



## *Animals: The Invertebrates*

Invertebrates (lack a back bone)-  
97.5% of animal organisms – sponges,  
jellyfish, flatworms, insects, etc.

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## **Outline**

1. **Key concepts**
2. **Evolution of the Animalia**
3. **Overview of the Animal Kingdom**
4. **Classification**
5. **Major groups and representatives**
6. **Conclusions**

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## *Key Concepts:*

1. All animals are multicelled, aerobic heterotrophs
2. Animals originated about 900 million years ago
3. The sponges are structurally simple animals without body symmetry
4. Flatworms, roundworms, and nearly all animals are more complex than cnidarians
5. Bilateral symmetry is seen in animals more complex than the cnidarians and show bilateral symmetry

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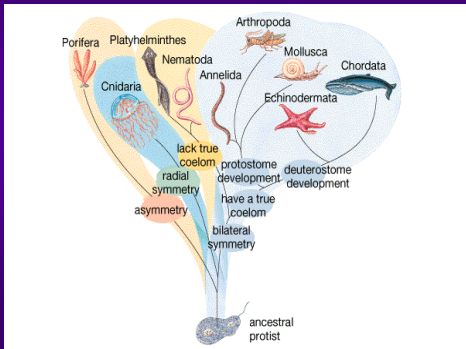
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## Evolutionary Tree Diagram




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## Overview of the Animal Kingdom

### Animals

1. Multicellular
2. Heterotrophs
3. Oxygen is required
4. Sexual reproduction (some asexual)
5. Motile - in part of life cycle

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## Invertebrates and Vertebrates

1. Invertebrates
- No backbones



2. Vertebrates

### Backbones

- Fishes,  
Amphibians,  
Reptiles, Birds,  
Mammals




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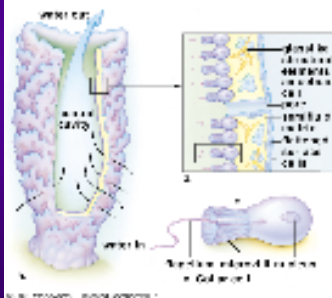
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## Porifera - Sponges Success in Simplicity

No symmetry, tissues, organs, or coelom



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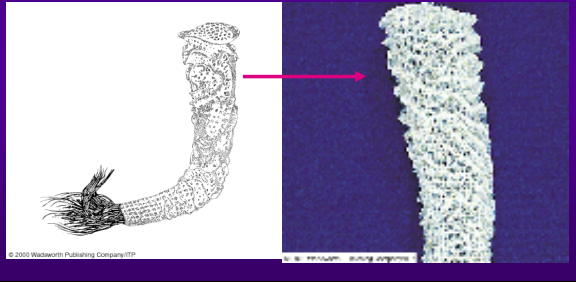
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## Sponges Success in Simplicity

Skeletal elements - Venus's flower basket (*Euplectella*)



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## Cnidaria - Jellyfish, Hydra

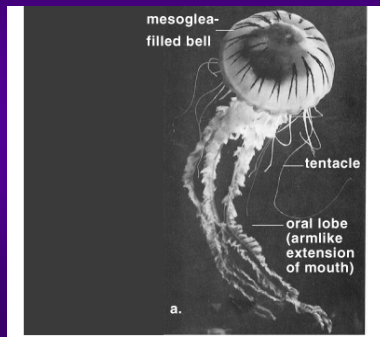
Radial symmetry

No coelom

Have tissues

No organs

*The sea nettle,  
a jellyfish  
(Chrysaora)*



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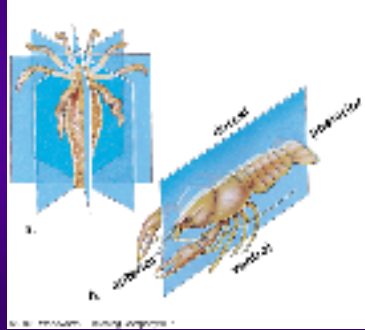
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## Examples of Body Symmetry

1. Radial  
Live in water
2. Bilateral  
Mirror image




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## Platyhelminthes - Flatworms, Flukes, & Tapeworms

1. Bilateral
2. Organ system
3. No coelom
4. Flat bodies



A Planarian

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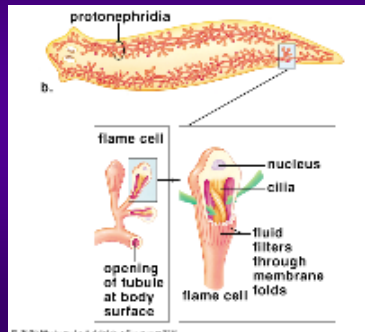
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## Flatworms:

