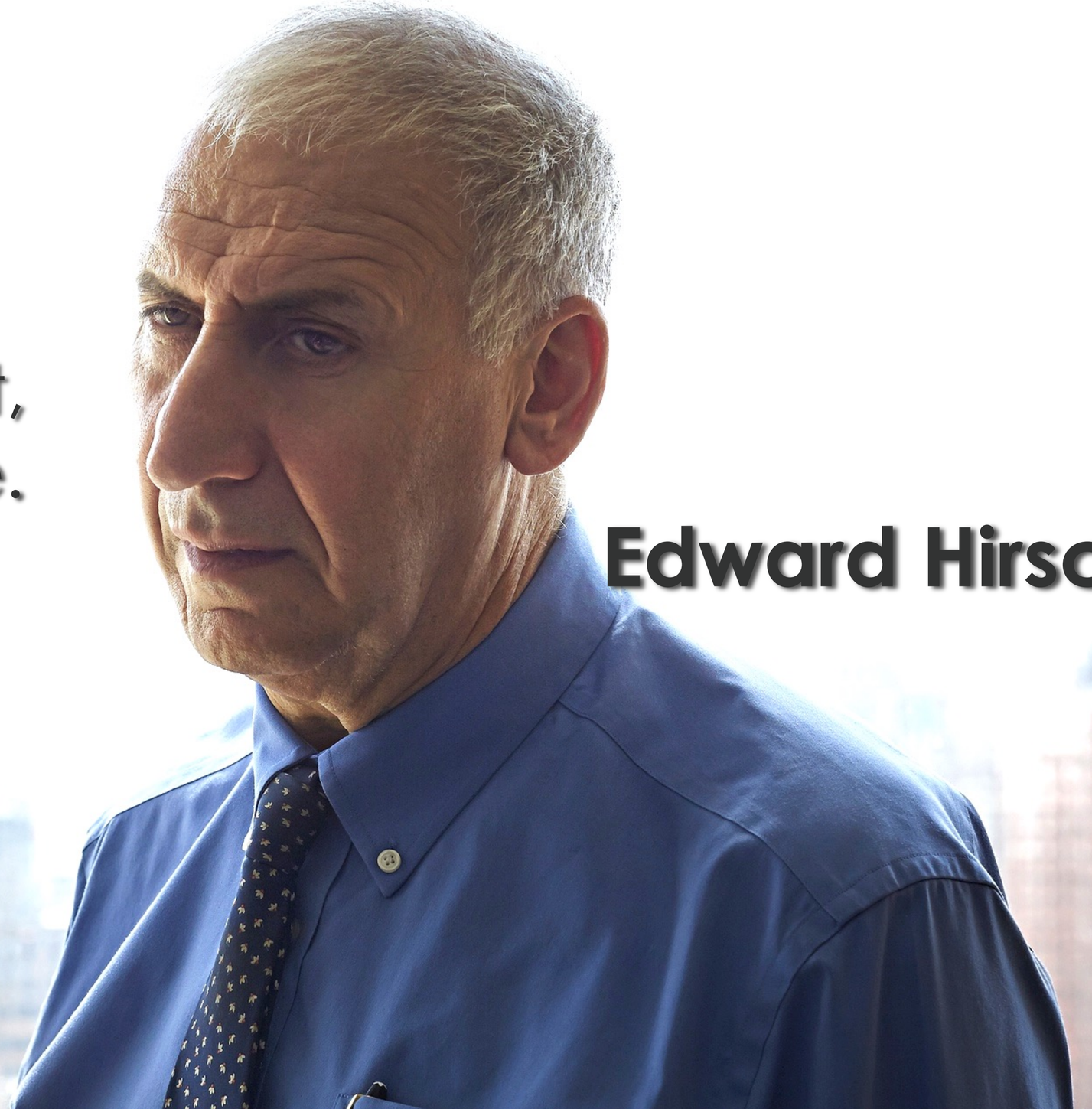
Rhythm is sound in motion.
It is related to the pulse, the heartbeat, the way we breathe.

It rises and falls.
It takes us into ourselves; it takes us out of ourselves.



Edward Hirsch

The Rhythm of Life

the beat and dance of the heart

Martin Elliott: Gresham Professor of Physic

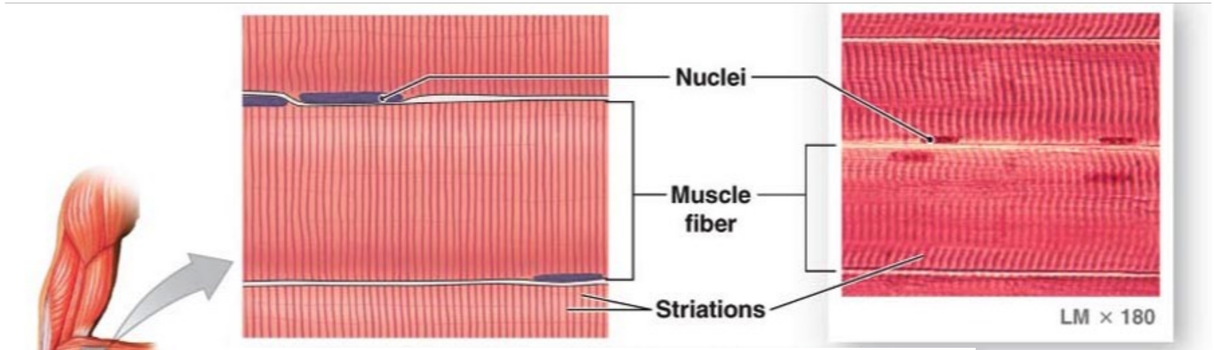
LA SHARK

All songs composed & performed by La Shark.
Produced by World League.
Recorded by Sean Woodlock at Hackney Road Studios.
Copyright La Shark & Tape Music 2015.
lashark.com

