Cardiac Cycle

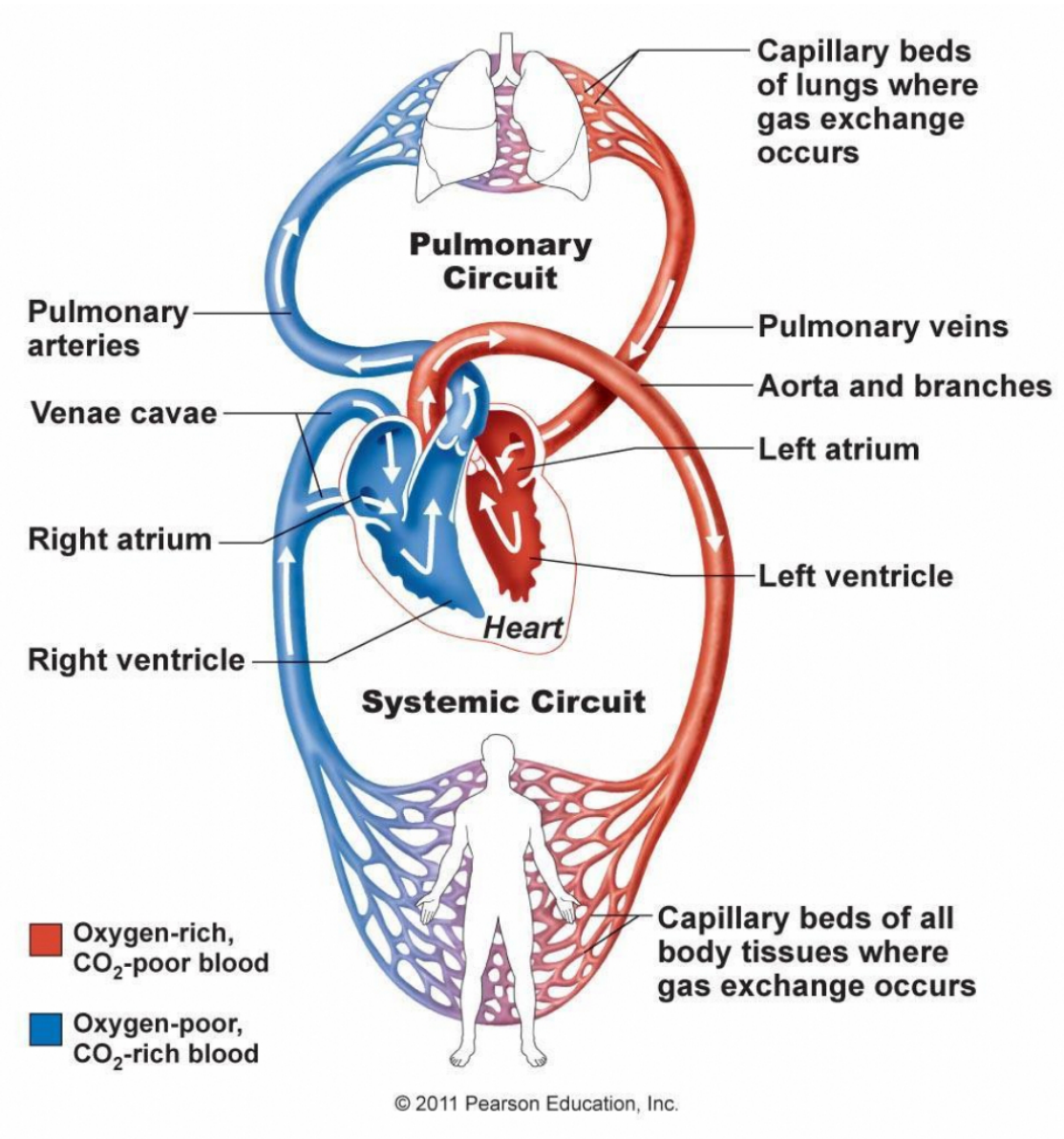
Central Circulation and Electrocardiogram

ZOOL 430

Circulatory System

- **Central Circulation:**
  - Heart
- **Peripheral Circulation:**
  - Arteries
  - Veins
  - Capillaries