Water-regulating system in a Planarian




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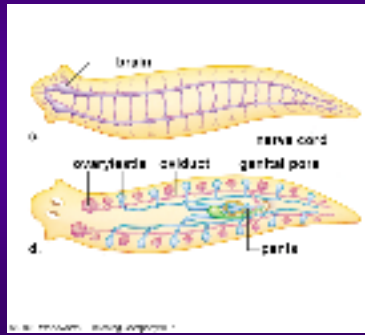
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## Flatworms:

Nervous system  
in a Planarian

Reproductive  
system in a  
Planarian




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## Tapeworms

Parasitic




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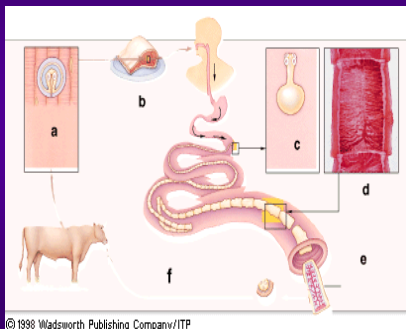
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## Tapeworms

Life cycle of *Taenia saginata* (beef tapeworm)



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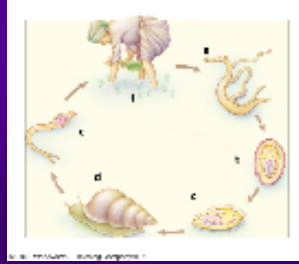
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## Flukes

1. Parasitic
2. Two hosts
  1. Snail
  2. Human

### Life Cycle of *Schistosoma japonicum*




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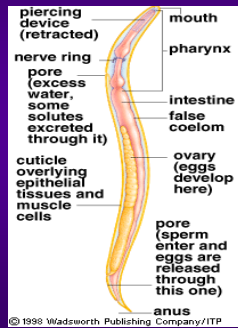
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## Nematoda - Roundworms

- Bilateral symmetry
- Complete digestive system (organ system)
- Separate mouth and anus
- False coelom




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## Nematoda - Roundworms

Legs of a woman parasitized by the roundworm *Wuchereria bancrofti*




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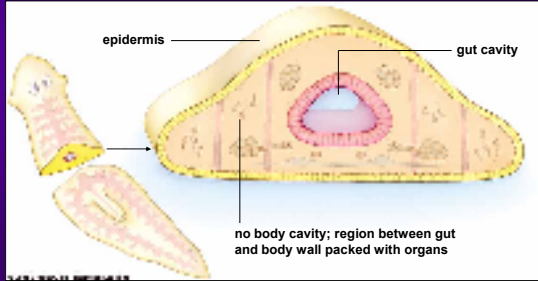
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## Body Cavities - Acoelomate



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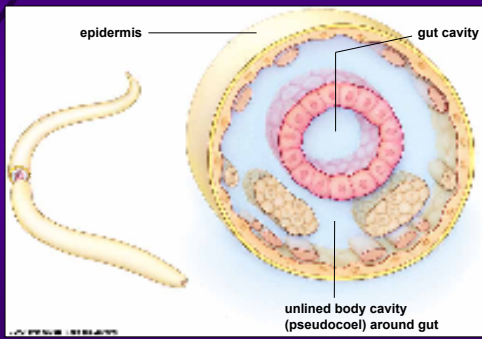
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## Body Cavities - Pseudocoel



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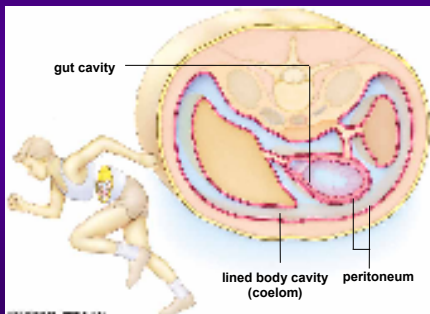
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## Body Cavities - Coelom



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## Annelida - Segmented body

1. Bilateral
2. Organ system
3. Segmented
4. Earthworms
5. True coelom
6. Separate mouth and anus




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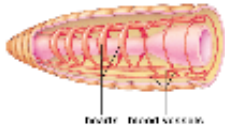
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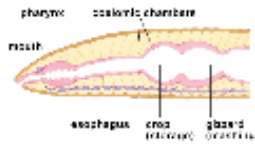
## Earthworm

