Types of Symmetry: 3 Types | Animal Kingdom

The following points highlight the three types of symmetry in animals. The types are: 1. Spherical Symmetry 2. Radial Symmetry 3. Bilateral Symmetry.

Type # 1. Spherical Symmetry:

In this type of symmetry, the body of the individual can be divided into similar halves by any plane passing through the centre, e.g. Volvox, some sponges and some corals.

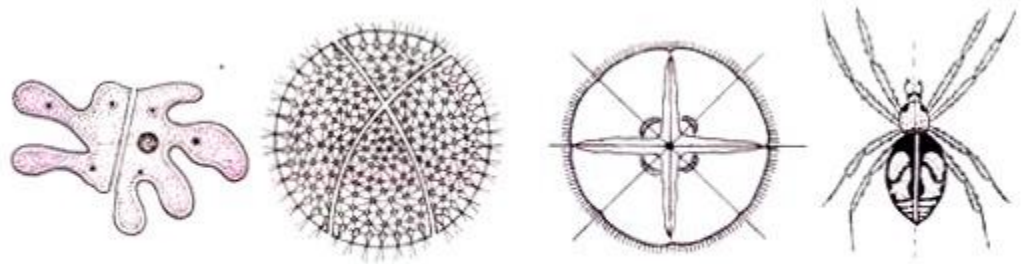

Fig. 4.2. A, Asymmetry in *Amoeba*; B, Spherical symmetry in *Volvox*; C, Radial symmetry in Jelly fish; D, Bilateral symmetry in Spider.

Type # 2. Radial Symmetry:

In this type of symmetry, the body of the individual divided into equal halves by any plane passing through the centre from top to bottom.

The type of symmetry is found in some sponges (Sycon), cnidarians (e.g. Hydra jelly), and echinoderms (e.g. star fish). When the body can be divided into two similar halves by one or two vertical planes only, the radial symmetry is called biradial symmetry. It is present in the sea anemones. Type # 3. Bilateral Symmetry:

In this type of symmetry, the body can be divided into two equal halves by a single plane only because the important body organs are paired and occur on the two sides of a central axis. Bilateral symmetry is found in many invertebrates and all vertebrates.

i. The right and left sides of the body are called the lateral sides. The side of the body which is kept forward during locomotion is termed the anterior side and the opposite one is called posterior side. The back or upper surface is termed dorsal and the under surface (towards the substratum) is called ventral (Lventerbelly).

ii. The part of a tissue, organ, etc. that is nearest to the point of attachment or origin is known as proximal end. For example, upper arm is proximal end of the forelimb.

The part of a tissue, organ, limb, etc. that is farther away from the point of attachment or origin is called distal end. For example, the fingers are at the distal end of the fore limb.

iii. Anatomical Body Planes.

Animal body can be cut along three planes (transverse, horizontal and vertical) for examining its internal structure. A vertical section passing through the middle line of the body is known as the saggital section.

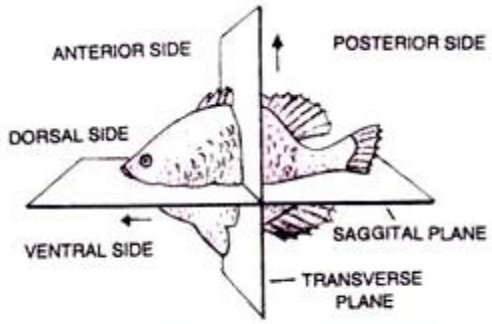

Fig. 4.3. Diagram showing the different sides, planes, etc.

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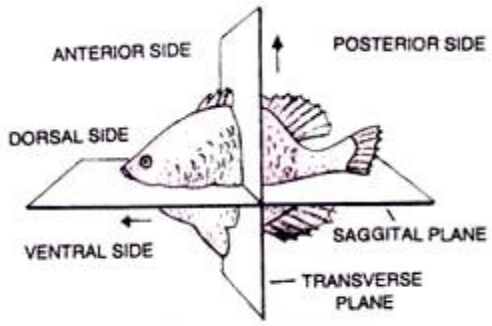

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5 Main Types of Symmetry Seen in Animals

The following points highlight the five main types of symmetry seen in animals. The types are: 1. Asymmetrical Symmetry 2. Spherical Symmetry 3. Radial Symmetry 4. Biradial Symmetry 5. Bilateral Symmetry.

Type # 1. Asymmetrical Symmetry:

In some animals there are no body axis and no plane of symmetry, hence the animals are called asymmetrical. The amoeboid forms (e.g., Amoeba) and many sponges have irregular growth pattern of the body and cannot be divided into two equal halves (Fig. 9.1).

