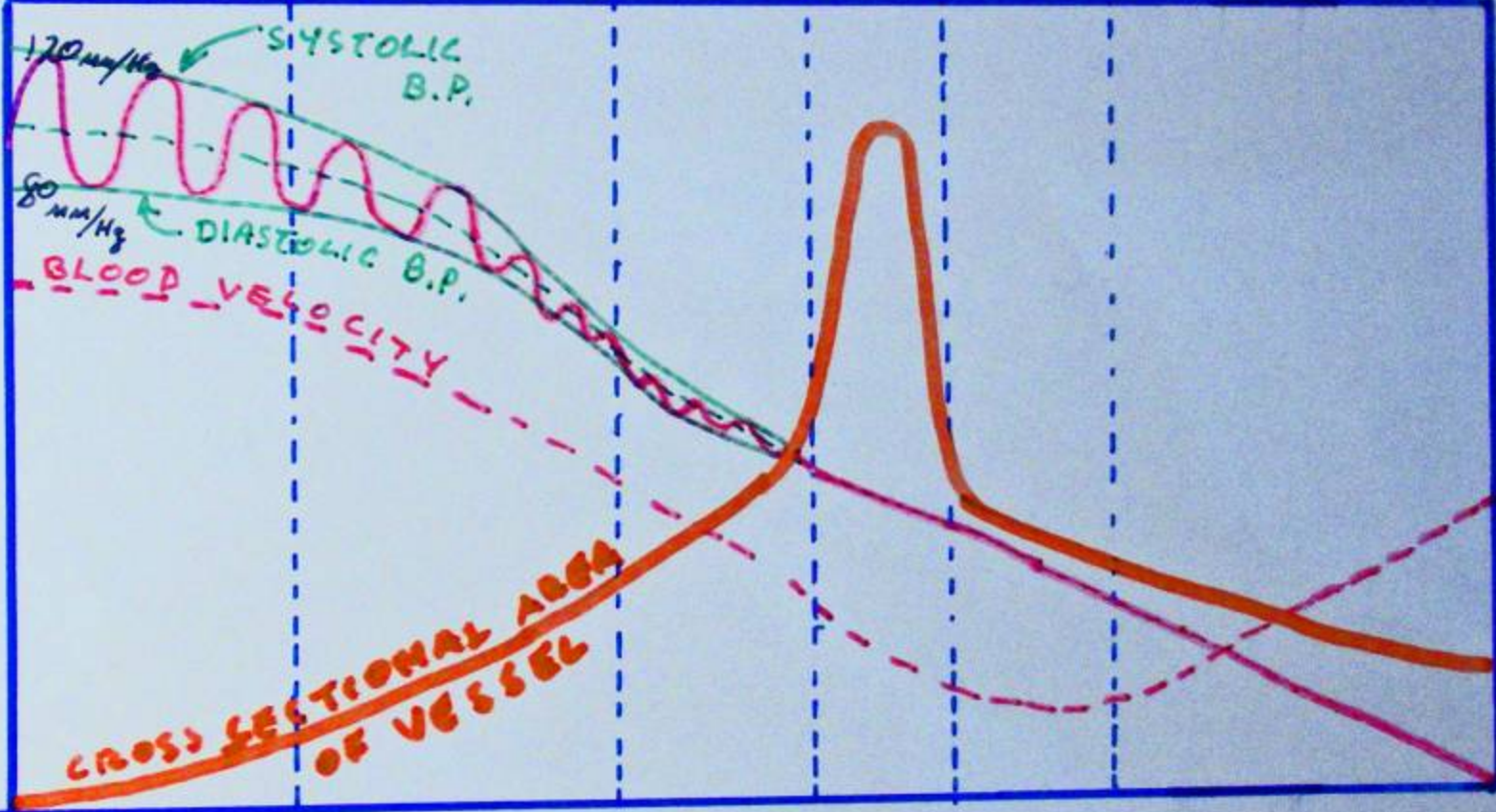
ARTERIES

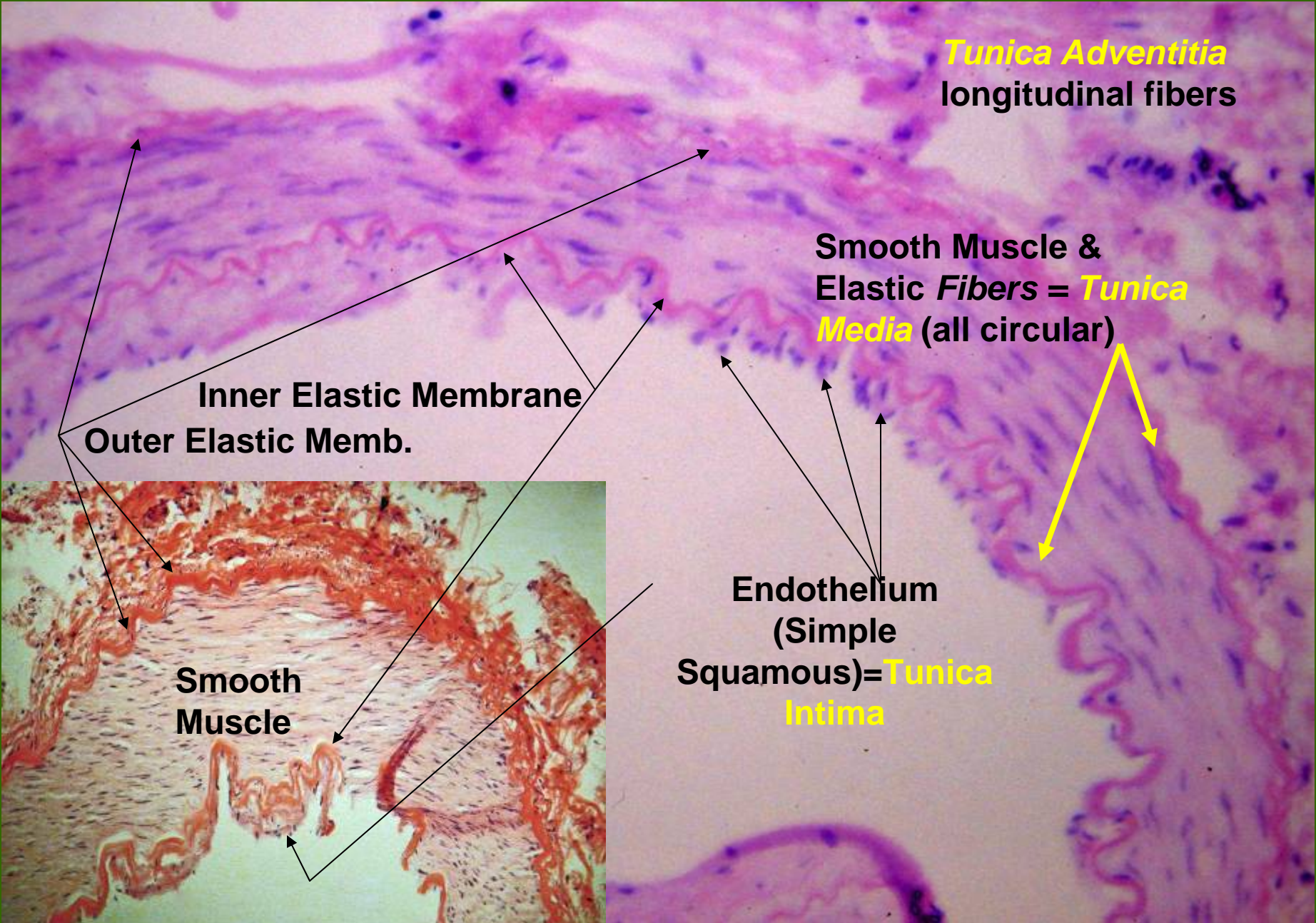
ARTERIOLES

CAPILLARIES

VENULES

VEINS





Tunica Adventitia