Portion of the closed circulatory system



heart blood vessels

Part of the digestive system



pharynx esophageal chamber  
mouth  
esophagus crop gizzard

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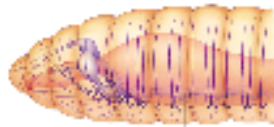
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## Earthworm

Part of the nervous system



brain nerve cord

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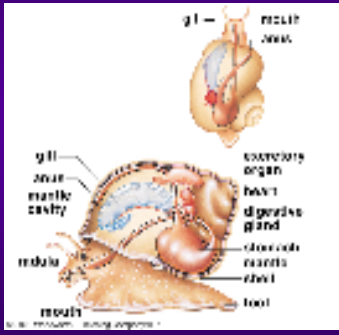


# Mollusca - snails, clams, octopuses, squids

## Mollusk

- Bilateral
- Organ system
- Coelom
- Soft body
- Shell
- Fleshy foot
- Separate mouth & anus

An aquatic snail




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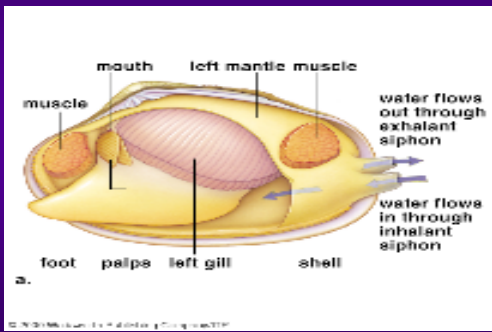
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# clam




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# Representatives of Mollusca



A squid (*Dosidiscus*)



A land snail



Two sea slugs



A scallop

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# Arthropoda: The Most Successful Organisms on Earth

## Classification

Over one million species

1. Chelicerates  
Spiders
2. Crustaceans  
Barnacles and crabs
3. Uniramians  
insects

## Characteristics

1. Hardened exoskeleton
2. Jointed appendages
3. Fused and modified segments
4. Specialized Sensory Structures

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# A Look at Spiders

## Organization of a Spider Body




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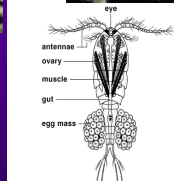
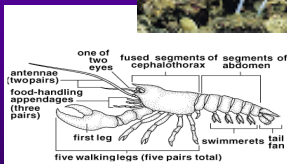
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# A Look at Crustaceans

Shrimps, lobsters, crabs, barnacles

A Copepod

## A Lobster




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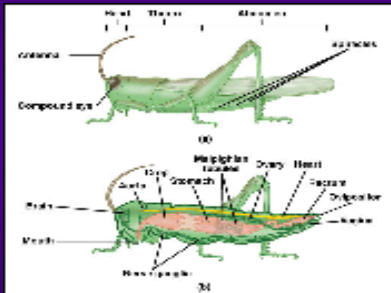
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## A Look at Insects

1. Head, thorax, abdomen
2. Sensory antennae
3. 3 pairs of legs
4. 2 pairs of wings



Grasshopper

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## A Look at Insects

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## Echinodermata - sea urchins and sea star

### Echinoderms

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|------------------|---|
| 1. Sea star      | 1. Body walls                                 |
| 2. Sea urchin    | Spines  |
| 3. Sea cucumber  | 2. Larvae - bilaterally symmetry              |
| 4. Brittle stars | adults - radial symmetry                      |
|                  | 3. No head or brain, with central never rings |
|                  | 4. Water-vascular system                      |

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### *In Conclusion*

- 1. Animals are multicellular, aerobic heterotrophs that ingest or parasitize other organisms*
- 2. Animals range from structurally simple sponges to vertebrates*
- 3. Cnidarians include the jellyfishes, sea anemones, and hydras*
- 4. Almost all animals more complex than cnidarians show bilateral symmetry, form tissues, organs, and organ systems*

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### *In Conclusion*

- 5. All mollusks have a fleshy soft body*
- 6. The annelids, have a segmented body, complex organs, and coelomic chambers*
- 7. Arthropods are the most successful of all groups in terms of diversity, numbers, distribution, defenses, and capacity to exploit food resources*
- 8. Echinoderms have spines in their body wall*

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