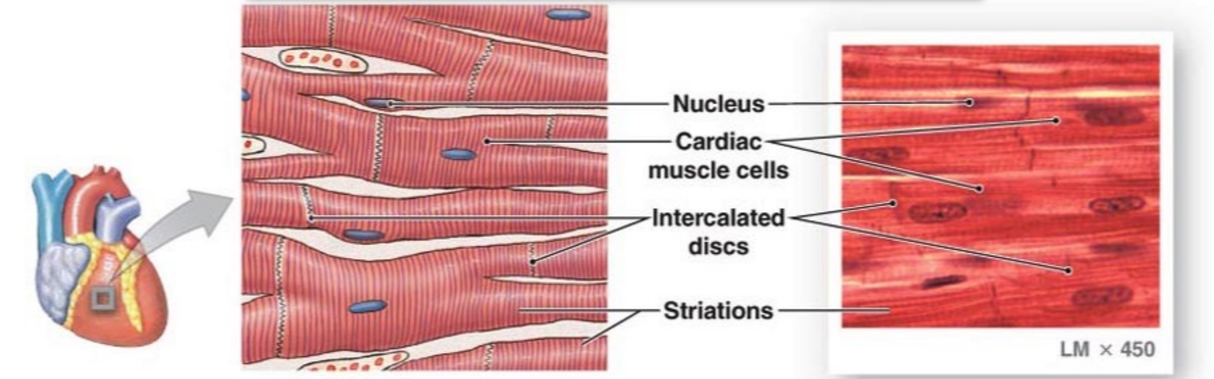
IMAGINARY MUSIC

Hanna Harlyn

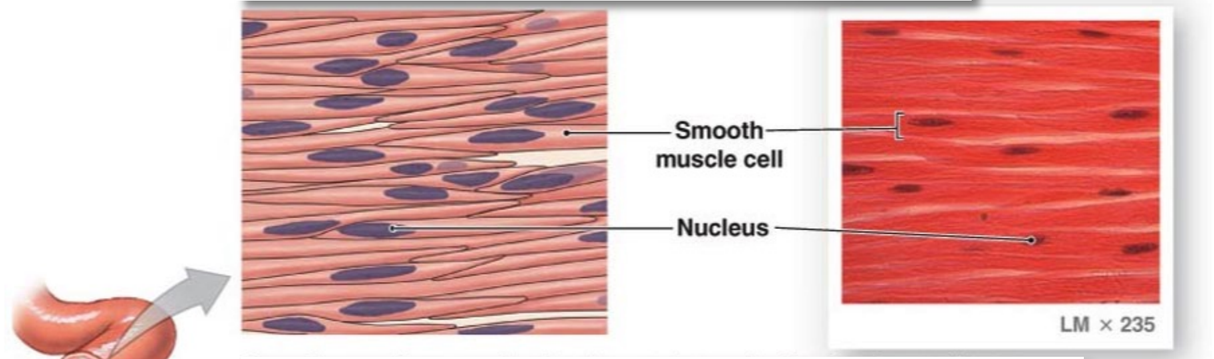
3 types of muscle in the human



Skeletal

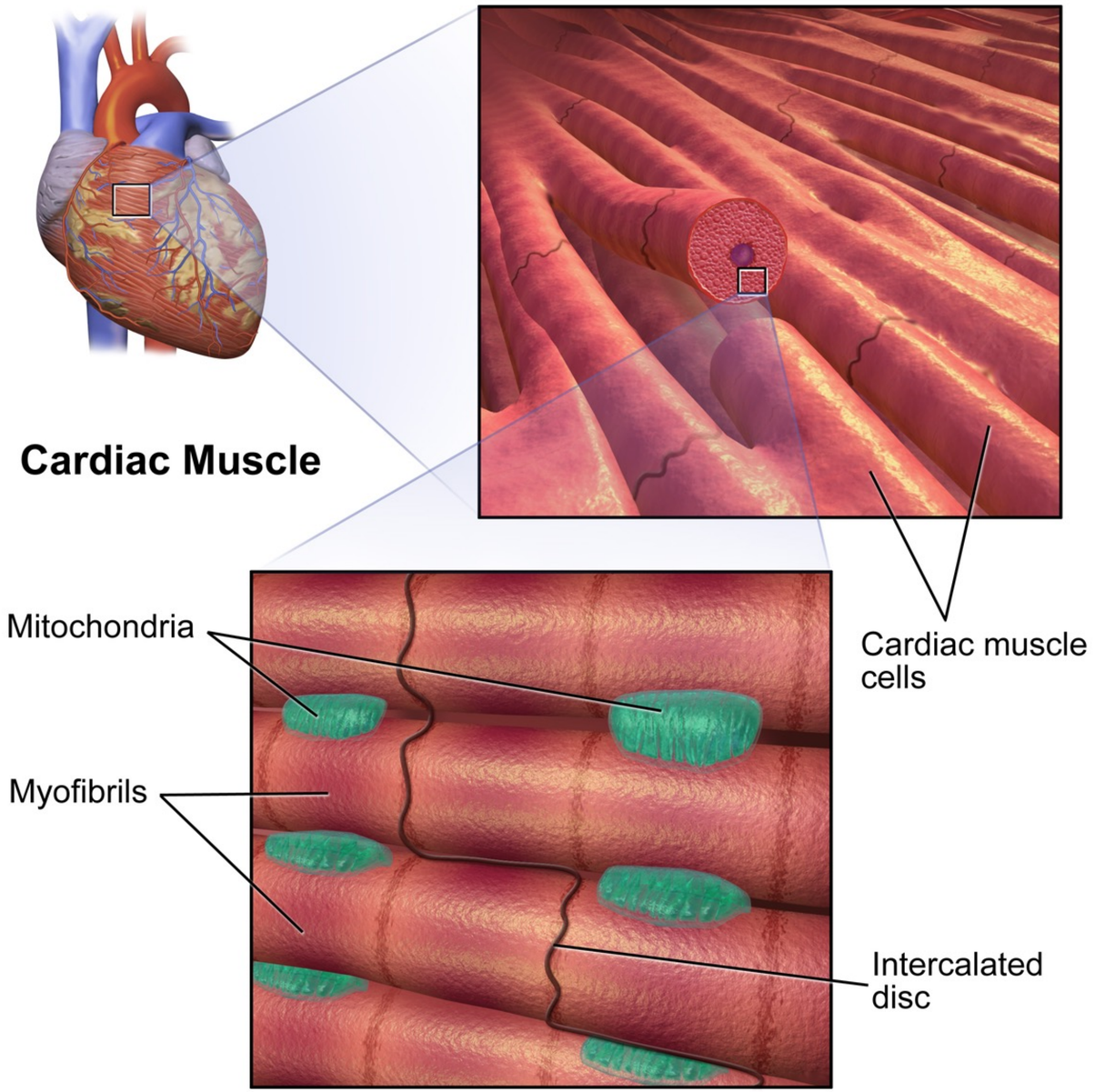


Cardiac

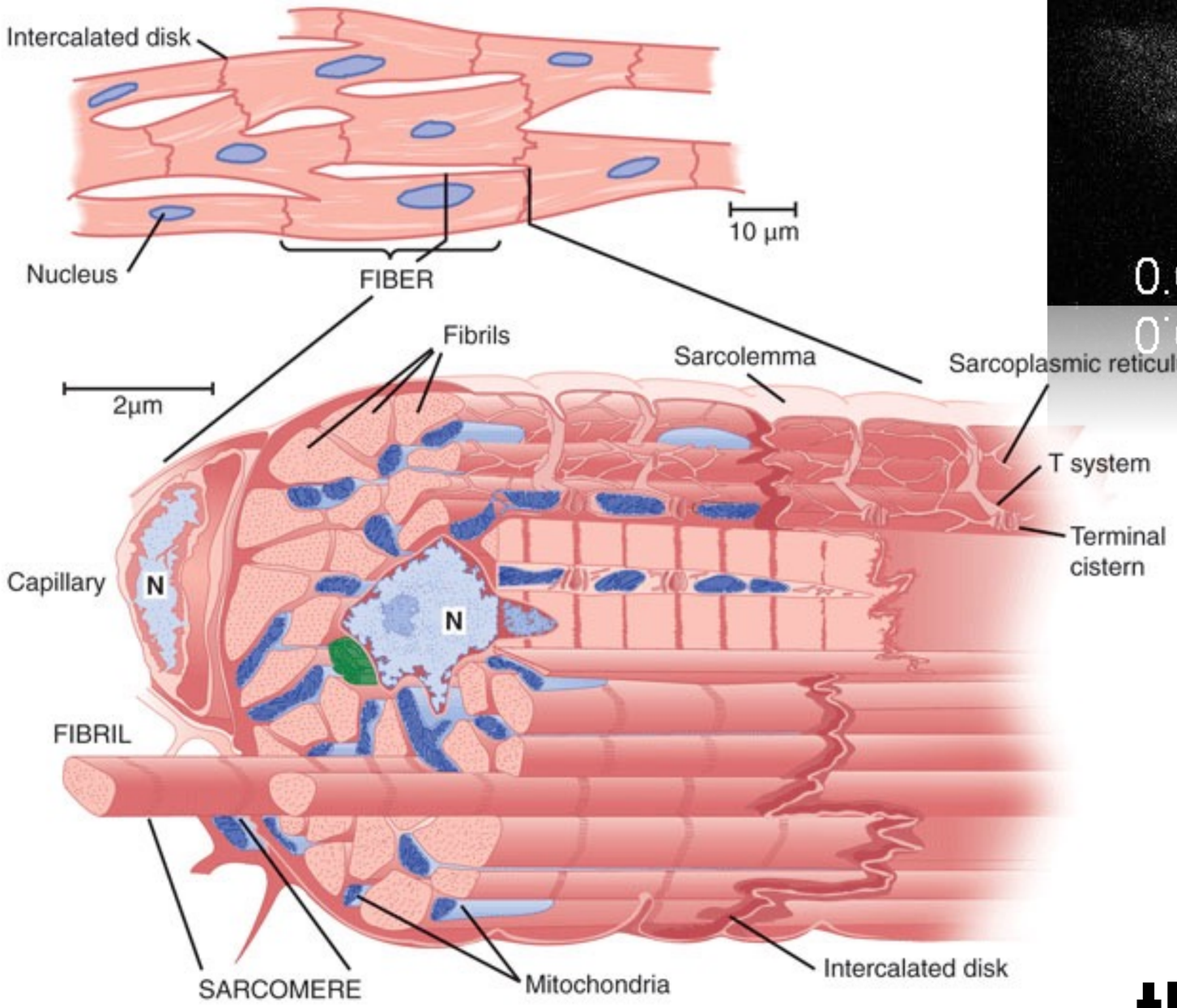


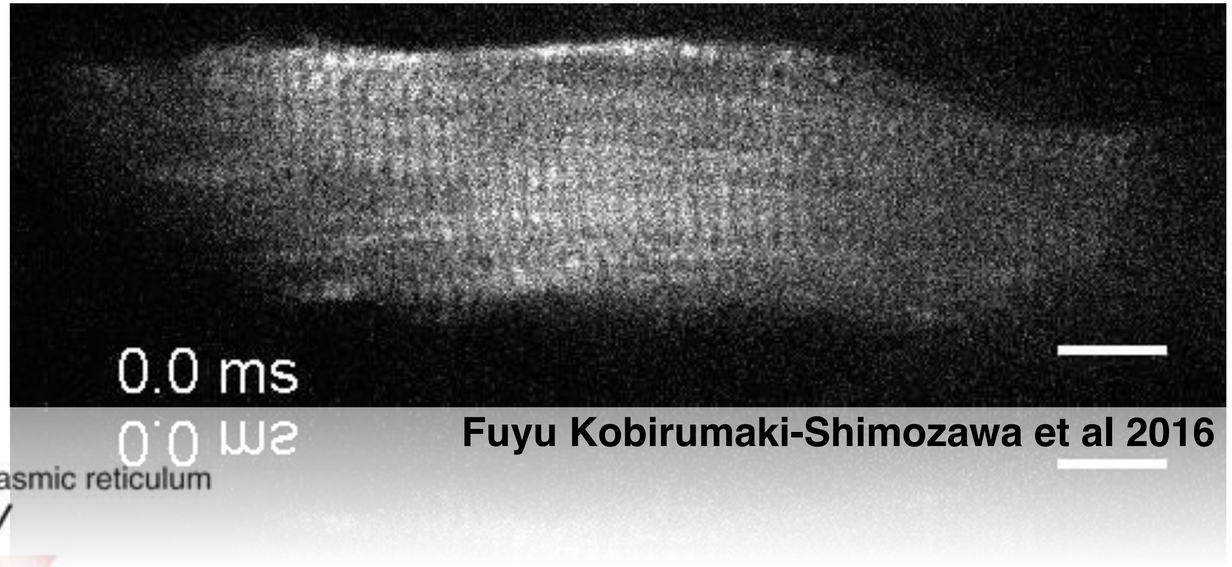
Smooth

https://www.studyblue.com/notes/note/n/md-mcs-study-guide-2015-16-weichmann/deck/15219300



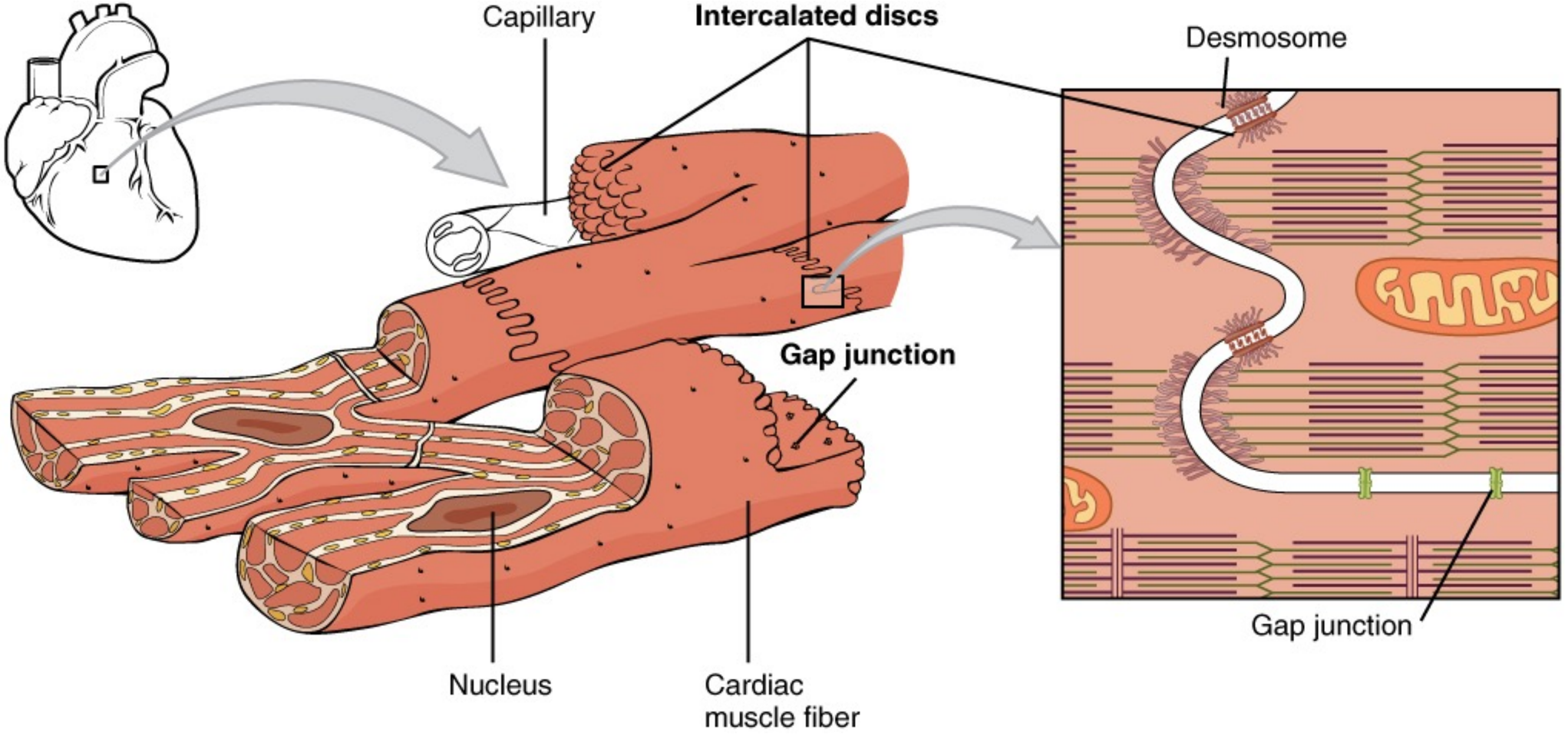
By BruceBlaus - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=44969447



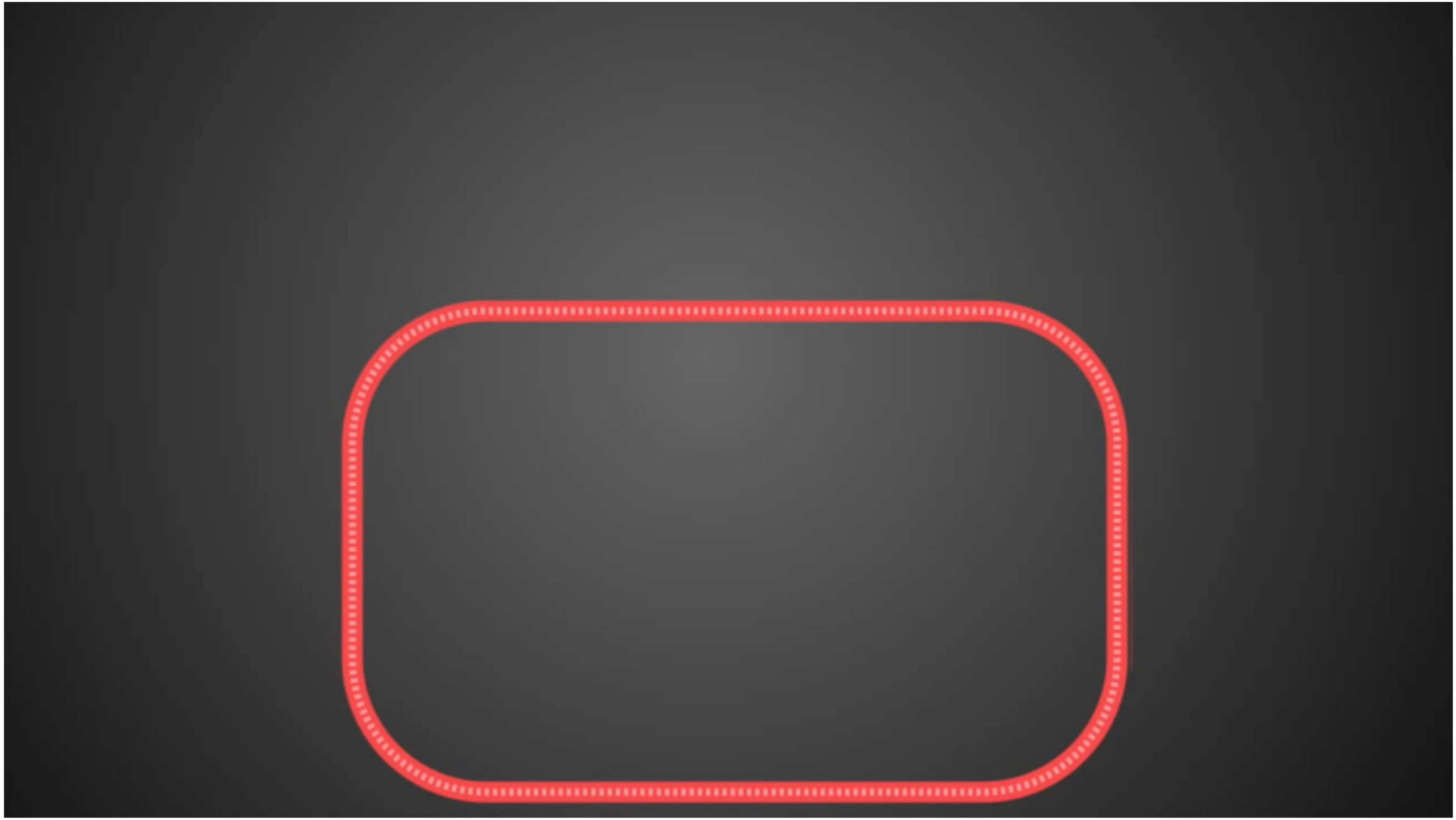


Fuyu Kobirumaki-Shimozawa et al 2016

the cardiomyocyte

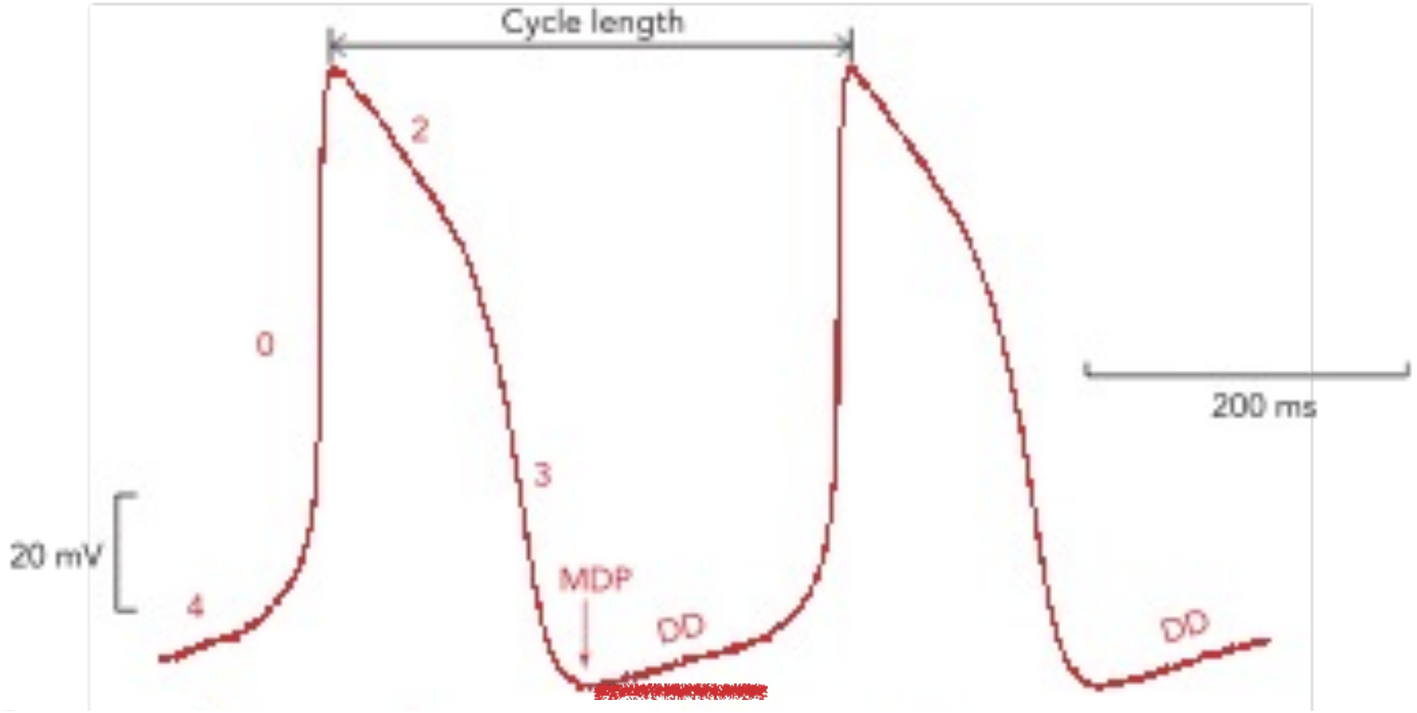


By OpenStax [CC BY 4.0 (http://creativecommons.org/licenses/by/4.0)], via Wikimedia Commons