longitudinal fibers

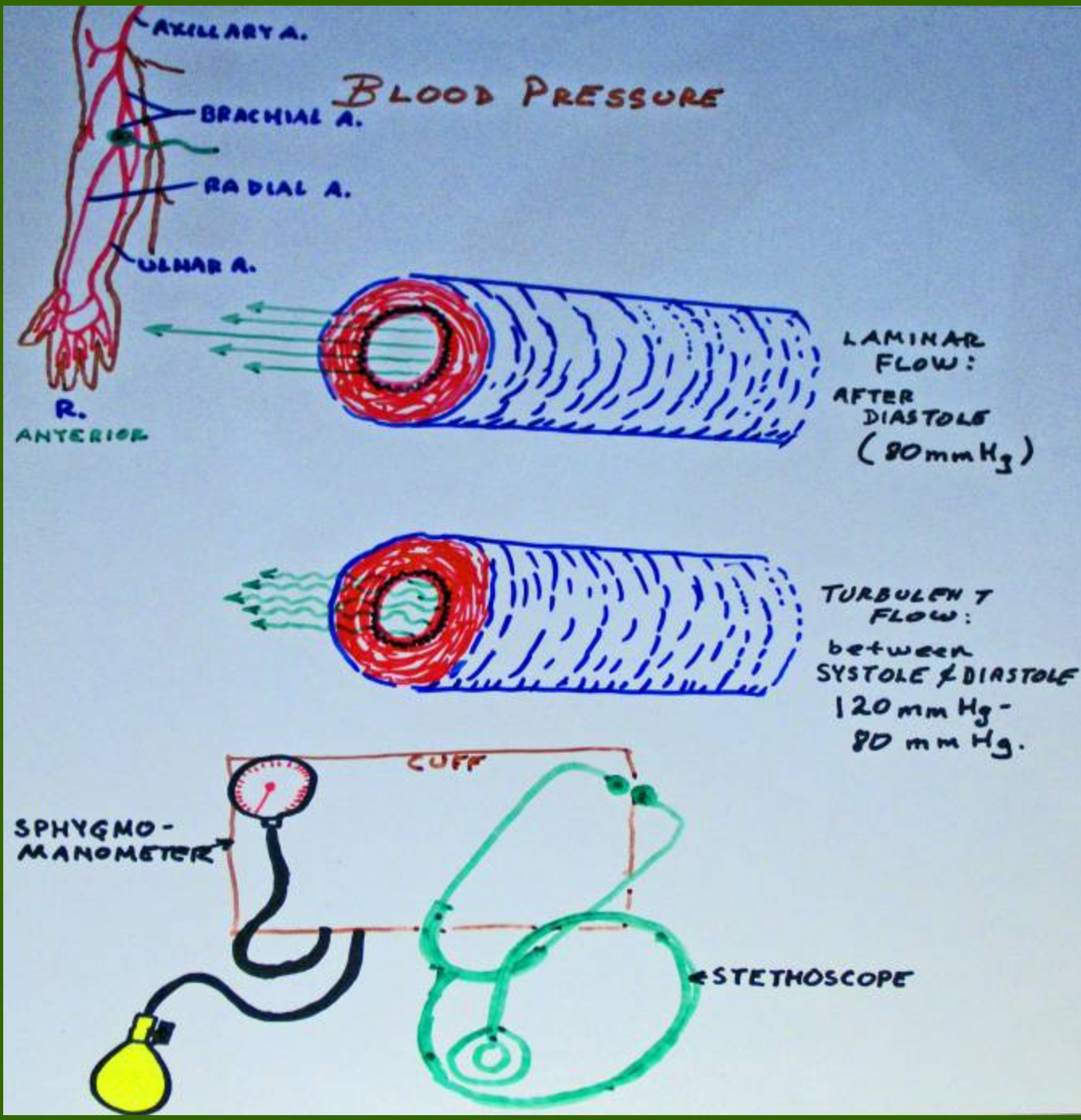
Smooth Muscle & Elastic Fibers = Tunica Media (all circular)

Inner Elastic Membrane
Outer Elastic Memb.

