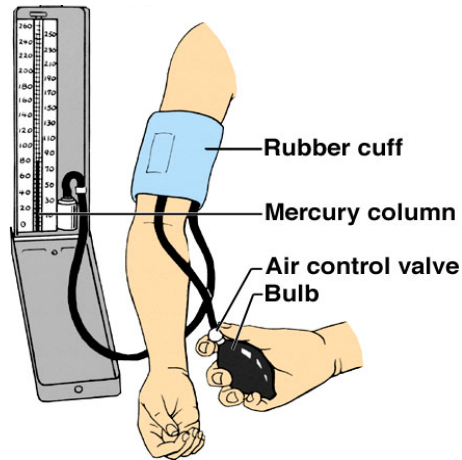
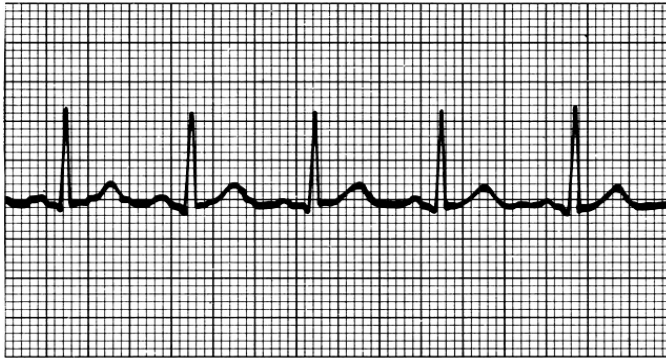


**BIO 212:**  
**ANATOMY & PHYSIOLOGY II**

1



**LAB**

**EKG**  
*and*  
**Blood Pressure**

**Dr. Lawrence G. Altman**

[www.lawrencegaltman.com](http://www.lawrencegaltman.com)

*Some illustrations are courtesy of McGraw-Hill.*



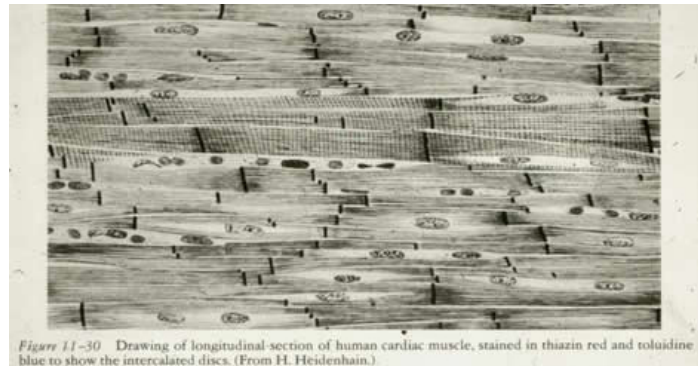
Review Lecture notes on conduction through the heart. 2

## SELF-STIMULATION (SA Node)

The heart does **NOT** require nerves to beat.  
(Nerves usually change the **RATE** of the heartbeat)

**Ectopic beats:** originate outside of the normal pacemaker.

**Conduction through GAP JUNCTIONS (low resistance)**  
**found in intercalated discs of cardiac muscle.**



*Figure 11-30* Drawing of longitudinal-section of human cardiac muscle, stained in thiazin red and toluidine blue to show the intercalated discs. (From H. Heidenhain.)

**EKG values are small voltages** since readings are taken through the skin (some distance from the heart).

**Actually, measures average voltage output of millions of cardiac cells.**

# Electrode Placement

*For a 3 lead setup:*

**Ground**

**LEAD 1**

(BASE of HEART)

Right wrist, left wrist

left ankle

**LEAD 2**

(RIGHT SIDE OF HEART)

