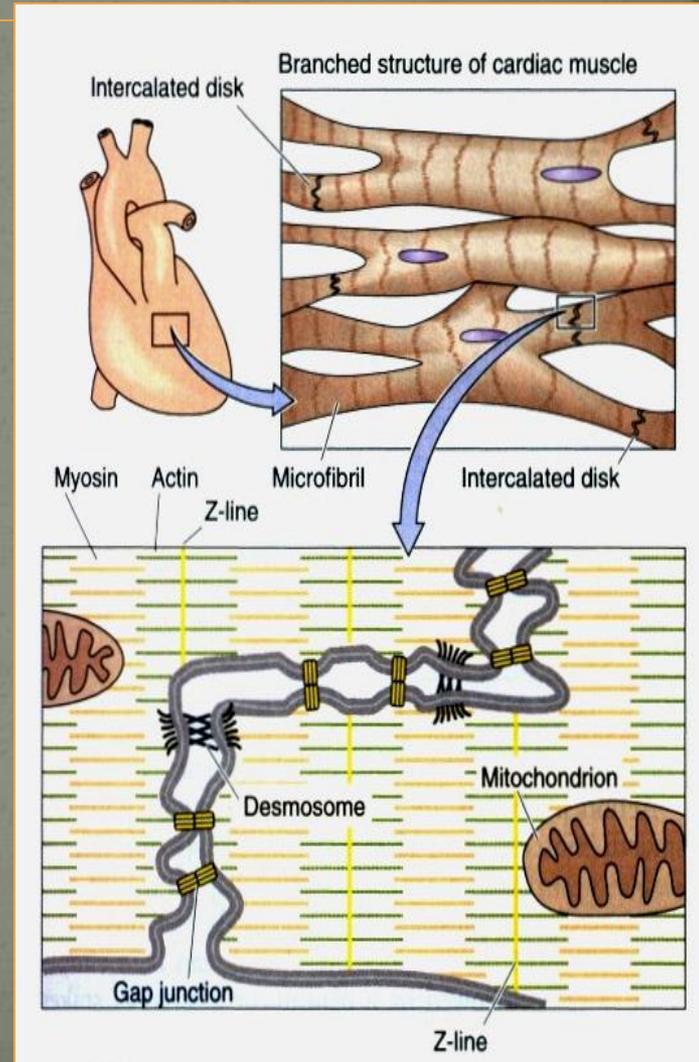


Structure of cardiac muscle

- Cardiac myocytes are short branched striated muscle cells
- Connected **with gap junctions**
- gap junctions transmit electrical activity between cells
- So, cardiac myocytes act as **a single functional unit (syncytium)**