Endothelium
(Simple Squamous) = **Tunica Intima**

Smooth Muscle

2 medium- sized ARTERIES

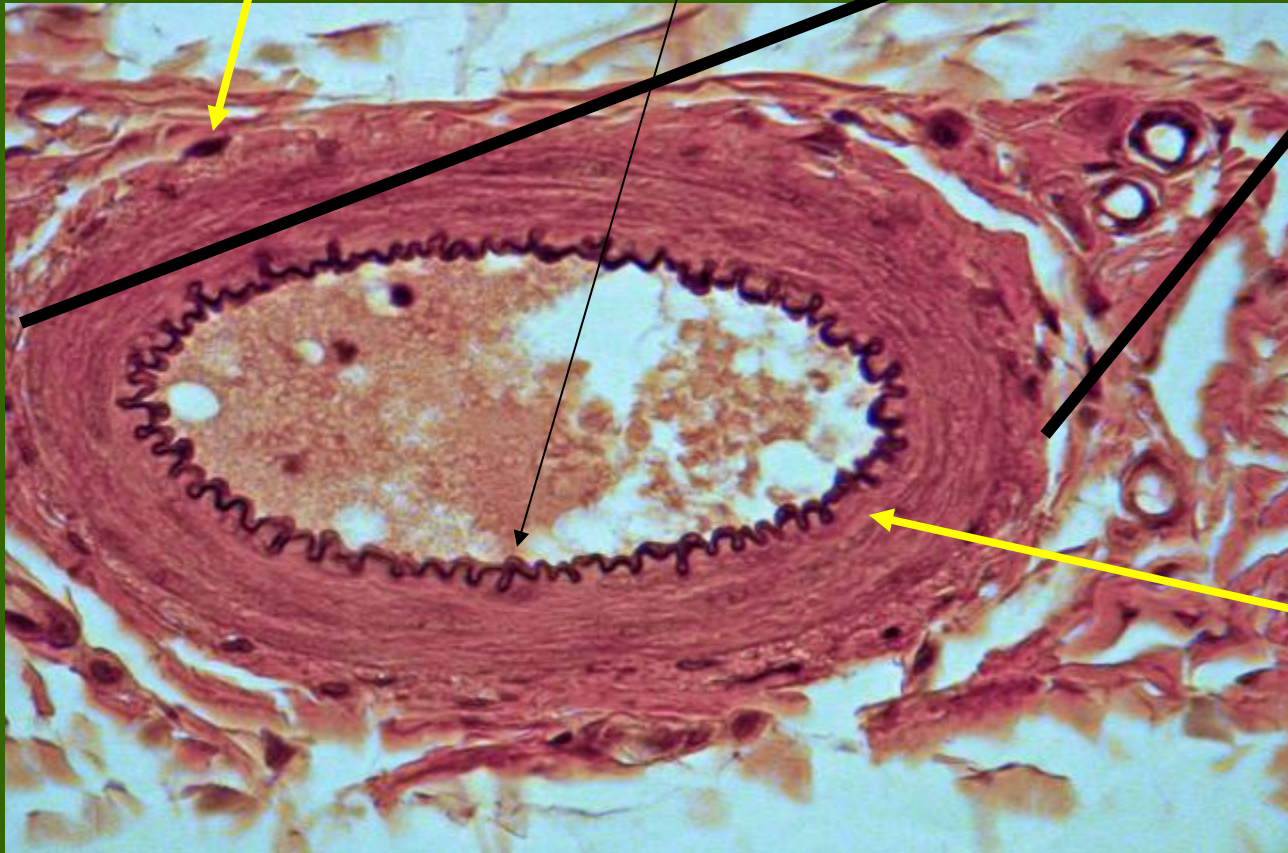
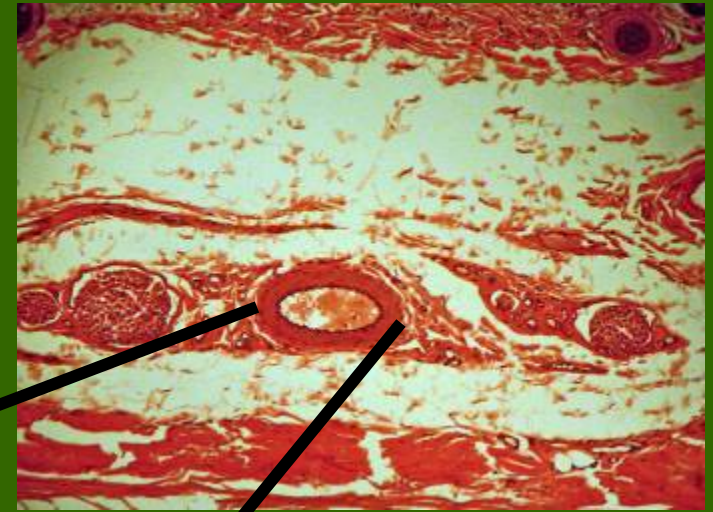




