

Chapters 32-34: Animal Diversity

AP Biology 2012

1

Animal Characteristics

- * Heterotrophs
- * Multicellular Eukaryotes
- * Cells lack cell walls
- * Bodies held together by structural proteins like collagen
- * Contain nervous tissue and muscle tissue
- * Most reproduce sexually with diploid stage that dominates the life cycle
- * After fertilization, zygote undergoes cleavage and forms blastula
- * Blastula undergoes gastrulation resulting in the formation of embryonic tissue layers and a gastrula
- * Only animals have the Hox genes that regulate development of body form (Hox gene is highly conserved)

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Embryonic Development

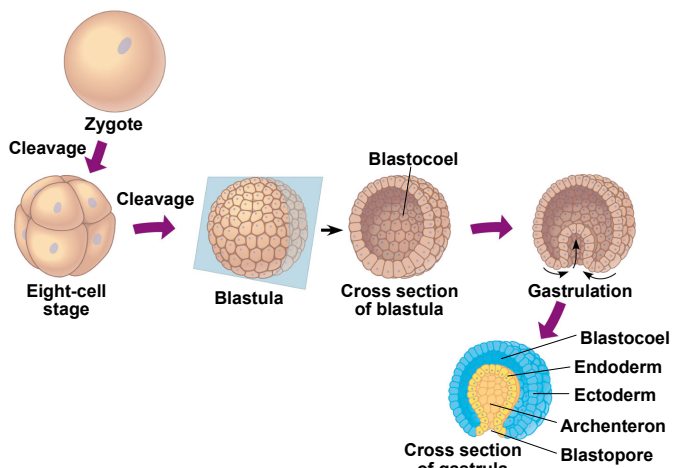


Fig.
32.2

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Evolutionary History

- * Common ancestor of living animals lived between 675-800 million years ago
- * Resembled modern choanoflagellates (protists)
- * Was probably a colonial, flagellated protist

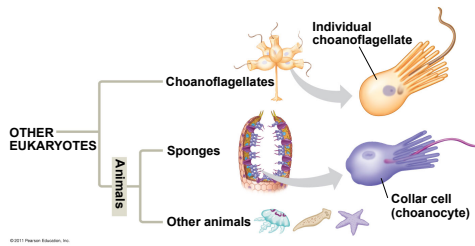
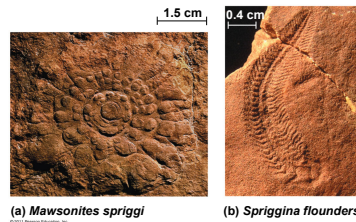


Fig. 32.3

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Evolutionary History

- * Neoproterozoic Era (1 billion - 542 million years ago): Early members of the animal fossil record
- * Paleozoic Era (542 - 251 million years ago): Cambrian explosion - earliest fossil appearance of many major groups of living animals
- * Mesozoic Era (251-65.5 million years ago): Dinosaurs were dominant terrestrial vertebrates, coral reefs emerged, first mammals, diversification of flowering plants and insects
- * Cenozoic Era (65.5 millions years ago to the present): Followed mass extinctions of both terrestrial and marine animals



(a) *Mawsonites spriggi*

(b) *Spriggina flouderesi*

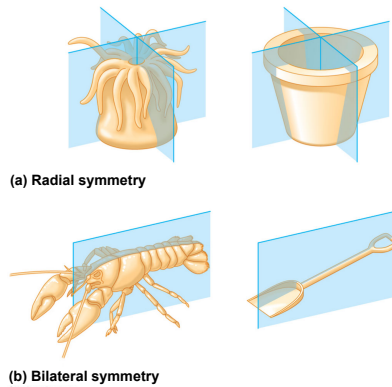


Figs. 32.5 & 32.6

5

Characterization of Animals

- * Characterized on the basis of a body plan (morphology and development)
- * Radial symmetry - no front, back, left, or right
- * Bilateral symmetry
 - * Dorsal (top) and Ventral (bottom)
 - * Anterior (head) and Posterior (tail)
 - * Cephalization - development of a head