Right wrist, left ankle

left wrist

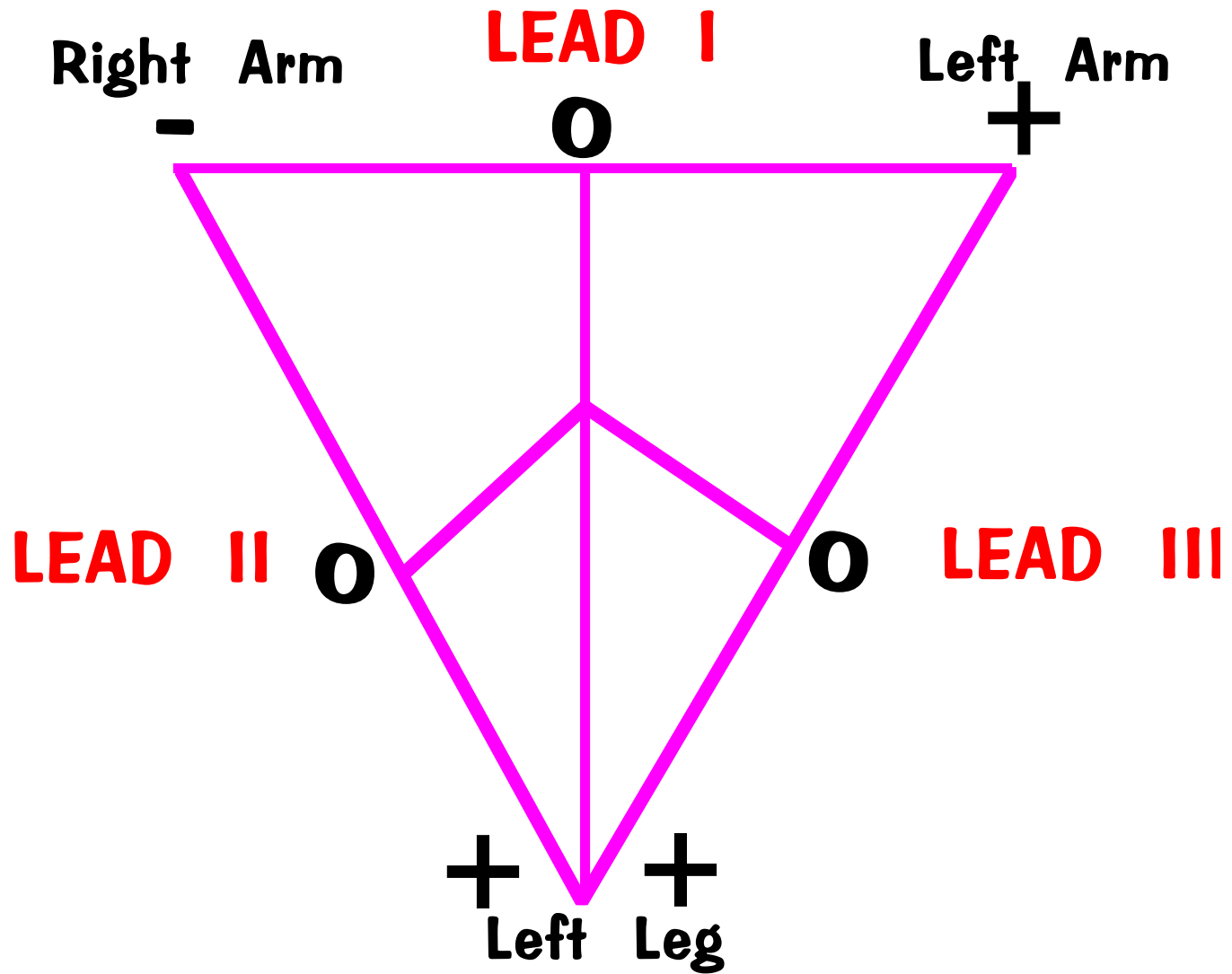
**LEAD 3**

(LEFT SIDE OF HEART)