Mammalian 4-chambered heart



Myogenic Heart

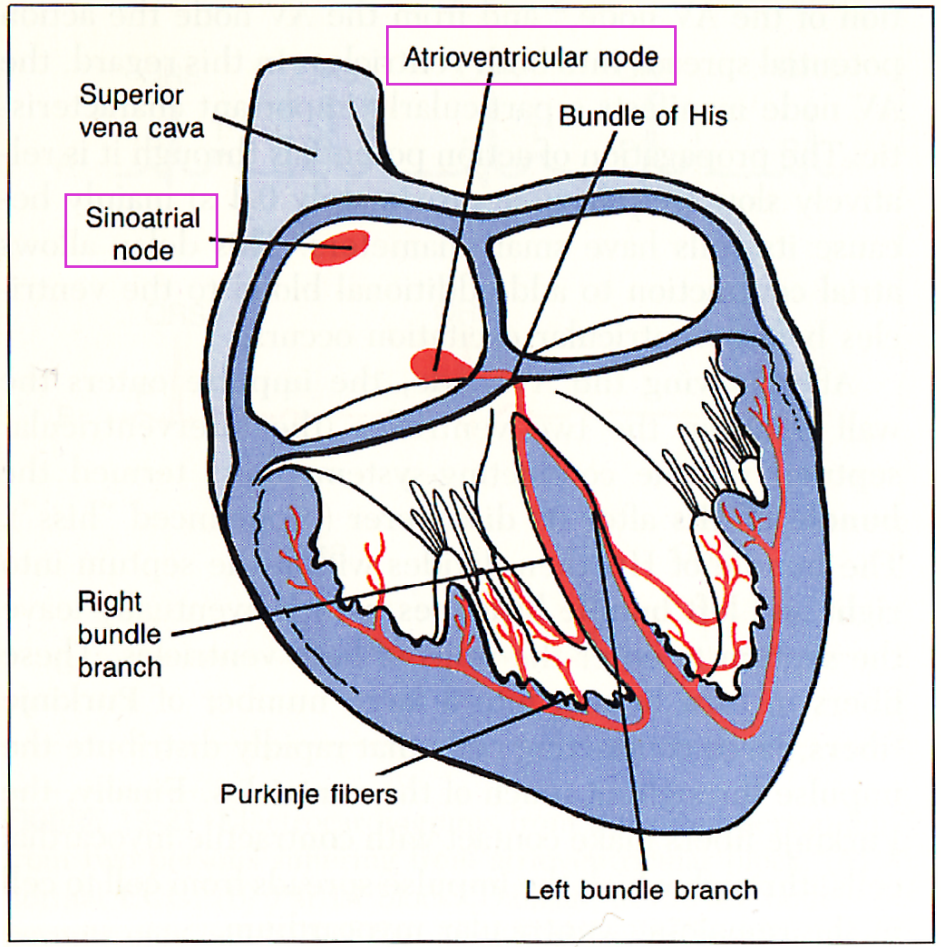
electrical signals

Pacemaker beats on its Own!

Myogenic = modified **muscle** cells

Found in two nodes

- Vertebrate Pacemaker Cells
  1. Sinoatrial (SA) node
  2. Atrioventricular (AV) node



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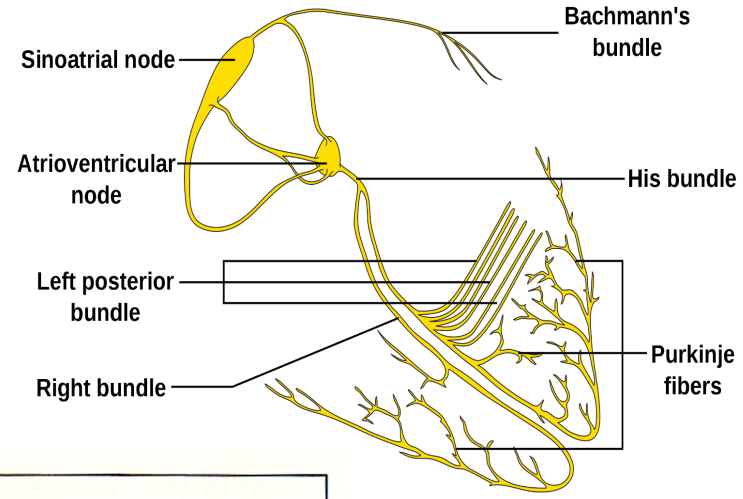
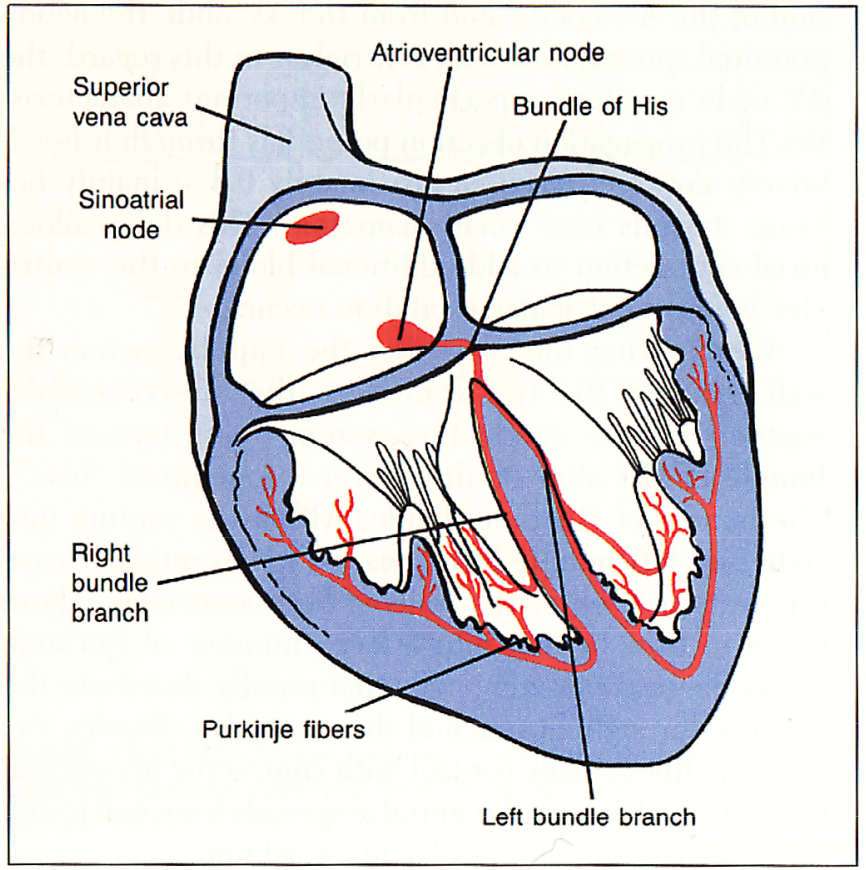
Pacemaker Cells

- **Initiate** cardiac action potential
- **Separate** from nervous system
- A natural pacemaker: setting up the rhythmic beating of the heart
- Transfers cardiac action potential: SA node → AV node → Bundle of His → Purkinje fibers





What moves the heart?

