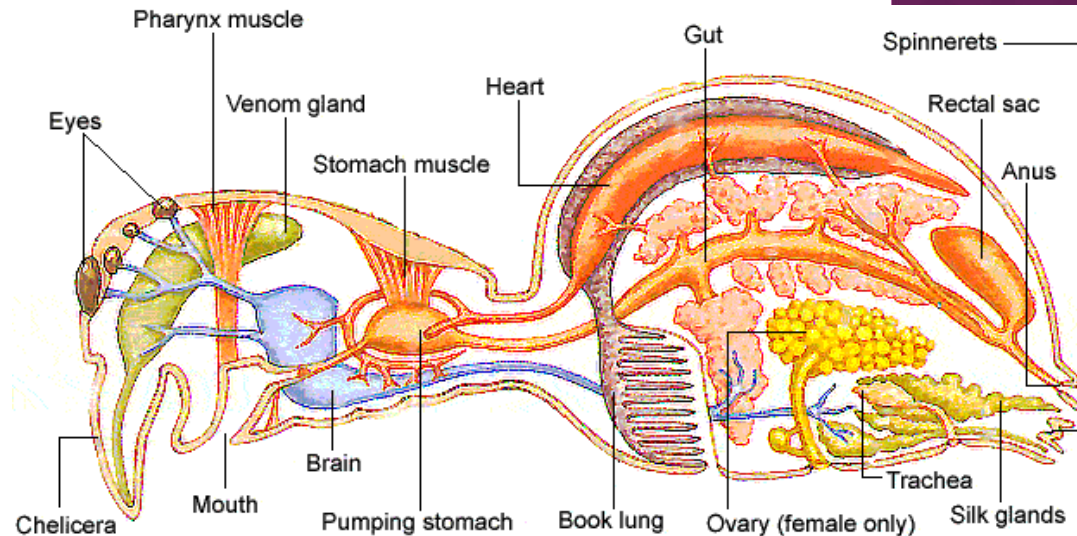


**SPECIALIZED
STRUCTURES THAT
EXEMPLIFY
ADAPTATIONS TO
LIFE IN WATER AND
ON LAND**

Kate Bailey

LAND: SPIDERS

- ◉ Different respiratory systems
 - Single pair of booklungs; Pholcidae
 - Two pairs of booklungs; Mesothelae
 - Pair of booklungs and tubular trachea; orb weavers and wolf spiders
- ◉ Book lungs
 - Stacked platelike structures contained in an internal chamber
 - Extensive surface area
 - Structural adaptation that enhances exchange of oxygen and CO₂ between hemolymph and air

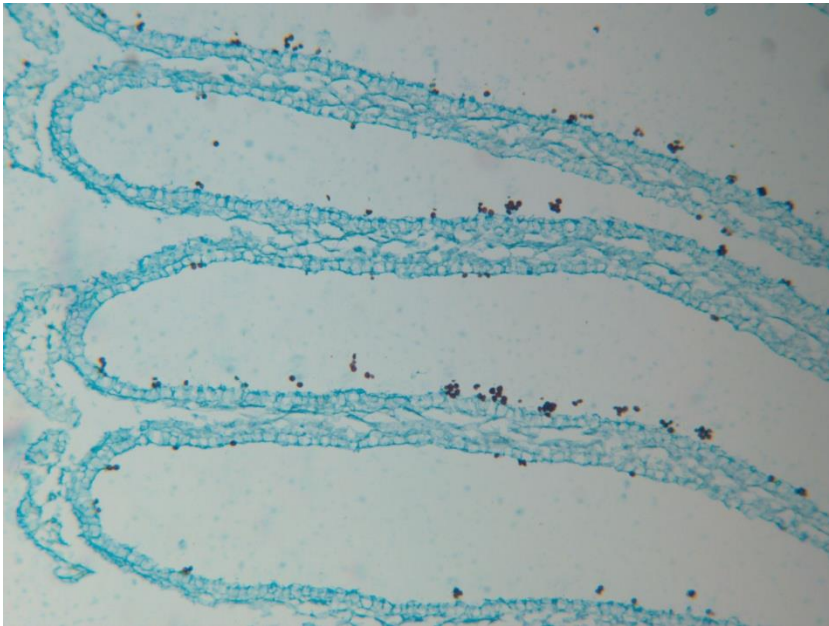


LAND: COCONUT CRABS, *BIRGUS LATRO*

- Largest land-living arthropod in the world
- Breathe using a branchiostegal lung
 - Developmental stage between lungs and gills
 - Contains a tissue similar to that found in gills
 - Suited to absorption of oxygen from air
 - Located in cephalothorax
 - Expanded laterally to reduce diffusion distance
- Has an additional set of rudimentary gills



Land: Fungi



Coprinus spp. hyphae comprising the gills and basidiospores

- Haploid basidiospores produce new haploid mycelia when they germinate
- Gills increase surface area:
 - Spore production
 - Spore dispersal

(Fischer and Money 2010)

LAND: PLANTS

- **Horsetails (Phylum Sphenophyta)**
 - Microphylls have epidermal cells containing silica
 - Stem longevity
 - Alternative to lignin
 - Sporangia clustered into umbrella-shaped sporangiophores
 - Grouped together geometrically into a strobilus
 - Asexual reproductive structure



(imagejuicy.com)