Cardiac Ms Fibers

1. Nodal fibers

Sinoatrial Node

Atrioventricular Node

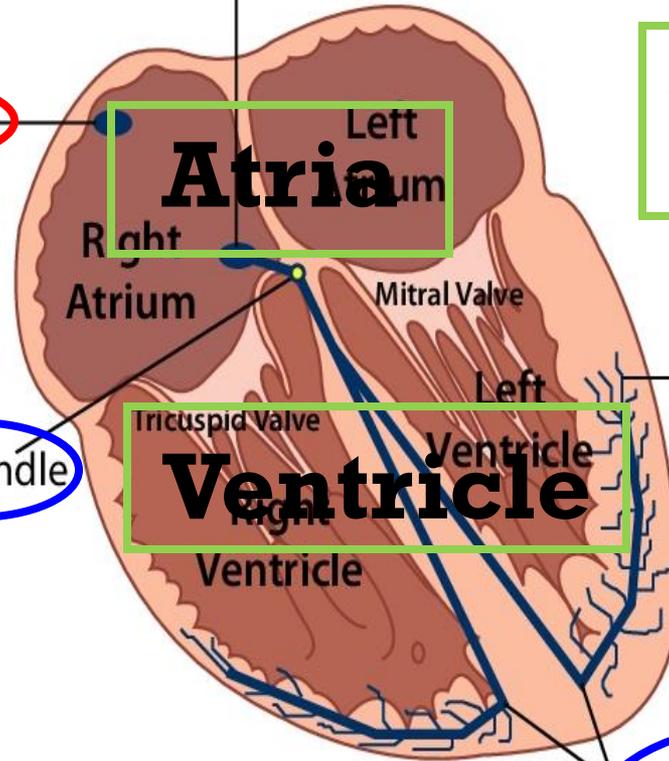
2. Conducting fibers

His Bundle

3. Contractile fibers

Purkinje Fibers

Right and Left Bundle Branches



Properties of Cardiac Muscle

1. Rhythmicity
2. Excitability
3. Conductivity
4. Contractility

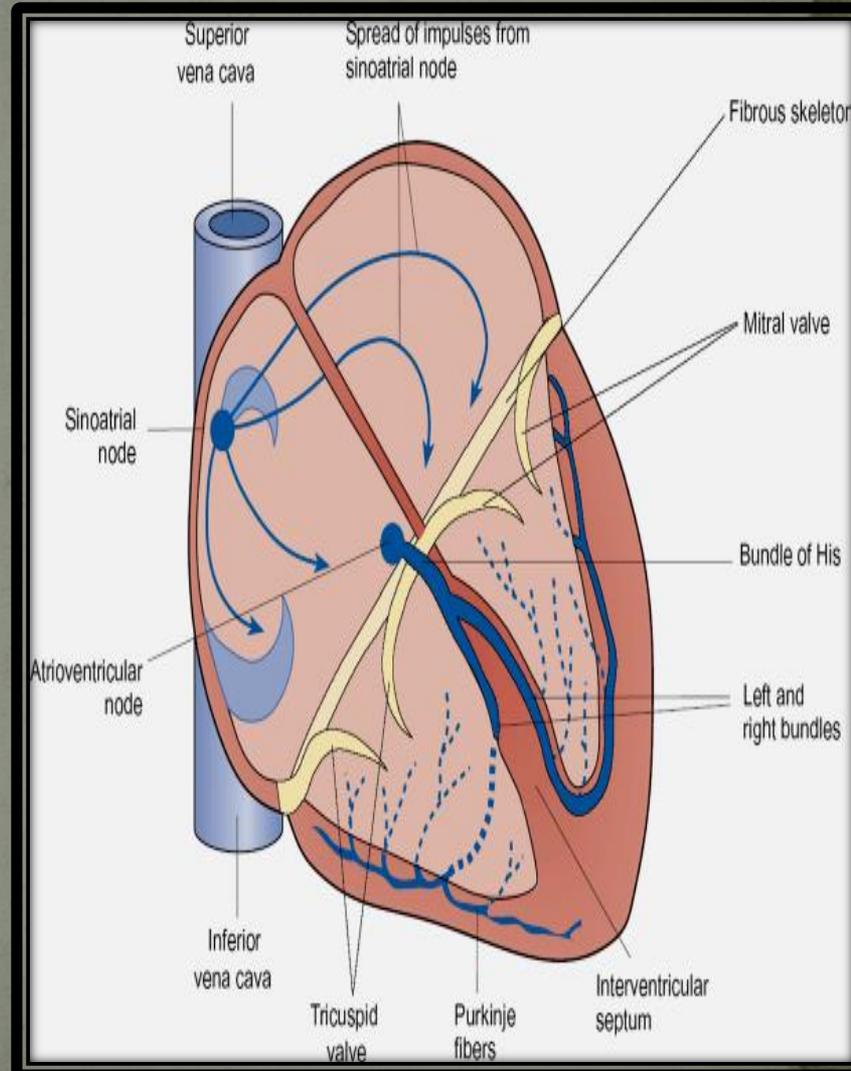
Rhythmicity

- **Rhythmicity** means the ability of the heart to beat regularly without external stimulation.
- It is *myogenic* in origin *not neurogenic*
- The nodal fibres and conducting system are *self-excitable*.
- Sinoatrial node (SAN) → 110 b/min
- Atrioventricular node (AVN) → 90
- ❖ Bundle of His (A-V bundle) → 45
- ❖ Purkinje fibres → 35
- ❖ Ventricular fibres → 25

The cells of SAN; (posterior wall of right atrium) **is the primary pacemaker of the heart**

II- Conductivity

- The ability to conduct impulse from one cell to another--- facilitated by the presence of **gap junctions** that transmit electrical currents
- From SAN → atrial muscle & atrioventricular node (AVN)
- From AVN (**slowest**) → atrioventricular (AV) bundle (bundle of His) → left & right bundles → Purkinje fibres (**fastest**)



Excitability

- The heart muscle responds to stimuli which may be mechanical, electrical or chemical

Refractory Period

- The refractory period of the myocardial fibers is of **much longer duration** than that of skeletal muscle fibers and lasts approximately as long as the cardiac contraction----- so no continuous contraction without relaxation (tetanus) can occur in heart.