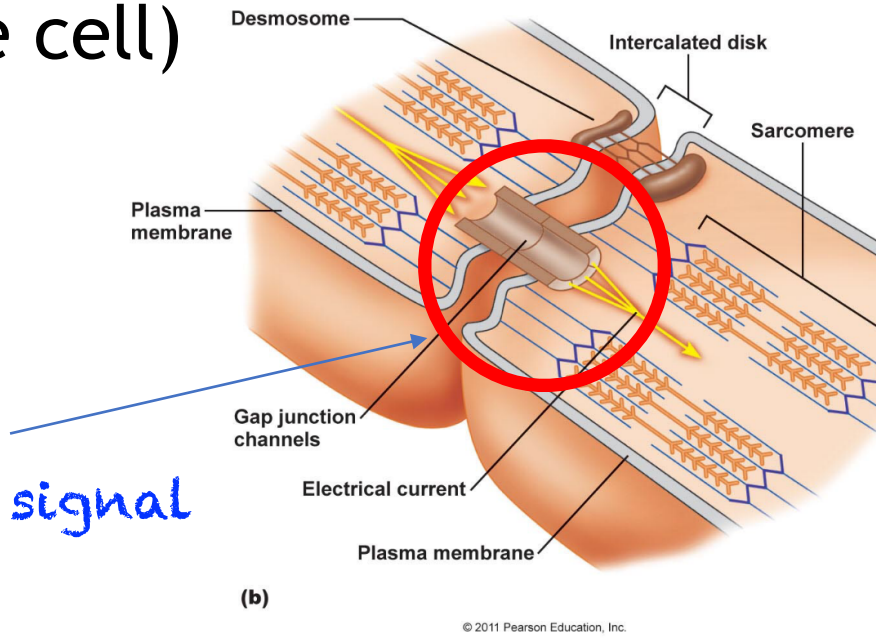
- Pacemaker Cells

  electrical signals

  1. Sinoatrial (SA) node
  2. Atrioventricular (AV) node

- Cardiomyocyte (Muscle cell)
  - Cardiac muscle cells
  - Conduction fibers: larger, connected by gap junctions

Allows flow of electrical signal between myocytes



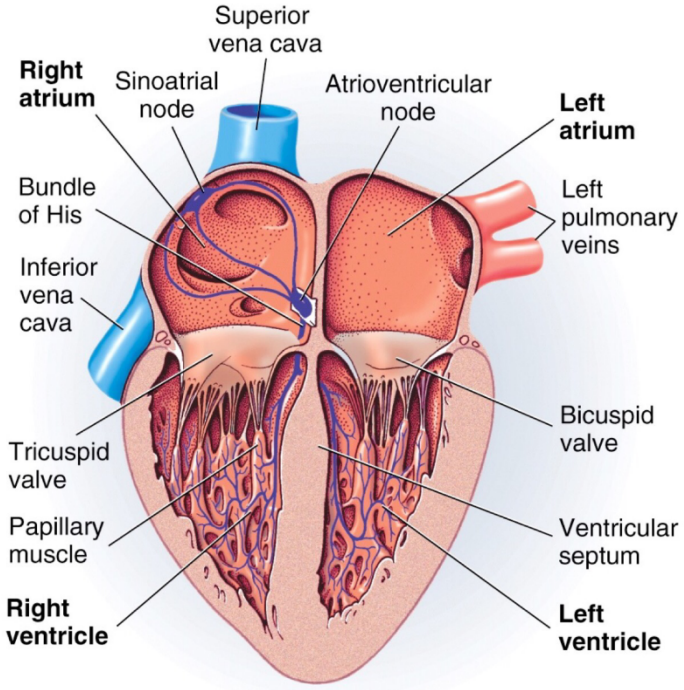
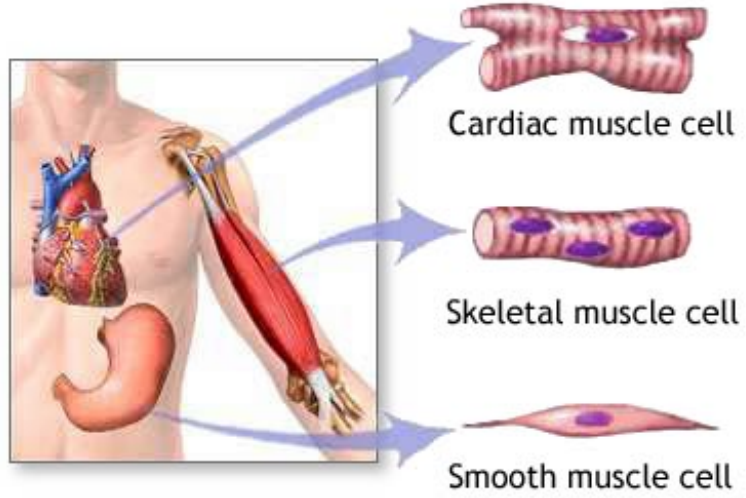
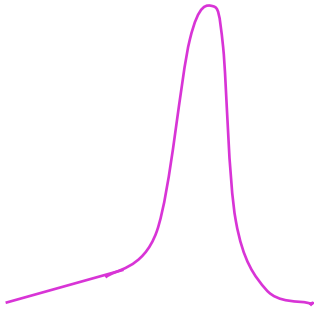


Figure 1. The 4 chambered heart

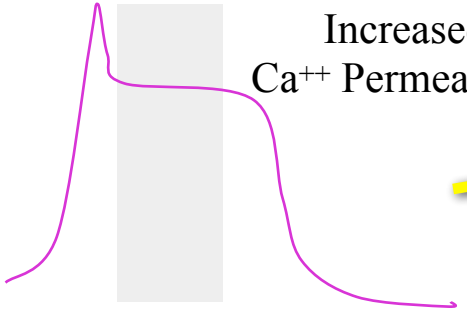


Pacemaker and Cardiac Potentials (special types of action potentials)