Bio VFX

https://www.youtube.com/watch?v=tLt3ZTeVzEY



DD = Diastolic Depolarisation

pacemaker cells

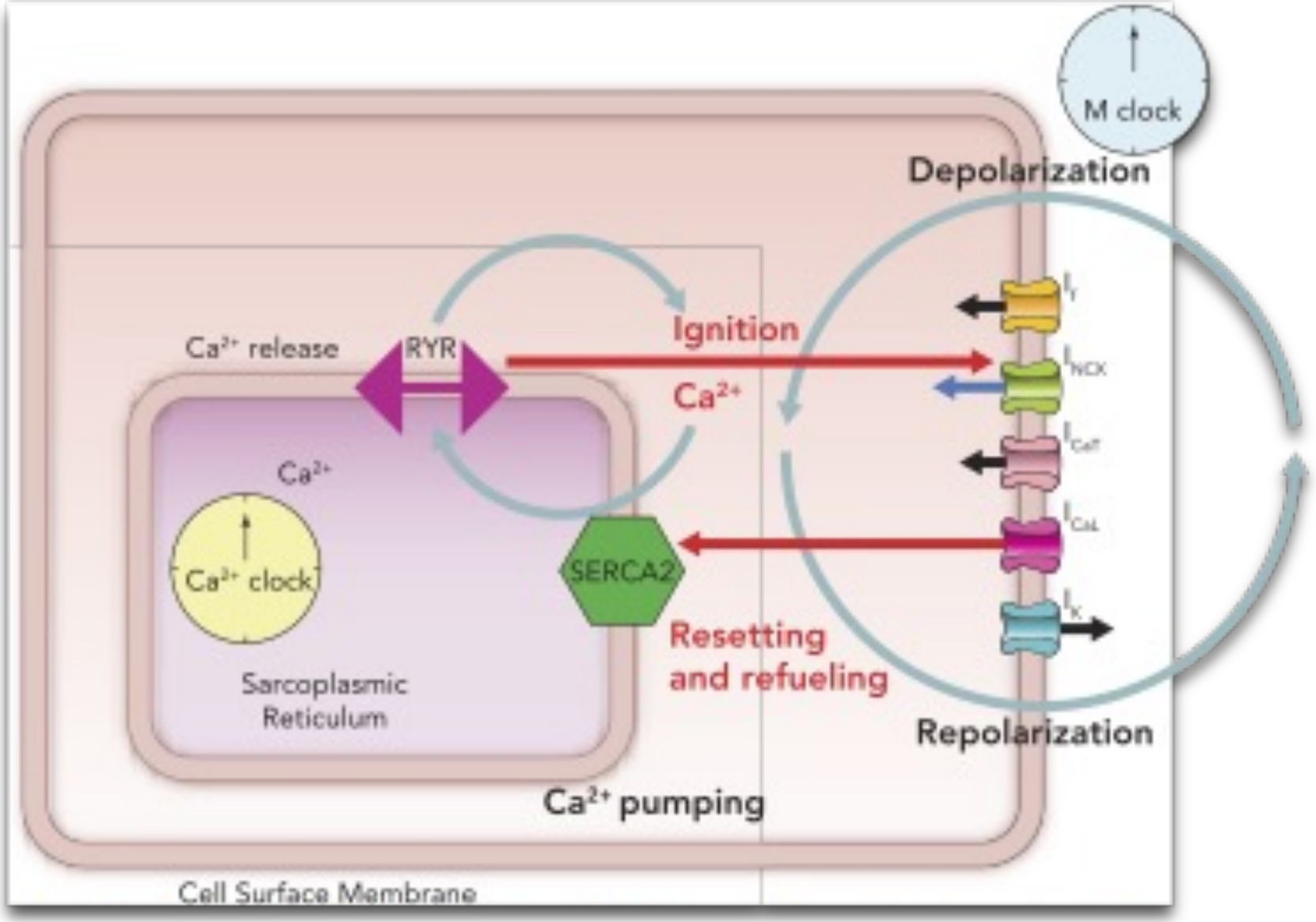
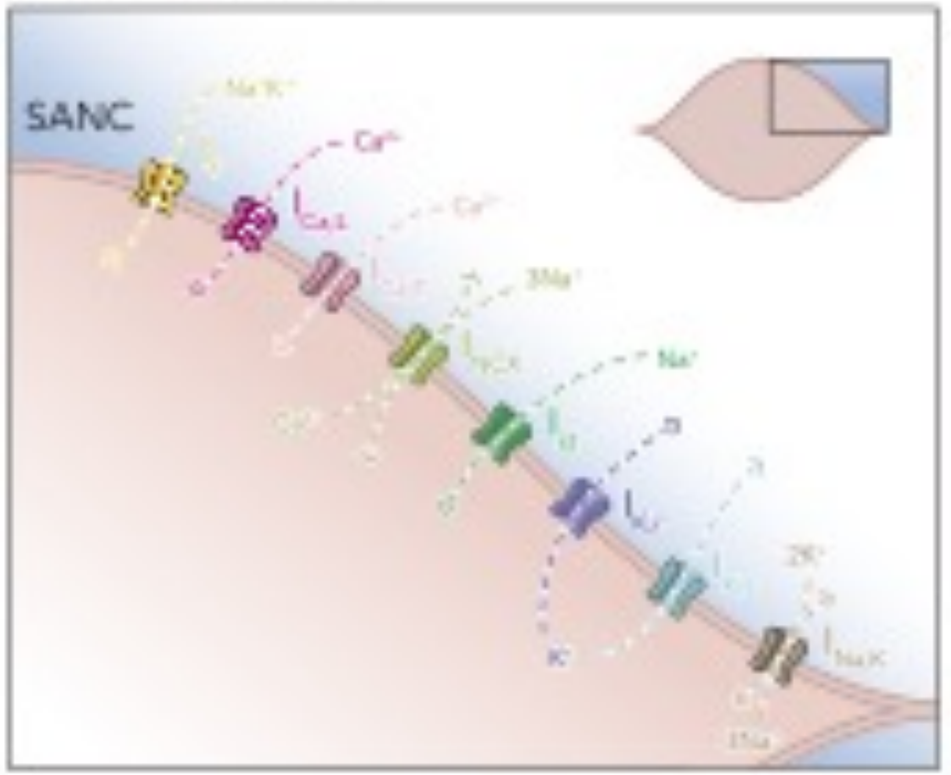


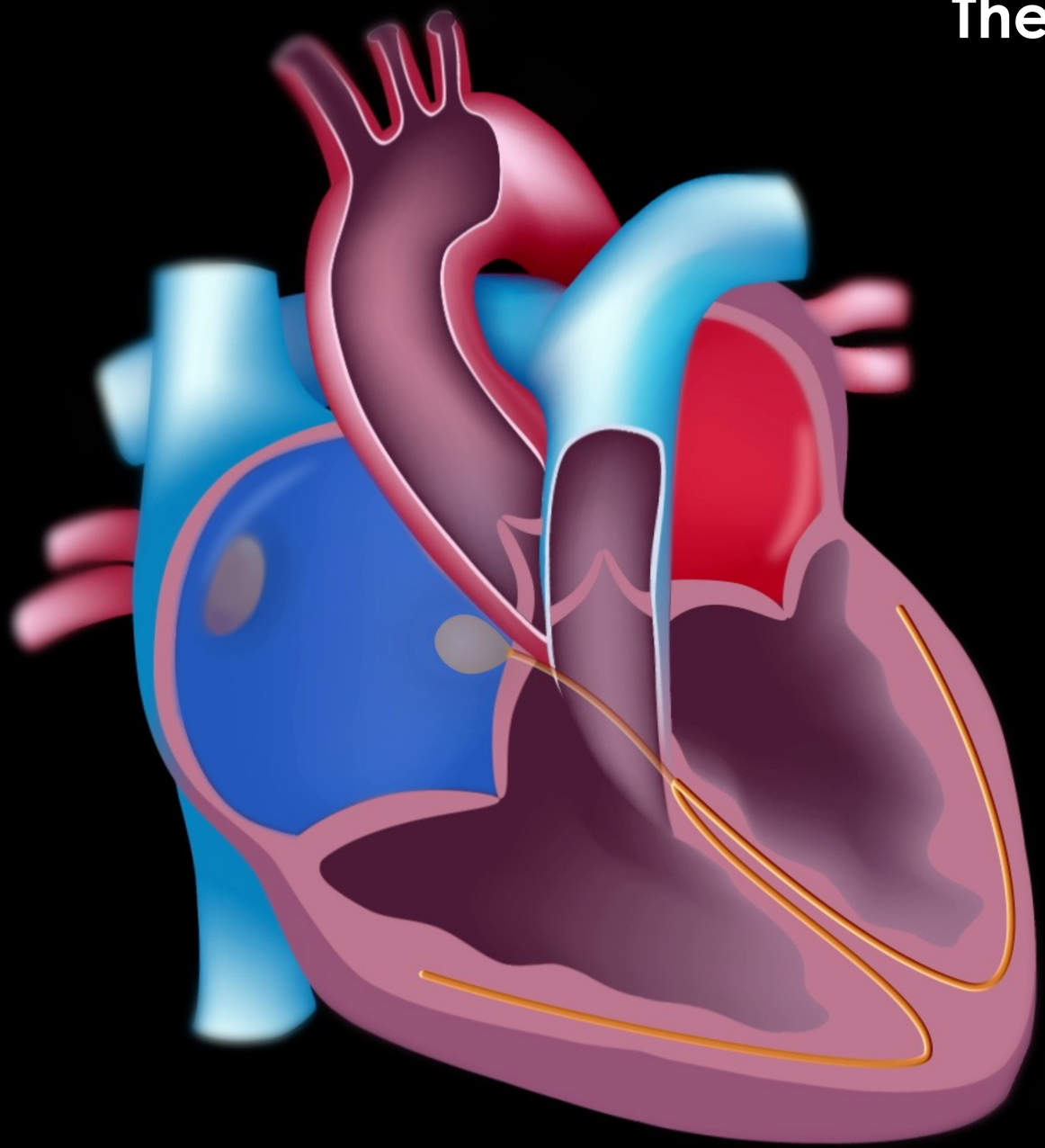
FIGURE 2. Schematic figure illustrating the cross talk between the membrane clock (right side of schematic SANC) and the Ca^{2+} clock (lying in the center of the schematic SANC)