Rules controlling Contractility

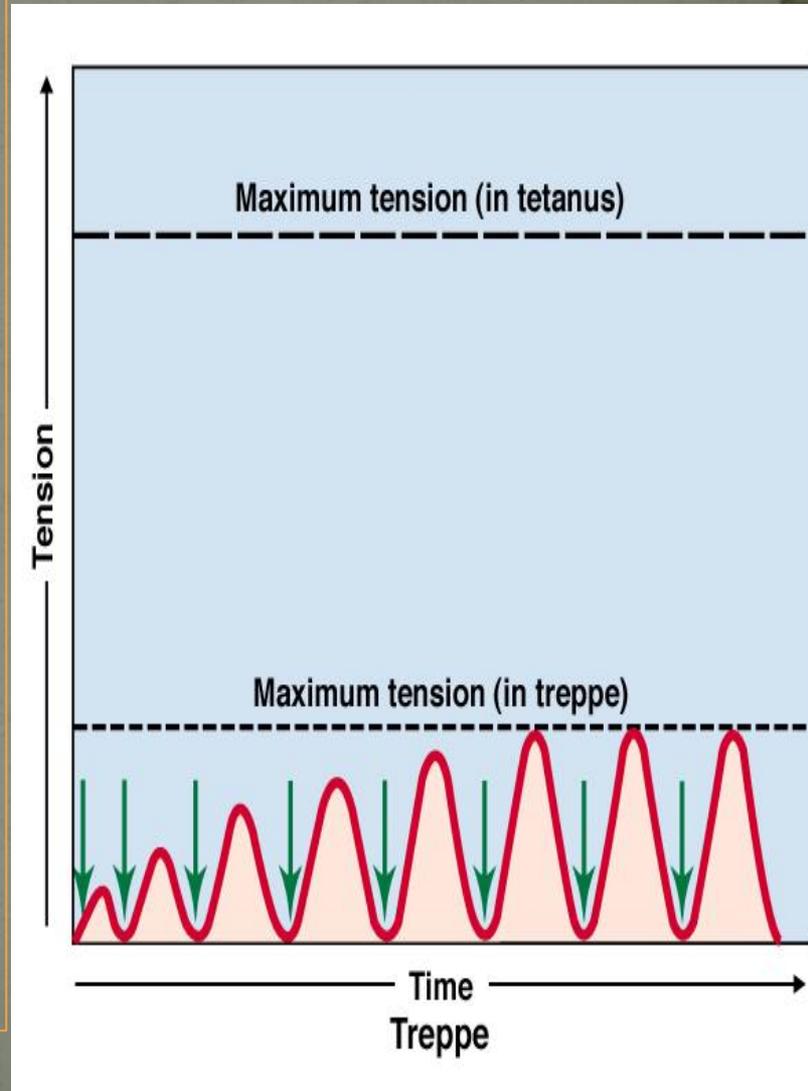
1- All or None Law

- The cardiac muscle contracts either maximally or not at all (under constant conditions)
- The Atria contract as one unit & the ventricles contract as one unit
- This is significant for efficient pumping of the blood

Rules controlling cardiac Contractility

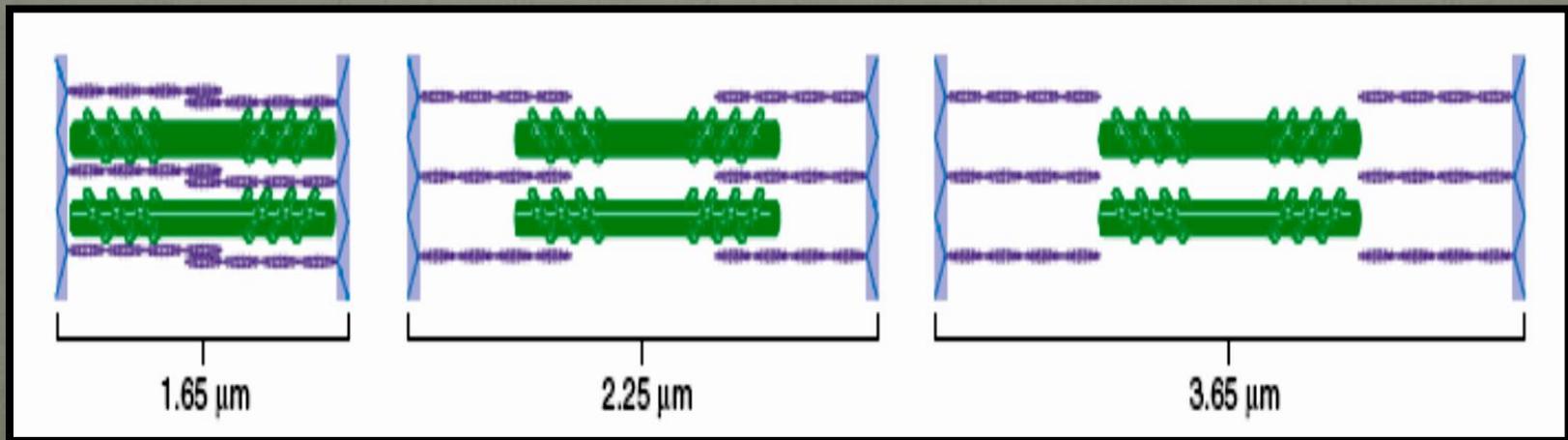
2- Staircase or Treppe Phenomenon

- Rapidly Repeated stimulation of the cardiac muscle produce gradual increase in the strength of contraction
- The earlier contractions produce better conditions (heat, less viscosity between muscle fiber, more Ca) for the following contraction



3- Starling Law

- Within limits, the greater the initial length of cardiac muscle fibre (stretch), the greater the force of contraction
- The initial length is determined by the volume of blood filling ventricles at end of diastole (**end-diastolic volume; EDV**)



Nerve Supply of the Heart

A) Sympathetic supply:

1. ↑es all cardiac properties
2. ↑es the coronary blood flow.

B) Parasympathetic supply:

1. ↓es all cardiac properties except the ventricles (not supplied by vagus nerve)
2. ↓es the coronary blood flow