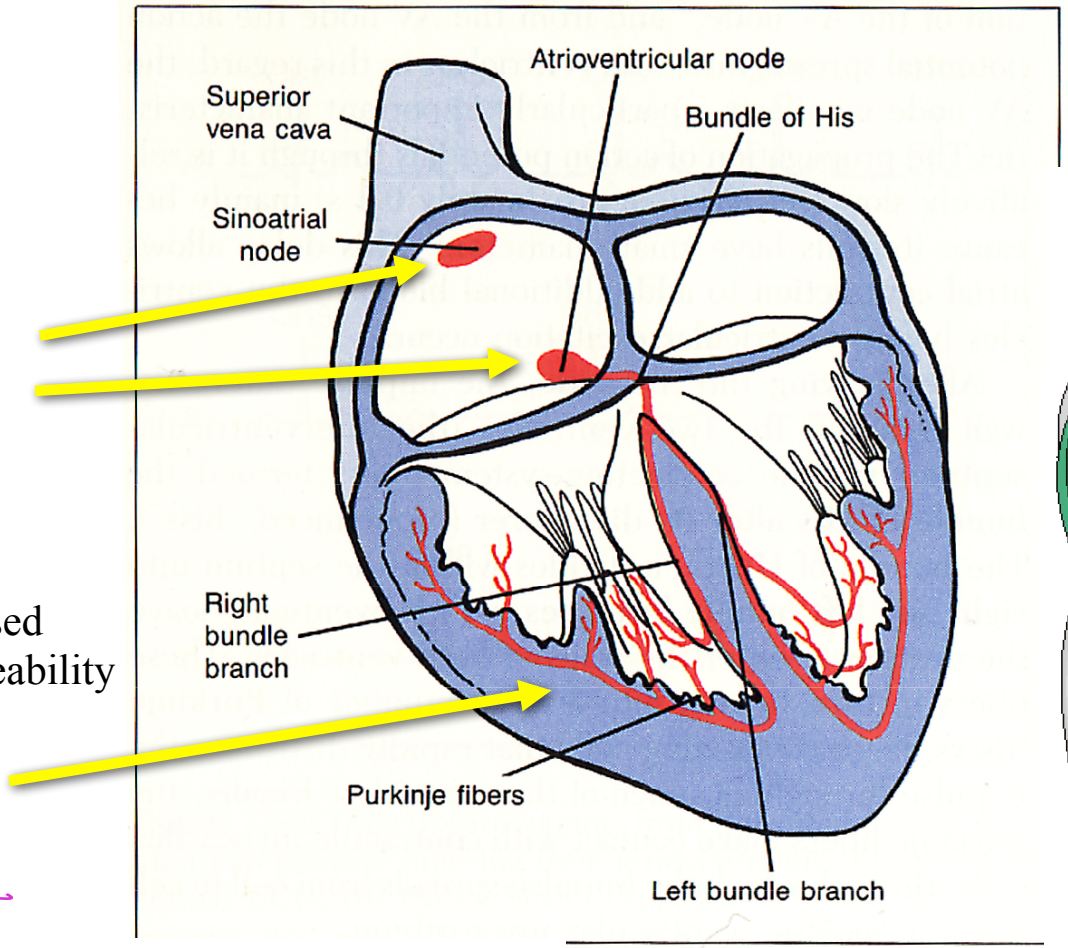
Pacemaker Potential

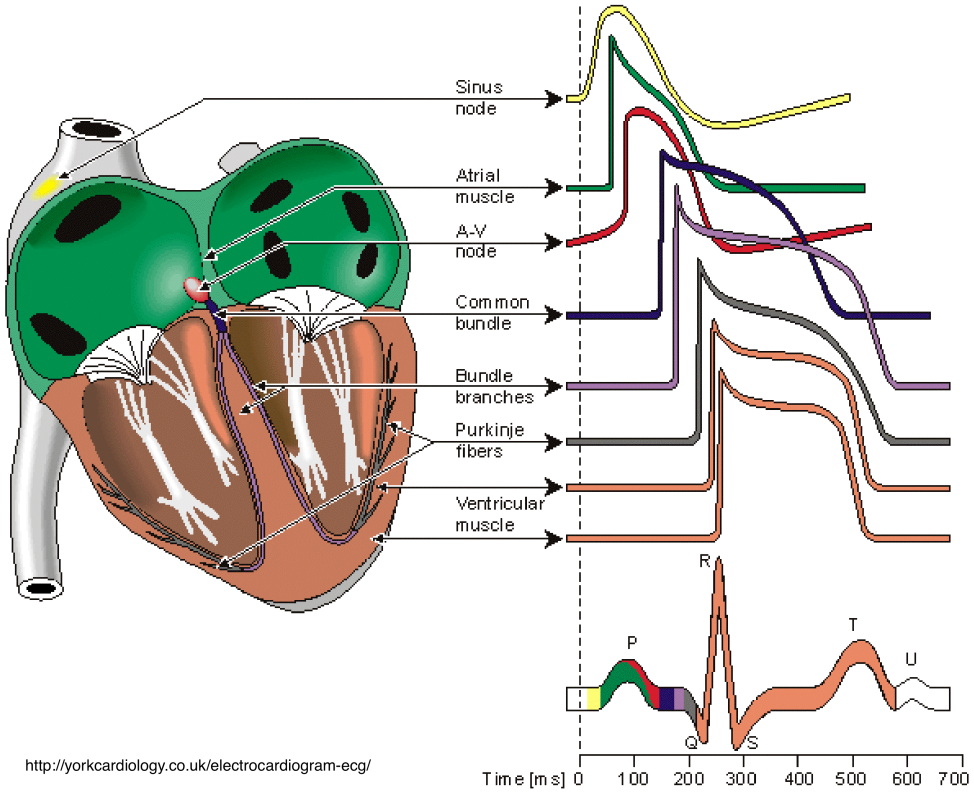


Cardiac Potential



Increased Ca^{++} Permeability





http://yorkcardiology.co.uk/electrocardiogram-ecg/

Prolonged Potential