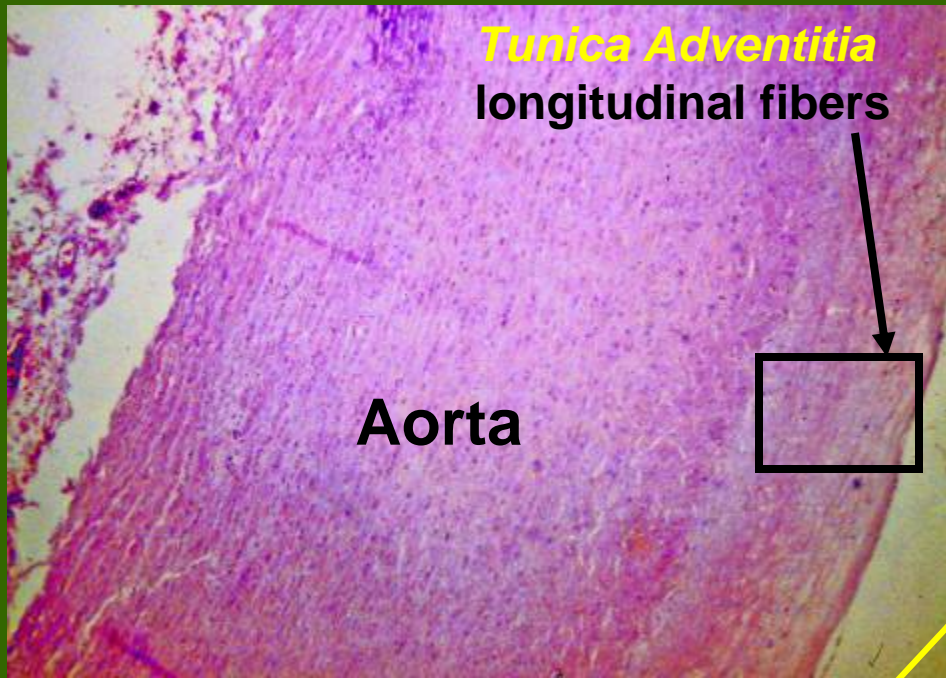
**A more modern digital
sphygmomanometer**

Endothelium (Simple Squamous)=**Tunica Intima**

Tunica Adventitia
longitudinal fibers



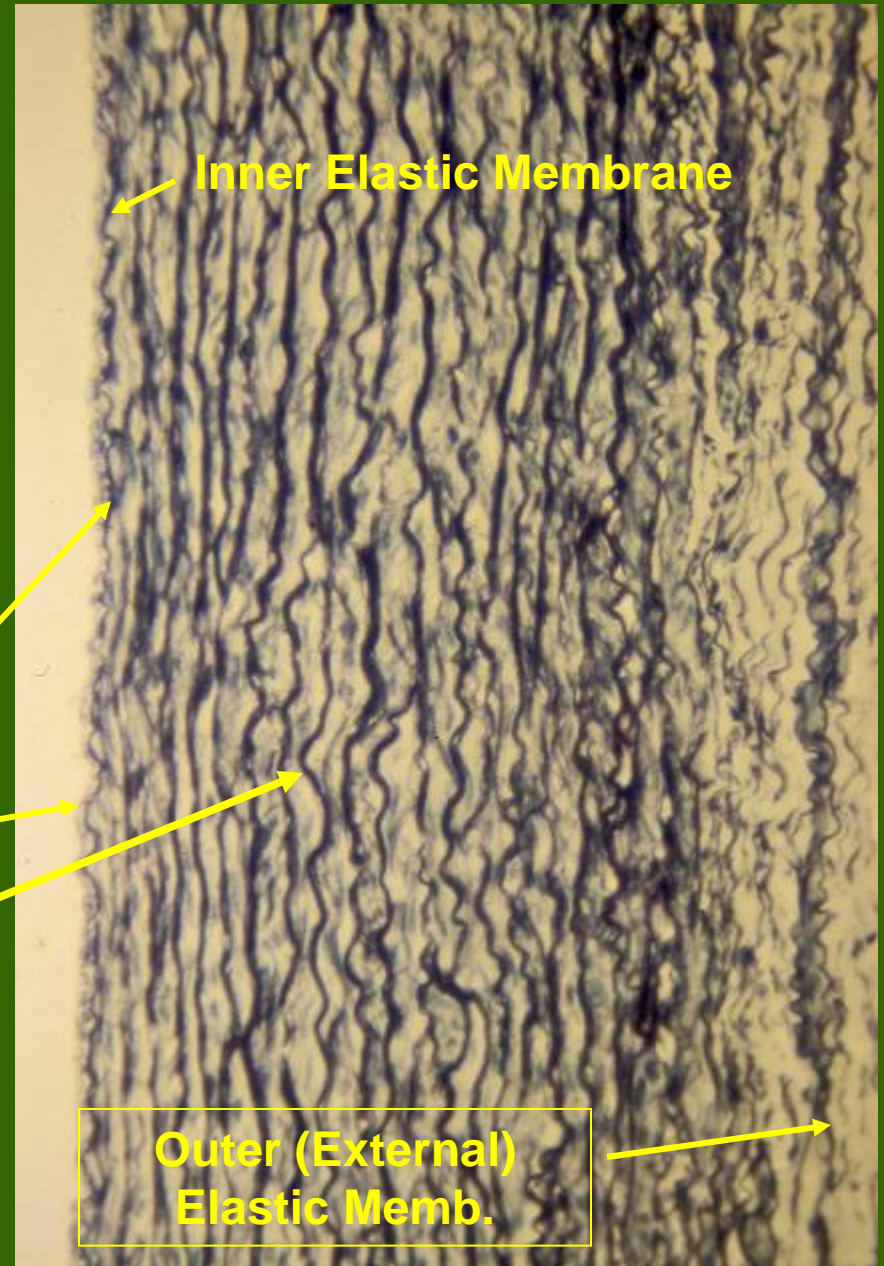
Smooth Muscle & Elastic *Fibers* = **Tunica Media** (all circular)

