

ZOOLOGY 101 SECTION 1 LECTURE NOTES

I. Patterns of Organization

The Hierarchical Organization of Animal Complexity

Five major grades of organization:

1. Protoplasmic level of organization
2. Cellular level of organization
3. Cell-tissue level of organization
4. Tissue-organ level of organization
 - Two subdivisions:
 - a) Parenchyma: chief functional cells of an organ
 - b) Stroma: supportive tissues
5. Organ-system level of organization
 - 11 different systems in animals (metazoans)
 - a) Skeletal
 - b) Muscular
 - c) Integumentary
 - d) Digestive
 - e) Respiratory
 - f) Circulatory
 - g) Excretory
 - h) Nervous
 - i) Endocrine
 - j) Immune
 - k) Reproductive

Complexity and body size: complex organization permits, and to some extent promotes, the evolution of large body size.

Body Fluids: Extracellular Components

The body fluids are subdivided into two major groups:

1. Intracellular: the fluid within the body's cells
2. Extracellular: the fluid outside the cells
 - Subdivided further:
 - a) Blood plasma = fluid portion of blood
 - b) Interstitial fluid = occupies space surrounding cells

Types of Tissues

Histology = the study of tissues

Four principle kinds of tissue:

1. Epithelial
2. Connective
3. Muscular
4. Nervous

Animal Body Plans

Advances in body structure over time:

- 1) Multicellularity
- 2) Bilateral symmetry
- 3) "Tube within tube" body plan
- 4) True body cavity

Unicellular vs. Multicellular vs. Colonial

Animal symmetry:

- 1) Spherical symmetry = any plane passing through the center divides the body into equal halves.
- 2) Radial symmetry = body can be divided into similar halves by more than two planes passing through the longitudinal axis.
- 3) Bilateral symmetry = a medial plane can divide the body into two mirrored portions - right and left halves.

Body Cavities: coelom = a cavity between the outer body wall and the gut, maybe fluid filled.

- 1) Acoelomate – have no body cavity; flatworms and ribbon worms
- 2) Pseudocoelomate – false cavity lacking peritoneum; nematodes
- 3) Eucoelomate – a true coelom lined with peritoneum; humans

Metamerism (segmentation)

- The serial repetition of similar body segments
- Somite (or metamere) = each segment
- True metamerism is found in only three phyla: Annelida, Arthropoda and Chordata

Cephalization

- The differentiation of a head end with concentrated sensory organs
- Found chiefly in bilaterally symmetrical animals
- Polarity: differentiation along a anterior/posterior axis accompanying cephalization

Directional Terms

Anterior	Medial
Posterior	Lateral
Dorsal	Distal
Ventral	Proximal

Planes

1. Frontal: divides an animal into dorsal and ventral halves

2. Sagittal: divides an animal into right and left halves
3. Transverse: divides an animal into front and rear halves

Patterns of Cleavage

Cleavage: division of an egg into a large number of cells called a *blastula*. Two patterns:

- 1) Radial
- 2) Spiral

This leads to the evolution of animals into two separate lineages.

1. Protostomia: "mouth first" - division characterized by spiral cleavage; includes annelids, mollusks and other invertebrates
2. Deuterostomia: division characterized by radial cleavage; includes echinoderms and chordates

II. Taxonomy

What is zoology?

The classification of animals: Taxonomy

1. Linnaean System of Classification
2. Kingdom, Phylum, Class, Order, Family, Genus, Species

Ex. Animalia, Chordata, Mammalia, Primates, Hominidae, Homo, Homo sapiens

There are currently two popular theories of taxonomy:

1. Traditional (cladistics)
2. Phylogenetic systematics (evolutionary)

Three forms of taxonomic relationships:

1. Monophyly = a taxon includes the most recent common ancestor of the group and all descendants of that ancestor

2. Paraphyly = a taxon includes the most recent ancestor of a group but not all of its descendants
3. Polyphyly = a taxon includes members with at least two separate evolutionary origins from unrelated ancestors

What is a Species?