Synchronizes Contraction

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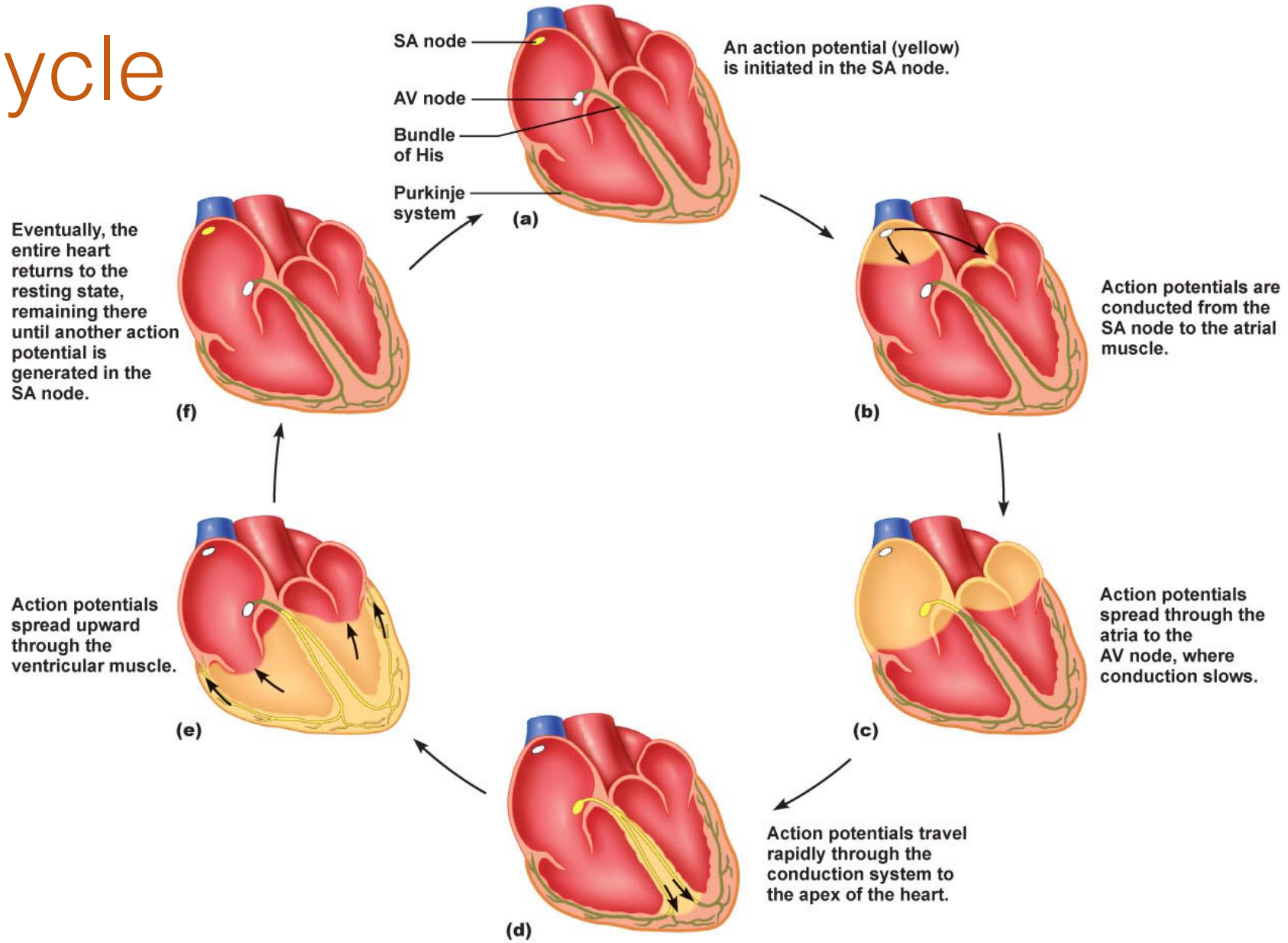
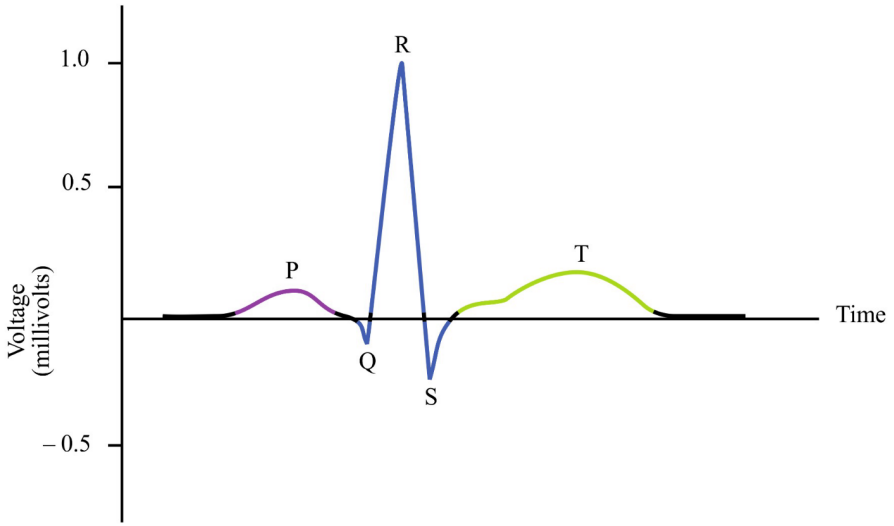
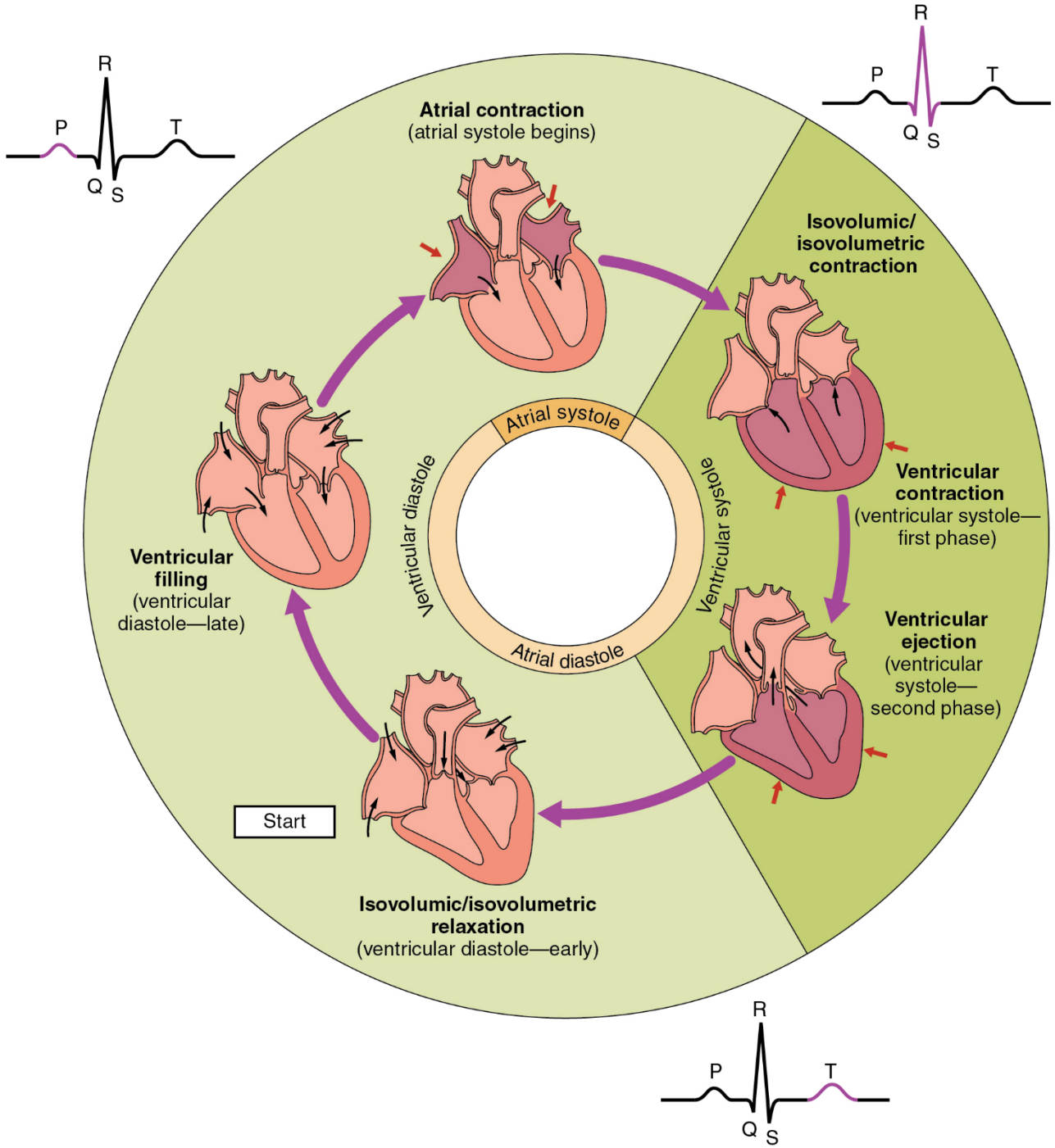
Cardiac Cycle