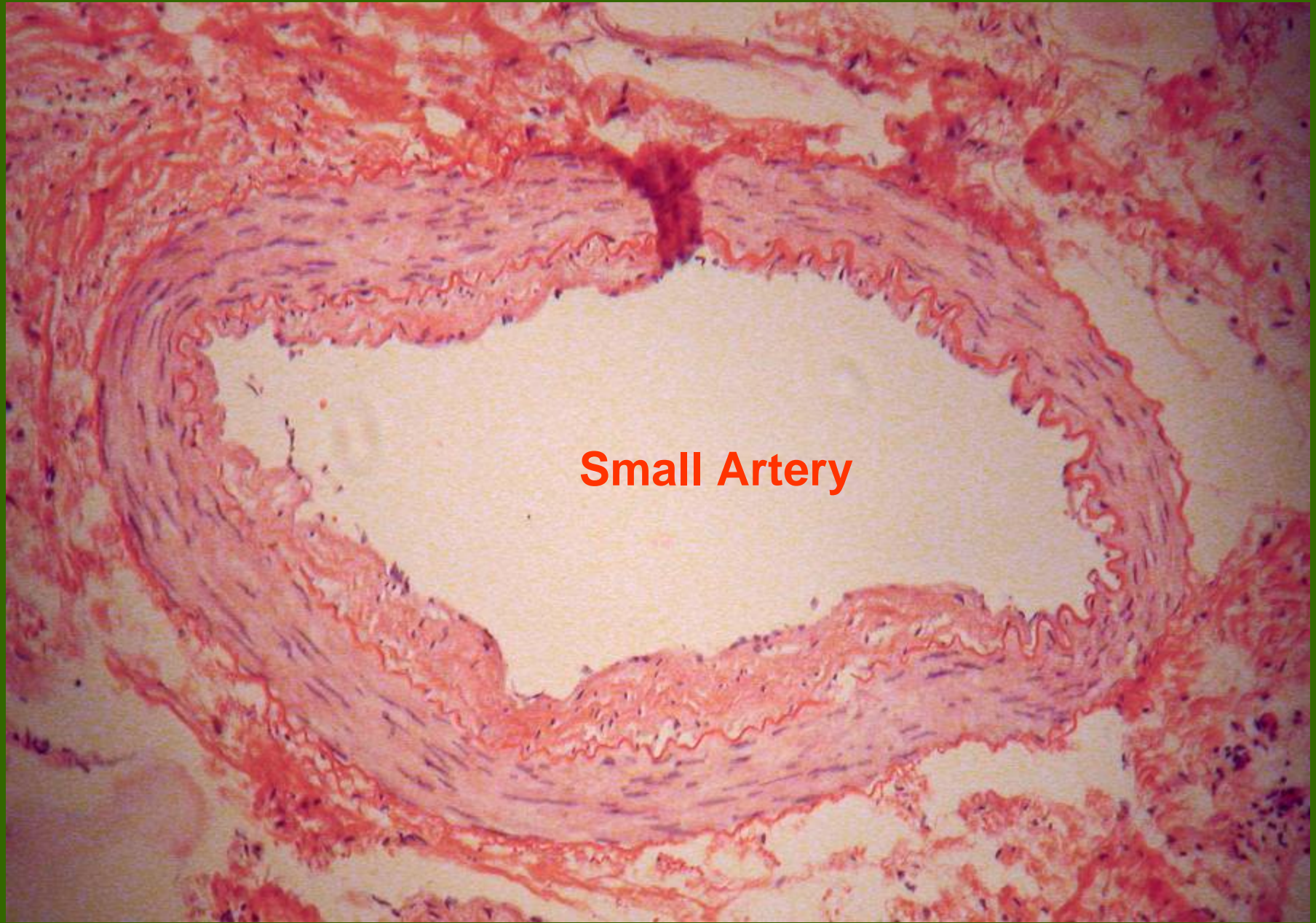


Inner Elastic Memb.

