Organismal Biology Test 3

Growth

- Primary growth: increase in length, primary plant body
  - Primary plant body: parts produced by primary growth
  - Green herbivorous
  - Meristems – zone of rapid mitosis
    - Apical: shoot, root
    - Initials and derivatives
    - 3 tissue systems

- Secondary growth: occurs 2nd year of life, secondary plant body
  - Increase in girth (gets wider)
  - Lateral growth
  - Woody
  - Meristems
    - Vascular cambium
      - Xylem to inside
      - Phloem to outside
      - Newest part right next to vascular cambium
      - Xylem is accumulated year after year, phloem is not
      - Count xylem for age
    - Cork cambium
      - Produces periderm (around trunk)
      - Development of secondary meristems
        - 1st year stem
      - Picture:
What is bark?
- Xylem is wood
- Vascular Cambium – meristem
- Secondary Phloem
- Periderm = complicated: 2 layers + meristem
  - Phelloderm
  - Phellogen = cork cambium
  - Phellum

What is Girdling?
- Kills the tree
- Cutting off a ring of bark
- Meristems are removed in the entire ring to where it won't grow back

Why are there rings in wood?
- Seasonal change
- Dormant + spring (rain) + water = BIG cells → then summer = dryer → then they stop = dormant & repeat
- Picture:
What is heart wood?
- In the center
- Older wood
- May or may not be functional
- Die but still alive

What is sap wood?
- New wood
- Functional

Plant Physiology= how?
- Plant hormones= organic chemical produced by plants in response to environment and produce response in other plant parts
  - Response to environmental influence
  - Stimulatory/inhibitory regulation
  - Allows plants to do right thing at right time

1. Auxins
   - Apical dominance
   - leaf abscission
   - increased mitosis
   - phototropism
     - Phototropism= plant bends to face light
   - Sun inhibits auxins
   - Up mitosis
2. Cytokinins
   - Influence cell division
   - oppose auxins
   - balanced growth
3. Ethylene
   - Fruit ripening
   - smallest hormone
   - same in every plant
   - can influence other plants
4. Abscisic Acid
   - Response to Stress and dormancy
   - Inhibits growth
5. Gibberellins
   - Cell division and elongation
   - Dwarfism – lack of gibber
     - Causes dwarfism when absent
Plant Behavior

- Response to environmental influence through hormones
- Tropisms = directional response (growth) to environmental stimulus
  - Phototropism: light
    - Positive (usually) – heliotropism
    - Negative = scototropism (rare)
    - Heliotropism = tracking movement of sun
      - Ex: sunflowers
      - Positive
    - Tortilifoliation = twisting of leaves
  - Gravitropism = plant stems grow up (negative), roots grow down (positive)
  - Hydrotropism = water response
  - Thigmotropism = touch; twining
    - Reduces growth rate
    - Jasmine

Nastic Movements

- Non-directional = nasty
- Nyctinasty
  - Night
  - In response to darkness
  - Prayer plant
- Thigmonasty
  - In response to touch
  - Venus Fly Trap

Kingdom Fungi

- Heterotrophic – not capable of making their own food
  - Exoenzymes – feeding takes place on the outside of their body
  - Absorptive – no indigestion
  - Decomposers – feed on dead organisms
    - Saprobic
  - Parasitic/pathogenic – feed on living organisms
  - Mutualists – each get a benefit; host & dependent

Sessile: No movement (most)