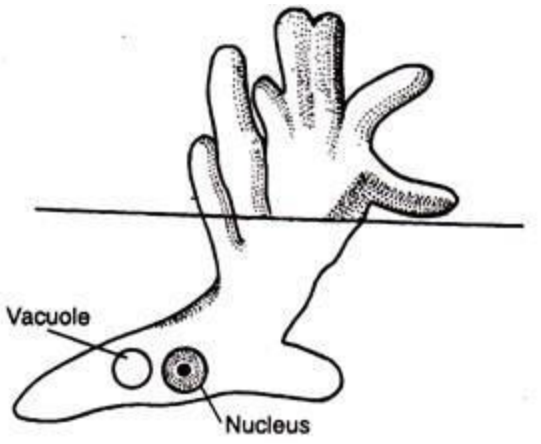

Fig. 9.1: Diagram of *Amoeba* showing the asymmetrical symmetry.

Type # 2. Spherical Symmetry:

In spherical symmetry the shape of the body is spherical and lack any axis. The body can be divided into two identical halves in any plane that runs through the

organism's centre. In asymmetrical symmetry and spherical symmetry the polarity does not exist and spherical symmetry is seen in radiolarian protozoa (Fig. 9.2).

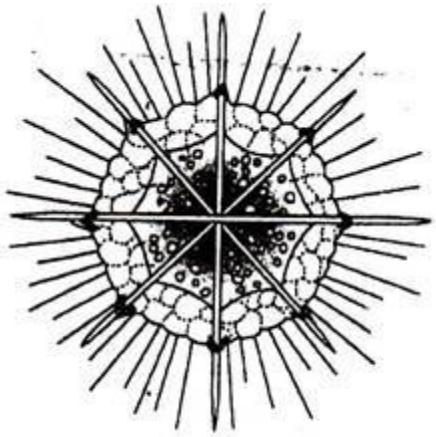

Fig. 9.2: Diagram of a radiolarian showing the spherical symmetry.

Type # 3. Radial Symmetry:

In radial symmetry the body can be divided into two roughly equal halves by any one of many vertical planes passing through the central axis (Fig. 9.3A-C) like the spokes of a wheel. The animals which exhibit primarily radial symmetry are cylinder in form and the similar parts of the body are arranged equally around the axis. The axis extends from the centre of the mouth to the centre of the aboral side.

The radial symmetry is seen among the sessile and sedentary animals such as in some sponges, hydroids, anthozoan polyps, medusae and sea stars.

Special forms of radial symmetry are observed in different groups of animals such as:

(i) Tetramerous symmetry:

Many jelly fishes possess 4 radial canals and the body can be divided into 4 equal parts. Hence the animals exhibit tetramerous raidal symmetry (Fig. 9.3B).

(ii) Pentamerous symmetry:

Most echinoderms possess pentamerous radial symmetry because the body can be divided into 5 roughly equal parts (Fig. 20.1). The body parts are arranged around the axis of the mouth at orientations of 72° apart. The larvae of echinoderms are bilaterally symmetrical but acquires radial symmetry in adult stage. The radial symmetry of echinoderms is regarded as a secondary acquisition.

(iii) Hexamerous symmetry:

The sea anemones and true coral polyps belong to the subclass Hexacorallia (class Anthozoa). The mesenteries and tentacles are arranged in the multiple of six. The mesenteries are usually paired and are arranged in the multiple of six. The body of hexacorallian polyps exhibits hexameric plan and have sixfold internal symmetry.

(iv) Octomerous symmetry:

The body of octocorallian polyps (subclass Octocorallia) shows octomeric radial symmetry and contains 8 hollow marginal tentacles and 8 mesenteries and the body can be divided into 8 equal parts (Fig. 9.3C).

