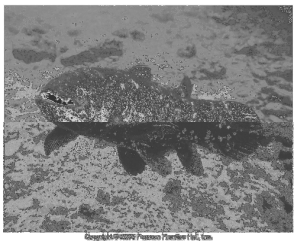
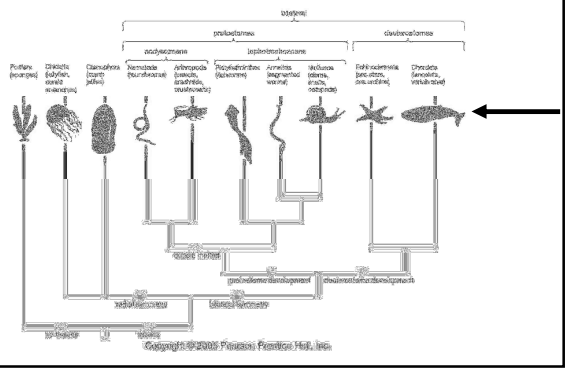
The Diversity of Animals 2

Chapter 23

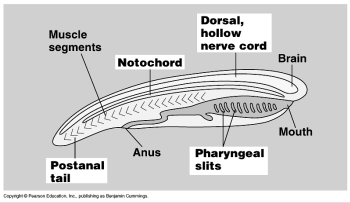


Phylogeny of Animalia (overview)

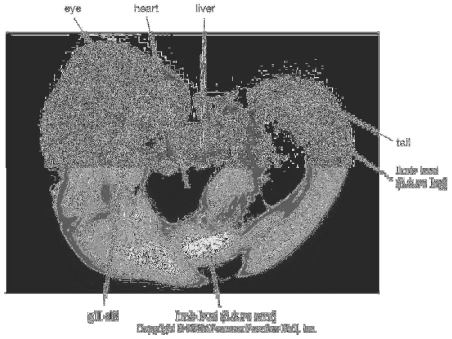


Key features of Chordates

- Phylum Chordata (the Chordates) includes both invertebrates and vertebrates that share (at some point in their life:
  - ❖Notochord
  - ❖Dorsal, hollow nerve cord
  - ❖Pharyngeal gill slits
  - ❖Post-anal tail

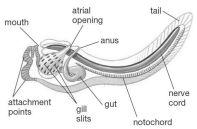


Human embryo: chordate features

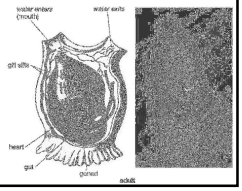


Invertebrate chordates

- Have a notochord, but not a true vertebral column
- Example: tunicates
  - ❖Have all 4 chordate features as larvae
  - ❖Lose
    - ➢Post-anal tail
    - ➢Notochord
    - ➢Most of dorsal hollow nerve tube
  - ❖Keep
    - ➢Pharyngeal gill slits
    - ➢Pharynx expands, used for filter-feeding



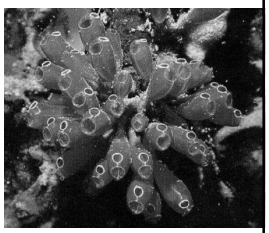
larva



adult

tunicates

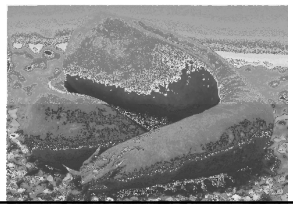
larvae



tunicate

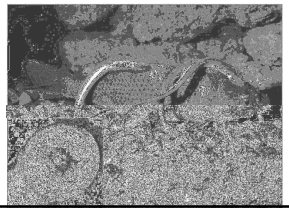
Vertebrates 1: Jawless Vertebrates

- Example 1: Hagfish
  - ❖Don't have a true vertebral column
    - ➢Not really vertebrates, but usually grouped with them.
  - ❖Secrete copious amounts of enzymatic slime to digest prey!



Vertebrates 1: Jawless vertebrates

- Example 2: Lampreys
  - ❖These do have a vertebral column, and thus are true vertebrates
  - ❖Parasites on other fish
    - ➢Use sucker-like mouth with rasping teeth (inside mouth and on tongue) to latch on and suck blood and body fluids



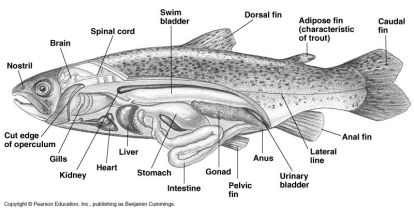
Vertebrates 2: Cartilaginous fishes

- New (derived) features
  - ❖ Jaws
  - ❖ Paired appendages
  - ❖ Mineralized skeleton
    - ➢ But reduced in the cartilagenous fish… (do have mineralization in teeth, parts of skeleton)
    - ➢ Thought to have evolved from more mineralized fishes
- Many cartilaginous fish are predators
- Examples: Rays and sharks

Rays & sharks

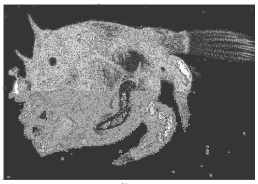
Vertebrates 3: Bony fishes

- New (derived) feature: swim bladder
  - ❖Gives rise to lungs in land vertebrates!
  - ❖NOTE: Mineralized bone is not a new feature despite the fact that they are the bony fishes!