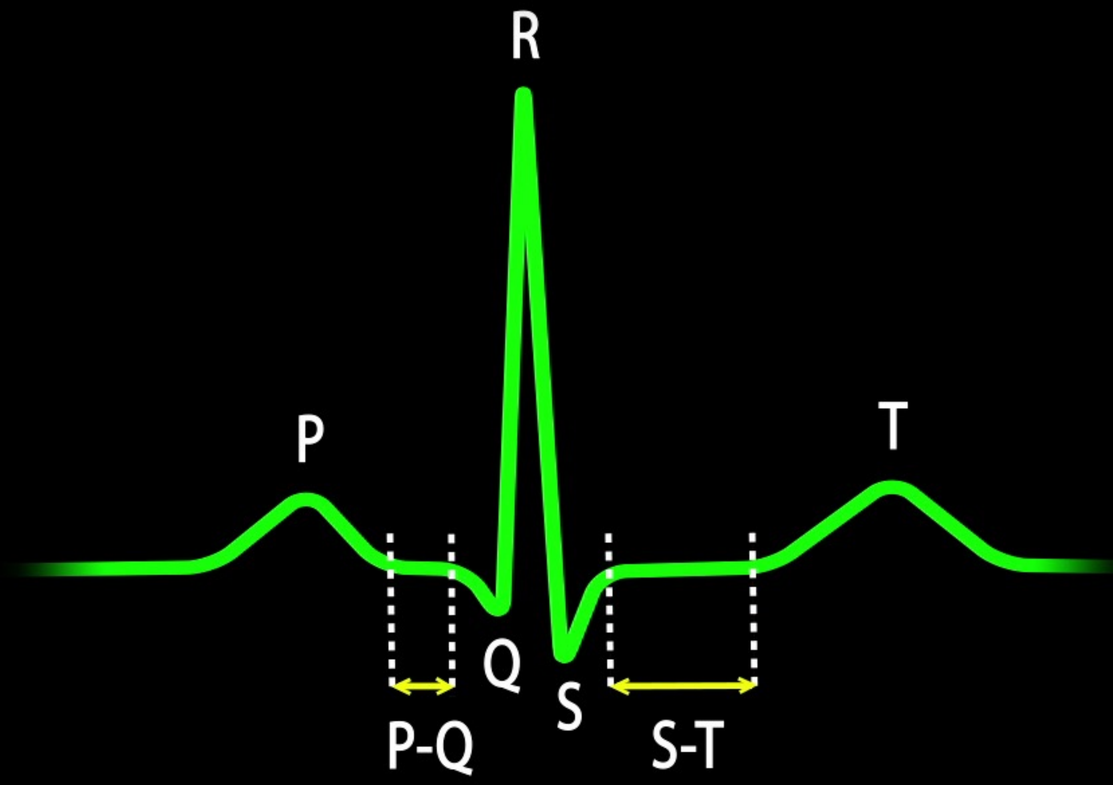
The membrane clock



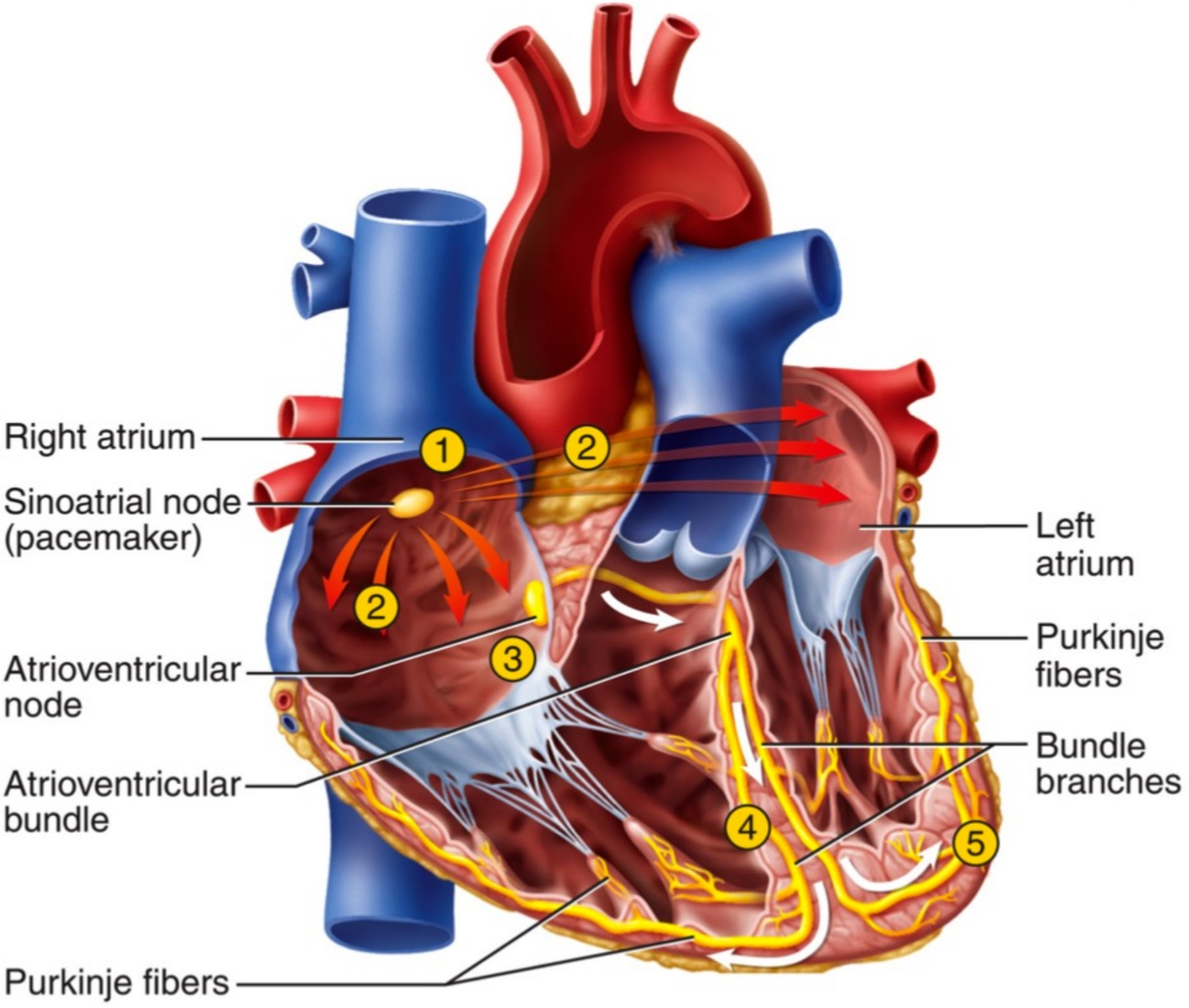
The Coupled Clock System

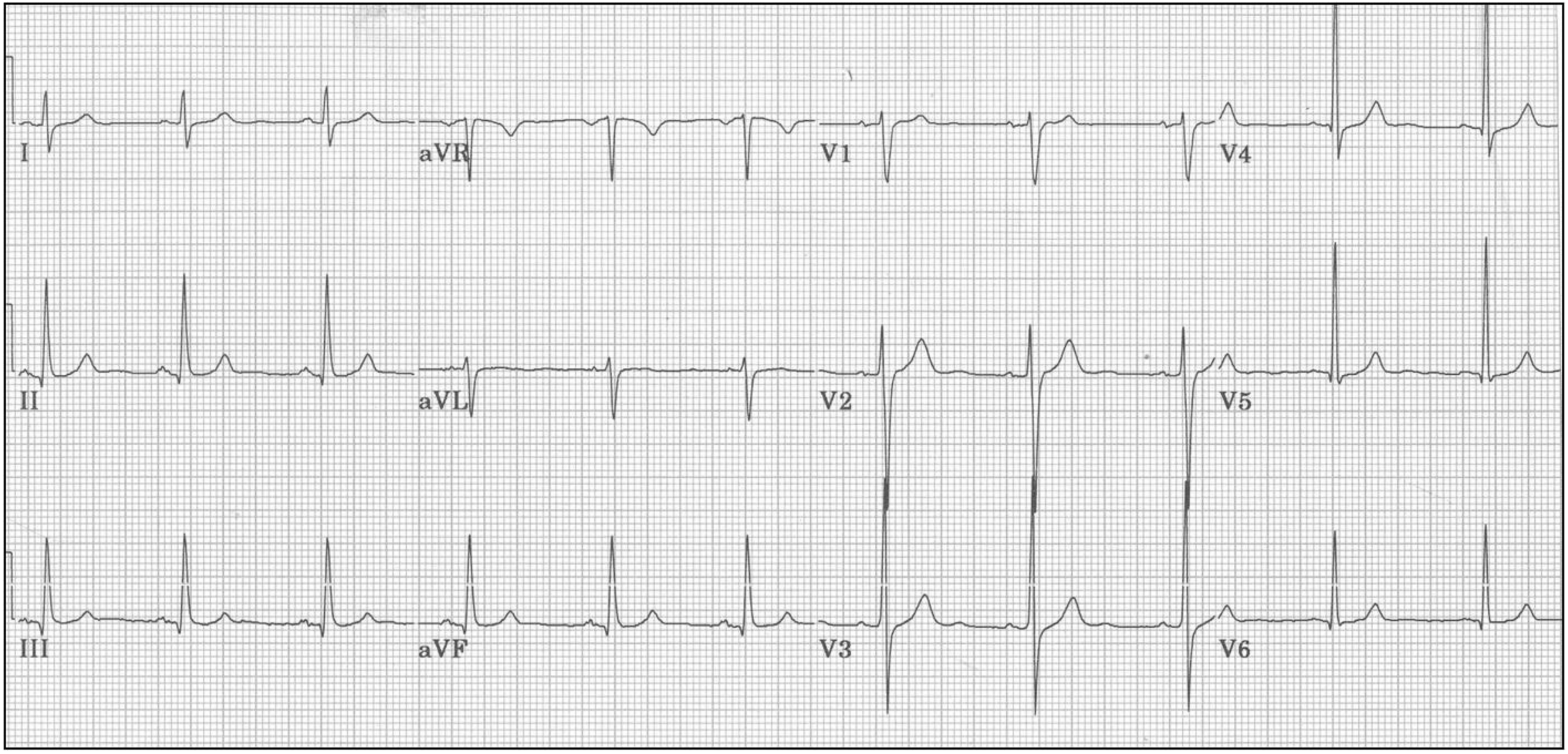
The Conduction System, and the ECG





© Alila Medical Images


Right atrium
Sinoatrial node (pacemaker)
Atrioventricular node
Atrioventricular bundle
Purkinje fibers
Left atrium
Purkinje fibers
Bundle branches
1
2
2
3
4
5



normal ecg

normal sinus rhythm **60 - 100 bpm**

sinus **bradycardia** **< 60 bpm**

sinus **tachycardia** **> 100 bpm**

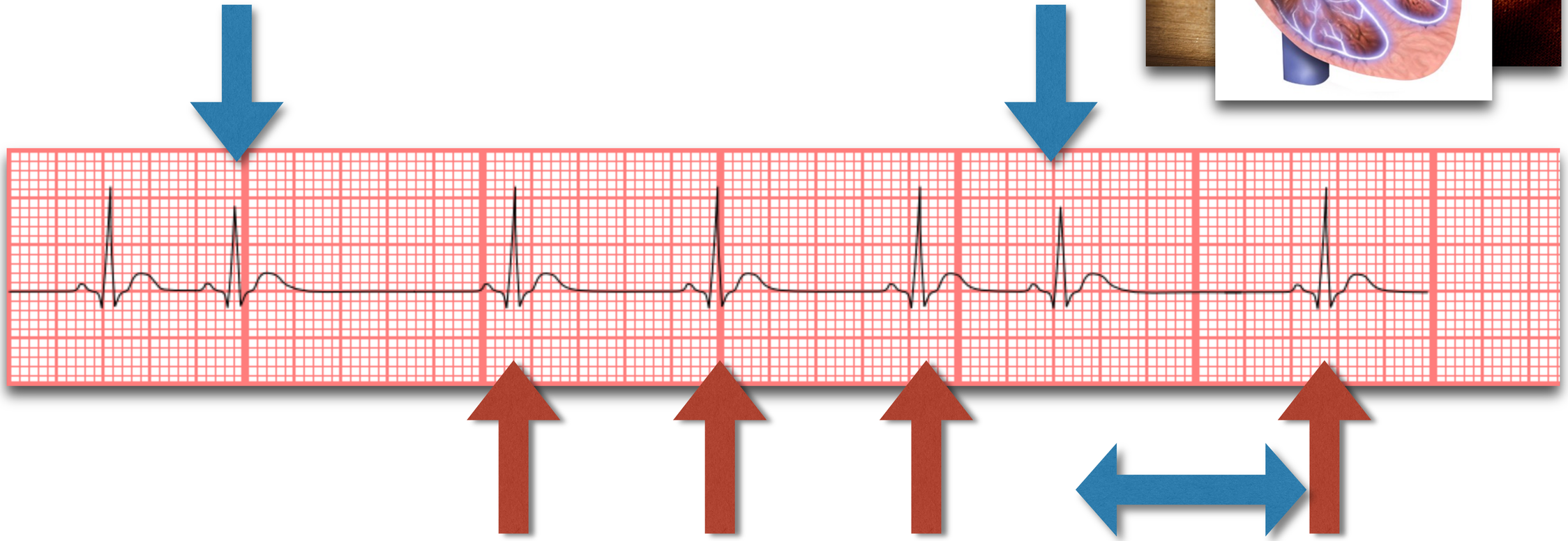
when it all goes **pear shaped**

4 main types of abnormal rhythm

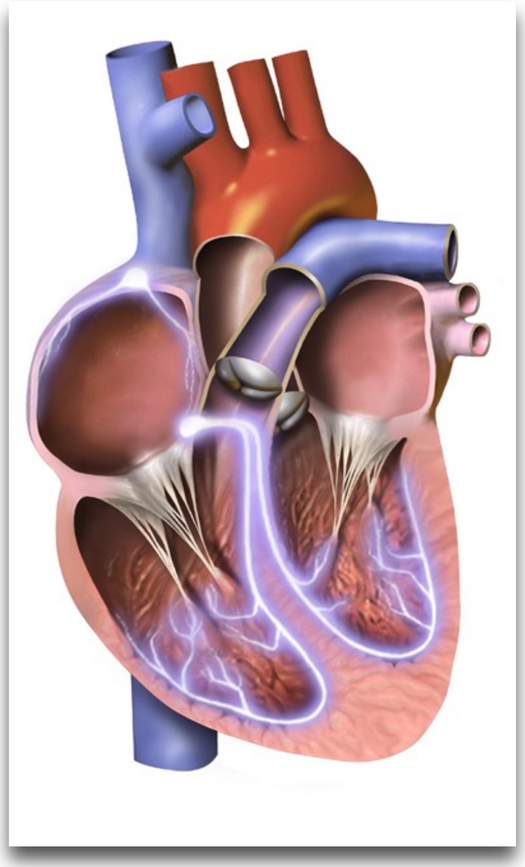
- extra, or premature, beats
- supra-ventricular tachycardias [fast]
- ventricular arrhythmias
- brady [slow] arrhythmias

extra or premature beats

Premature Atrial Contractions



Premature Ventricular Contractions

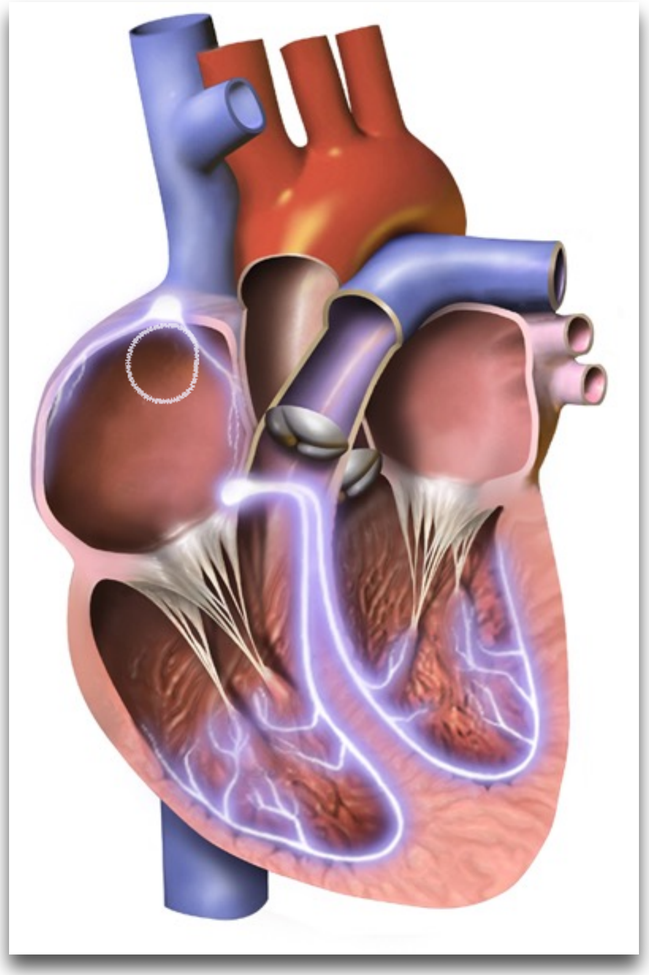


enhanced automaticity, re-entry signalling and toxicity

supra-ventricular tachycardias

Re-entry usually almost immediate increase in heart rate

Automaticity more gradual increase in heart rate



Supra-ventricular tachycardia (SVT)

start

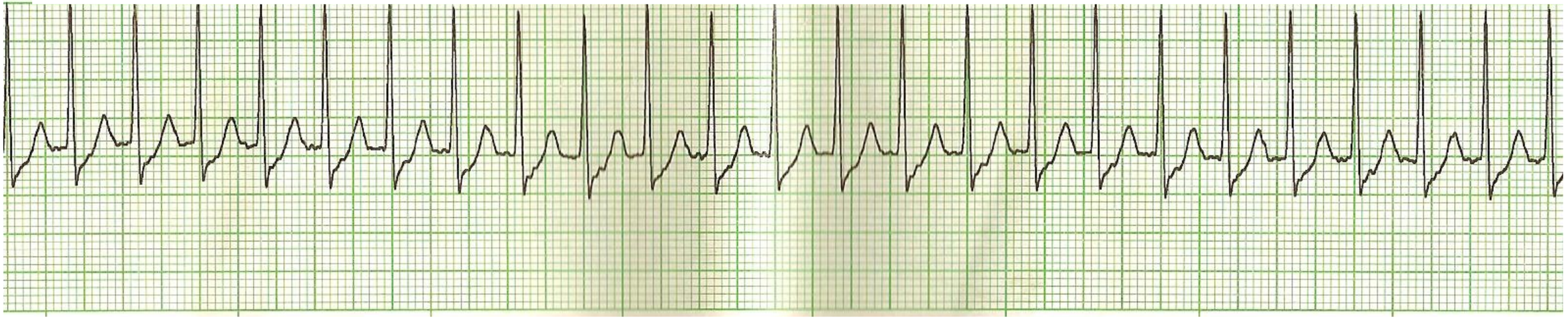
70

140

end

70

Supra-ventricular tachycardia (SVT)