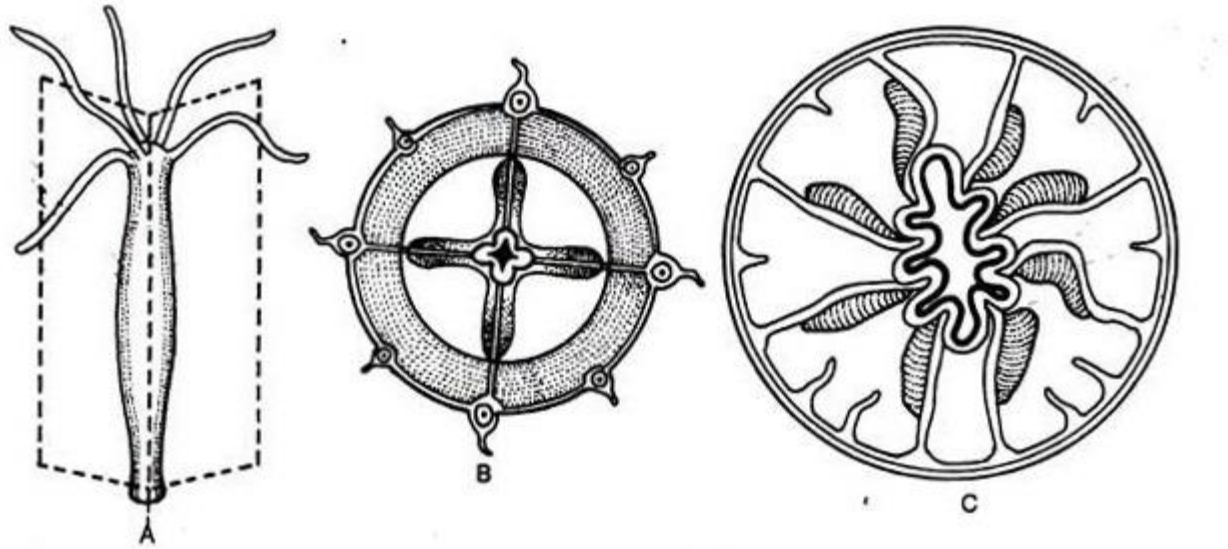

Fig. 9.3: Diagrams showing the different forms of radial symmetry. A. Radial symmetry (Hydra). B. Tetramerous radial symmetry (Jelly fish). C. Octomerous radial symmetry (a octocorallian polyp).

The animals with radial symmetry do not have anterior and posterior sides or dorsal and ventral surfaces. They have a mouth bearing oral side and the side away from the mouth called the aboral side.

Type # 4. Biradial Symmetry:

The body of animals which exhibits biradial symmetry, represents a combination of both radial and bilateral symmetry. The organs are arranged radially and the body can be divided into two by a mid-longitudinal plane. Ctenophores exhibit biradial symmetry.

Type # 5. Bilateral Symmetry:

In bilateral symmetry the body parts are arranged in such a way that the animal is divisible into roughly mirror image halves through one plane (mid sagittal plane) only (Fig. 9.4A). This plane passes through the axis of the body to separate the two halves which are referred to as the right and left halves.

The animals which exhibit bilateral symmetry called bilateria. Bilaterally symmetrical animals include acoelomates, pseudo-coelomates and eucoelomates among invertebrates and both lower chordates and vertebrates.

The entire body of a bilateria can be divided into three planes such as— (i) frontal (ii) sagittal and (iii) transverse (Fig. 9.4). Any of the vertical planes perpendicular to the sagittal plane that passes through the body separating the upper and underside is called frontal plane.

The upper-side is also called dorsal which is usually away from the ground and near the back of the animal. The underside is also called ventral which is usually facing towards ground. A longitudinal plane that passes along the axis of the body of bilaterally symmetrical animal to separate right and left sides is called the mid-sagittal plane (Fig. 9.4B).

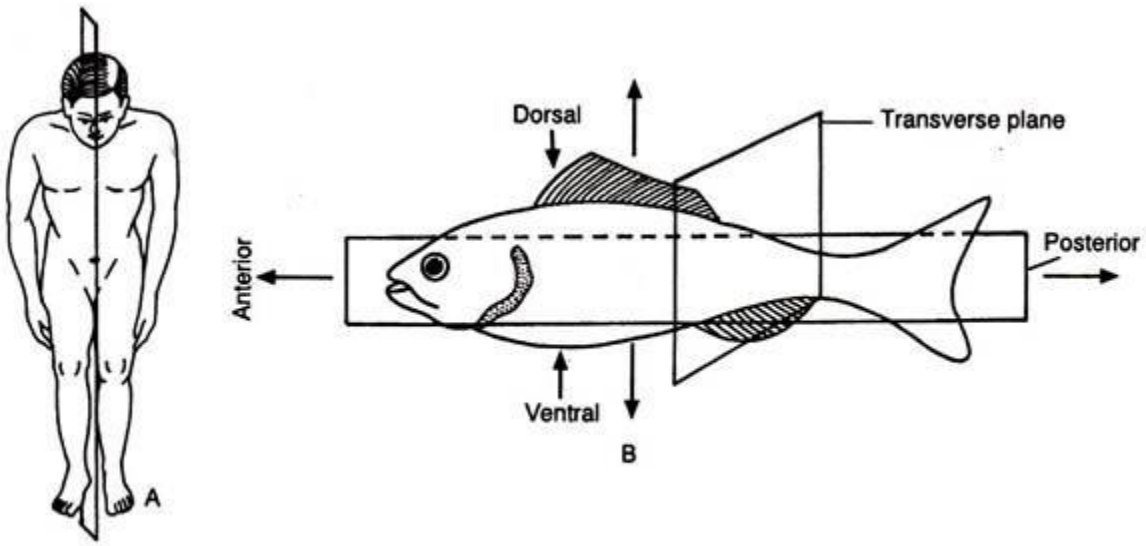

Fig. 9.4: A. Diagram showing the bilateral symmetry in man. B. A fish showing the different planes of bilateral symmetry.