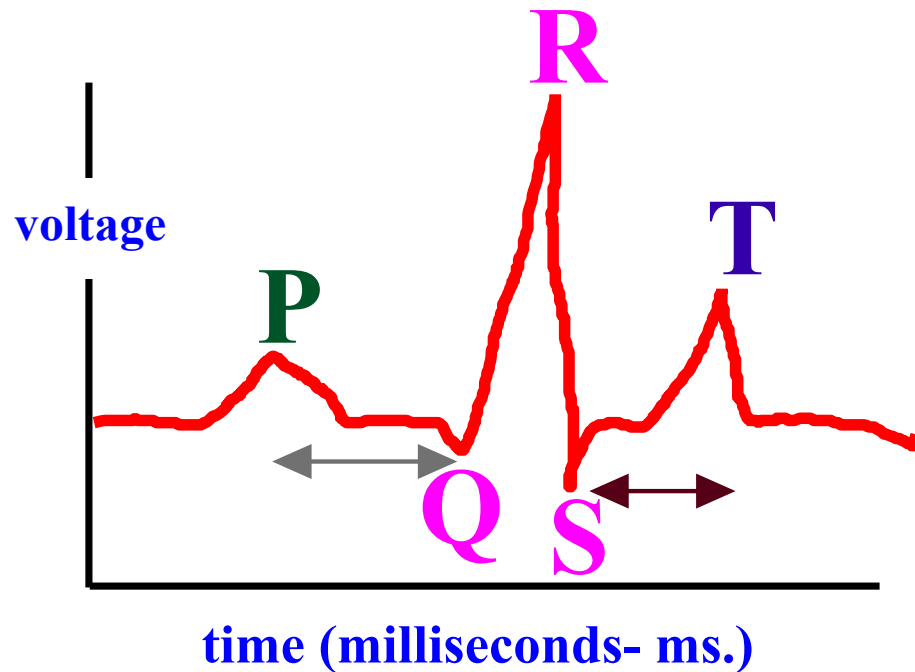
left wrist, left ankle

right wrist

# EINTHOVEN TRIANGLE



# EKG/ECG



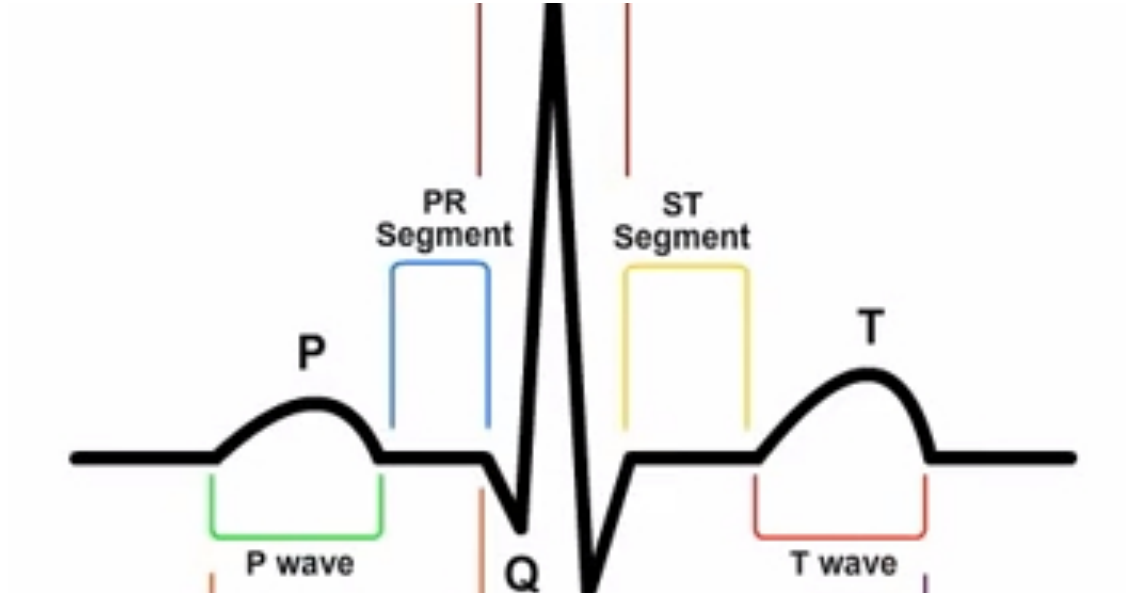
**P** = atrial depolarization  
(conduction through atria)

**QRS** complex =  
ventricular depolarization

**T** = ventricular repolarization

**S-T line** = refractory state of  
the ventricular myocardium

**P-Q line** = nonconductive  
state of AV during which  
atrial systole can be  
completed.



*See the You Tube Video on Lab Page*

# EKG/ECG

## Summary

7

**P**

atrial depolarization; time for the impulse to travel from *the sinoatrial node (SA) throughout the atria.*