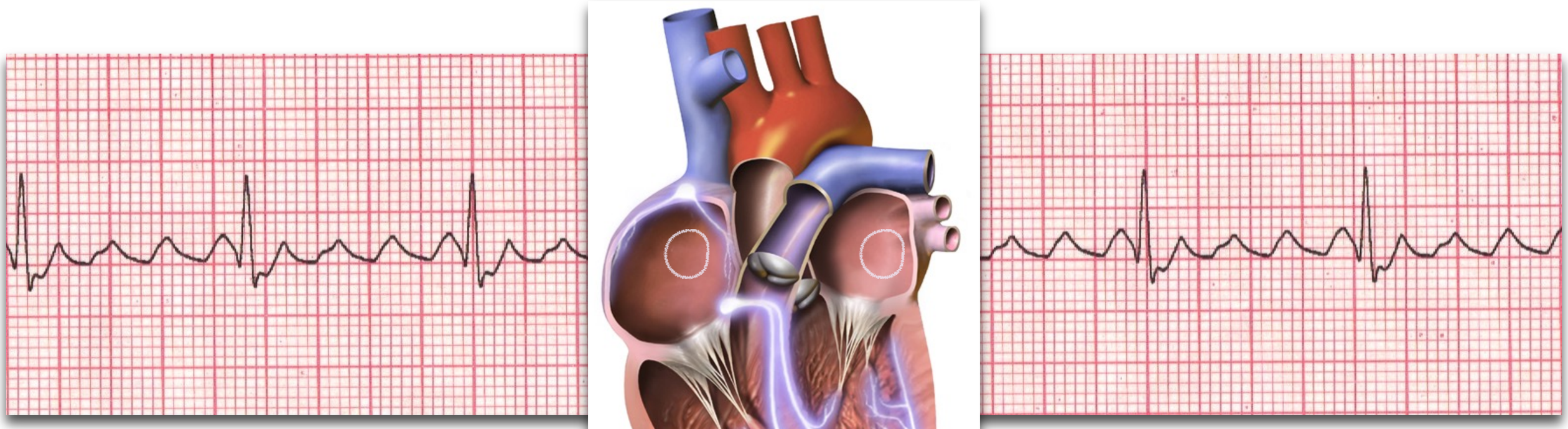


heart rate 180 bpm

the faster the rate (150 - 270 bpm), the worse the symptoms

no time to fill

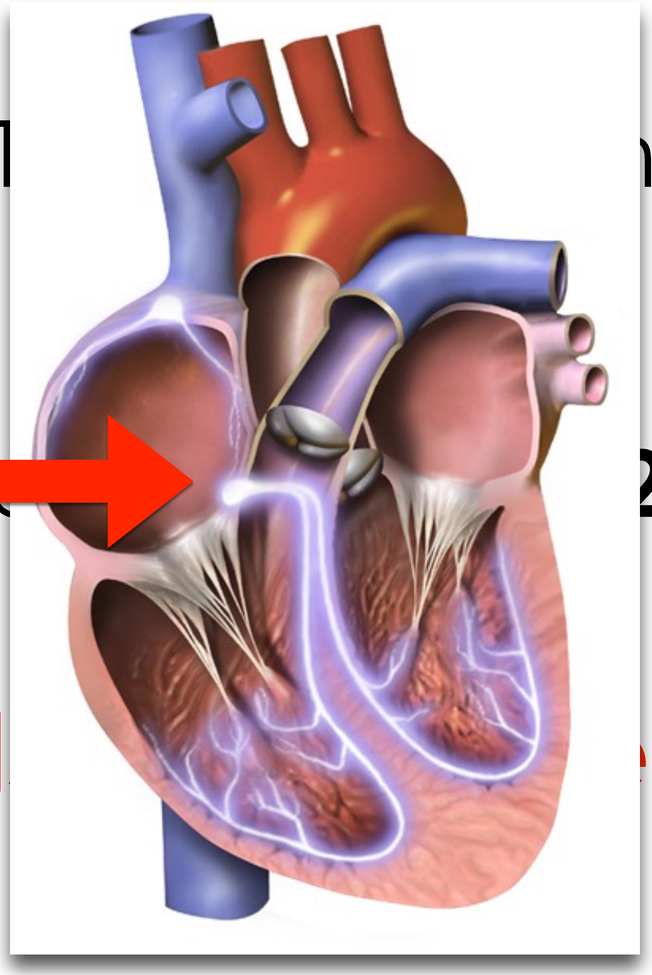
Atrial Flutter regular, very fast atrial signal (p-wave) **300-440 bpm**



the **refractory period** of the AV-node **is 330ms**

thus the fastest 1 rate is **300 bpm**

if atrial rate is >300, **2:1**, **4:1** or (rarely) **3:1**



The Pul gular

the **risks** and **treatment**

- inefficient heart rate (too fast)

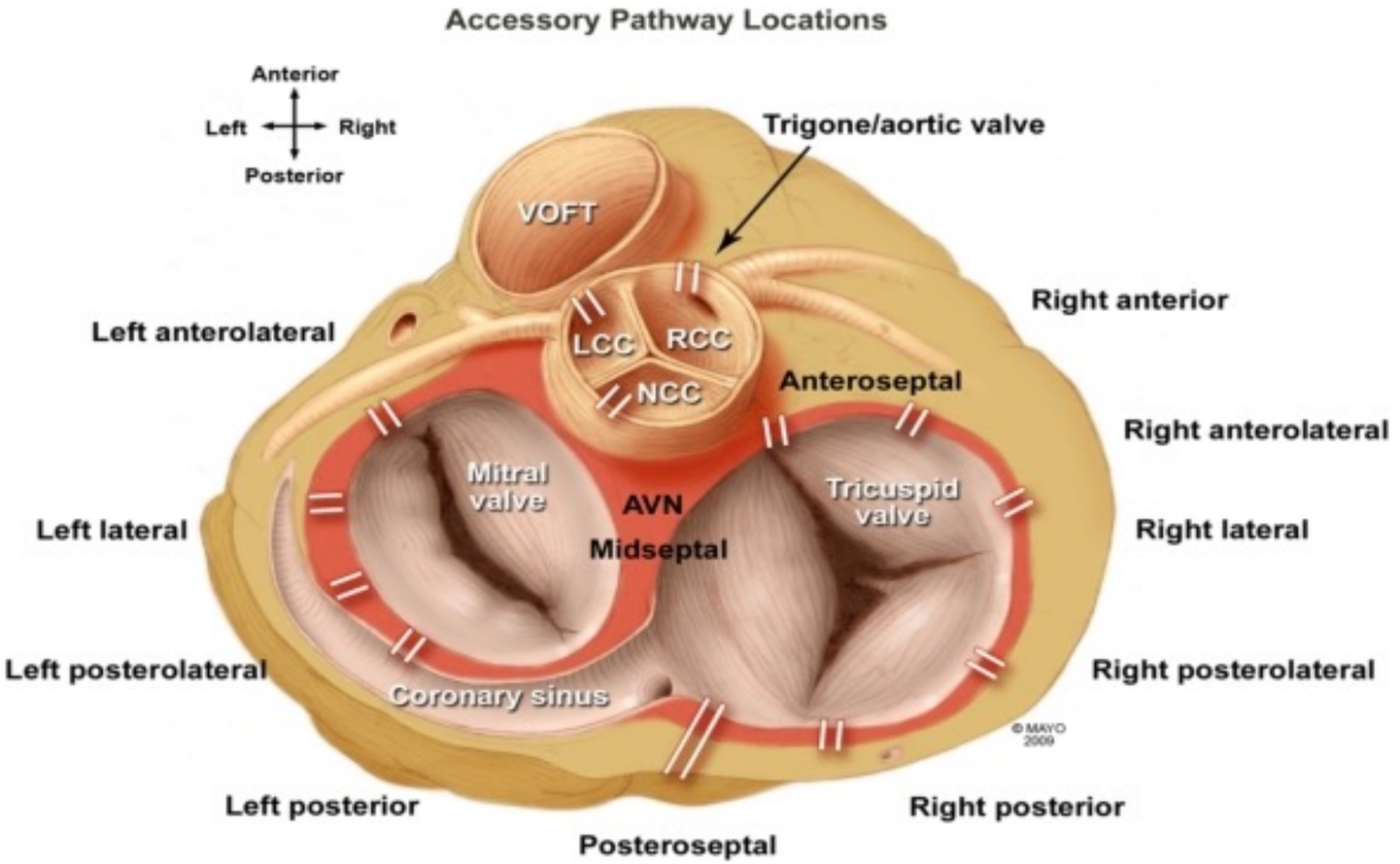
  β-blockers, Ca^{++} channel blockers, DC Shock, ablation

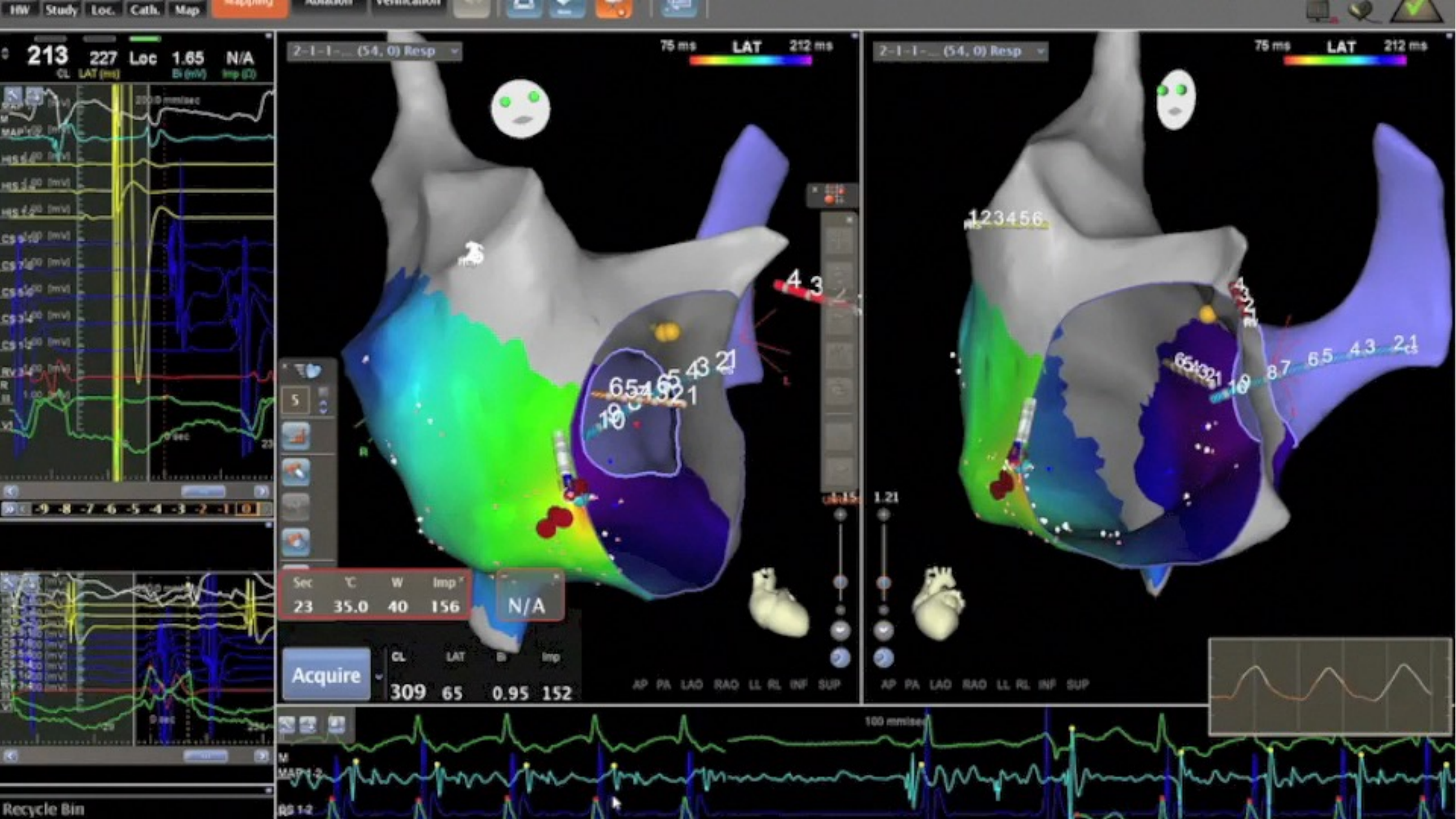
- stasis resulting in clot formation

  anticoagulation

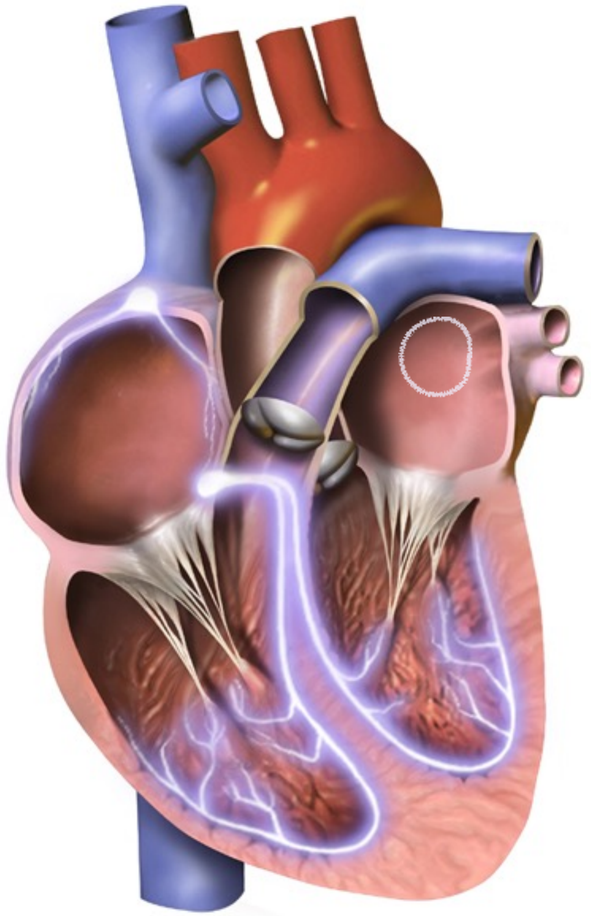
Accessory Pathways

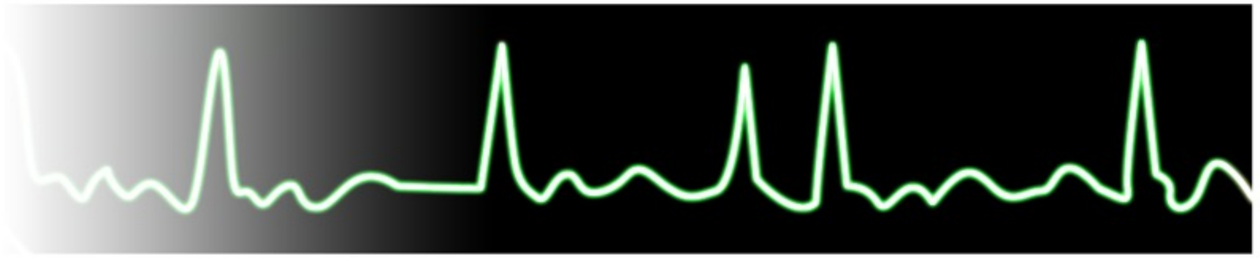
- Additional muscular connection between atria and ventricle, multiple connections in 10-15%