(a) Radial symmetry

(b) Bilateral symmetry

Fig. 32.7

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Tissues

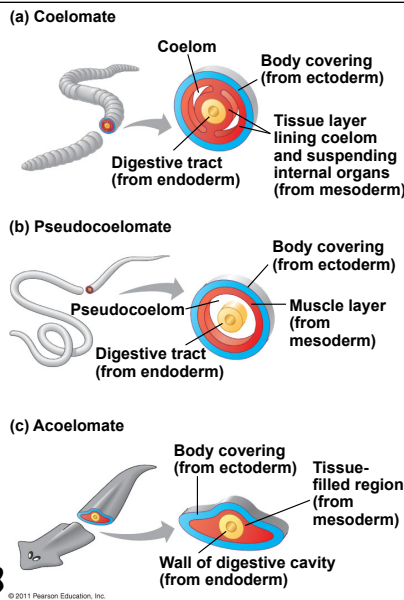
- * Tissues - collections of specialized cells isolated from other tissues by membranous layers
- * Body plans vary according to organization of animal tissues
- * Animal embryos form germ layers, embryonic tissues: ectoderm (germ layer covering embryo's surface), endoderm (innermost layer, lines digestive tube), mesoderm (intervening layer)
- * Diploblastic animals have two germ layers (ectoderm and endoderm)
- * Triploblastic animals have three germ layers
 - * Body cavity may be present or absent

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Body Cavity

- * Called a coelom and is derived from the mesoderm
- * Pseudocoelom is a body cavity derived from the blastocoel rather than the mesoderm
- * Acoelomates are organisms without body cavities

Fig. 32.8



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Protostome and Deuterostome

- * Protostome development - cleavage is spiral and determinate, blastopore becomes the mouth
- * Deuterostome development - cleavage is radial and indeterminate (each cell in the early stages retains capacity to develop into a complete embryo), blastopore becomes the anus

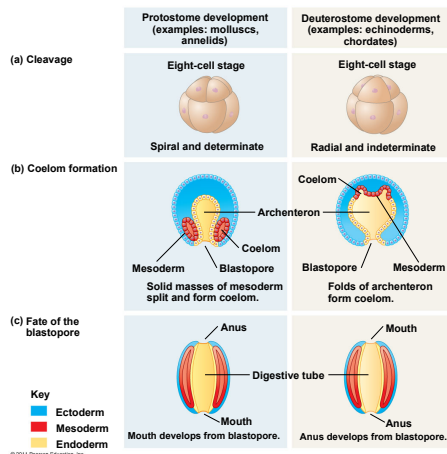
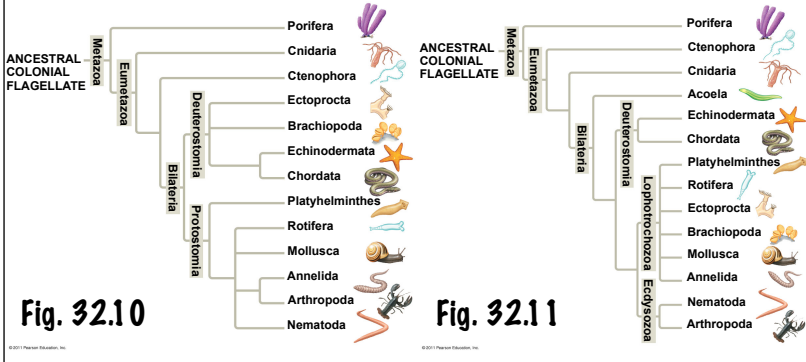


Fig. 32.9

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Phylogenetic Tree

- * Zoologists recognize about 35 animal phyla
- * Can be looked at based on morphological and developmental comparisons
- * Can be looked at based on molecular data