- Some with flagellate spores
- Growth
- Spore dispersal

Zygotic meiosis– haploid organism

- Syngamy
  - Plasmogamy → n + n = dikaryotic cells
  - Plasmogamy + karyogamy = 2n = zygote
• Single-celled
  o Ex: yeast
  o Budding
• Multicellular – most fungi
  o Hypha (-ae)
    ▪ Septate= with divisions between cells
    ▪ Nonseptate= no divisions
    ▪ Nonseptate=coenocytic
  o Mycelium
  o Haustoria=specialized cells that allow fungi to penetrate host cells
    ▪ Mycorrhizae
  o Spores= variety
    ▪ Used for dispersal and dormancy
    ▪ n, 2n
    ▪ single cells, some multi
    ▪ asexual/sexual
• Phylum Chytridiomycota
  o Aquatic fungi with flagellated zoospores including parasites of amphibian skin
  o Only group with motile spores (zoospores)
• Phylum Zygomycota
  o means “cat” bc mushrooms
  o Bread molds, sugar molds, and pin fungi
  o Thick-walled dormant zygospores
  o Spores → inside spore containers
    ▪ Yolk fungi
  o Terrestrial
  o Has zygosporangium that contains zygospores
• Phylum Glomeromycota
  o Arbuscular mycorrhizae (most)
    ▪ Tree-like fungus roots
    ▪ Have structures that penetrate host cells and look like trees
• Phylum Ascomycota
  o The sac fungi
  o Asexual spores= conidia
  o Sexual spores= ascospores
  o Ascocarp
    ▪ Ascus
      • Ascospores
  o Conidium
    ▪ Asexual spores
  o Morel
- Bread yeast, brewer’s yeast
- Dutch elm disease, chestnut blight
- Ringworm
- Truffles- smells like hogs breath; hard wood trees in Europe
- **Claviceps purpurea**
  - Ergot/ergotism
  - LSD is made from this
  - St. Anthoney’s
- Life Cycle of an Ascomycota:
- **Phylum Basidiomycota** – “club fungi”
  - Club fungi
  - Mushrooms and toadstools
  - No asexual spores, no gametangia
  - Sexual spores = basidiospores
  - Basidium – 4 spores on the outside
  - Toadstools = poisonous
  - Life cycle:

- **Lichens** – group of fungi (2 phyla)
  - Composite organisms
  - Photobiont and mycobiont
  - Mutualism
  - Crustose
  - Foliose
  - Leaf-like
  - Fruticose
    - Most common
- **Imperfect fungi** – group of fungi – may not all be related
  - No sexual stages known
  - *Aspergillus niger*
    - Causes black mold; common food contaminant
  - Trichophyton sp.
    - Causes athlete’s foot
Kingdom Flanimalia

- Metazoa (not Protozoa)
- Multicellular
- Movement= locomotory structures
  - Some sessile
- Heterotrophic (consumes food)
  - Ingest → digest → egest
  - Some with symbiosis
- No cell walls
- Gametic meiosis
  - Asexual and/or sexual reproduction
- Evolutionary Trends:
  - 1. Level of Organization
    - Protoplasmic
    - Cellular
    - Tissue
    - Organ and organ system
  - 2. Symmetry
    - Asymmetry
      - Rare
      - Occurs in sponges
    - Radial
      - Associated with animals that don’t move much
      - Biradial=bilateral + radial
    - Bilateral
      - Associated with more locomotion
      - Cephalization=development of heads
    - Secondary radial symmetry
  - 3. Body Cavity
    - Acoelomate= without body cavity
    - Pseudocoelomate= no true body cavity
      - In smaller animals
      - Simple, not large cavity
    - Eucoelomate with peritoneum
      - Most animals
  - 4. Embryological development
    - Picture:
5. Metamerism = segmentation
   - Repeating body parts
   - Tagmosis

6. Ecdysis
   - Molting
   - “ecdysozoa” = one of the three main lineages of bilaterian animals; animals that molt (shed)

7. Larval types, feeding structures
   - “Lophotrochozoa” = one of the three main lineages of bilaterian animals; organisms that have lophophores or trophophore larvae

Basal Metazoa (= Animalia)
   - Basal = sponge – “beginning”

Organism of the week:
   - Cliona celata – the boring sponge
   - Bioerosion – function: speeding up of calcium carbonate
   - Hard sponge – sclerosponges, hard, calcareous

- Phylum Porifera
  - Sponges cellular level of organization
  - Lack of symmetry – asymmetry
  - Sessile adults
    - No structures for locomotion
  - Cells unattached in sponges
    - No tissues (only group without tissues)
  - Matrix – mesophyl (with cells and skeleton imbedded)
    - Gel like substance secreted by cells
  - Cell types
    - Choanocytes
    - Respiration
    - Waste removal
      - Filter feeding

Picture:

- Cell Types:
  - Choanocytes
  - Archaeocytes
- Function: food transfer
- Ameboid shape – flexible
- secreting skeleton
- totipotent – grow back
  - Porocytes
    - Not found anywhere else
    - Cells that make up spores
    - Tubular shape
    - Ostium: in simple sponge- opening for water entry
    - Water movement
    - Smallest
    - Picture:

- Pinacocytes
  - Found on external surface (covers surface)
  - Thin and flat
  - Also internal: maintain shape of canals

- Skeleton:
  - Organic fibers
    - Collagen
    - Sponging – protein fibers
  - Inorganic spicules
    - Hard; made of silicon dioxide or calcareous – calcium carbonate
      - Silicious – glass like
    - Triaxons:
      - Hexactines:

- 3 body types
  - Simple (ascon)
    - Single osculum
• Choanocytes line spongocoel
• Porocytes form ostia
  ▪ Intermediate (sycon)
    • Single osculum
    • Choanocytes line flagellated chambers
    • Ostia lead to incurrent canals
    • Prosopyles
    • LARGE sponges
  ▪ Complex (leucon)
    • Multiple oscula
    • No spongocoel (atrium)
    • Incurrent & excurrent canals
    • Prosopyles & apopyles

Picture:

- Aquiferous systems: trace water flow through structures
- **Class Calcarea**
  - Named by calcareous spicuals
  - All marine
  - All small
  - May exhibit any of 3 body types
- **Class Hexactinellida**
  - “glass sponges” – silicious spicuals
  - Spongicola – sponge loving shrimp
    • Symbiosis – only benefit to one side
    • + 0 (plus zero)= commen salism
  - Sycon
- **Class Demospongiae** – largest of them all!!!
- Spongy & fibers
- Silicious spicuals
- Leucon (all)
- Freshwater sponges
  - Environment changes
    - Winter = harsh – set aside dormant
- Gemmules
  - Dormancy + dispersal
    - Matrix: mesophyll – holds it all together

**Phylum Ctenophora**
- Ctenophora – sister vs. Porifera – sister hypotheses (an unsettled debate)
  - Basal
  - Ctene = “cone like” = 8 ctene rows
  - Bioluminescence
  - Irridescence
  - Biradial symmetry
  - Diploblastic -2 layers of tissues
  - Ctenes & colloblasts
    - Ctenes used in locomotion & feeding
      - Contractile – not bendable
    - Many transparent & bioluminescent
  - Ctenophoran diversity
    - 200 + species
    - 2 classes (with and without tentacles)
    - Most plankton

**Organism-of-the-week:**
- **Species:** *Grammostola rosea*
  - Rose hair tarantula
- **Genus:** *Grammostola*
- **Family:** Theraphosidae
- **Order:** Aranea
- **Class:** Arachnida
- **Phylum:** Arthropoda
- **Kingdom:** Animalia
- **Domain:** Eukarya
- **Characteristics:**
  - Chelicera-first pair of clawlike feeding appendages characteristic of chelicerates
  - Pedipalps – second pair of appendages
    - Mouth accessories
  - Spinnerets
  - Urticating hairs- not in other spinder
Super Phylum Radiata

- Phylum Cnidaria
  - Radial symmetry
  - Diploblastic = 2 layers of tissue in embryo
    - Tissue level of organization - no organs
  - 2 developmental body forms: polyp and medusa
    - Mouth
    - Hypostome or manubrium
    - Tentacles
    - Body column or bell
    - Attached or unattached pedal disc
    - Thick or thin mesoglea
    - Words of position: oral and aboral
    - Simple gut — only one opening (no complex development)
    - Medusa = capable of sexual reproduction (mature) — final stage of maturity
    - Polyp = asexual reproduction only — normal stage to find
    - When medusa is lost, polyp undergoes sexual and asexual reproduction
    - epidermis, mesoglea, gastrodermis, gastrovascular cavity
    - epidermis comes from embryonic ectoderm
    - gastroderm comes from embryonic endoderm
    - gastroderm lines the gut
    - mesoglea = layer between epidermis and gastroderm
      - mesoglea = glue-like noncellular layer (not a tissue)
    - gastrovascular cavity = gut (simple gut)
      - Develops from gastalation
      - Digestion
      - Nutrients & wastey hormones are distributed
      - Fluid filled — hydrostatic
        - Pressurized
    - hydrostatic skeleton
  - Medusa:
    - Unattached
    - Jelly: mesoglea = thick
    - Bell
    - Manubrium
    - Planktonic
    - Think mesoglea
    - Thinner gastrovascular cavity
  - Polyp:
    - Attached
- Body column
- Hypostome → becomes manubrium
- Pedal disc
- Thin mesoglea

