BI 358 Lecture 8
Dedicated to Donald Zadoff & Family

I. Announcements
Kraig Jacobson MD, Allergy & Asthma Research Associates, Oak Street Medical on Tuesday!
Quiz 3 on Blood & Immunology in Discussion. Questions?
Last update on outlines and paper drafts. Questions?

II. Cardiovascular Physiology
Torstar Books, G&H, Katz, LS,...
A. Cardiovascular system? Figure-8 loop D Chiras (DC), LS
B. Fetal development & circulation Torstar…, G&H fig 83-4
C. Layers: peri-, epi-, myo- & endocardium Torstar Books
D. ❤️ structure & function G&H fig 9-7, LS1...
E. Blood flow through ❤️ & periphery G&H fig 9-1, LS, DC
F. Coronary circulation & the cardiac cycle, composite events G&H fig 21-3, Katz, G&H fig 21-5, 21-6, 21-4; ch 9 fig 9-6
G. Autorhythmic cells & ❤️‘s electrical highway G&H fig 10-1

III. Lymphatic System
Torstar Books, DC, LS +...
Dedication to True Friend, Beloved Husband, Father, Grandfather, Artist & Dog-Lover
Donald Jerome Zadoff, 022426-012913
Wear Red next Friday (Feb 7th!) 
Help raise awareness about Women & ❤️ disease 

http://www.goredforwomen.org/
https://www.goredforwomen.org/about-heart-disease/facts_about_heart_disease_in_women-sub-category/statistics-at-a-glance/
7 Resolutions to Improve Health in 2014

• Quit smoking
• Avoid 2nd –hand smoke
• Know your numbers
• Process out processed foods
• Get moving
• Get your friends & family on board
• Spread awareness

Cardiovascular (CV) = Heart + Vessels + Blood!
**NB:** Figure-8 loop

- **Pulmonary**
  - Pulmonary arteries
  - Vena cavae
  - Capillary beds of lungs where gas exchange occurs

- **Systemic**
  - Aorta and branches
  - Arterioles
  - Capillary beds of all body tissues where gas exchange occurs
  - Venules
  - Oxygen-poor, CO$_2$-rich blood
  - Oxygen-rich, CO$_2$-poor blood

D Chiras 2013 fig 4-1b
Dual Pump Action & Parallel Circulation
Counter-clockwise
Fetal Circulation
≡ Aqua Animal
Bypass Lungs
R → L ♥ Shunt

G&H 2011 fig 83-4
Human \( \heartsuit = 4\)-chambered box? 2 separate pumps?

Upper = Atria

Lower = Ventricles

Upper = RA

Lower = RV

Pulmonary

Left = LA

Right = LV

Systemic

Primer Pumps

Power Pumps
Human $\heartsuit = 4$ unique valves?  
2 valve sets?

**Semilunar** = *Half-moon shaped*

1. Pulmonic/Pulmonary
2. Aortic

**AV** = *Atrioventricular*

3. $\bigcirc R$ AV = Tricuspid
4. $\bigcirc L$ AV = Mitral/Bicuspid
MITRAL VALVE
- Cusp
- Chordae tendineae
- Papillary muscles

AORTIC VALVE
- Cusp

G&H 2006 fig 9-6;
cf: G&H 2011 fig 9-7
Heart Valve Orientation & Scaffolding

- Pulmonary ring
- Aortic ring
- Mitral ring
- Tricuspid ring
- Muscle fiber
What the heck’s a *bruit*? *(brwe, bro̞ot) [Fr.] sound ≥ 25 subclassifications!*

**Aneurysmal b.** a blowing sound over an aneurysm.

**b. de canon** [Fr. sound of cannon] abnormally loud 1st heart sound heard in complete heart block.

**b. de craquement** [Fr. sound of crackling] a crackling pericardial or pleural bruit.

**False b.** artifact caused by pressure of the stethoscope or derived from circulation of the ear.

**b. de lime** [Fr. sound of a file] cardiac sound resembling filing.
Coronary Circulation = Crowns the Heart!
Heart Dominance May Influence Survival

**FIG. 1.9.** Diagrammatic views of the posterior surfaces of the human heart showing left (A) and right dominant (B) patterns of coronary artery supply. In the left dominant pattern, the posterior descending artery (PDA) is supplied by the circumflex branch of the left coronary artery (CIRC). In the right dominant pattern, the posterior descending artery is supplied by the right coronary artery (RCA). Other abbreviations: LAD, left anterior descending coronary artery; LA, left atrium; RA, right atrium; LV, left ventricle; RV, right ventricle; SVC, superior vena cava; IVC, inferior vena cava.
Coronary Arteries Pierce the Heart from Epi to Endo
Anastomoses May Provide Lifesaving Collateral Circulation!!

G&H 2011 fig 21-6
Coronary blood flow (ml/min)

- **Systole**
  - Contract & Empty

- **Diastole**
  - Relax & Fill

G&H 2011 fig 21-4
Electrical Events Precede Mechanical Events!

G&H 2011 fig 9-6
(Automatically) Shock the Heart then it Contracts!
Intrinsic Regulation: Autorhythmic
(a) Normal pacemaker activity: Whole train will go 70 mph (heart rate set by SA node, the fastest autorhythmic tissue).

(b) Takeover of pacemaker activity by AV node when the SA node is nonfunctional: Train will go 50 mph (the next fastest autorhythmic tissue, the AV node, will set the heart rate).

(c) Takeover of ventricular rate by the slower ventricular autorhythmic tissue in complete heart block: First part of train will go 70 mph; last part will go 30 mph (atria will be driven by SA node; ventricles will assume own, much slower rhythm).
Extrinsic Regulation: Nervous

**NB:** + Extrinsic Hormonal e.g. Adrenal Epi + NE

G&H 2006 fig 9-12
**Lymphatic System**

1. Lymph Nodes
2. Vessels
3. Lymph

No pump!
Lymphatic System
Alternative System of Circulation or Drainage System

Lymph Vessels || Veins
Lymphatic Vessel
Elephantiasis: Lymphatic Blockage Due to Mosquito-Borne Parasitic Worm

L Sherwood 2007