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Phylogenetics

- * All animals share common ancestors
- * Sponges are basal animals
- * Most animal phyla belong to the clade Bilateria
- * Morphology tree divides bilaterians into two clades (deuterostomes and protostomes)

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Porifera (5,500 species)
A sponge

Cnidaria (10,000 species)
A jelly

Acoela (400 species)
Acoel flatworms (LM)

Loricifera (10 species)
A loriceran (LM)

Nematoda (25,000 species)
A roundworm (colored SEM)

Placozoa (1 species)
0.5 mm
A placozoon (LM)

Ctenophora (100 species)
A ctenophore, or comb jelly

Hemichordata (85 species)
An acorn worm

Chordata (52,000 species)
A human
A sea urchin

Echinodermata (7,000 species)
A sea urchin

Deuterostomia

Triplipula (16 species)
A tripulan

Onychophora (110 species)
An onychophoran

Tardigrada (800 species)
A tardigrade (colored SEM)

Arthropoda (1,000,000 species)
A scorpion (an arachnid)

Invertebrates

- * Animals that lack a backbone
- * 95% of known animal species

Platyhelminthes (20,000 species)
A marine flatworm

Acanthocephala (1,100 species)
An acanthocephalan (LM)

Mollusca (93,000 species)
An octopus

Ectoprocta (4,500 species)
Ectoproct

Nemertea (900 species)
A ribbon worm

Cyclophora (1 species)
A cyclophore (colored SEM)

Rotifera (1,800 species)
A rotifer (LM)

Brachiopoda (335 species)
A brachiopod

Annelida (16,500 species)
A marine annelid

Lophotrochozoa

Fig. 33.2 & 33.3

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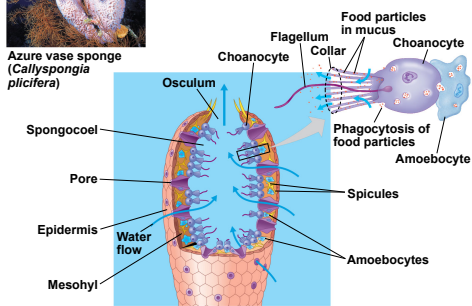
Sponges



- * Phylum Porifera
- * Sessile and have a porous body
- * Live in fresh and marine waters
- * Lack true tissues and organs
- * Suspension feeders (capture food particles suspended in the water)



Fig. 33.4



Choanocytes - flagellated collar cells that generate a water current through the sponge

Most sponges are hermaphrodites

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Cnidarians

- * All animals except sponges belong to the clade Eumetazoa (animals with true tissues)
- * Phylum Cnidaria is one of the oldest groups in this clade
- * Wide range of sessile (polyp) and floating (medusa) forms including jellies, corals, and hydras
- * Have a simple diploblastic, radial body plan
- * Body plan is a sac with a central digestive compartment (gastrovascular cavity)
- * Single opening that functions as both mouth and anus

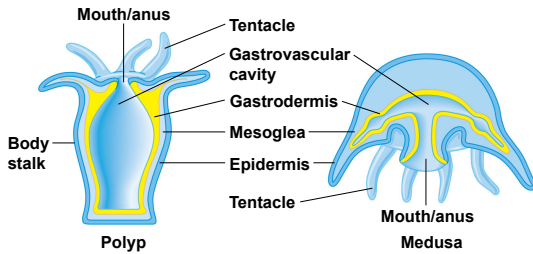
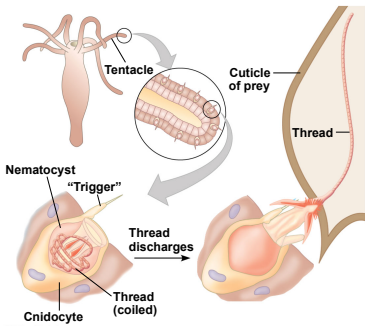


Fig. 33.5

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Cnidarians

- * Carnivores that use tentacles to capture prey
- * Tentacles armed with cnidocytes
- * Four classes: Hydrozoa, Scyphozoa, Cubozoa, and Anthozoa