Endothelium
(Simple
Squamous)=Tunica
Intima

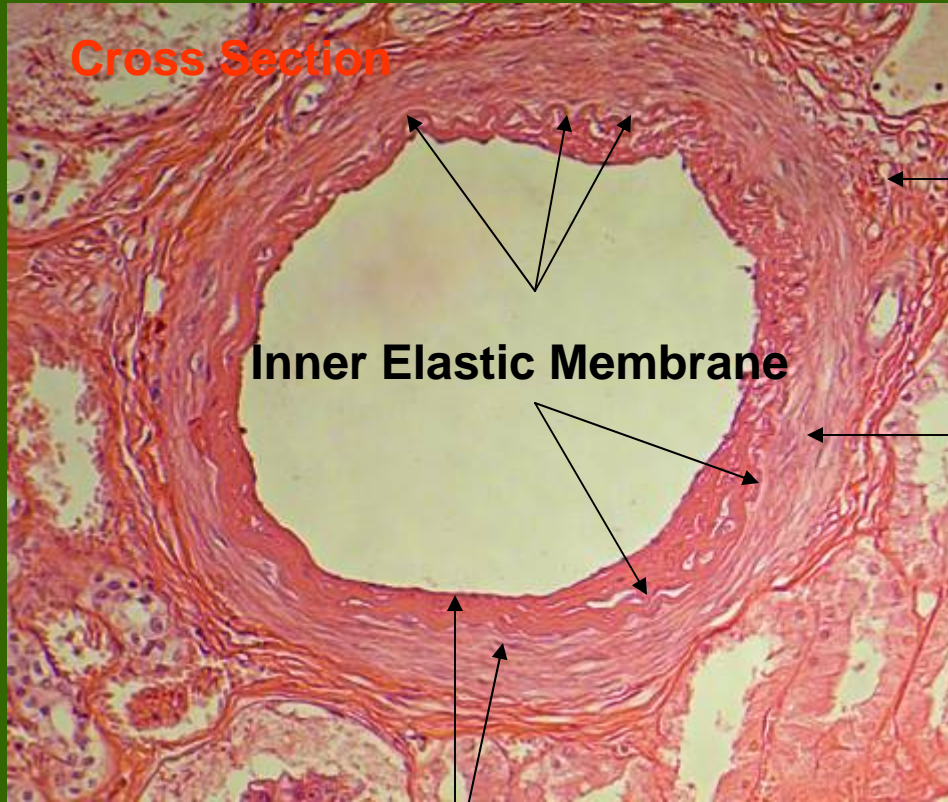
Silver-stained elastic fibers in
TUNICA MEDIA of Aorta





Small Artery

Cross Section



Inner Elastic Membrane

Tunica Adventitia
longitudinal fibers

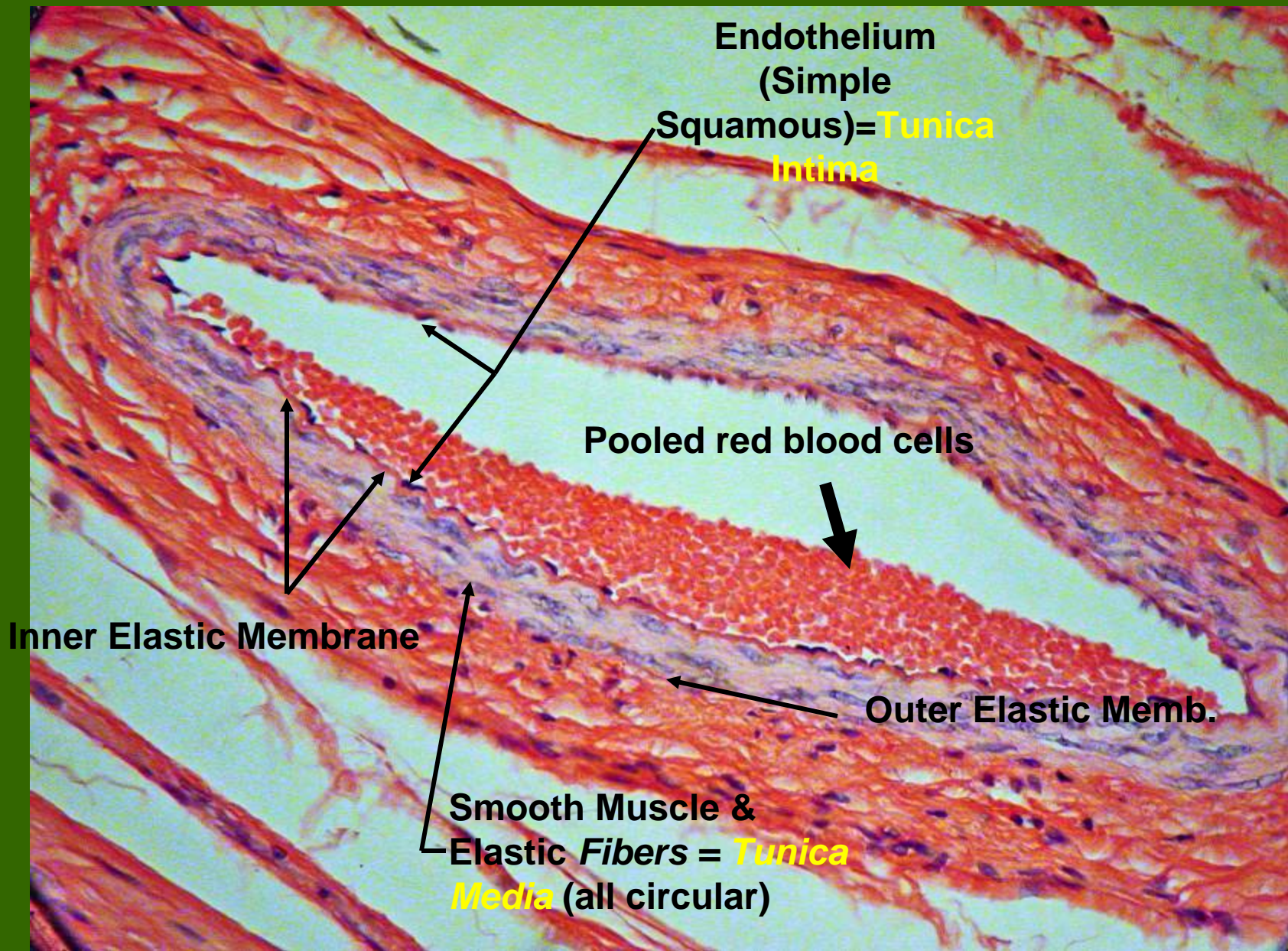
Smooth Muscle & Elastic Fibers = Tunica Media (all circular)