**PR**

interval

time for the impulse to travel from the *atria ----> bundle of His ----> bundle branches of Purkinje's fibers*

**QRS**  
complex

**ventricular depolarization; time varies with sex/age**

**QT**

interval

time necessary for ventricular depolarization AND repolarization. *time varies with sex/age/heartbeat*

**T**

wave

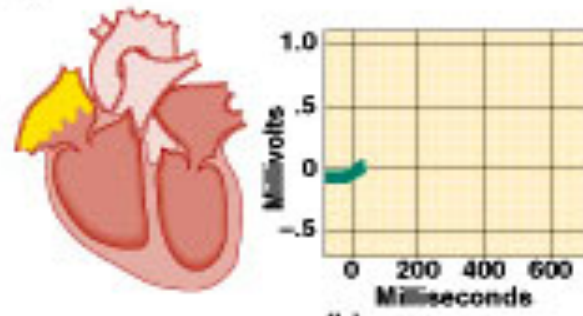
**repolarization of the ventricles. sometimes followed by a U wave (His/Purkinje's fibers repolarization)...not shown.**

**ST**

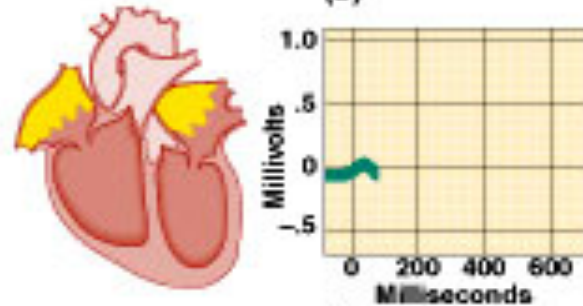
line

**indicates: end of ventricular depolarization AND beginning of ventricular repolarization**

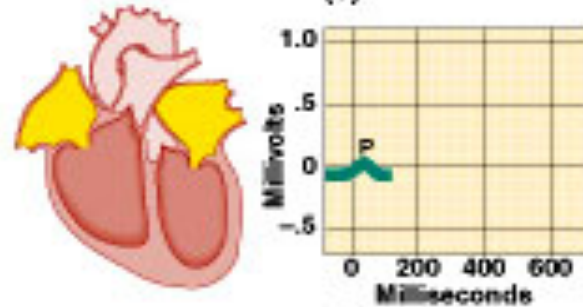
# EKG



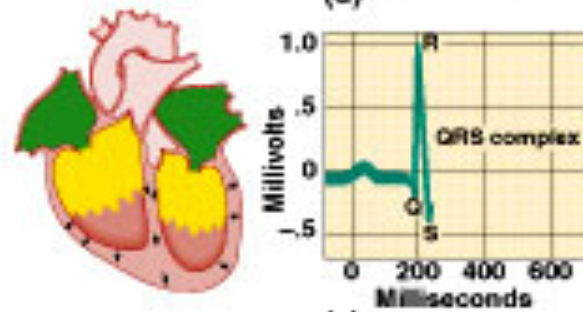
(b)



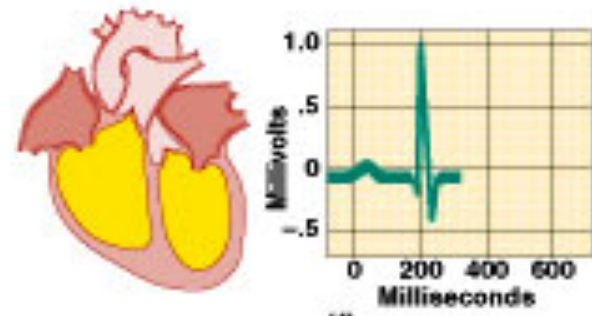
(c)



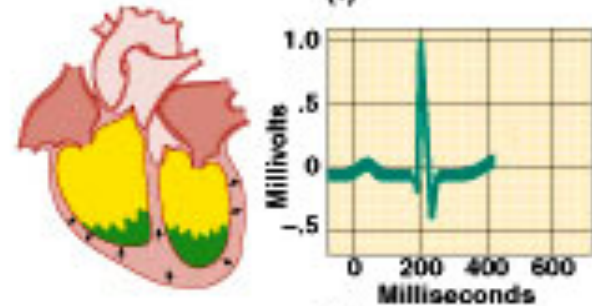
(d)