HW
Study
Loc.
Cath.
Map
Mapping
Ablation
Verification
213
227
Loc
1.65
N/A
CL
LAT (ms)
Bi (mV)
Imp (Ω)
2-1-1-... (54, 0) Resp
75 ms
LAT
212 ms
Sec
℃
W
Imp
23
35.0
40
156
N/A
Acquire
CL
LAT
Bi
Imp
309
65
0.95
152
AP PA LAO RAO LL RL INF SUP
Recycle Bin

Atrial Fibrillation





100- 170 bpm, irregular

Atrial Fibrillation

Normal

AF

the **risks** and **treatment**

- any underlying cause
- inefficient heart rate (too fast)

  β-blockers, Ca^{++} channel blockers, DC Shock, ablation

- stasis resulting in clot formation

  anticoagulation

Brad nms

eac
from AV N

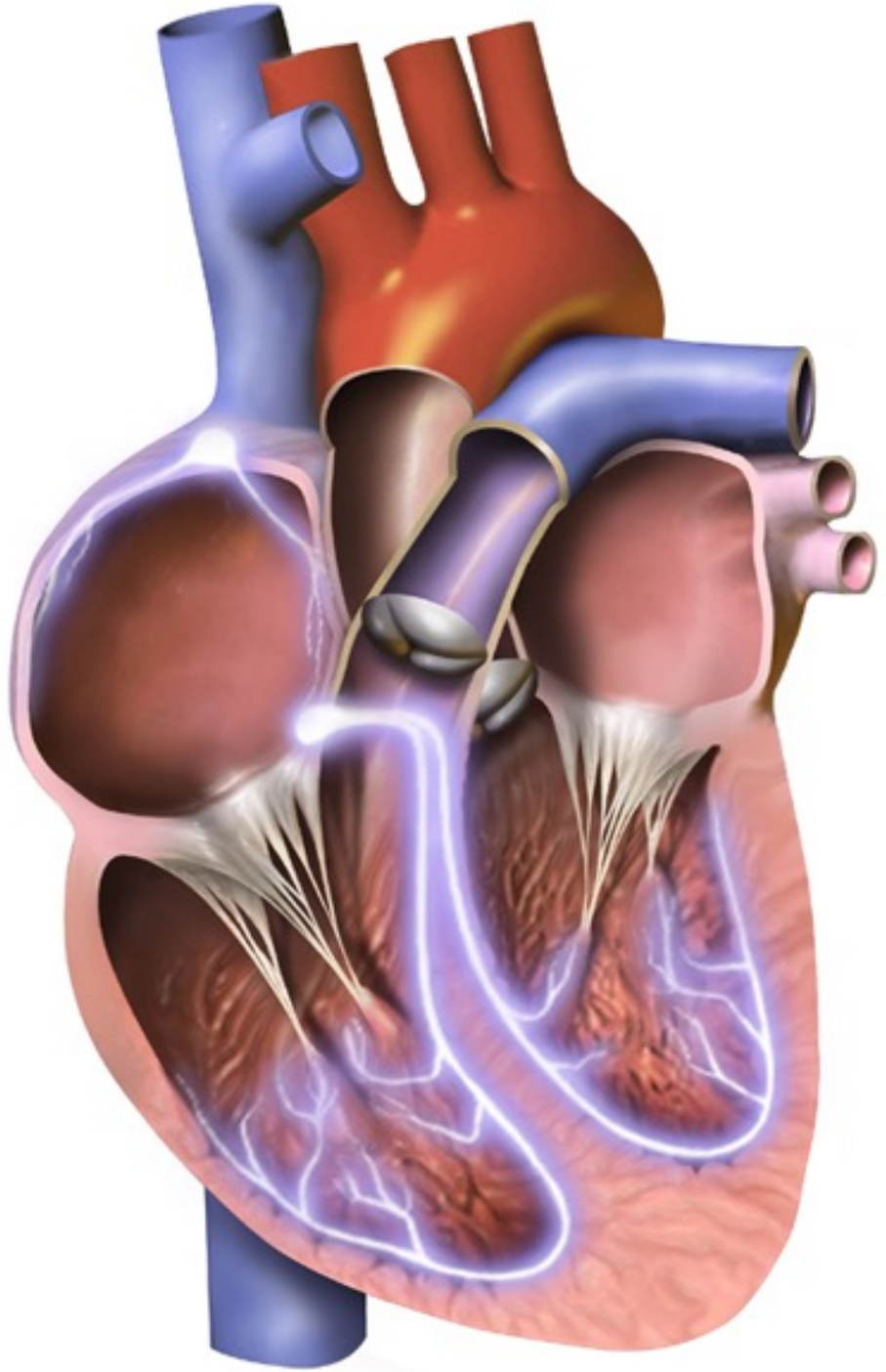
AV Juncti

ventricular r

vay,
atic rate

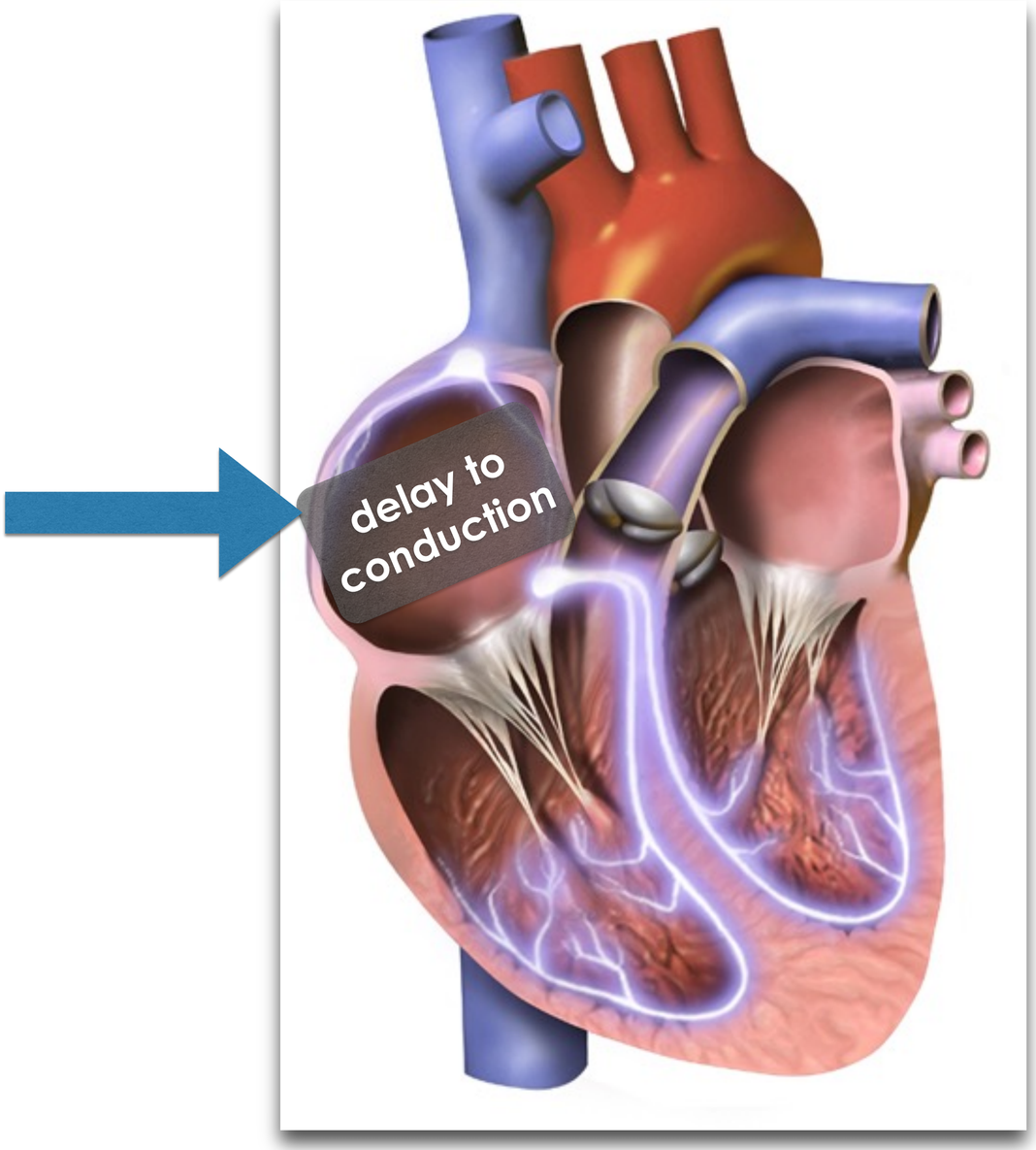
0 bpm

20 - 40 bpm

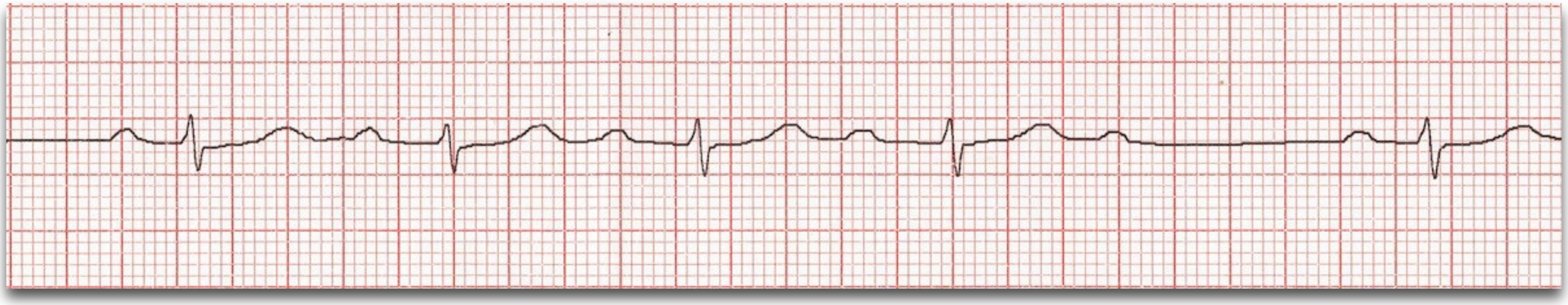


Heart Block

Normal



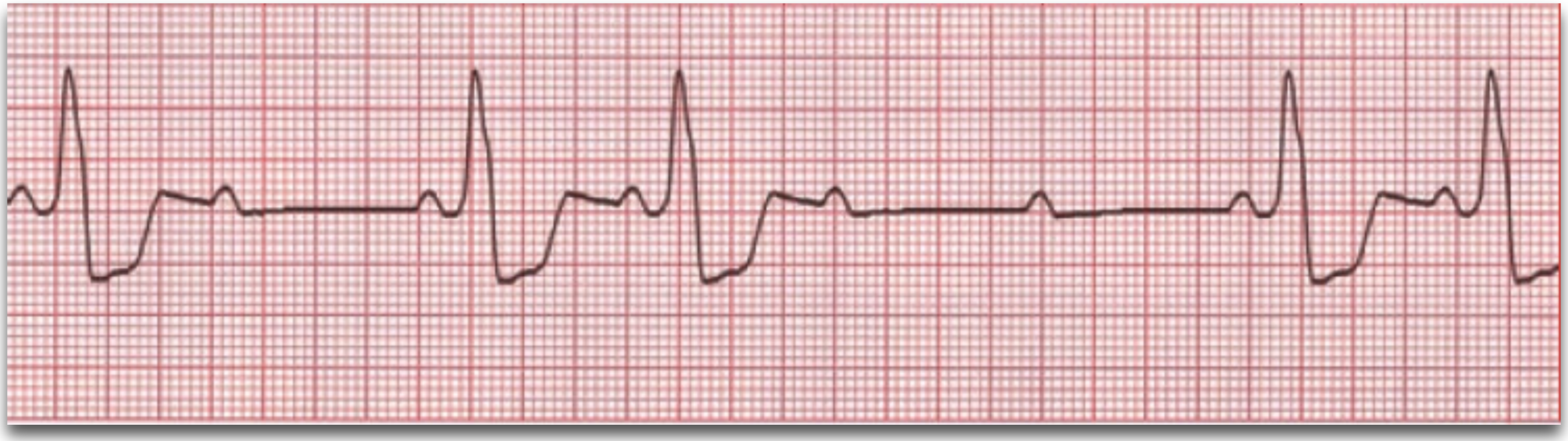
2nd Degree Heart Block (Mobius Type I), Wenckebach)



Progressive prolongation of the PR interval culminating in a non-conducted P wave

Malfunctioning AV node cells tend progressively to fatigue until they fail to conduct an impulse.