Figs. 33.6

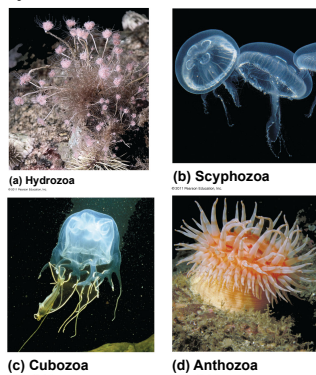
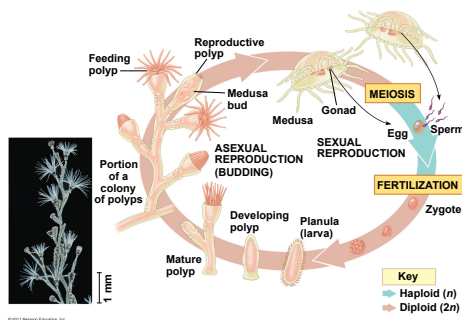


Fig. 33.7

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Cnidarians

- * Class Hydrozoans - alternate between polyp and medusa forms
- * Class Scyphozoa - Jellies (medusae) are the prevalent form of the life cycle
- * Class Cozoans - includes box jellies and sea wasps
- * Class Anthozoa - includes corals and sea anemones (only occur as polyps)



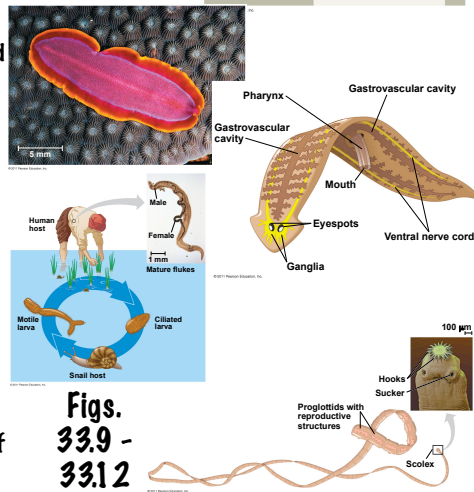
Figs. 33.8

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Phylum Platyhelminthes



- * From clade Lophotrochozoans
- * Flatworms
- * Live in marine, freshwater, and damp terrestrial habitats
- * Flattened dorsoventrally and have a gastrovascular cavity
- * Divided into four classes:
 - * Tubellarians - free-living, mostly marine
 - * Planarians (have light-sensitive eyespots)
 - * Monogeneans and trematodes - live as parasites in other animals
 - * Monogeneans - parasites of fish

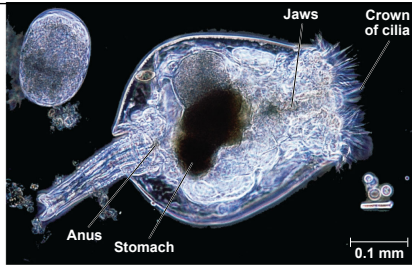


Figs. 33.9 - 33.12

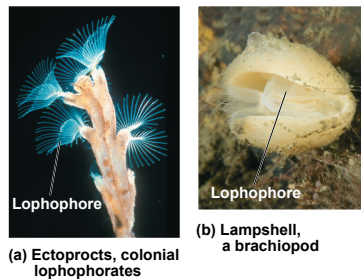
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Phylum Rotifera

- * Inhabit freshwater, marine, and damp soil
- * Smaller than many protists, but are multicellular and have specialized organ systems
- * Have alimentary canal (digestive tube with a separate mouth and anus)
- * Reproduce by parthenogenesis (females produce more females from unfertilized eggs)
- * Lophophorates have a lophophore (horseshoe-shaped, suspension-feeding organ)
 - * Ectoprocts - colonial animals that resemble plants
 - * Phoronids - tube-dwelling marine worms
 - * Brachiopods - superficially resemble clams



Figs. 33.13 & 33.14



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