○ Cnidocytes with nematocysts
  ▪ Cnidocytes are stinging cells
  ▪ Comes only from Cnidea
  ▪ Nematocysts deliver the sting
    • Eversible = turns inside out

○ Germ layers of embryo
  ▪ Ectoderm = outer → becomes epidermis
  ▪ Endoderm = inner → becomes gastrodermis

○ **Class Hydrozoa**
  ▪ Hydra = genus, chlorohydra, and others
    • Polyp predominates
  ▪ Why is chlorohydra green?
    • Green alga living within tissues
    • Lives of these animals depend on the alga
  ▪ Budding: form of asexual reproduction in polyp
  ▪ Colonial polyps with polymorphism
    • Portugese man-o-war (venomous)
    • Blue Button
    • By-the-wind sailor
    • Jelly fish = medusa
    • Stinging colony
    • Axial polyps = pneumatophore
      ○ Gastrozooids = feeding polyps - stomach
      ○ Gonozooids = reproductive polyps
      ○ Dactylozooids = stinging polyps
  ▪ **Craspedacusta sowerbyi** - freshwater jellyfish
    • not a member of true class
  ▪ Larva of cnidarians = planula
  ▪ Colony = gastrozooids and gonozooids

○ **Class Scyphozoa**
  ▪ Scyphozoan life cycle:
    • Egg and sperm
    • Lava = Planula
      ○ Characteristics of all Cniderans
      ○ Short distance dispersal
    • Scyphistoma
    • Strobila
- Ephyra → 8 lappets → young medusa (snowflake looking)
- Medusa
  - *Cyanea gigantean* – giant jellyfish
  - Upside-down jellyfish - sunlight
  - Thimble jellies
  - Stalked jellies
- **Class Cubozoa**
  - Box jellyfish
  - *Chironex fleckeri* = sea wasp
  - extremely potent venom
  - strong swimmers that overtake prey
  - Austrailia
    - Strong swimmers
    - deadly
- **Class Anthozoa**
  - Anemones = solitary, no skeleton
  - Anthro = flower
  - Corals = colonial, produces exoskeleton
  - Largest class of Cnidaria
  - all lack medusa
  - sexual & asexual due to absence
  - polyp only
    - capable of both asexual and sexual reproduction
  - largest polyp
  - body wall folded for support and to divide gastrovascular cavity
    - septum
    - pharynx → just inside mouth (tube within a tube)
    - gastrovascular cavity is divided into separate compartments
  - *Fungia sp.*
    - Solitary coral, mushroom coral
  - Other stony corals → colonial
  - Soft corals, gorgonians
    - Called gorgonians because they have the protein gorgonian dominant in their exoskeleton

**Super Phylum Bilateria**
- No body cavity
- Bilateral symmetry
- Lophotrochozoa
- Platyzoa
- **Phylum Platyhelminthes**
  - Flat worms
- Triploblastic
- Acoelomate
- Protostome= “first mouth”; formed from first opening called the blastophore
- Organs and organ systems
- “acoelomate bilateria”
- **Class Lophotrochozoans**
  - Named for two common characteristics:
    - Lophophore= a feeding structure with tentacles for filter feeding
      - A possible remnant from larval stage
    - A distinct larval stage called a trochophore
- Why are Platyhelminthes flat?
  - The bigger they are the flatter they are
  - They are flat because they are acoelomate
    - Lack a body cavity
  - They only have 1 maximum distance that materials can be transported across solid tissue
- Ribbon worms
- Tape worms
- Digestive System:
  - Gastrovascular cavity (usually branched)
  - Pharynx
- Excretory System:
  - Osmoregulation
  - Protonephridium
    - Flame cells, ducts, nephriodiopores
    - For osmoregulation
    - Kidney-like
    - Fresh water – plananon anatomy
    - Flame cells excrete water with waste
- Nervous system:
  - Ganglia, cords, sensory structures (ocellus and auricles)
    - Auricles= ears, but they smell not hear
    - Ocellus = eye spots
  - Development of head=cephalization
- Regeneration: recover from wounding; reproduce asexually
- Neoblast, blastema
  - Neoblast=totipotent
- Reproductive system: most are monoecious
- **Class Turbellaria**
  - Planarians= flat or leaf-like
Most are free-living
- Only class that includes free-living
- Largest = marine form