2nd Degree Heart Block (Mobius Type II))

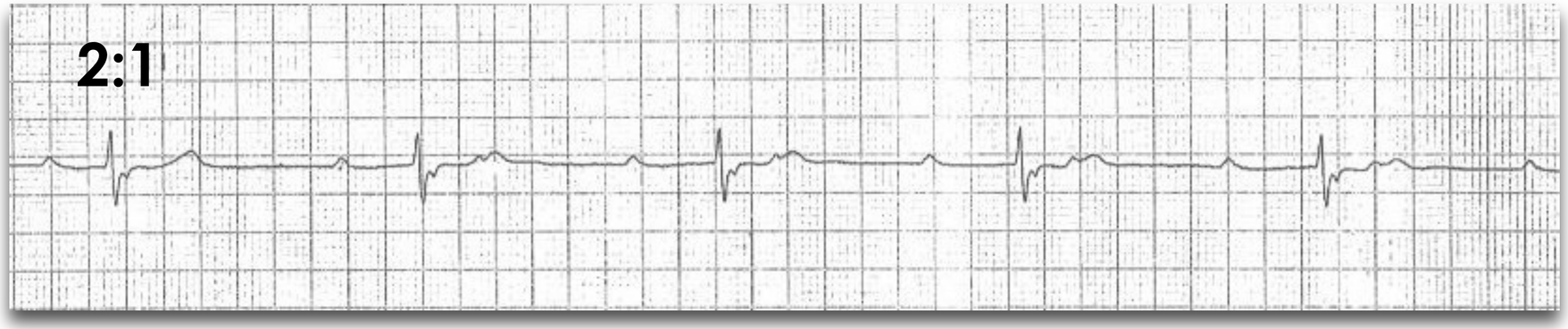


Intermittent non-conducted P waves without progressive prolongation of the PR interval
P-waves have constant rate

usually due to failure of conduction at the level of the His-Purkinje system (i.e. below the AV node)

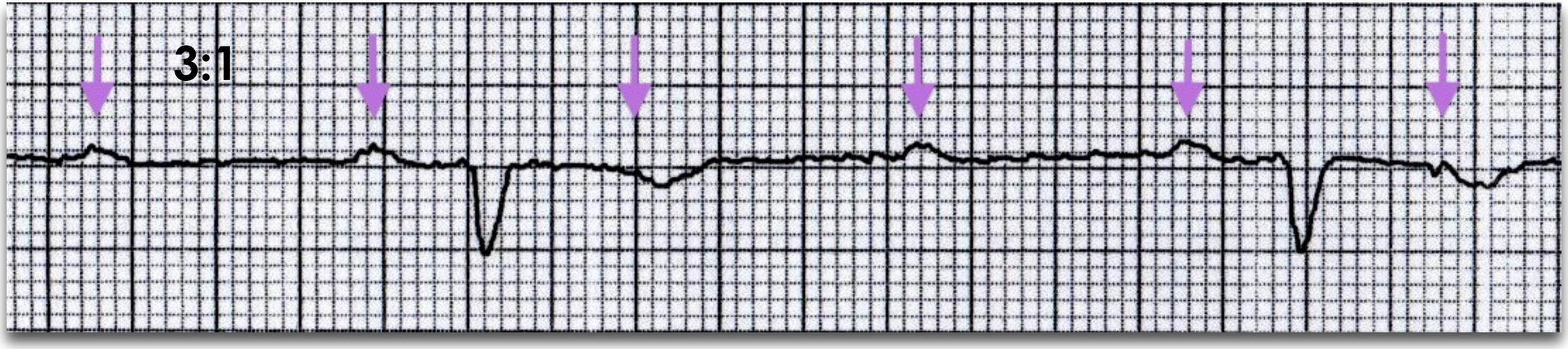
may progress to complete heart block, usually needs pacing

2nd Degree Heart Block; Fixed ratio



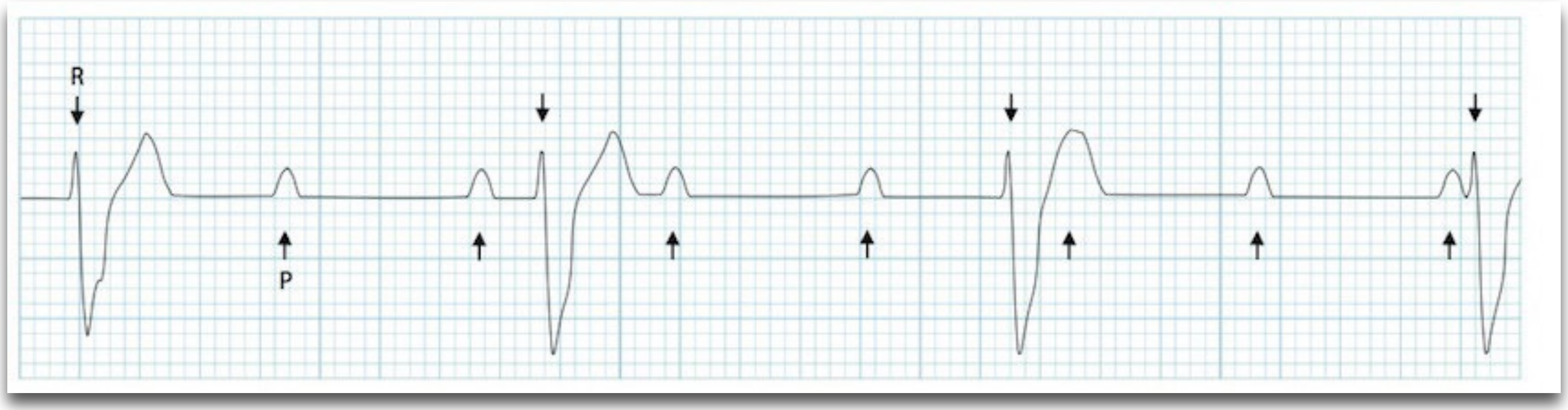
- The atrial rate is approximately 75 bpm.
- The ventricular rate is approximately 38 bpm.
- Non-conducted P waves are superimposed on the end of each T wave

2nd Degree Heart Block; Fixed ratio



- The atrial rate is approximately90 bpm.
- The ventricular rate is approximately30 bpm.
- every 3rd P wave is concealed in the T wave

3rd Degree (complete) Heart Block

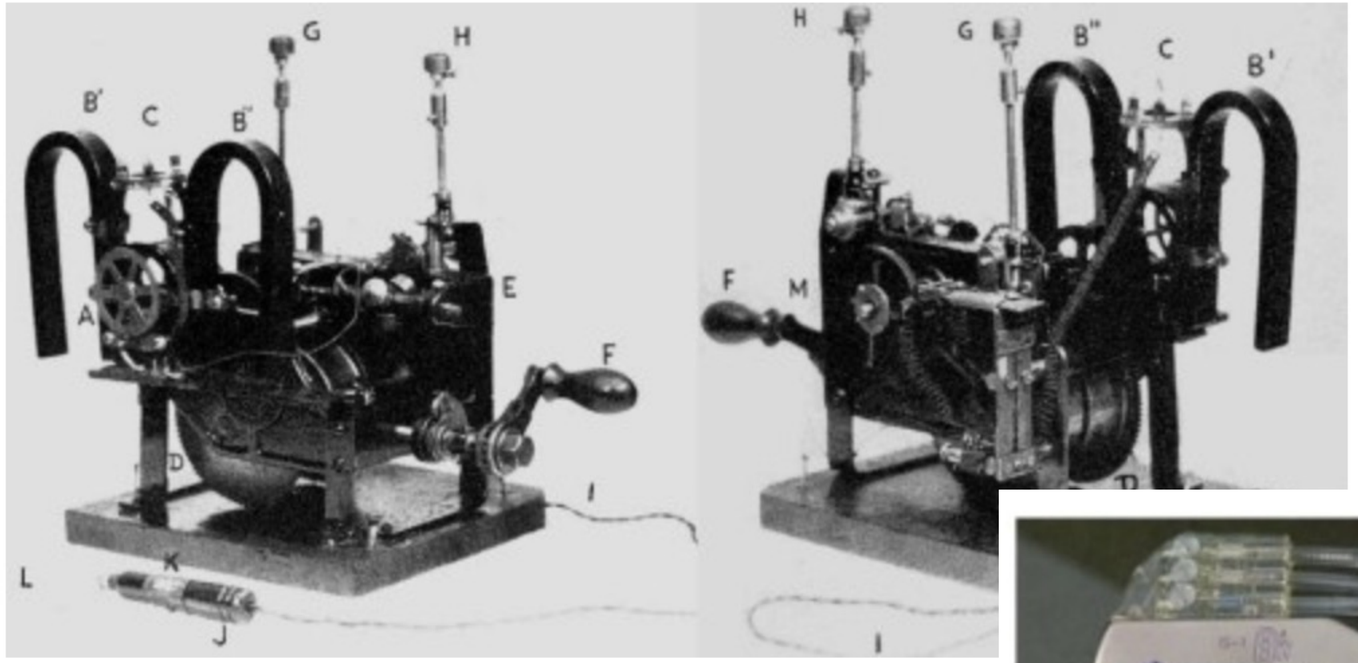


- The atrial rate is approximately 100 bpm.
- The ventricular rate is approximately 40 bpm.
- The two rates are independent; there is no evidence that any of the atrial impulses are conducted to the ventricles.

the ventricular rate may be very low and drugs or pacing urgent

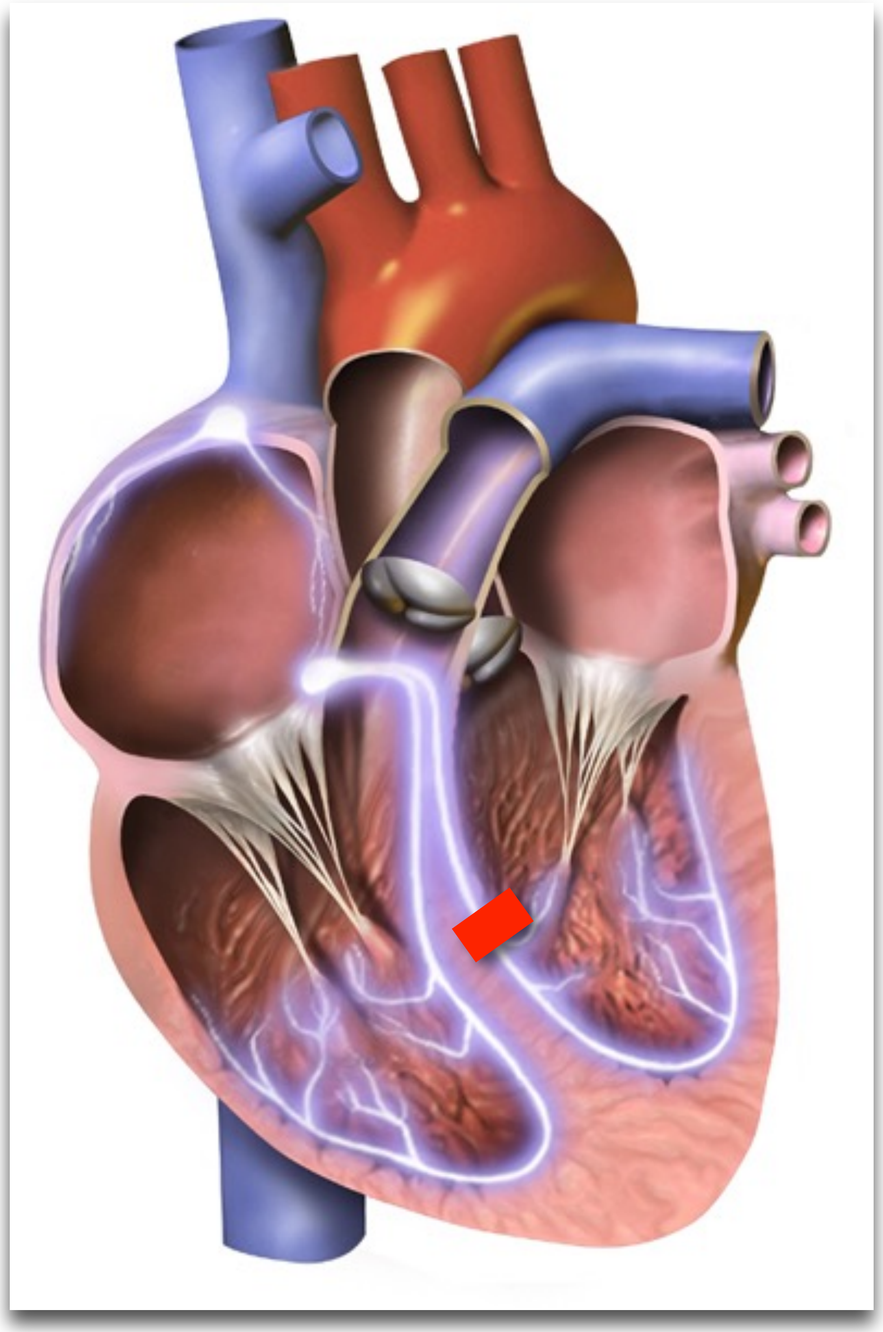
http://lifeinthefastlane.com/ecg-library