Electrocardiography

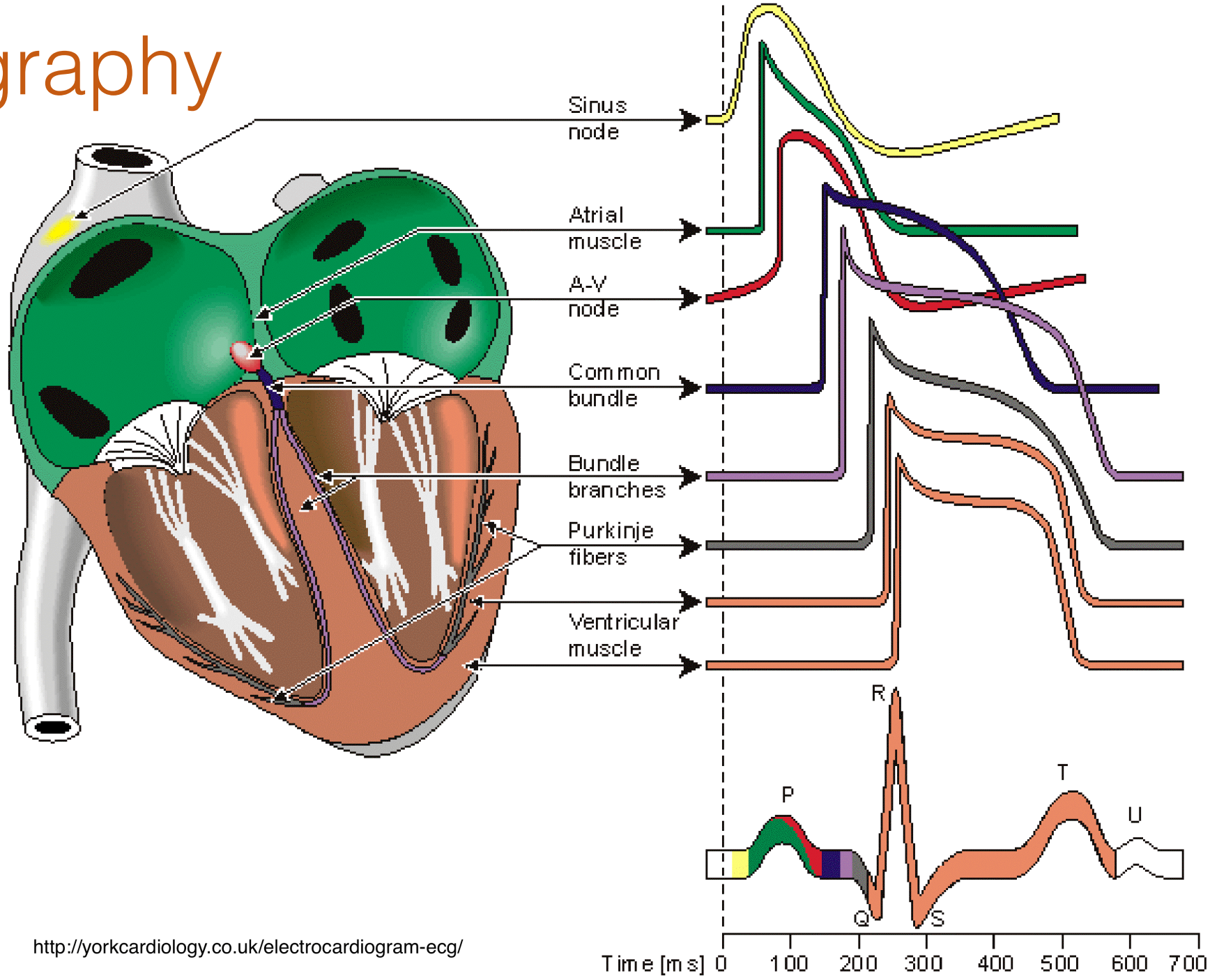
- Measure electrical changes caused by cardiac AP using electrodes attached to the surface of the skin
- Signals detected would be the combination of atrial and ventricular activities.