An imaginary plane that crosses the body, perpendicular to the mid sagittal plane called transverse plane. The body of bilateria has the term lateral (two sides of the

body), anterior (the end which usually moves forward during movement and bears mouth) and posterior (Fig. 9.5) (the end opposite to anterior).

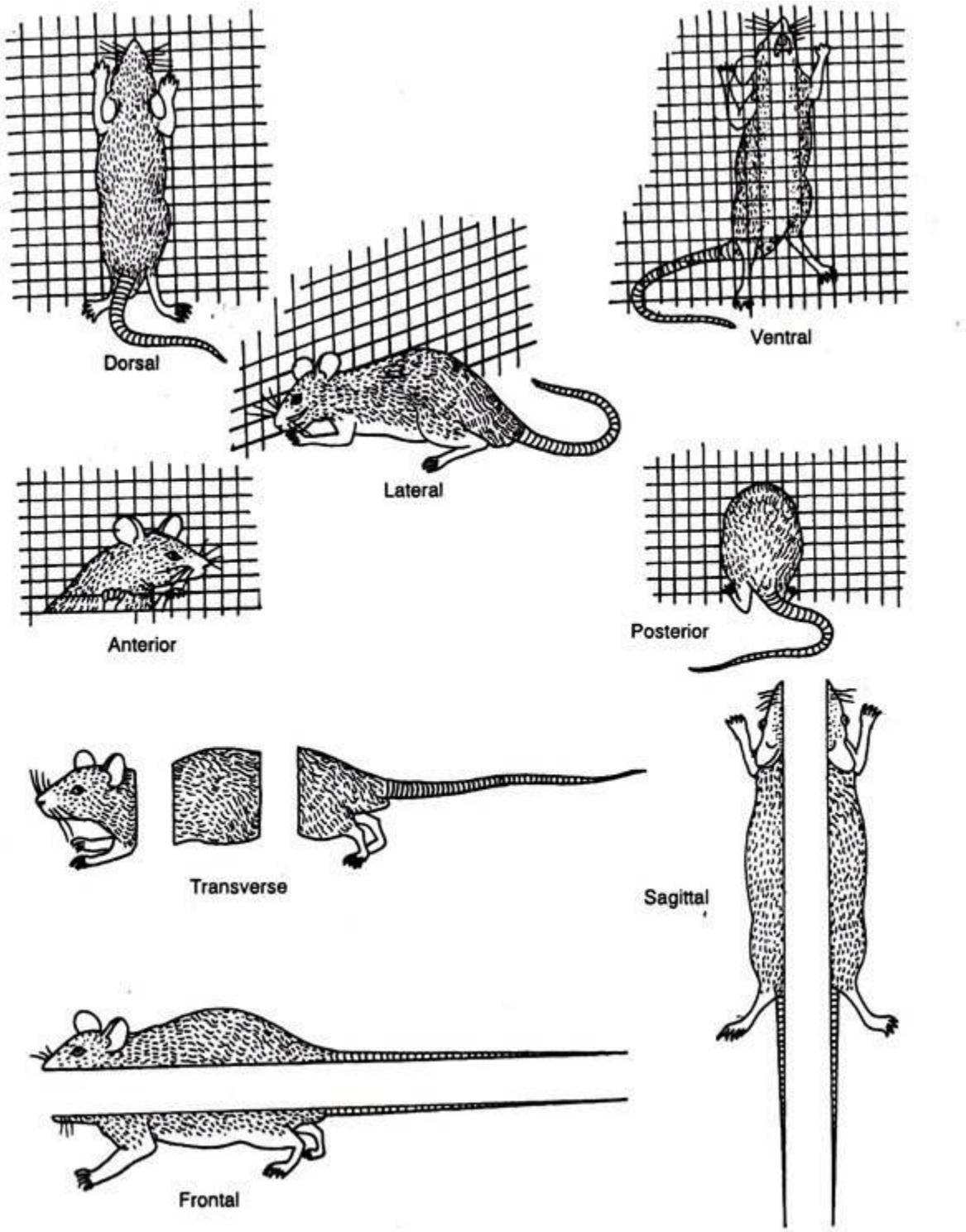

Fig. 9.5: For the convenience of study, the animal body is divided into a number of regions–dorsal, ventral, lateral anterior and posterior. The entire body may also be divided into three planes, transverse, frontal and sagittal.

Advantages of Symmetry:

1. Bilateral symmetry is associated with the term cephalization—meaning the specialization of the anterior end of the body to form the head where the nervous tissues, sense organs and feeding organs are concentrated.

2. Other advantages of this symmetry are the streamlining of the body, development of different organs in different body regions and more efficient unidirectional movement.

3. Radial symmetry helps the animals for collecting food and defence.