1932

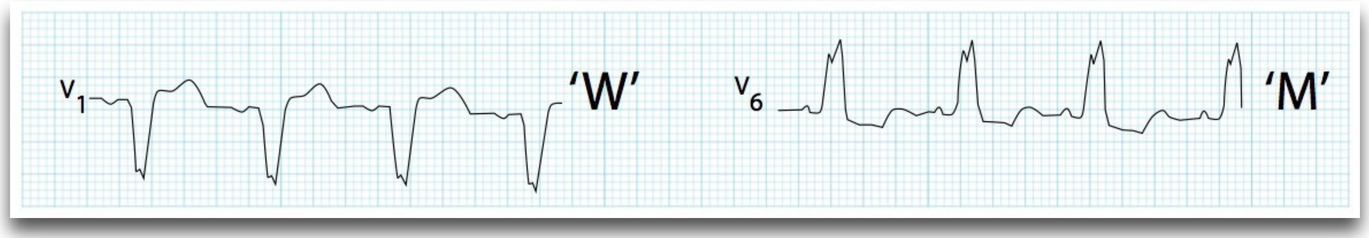


Albert Hyman's “artificial pacemaker”: the two photos

2000’s



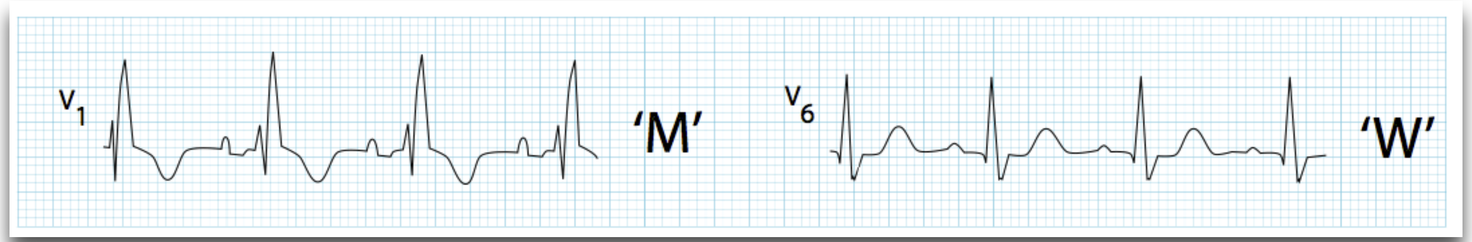
Left Bundle Branch Block



conduction must go R to L

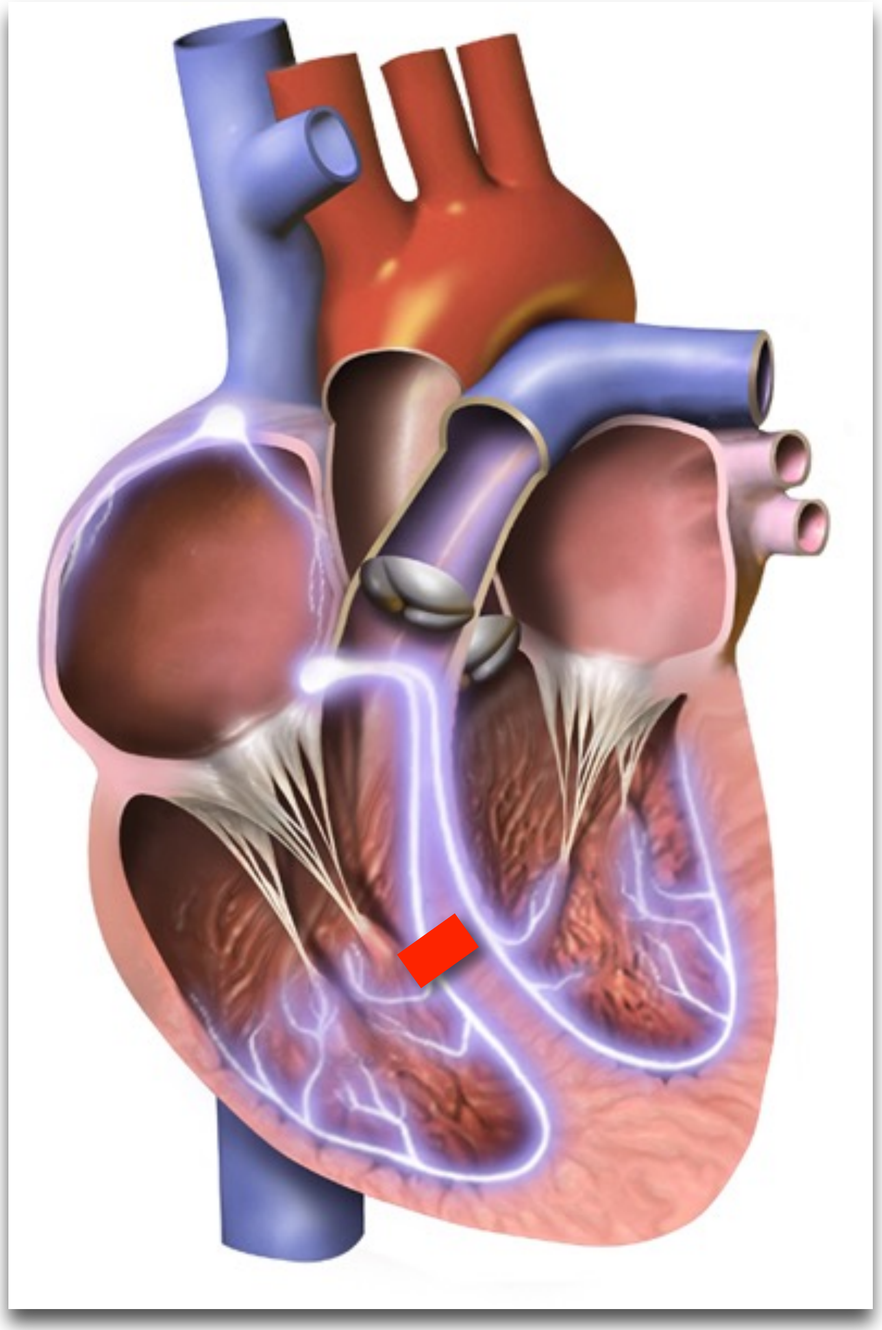
Left Ventricular contraction is delayed

Right Bundle Branch Block



conduction must go L to R

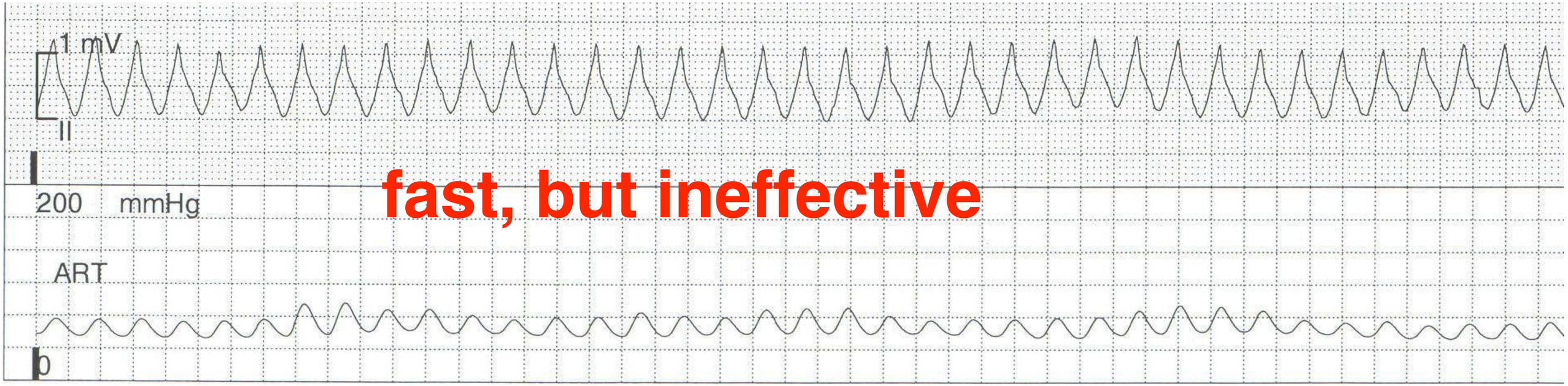
Right Ventricular contraction is delayed



Fast Ventricular Rhythms

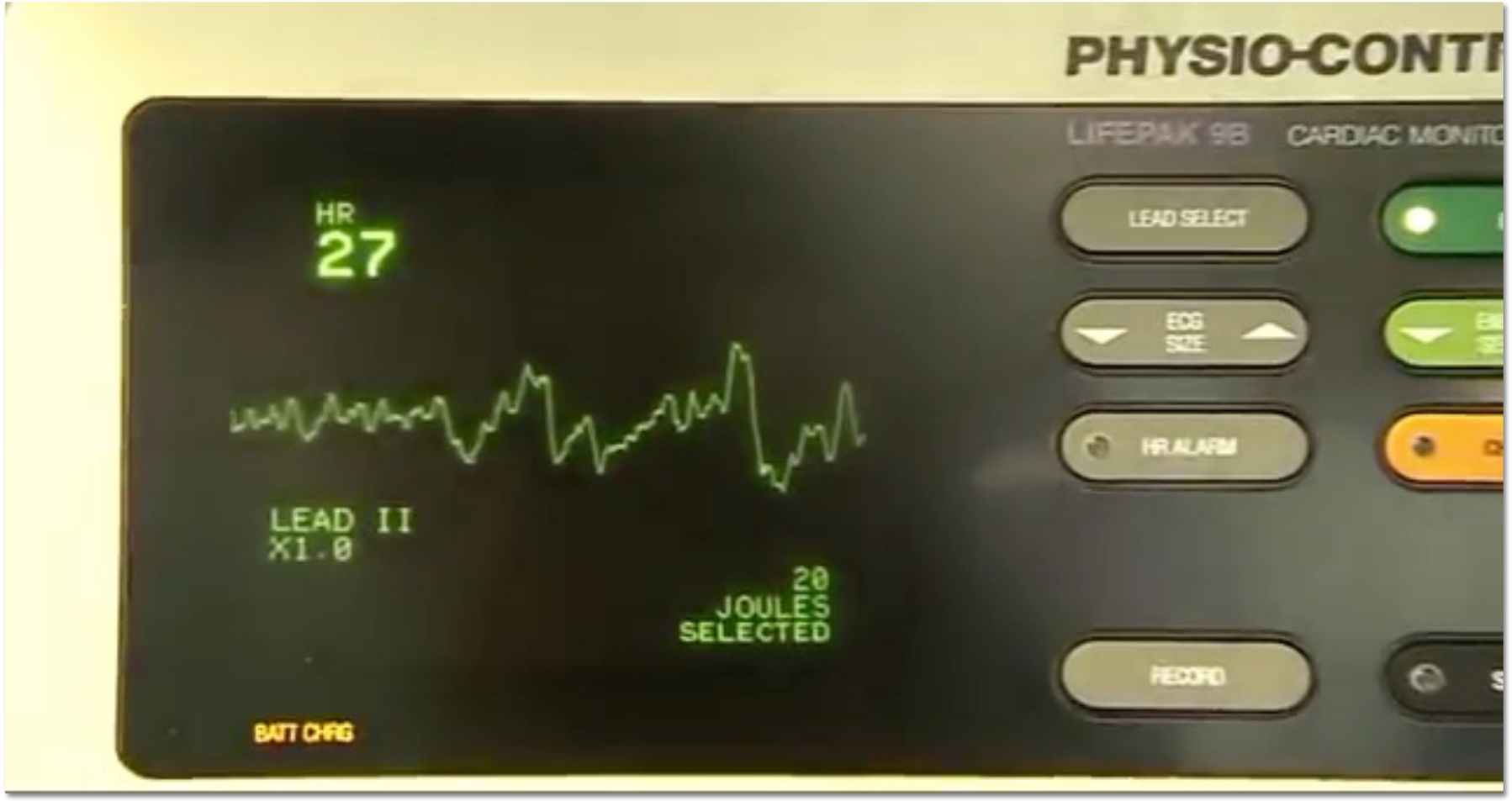
Ventricular Tachycardia

Monomorphic

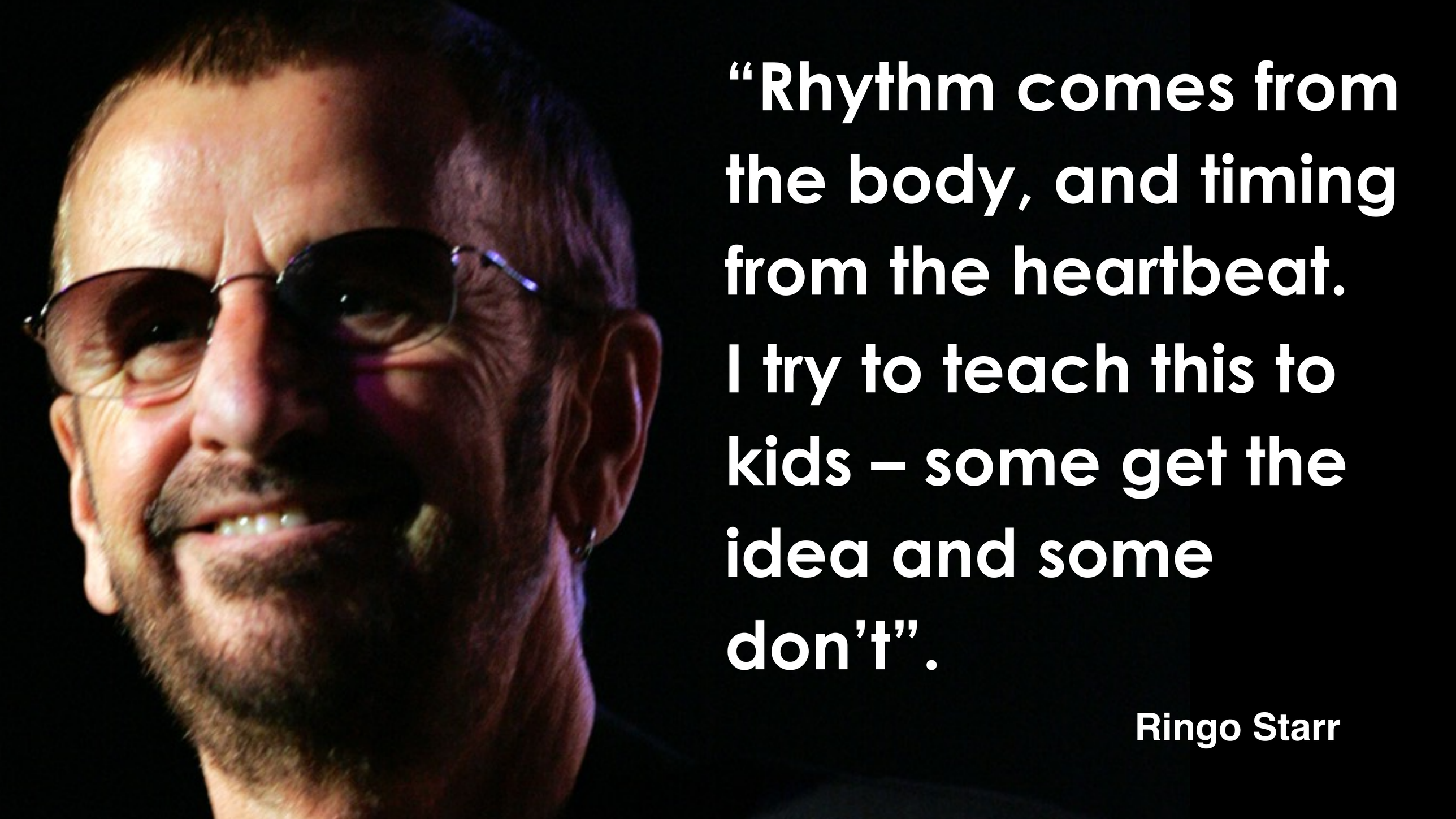


Polymorphic

ventricular fibrillation


PHYSIO-CONTR
LIFEPAK 9B
CARDIAC MONITO
HR
27
LEAD II
X1.0
20
JOULES
SELECTED
BATT CHRG
LEAD SELECT
ECG
SIZE
HR ALARM
RECORD

ventricular fibrillation


“Rhythm comes from the body, and timing from the heartbeat. I try to teach this to kids – some get the idea and some don’t”.
Ringo Starr

CPR ISN'T TAUGHT
IN ALL SCHOOLS.

IT SHOULD BE.

Thank You

Hanna Harlan
Denise Welsby
Nick Buxton
Dr Jasveer Mangat
The EP Team at GOSH
Becan Rickard-Elliott
Lesley Elliott