WATER: ARACHNIDS

○ Horseshoe crabs, *Limulus polyphemus*

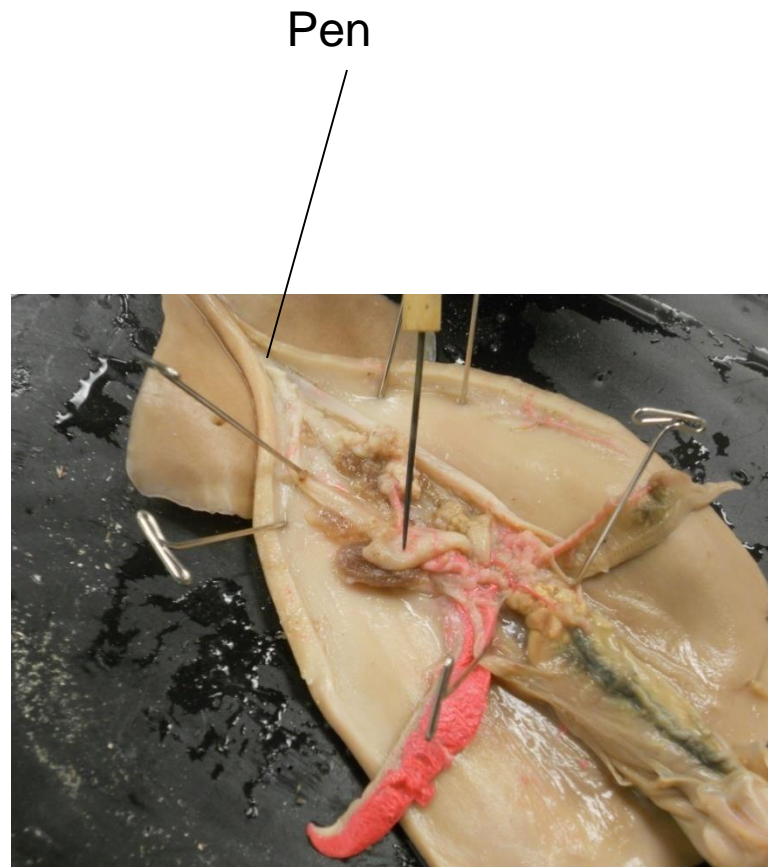
- U-shaped carapace is smooth and brown, can be covered with epiphytic plants epizooic animals
- Molts periodically to accommodate growing body
 - New skeleton is flexible and then hardens as protein reforms
- Spike-shaped tail, the telson, functions as a tool for digging in sand and also as an aid in flipping the crab over if it gets flipped on its back side
- 10 eyes located all over their bodies, on the back and sides
 - Eyes found on the back have 1000 photoreceptor clusters with cornea and lens
 - Have the largest cones and rods of all known species

EYE



Water: Cephalopods

- Squid, Phylum Mollusca
 - Pen for supporting the mantle and for muscle attachment
 - Water jet for propulsion



WATER: PROTISTS

◉ Diatoms (Phylum Bacillariophyta)

- Frustules (cell walls of silica) have elaborate patterns and numerous tiny pores
- Some species secrete mucilage from the pores, which allows gliding locomotion
- Free-swimming diatoms vary their density by producing or using oil

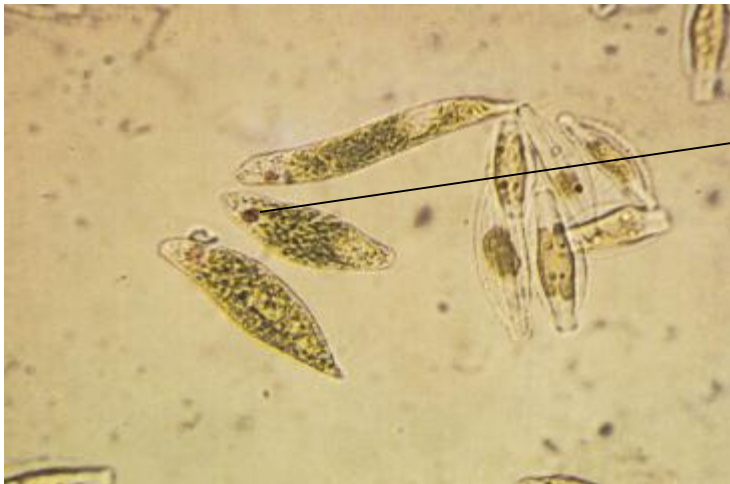


(Daviddarling.info)

Water: Protists

◉ *Euglena* (Clade Excavata)

- Mixotrophic; can engulf prey by phagocytosis or can become autotrophic in sunlight
- Eyespot: pigmented organelle that functions as a light shield
- Light detector: swelling at the base of the long flagellum
 - Detects light that is not blocked by the eyespot
 - *Euglena* moves toward light of appropriate intensity



Eyespot

WATER: MACROINVERTEBRATES

○ Caddisflies (Trichoptera)

- Build protective cases around their bodies
- Increase dissolved oxygen content by undulating bodies within the case



(photomacrography.net)

BRIDGING LAND AND WATER

- ◉ Structures to land and water are not restricted to one or the other
 - Consider the role of silica
- ◉ Major structures help the organism:
 - Maximize oxygen uptake
 - Book lungs and gills in water and land
 - Protection from predators
 - Structural support
 - Maximize reproductive success

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- ◉ **Image 7.** <http://people.westminstercollege.edu/faculty/tharrison/emigration/caddisfly.htm>
- ◉ **Image 8.**
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