Endothelium (Simple Squamous) = Tunica Intima



BLOOD

Longitudinal section (a renal artery)



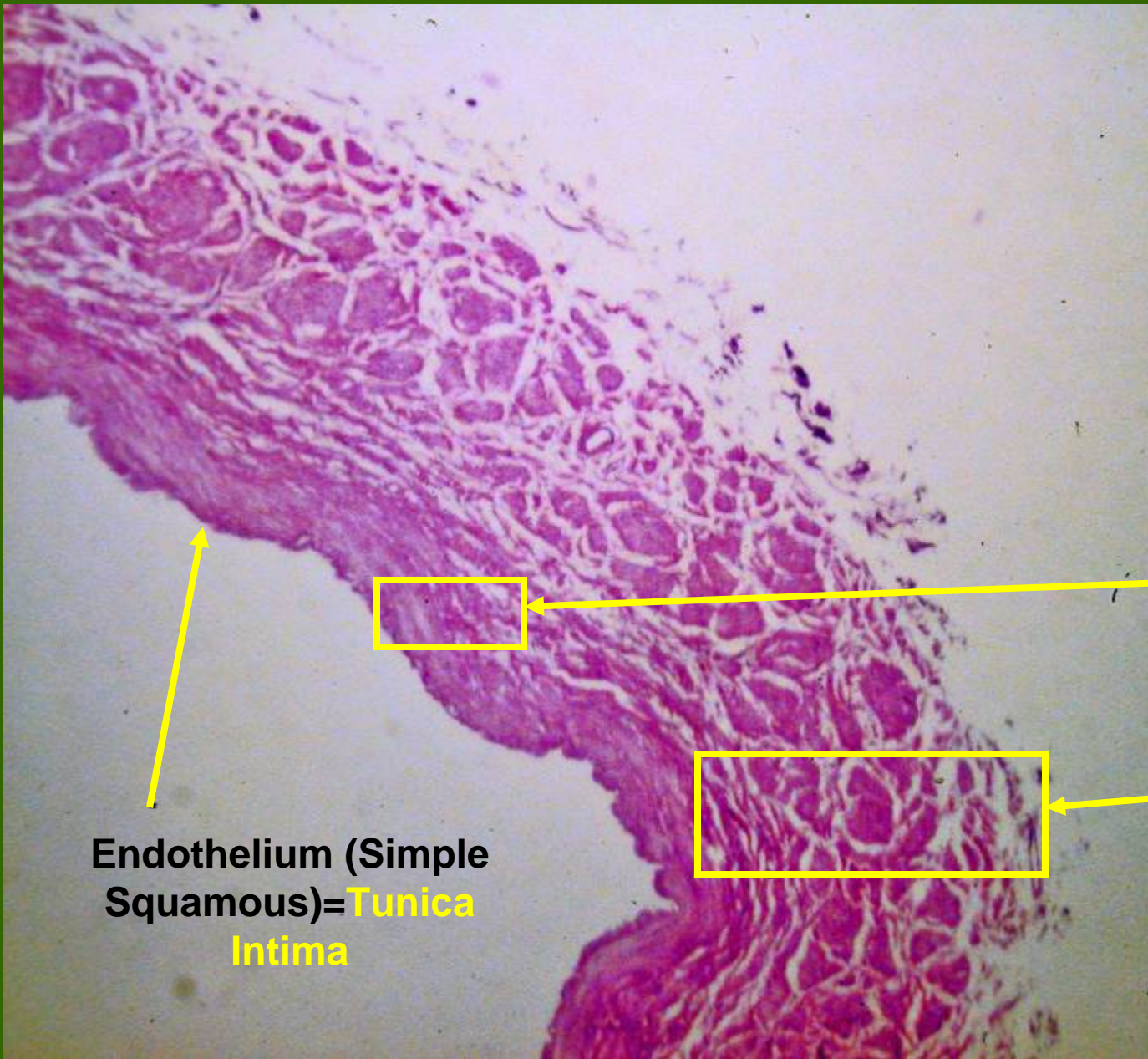
Small Artery

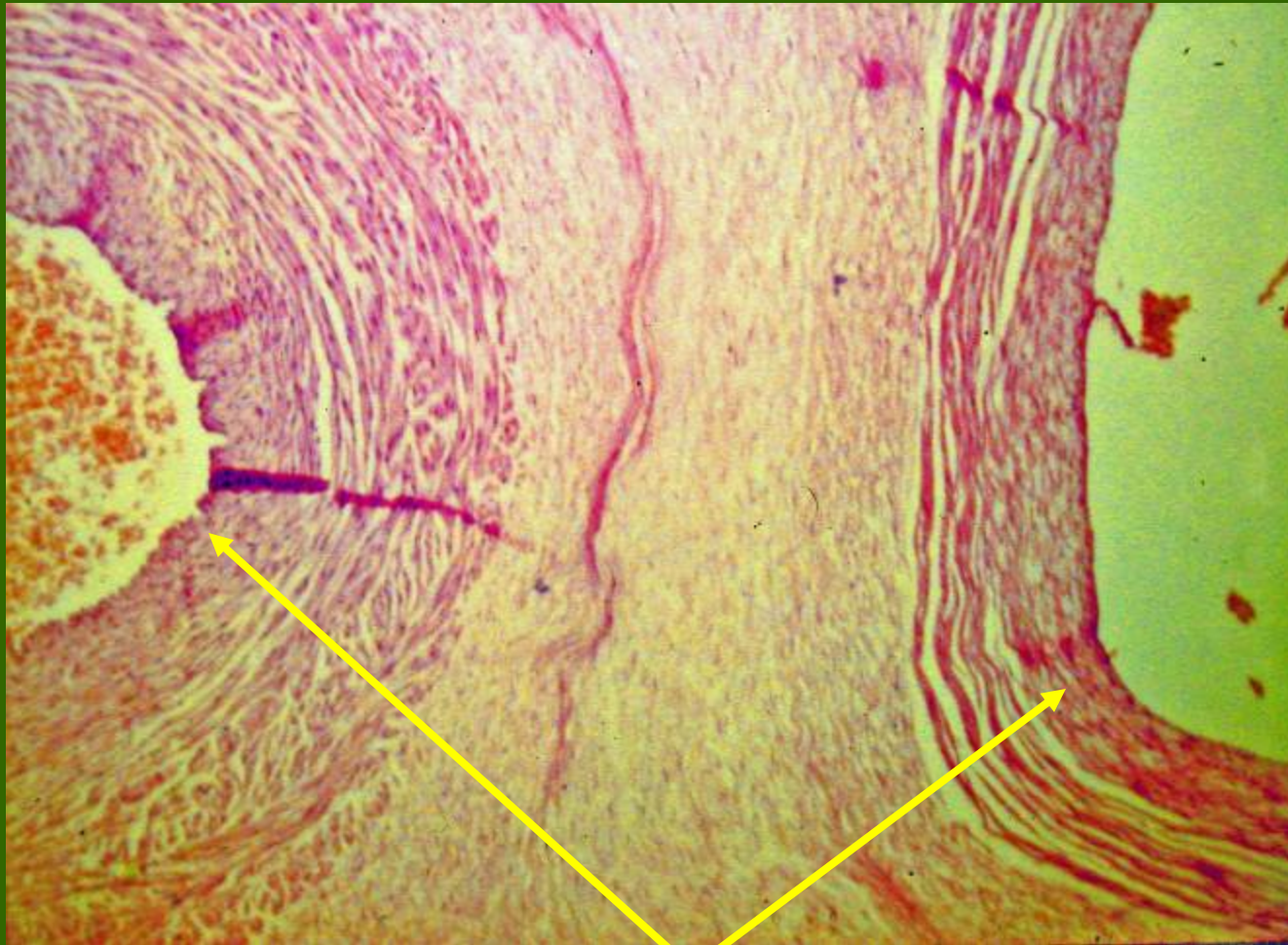
Vena Cava

Tunica Media

Tunica Adventitia

Endothelium (Simple Squamous)=Tunica Intima