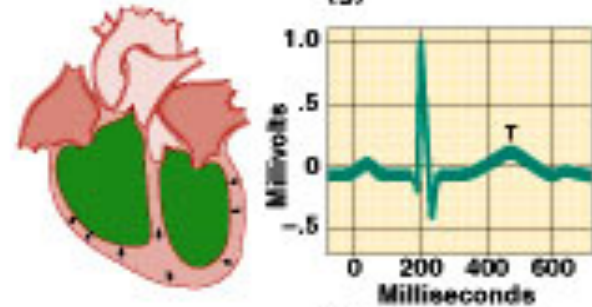
(e)



(f)



(g)

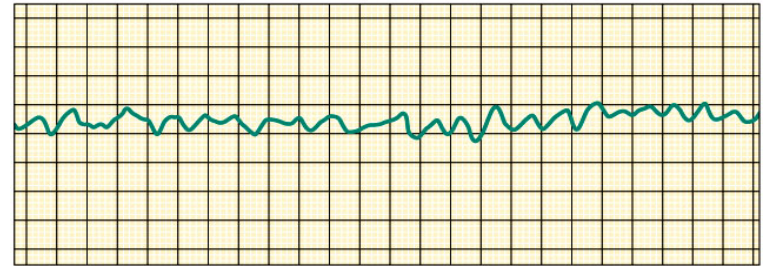


(h)

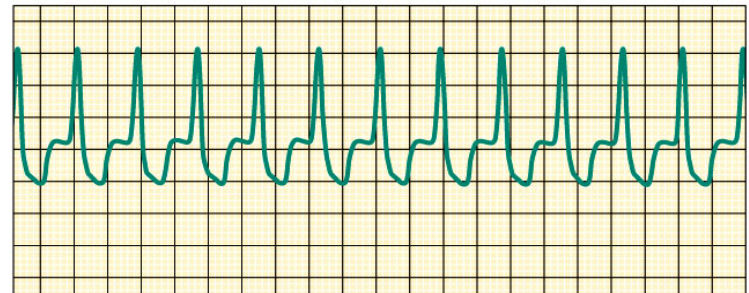


# Arrhythmias

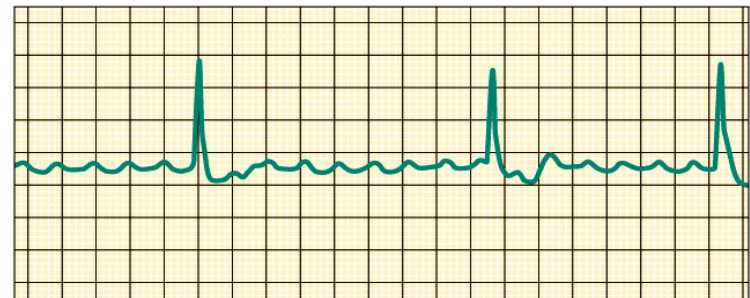
**Ventricular fibrillation**  
rapid, uncoordinated  
depolarization of ventricles



**Tachycardia**  
rapid heartbeat



**Atrial flutter**  
rapid rate of atrial  
depolarization



# Arrhythmias

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## Bradycardia



*Excellent EKG Exercise: [Link at our Lab website!](#)*

# *Sample EKG (ECG) Interpretations*

## *Normal Heart:*

*P wave always followed by a QRS wave.*

## *Damage to Coronary Circulation:*

*Waves may widen (contractions are slower).*

*Also, wave shape changes:*

*Example- ST segment depression*

## *Distance between two successive QRS waves:*

*Too close together- Heart beating too fast.*

*Too far apart- Heart beating too slowly.*

# BLOOD PRESSURE

measured with sphygmomanometer

**1st Korotkoff Sound: systolic pressure**  
artery has opened enough for blood to squirt through.

**Last Korotkoff Sound: diastolic pressure**  
artery completely opened; no more turbulence in blood.

**Systolic BP - Diastolic BP = PULSE PRESSURE**  
(actual working or driving pressure of the blood)

**END**