Electrocardiography

EKG's reveal the sum of all electrical potentials (pacemaker, cardiac), across the heart during a cardiac cycle



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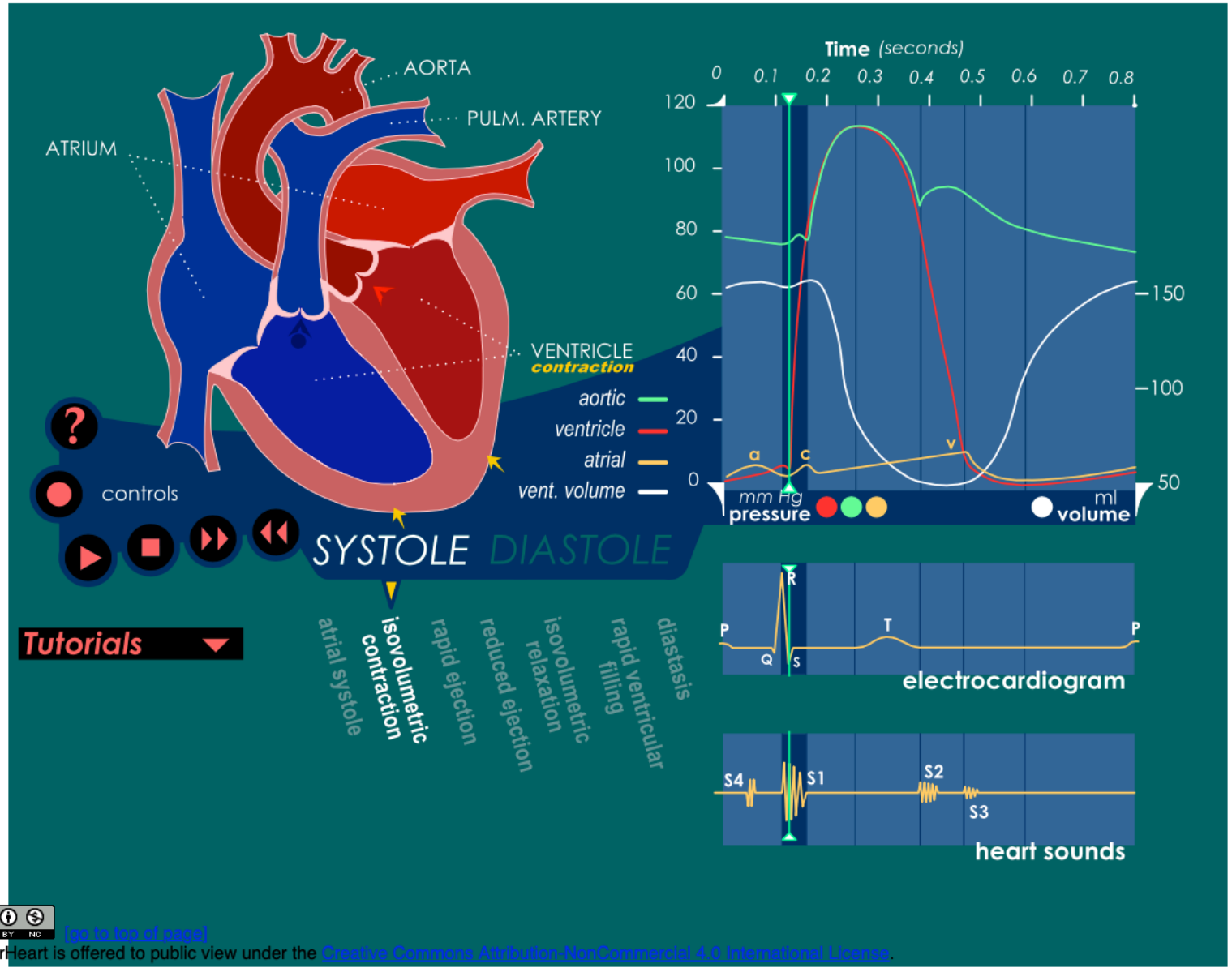
HyperHeart

Interactive animation updated from Flash to HTML 5 by Quentin Roper of Massey University, New Zealand. It is offered to public view under the Creative Common
commercial re-use with required attribution license (see below).

Click here to position animation.