**Class Trematoda**
- Flukes
- Digenia (two generations or two hosts)
  - Including: schistosomes
    - Blood flukes
    - Swimmer’s itch
    - No rediae, no metacercaria
- 1. Adult in human liver
  - capable of sexual reproduction through cell fertilization
  - eggs released in feces
    - get to gut through bile duct
- 2. Eggs hatch in fresh water → miracidium larva (first larval stage)
- 3. Eaten by snail → sporocyst (2nd larval stage)
  - Schizogony – capable of divisions into many (could be 1,000)
- 4. Redia
  - 3rd larval stage
  - Schizogony
  - Asexual reproduction
- 5. Cercaria (4th larval stage)
  - Exit snails body
  - Temporarily free-living
  - One function: find a host (fish)
    - Burrow into fish
- 6. Metacercariae-
  - dormant
  - Encyst: Bladder-like covering
- 7. Eaten by human
  - Then starts all over with number 1
  - Could develop into adult if eaten by human → end up in gut → blood

- Host → Host = environmental conditions
  - Fecal water
  - Snail & fish present
  - Human eat uncooked fish

- Cestoda – tapeworms
  - Scolex – consist of acetabula/ suckers
    - For host attachment
- Beef tapeworm – Taema Saginatus
  - Cows
- Largest tapework = 75ft
- No gut
- Microtiches = small hairs increase that increase surface area
- Bud = proglottids
  - Youngest: immature
    - Mature
    - Gravid
  - Chain – longitudily = strobila
    - Scolex + Stobila
- L.C
  - 1. Grand proglottids
    - Fecal contamination
  - 2. Eaten by cows
  - 3. Hatch into oncosphere (larva stage)
  - 4. Burrow in gut wall and end in circulatory system; encyst (becomes part of bladder – dormant) in muscle tissue
  - 5. Cysticercus L = bladderworm
    - Inside out scolex (young tapeworm)
  - 6. Eaten by human (under cooked)
    - Everts scolex, attaches, strobilizes
- Acoelomate bilateria (cont.)
- **Phylum Nemertea** – proboscis worms, ribbon worms
  - Rhynchocoel – snout cavity – lined with circular muscles to push proboscis out
    - Complete gut – 2 openings (mouth and anus)
    - True circulatory system
  - Lineus longissimus – the bootlace worm – longest animal

**Picture:**

Animals with body cavity
- Lophotrochozoa
  - **Phylum Annelida** – segmented worms
    - Protostomes, eucelomate, trophophore larvae
    - Metamerism – somites
    - Repetition of organs
      - EX: metanephridia
  - Metanephridium
    - Nephrostome – mouth like
    - Post septal coiled tubule, capillary network
    - Nephridiopore
  - **Class Oligochaeta** – “relatively few”
    - Clitellum – mucus production for mutual sperm transfer and cocoon formation
    - Sperm groove
      - Gonopore
  - **Class Polychaeta**
    - Errant & sedentary marine worms
    - Nereis – sandworms
    - Parapodia – leg on the side (lateral projections)
    - Sea mouse
      - Errant
    - Chaetopterus
    - Parachment tubeworm
      - Sedentary
      - Heteronomy – segments are different depending on region bc parapodia are different
    - Sabellids- feather duster fan worms
      - Sedentary
      - Radioles – extremely long and feathery; move particles to mouth for filter feeding
    - Lugworm – Arenicola
      - Sedentary burrow castings
    - Palolo – Eunice viridis
      - Errant
      - Epitoky
      - Negative phototaxis – atoke
      - Positive phototaxis – epitoke
      - Strobili
      - Sexually mature
      - Synchronous swarming
        - External fertilization
  - **Class Hirudinea**
- Parasitic & predaceous leeches
- Ectoparasitic – feeds on larger animals
- Half and half
- Hirudo medicinalis – medical leech
  - Stylets within anterior suckers
    - Mouth parts
      - Can puncture capillaries
  - Salivary secretions
    - Anaesthetic
    - Anticoagulant – prevent clotting
      - Most famous: hypouden
        - Heart drug
    - Antiseptic – kills bacteria