ANIMAL ORGANIZATION

INTRODUCTION

- The unicellular protozoan groups are the simplest animal like organisms.
- They show division of labour at protoplasm level.
- Unicellular organisms like protozoans exhibit protoplasmic grade of organization.
- The evolution of tissues is the first key transition in the animal body plan.
- Eumetazoans exhibit higher levels of organization.
- The embryonic tissue layers of eumetazoans are called germ layers
- The lowest level of organization is **cellular grade of organization**
- Cellular grade of organization is exhibit by **sponges**
- Division of labour is seen among the cells in sponges
- Such cells have litle tendency to become into tissues.
- **Nerve cells and sensory cell are absent**, hence cells are **functionally isolated** in sponges
- In cellular grade of organization cells demonstrate division of labour but are not strongly associated to perform a specific collective function.
- Diploblastic animals such as cnidarians exhibit **tissue grade of organization** or **diploblastic organization**
- In tissue grade of organization germ layers such as ectoderm and endoderm are developed
- Cells are aggregated into tissues
- Nerve cells and sensory cells are present in the epidermis and the gastrodermis.
- Ectoderm gives rise to the epidermis, endoderm gives rise to the gastrodermis.
- The cells of a tissue together perform their common functions as a highly coordinated unit.
- Triploblastic animals exhibit **organ - system grade of organization** or **triploblastic organization**
- In organ-system grade of organization all the three germ layers are present such as ectoderm endoderm and mesoderm
- The evolution of mesoderm resulted in structural complexcity.
- The tissues are assembled into larger functional units called organs.
- Organs woking together to perform one (or more) specific function(s) constitute an organ system.
- Eleven different kinds of organ systems are observed in metazoans such as integumentary, skeletal, muscular, digestive, respiratory, circulatory, excretory, nervous, endocrine, immune, and reproductive.
- Triploblastic animals have **highly specialized sensory cells and nerve cells which bring about a higher level of coordination and integration.**

SYMMETRY

- The symmetry of an animal generally fits its life-style.
- Radial symmetry is an advantages to sessile or planktonic or slow-moving organisms.
- Evolution of bilateral symmetry is **the second key transition in the animal body plan**.
- In symmetrical animals the body lacks definite form or geometrical arrangement of parts and cannot be divided into mirror image halves by any plane.
- Gastropods ae primarily bilaterally symmetical and secondary asymmetrical.
- Most of the sponges and some rptozoans like *Amoeba* exhibit **asymmetry**.

- In a symmetrical animal, similar body parts occur on the opposite sides of a plane passing through the principal axis of the animal.
- A symmetrical animal can be cut into two mirror image halves or antimeres by one or more planes of symmetry passing along the principal axis.
- The term axis refers to an imaginary straight line joining two opposite points at the ends, or on the surfaces of the body.
- The term principal axis means an imaginary straight line joining the midpoint at one end or surface and the midpoint at the opposite end or surface.
- The term plane means a flat area that runs through any axis.
- Bilaterally - symmetrical animals possesss anterior (cephalic) end posterior (caudal) end dorsal surface, ventral surface and lateral surfaces.
- Frontal plane is the plane that runs through the anterior - posterior and sagittal axis.
- Sagittal plane is the plane that runs through the anterior - posterior and sagittal axis.
- Transverse plane (cross section) passes through sagittal and transverse axis.
- Frontal plane divides a bilaterally symmetrical body into dorsal and ventral portions.
- Saggital plane divides a bilaterally symmetrical animal into right and left halves.
- Transverse plane divides the animal into anterior and posterior portions.
- Each of these three planes is at right angles to the other two

SPHERICAL SYMMETRY

- **Spherical symmetry** is also called **Homaxial apolar symmetry.**
- Spherically symmetrical forms are best suited for **floating and rolling**.
- The rare type of symmetry is **spherical symmetry.**
- Spherical symmetry is found in Heliozoans and radiolarians
- Body of the spherically symmetrical animal can be cut into two identical halves in any one of the infinite number of planes that pass through the central point.
- Body parts are arranged concentrically around or radiating from a central point in spherical symmetry.

RADIAL SYMMETRY

- **Radial symmetry** is also called **monaxial heteropolar symmetry.**
- In radial symmetry the sensory and feeding structures are uniformly distributed around the body hence they can interact with their environment equally in all the directions.
- In radially symmetrical animals body is cylindrical (e.g. ***Hydra***), or vase - like (sponges) or umbrealla-shaped (e.g. jelly fish).
- In Radially symmetrical animals the principal axis is **oral - aboral axis** it is heteropolar
- Anterior, posterior ends and dorsal, ventral, lateral surfaces are not differentiated in radially symmetrical forms as well as spherically symmetrical forms.
- Radial symmetry is found in some sponges and most of the cnidarians.
- Echinoderms are primarily bilateral animals (their larvae are bilateral).

- Most of the echinoderms have secondarily become radial, exhibiting pentamerous radial symmetry in the adult stage.

BIRADIAL SYMMETRY

- The biradial type of symmetry of sea anemone seems to have been derived from the radial type primarily by the elongation of the mouth and associated parts.
- Biradial symmetry has two planes of symmetry.
- Ctenophores and most anthozonas exhibit biradial symmetry.
- In ctenophores most of the body prts ae radially arranged but the tentacles are paired.
- A sea anemone with two siphonoglyphs exhibit **biradial symmetry.**
- A sea anemone with one siphonoglyph exhibit radial symmetry

BILATERAL SYMMETRY

- In Bilateral symmetry the principal axis is the anterior - posterior axis, it is heteropolar, with differentiated anterior and posterior ends.
- In Bilateral symmetry sagittal axis is heteropolar and the transverse axis is apolar.
- In bilateral symmetry there is only one plane of symmetry, it is **median sagittal plane.**
- The appearance of bilateral symmetry was a major advancement in animal evolution.
- Cephalization is associated with bilateral symmetry
- As a result of cephalization, bilaterally symmetrical animals can sense the new environment into which they enter and respond to it more efficiently than other animals.
- All the triploblastic animals of animal kingdom exhibit **bilateral symmetry**