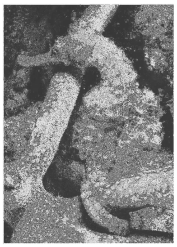


Vertebrates 3: Bony fishes

- Bony fish diversity



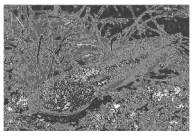
Deep sea anglerfish: reduced mineralization; reduced and attached males



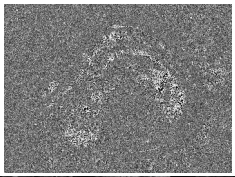
Seahorse: Long snout for feeding on plankton, long and mobile tail for hanging onto coral and algae, male has pouch for brooding young

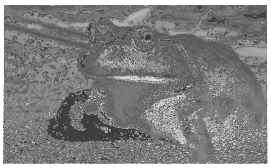
Vertebrates 4: Amphibians

- Amphibians live "double lives"
  - ❖Aquatic as larvae
    - ➢Gain oxygen with gills
    - ➢Move with tail
  - ❖Semi-terrestrial as adults
    - ➢Gain oxygen with lungs and through skin
    - ➢Move with legs
    - ➢Still tied to water for reproduction; <u>eggs will dry out without water;</u> many with external fertilization



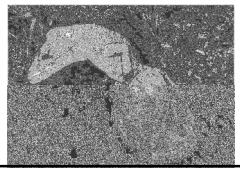
Frogs and salamanders



Vertebrates 5: Reptiles

- Reptiles, birds and many mammals are adapted for terrestrial life
  - ❖Key feature: <u>amniotic</u> egg
    - ➢Has shell that allows gas exchange without water loss (Nature's Gortex!)
    - ➢Internal membrane (amniotic sac) is fluid-filled and houses embryo
    - ➢Reproduction is thus no longer tied to water

Vertebrates 5: Reptiles

- Other adaptations of reptiles and birds to terrestrial life
  - ❖Tough, scaly skin resists water loss
  - ❖Internal fertilization
  - ❖More efficient lungs and circulatory system
    - ➢Better adapted than amphibians for air-breathing
    - ➢Birds have extremely efficient lungs!

Vertebrates 5: Reptiles (diversity)

Turtles

Tuataras
- Only found on New Zealand

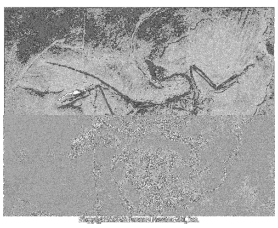
Crocodiles and Alligators
- Largest reptiles
- Closely related to dinosaurs

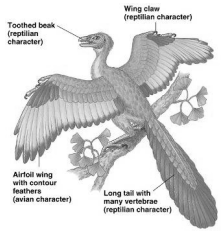
Snakes

Lizards

Vertebrates 6: Birds

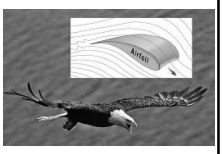
- Birds are closely related to reptiles ("feathered reptiles")
  - ❖*Archaeopteryx* (and similar fossil "reptile-birds") show relationships between reptiles and birds





Vertebrates 6: Birds

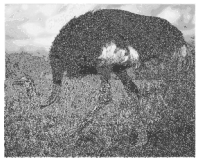
- Birds are adapted for flight
  - ❖Feathered wings (airfoils)
  - ❖Light for flight!
    - ➢Hollow spaces in bones
    - ➢Reduction of organs (i.e. single ovary)
    - ➢Absence of teeth
  - ❖Endothermic
    - ➢Higher metabolic rates needed for flight
  - ❖Acute visual systems
    - ➢Coordination of flight
  - ❖Efficient respiration and circulation



Vertebrates 6: Birds (Diversity)

Hummingbird
• Tiny
•60 cycles/sec wingbeat

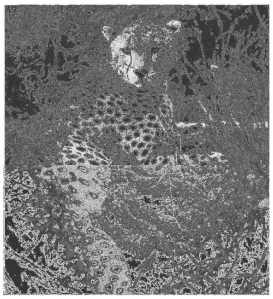
Frigatebird (juvenile)
• Type of seabird
• Many seabirds are extraordinary long-distance travelers and fishers



Ostrich
• Largest bird (up to 300 pounds)
• Flightless

Vertebrates 7: Mammals

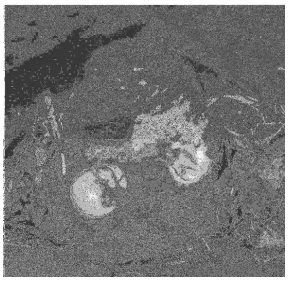
- Key features
  - ❖Hair
  - ❖Provide milk to their offspring
    - ➢Via mammary glands



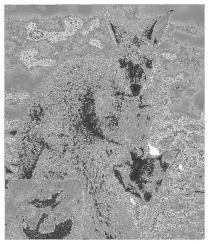
Vertebrates 7: Mammals (Groups)

- Monotremes (Example: duck-billed platypus)
  - ❖ **Egg-laying mammals**
  - ❖ **Have mammary gland but no nipples; young lick milk off fur.**
- Marsupials (kangaroos and koalas; primarily in Australia)
  - ❖ **Born early in development; completes development while nursing (usually in pouch)**
- Placental mammals
  - ❖ **Complete embryonic development within uterus**
  - ❖ **Extensive placenta where exchange of nutrients and gas between mother and offspring**

Monotremes



Marsupials



Placentals