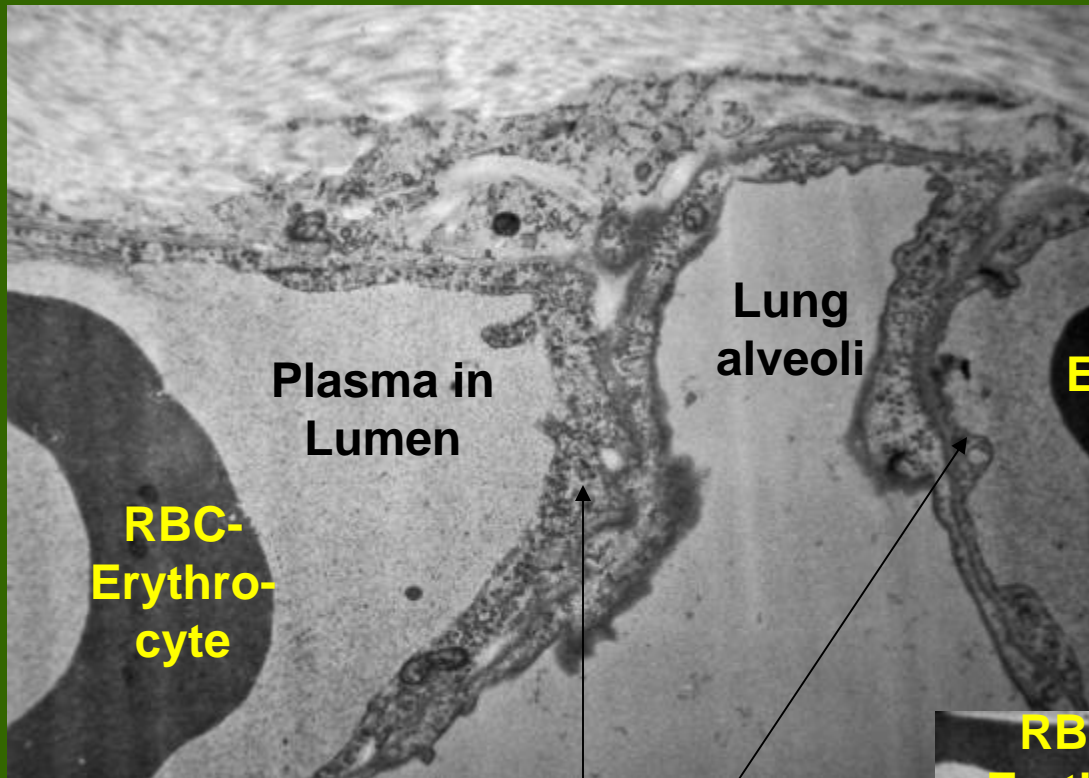




Umbilical Artery & Vein

**Coronary
Artery & Vein**





TEM's: UMDNJ

CAPILLARIES – where gas (O₂ and CO₂) are exchanged

RBC-Erythrocyte

Capillary – Endothelial cell wrapped around itself: so small red blood cells file through one at a time