Spencer S. Eccles Health Sciences Library home / *Knowledge Weavers projects*

https://library.med.utah.edu/kw/pharm/hyperheart/



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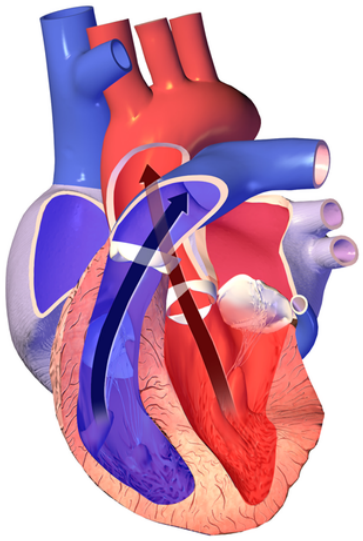
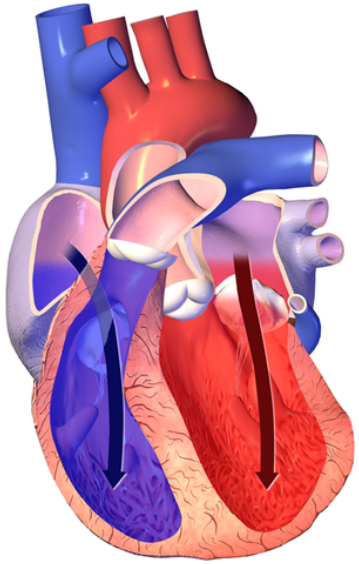
Cardiac Cycle

The performance of the heart from the start of one heartbeat to the next



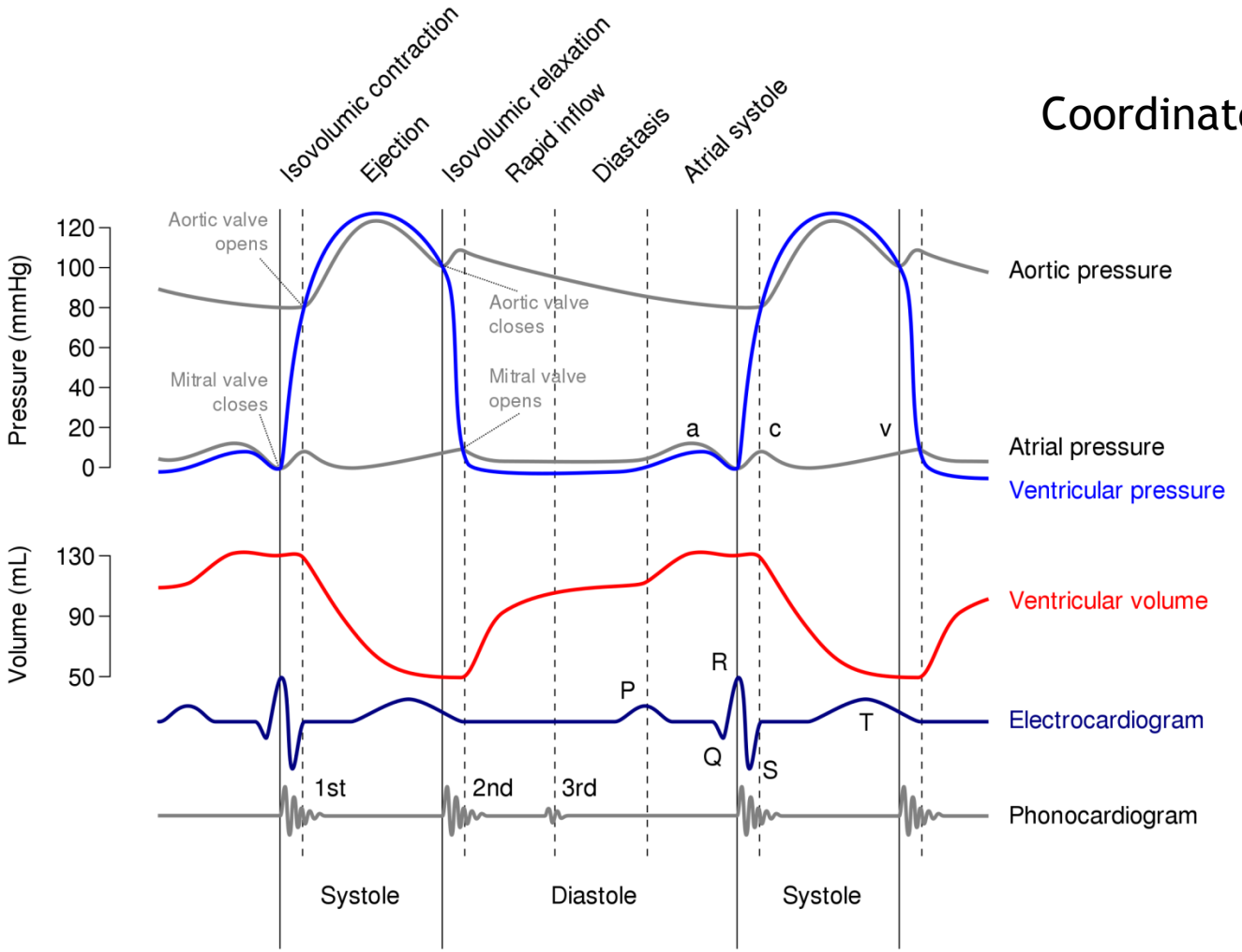
Systole
(pumping)

Ventricular Contraction



Diastole
(filling)

Ventricular Relaxation



Coordinated changes in:

Pressure

Volume

Electrical Activity

Today's Lab Electrocardiogram

Experiment

- What you need: PowerLab, BioAmp, electrodes, Push Button
- Make sure the colors or PowerLab and BioAmp match
- Remove any jewelry/watch
- Fill the electrode cups with conducting gel. Make sure there is no air between electrode and skin!
- Tape the electrode securely.