Comparative Anatomy
Biology 440

Fall semester:
TuTh 10:00 – 11:15  G23
Lab at 1:00 in 3106 or 3108

Spring semester:
TuTh 11:30-12:45  G23
Lab at 2:00 in either 3108 or 3106
Dr. Susan Raylman

Office hours:
Mon Wed 1:15 – 3:00
4234 LSB
Best way to contact me:
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Website
http://www.as.wvu.edu/~sraylman/comparative/

Anatomy Lab
Labs start next week on Tuesday
Don’t wear your best clothes to lab
No food or drink
Arrive on time
Go to either 3106 or 3108
Evacuation

Exit building from either of the two main doors
Move away from the building while avoiding parking lots
Do not congregate near building or parking lots

Why study comparative anatomy?

Shark cranial nerves
Human cranial nerves
Arteries leaving the heart

Your Inner Fish

Ancient history of the human hand
We see similar designs because organisms share a common ancestry.

The mechanism of evolutionary change is natural selection. It helps to consider NS at a population level.

How does the mechanism of NS relate to comparative anatomy?

1. There are physical limitations concerning animal design. Sometimes the genetic variation is not there.

Why doesn’t a dolphin have gills?

Nostril location modified

2. Evolution is restricted to modifying existing structures and genes.

Ex: Giant panda
3. Sometimes existing anatomy has no apparent function and is ‘leftover’ from ancestors or gains a different function. **Example:** Whale hips.
When we compare structures, we can mistakenly think that some designs are inadequate ‘stepping stones’ to designs of ‘higher’ organisms.

Branching bush of life:
All modern organisms (including humans) are each represented at the end of a branch. Each with their own evolutionary story.
Homologous structures
- share common ancestry, may have different functions

Analogous structures (homoplasic)
- same function
- may have different ancestry
- ex: bat wing & butterfly wing
- panda “thumb” and human thumb
Ancestral structure - state of a structure in earlier forms - “primitive”

Derived structure - state in later forms “advanced”

Synapomorphy - a derived structure that is shared by a group of organisms (and not found in others)
Zeroing in on Chordata

Some animal phyla

Coelomates

Body covering (from ecdysome)

Dorsal nerve cord

Dorsal vessel

Arteries

Digestive tract (from endoderm)

Mesoderm

Pharynx

Anus

Digestive tract (from endoderm)

Body covering (from endoderm)

These layer(s) lining internal organs (from mesoderm)

Annelid

Coelomate
Echinodermata, Hemichordata, Chordata are all deuterostomes

Some echinoderms

Deuterostomes have indeterminate development and radial cleavage (as opposed to determinate and spiral cleavage)

Linking echinoderms and chordates

At 8 blastomere stage...
Blastula stage - hollow ball of cells

Making the gut tube

Gastrulation
Then the blastula sinks in to make a blastopore, which has different fates depending on protostome vs. deuterostome

Making coelum
Protostome coelum forms in mesoderm
Deuterostome coelum buds off from developing gut
Chordates have the following structures at some time in their life cycle.
1. Dorsal hollow nerve cord
2. Notochord
3. Pharyngeal slits or pouches
4. Post-anal tail
5. Endostyle/thyroid gland

Early Cambrian seas about 550 million years ago:

Notochord
Dorsal to coelom - ventral to nerve cord.
Body support in Urochordata, Cephalochordata and vertebrate embryos
**Notochord**
Organizes later development, differentiation (induces neural plate)

Notochord is mostly replaced by vertebral column in vertebrates.

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**In mammals, a remnant of notochord remains in intervertebral disks (nucleus pulposus).**

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**Dorsal hollow nerve cord**
Formed by an invagination of some ectoderm (neural plate)

X-section through dorsal portion of embryo

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Slits are not present in all chordates, they may instead be pouches present during development.
Post anal tail

1. Area caudal to the anus, not containing coelom.

2. Used for locomotion in fish; various functions in tetrapods; may be lost.