8 Support and Movements of Organisms

8.1 Support and movements of animals

Living organisms change the location of their whole body or a part of its body as a response to a stimulus. This process is known as a **movement**. You know very well that movement is a feature of living organisms. Not only the animals but also the plants do movements.

Let us engage in activity 8.1 to study about the movements of animals.

Activity 8.1

You will need:- Video clips that show the movements of human and other animals or live specimens of animals such as snail, earthworm, prawn, frog, crow and fish

Method:-

- Observe the movements of the given animals (figure 8.1) by using the video clips or specimens. (Make sure not to harm the living animals)
- Identify the appendages used by these animals for movements.
- Complete the table 8.1, using your observations.

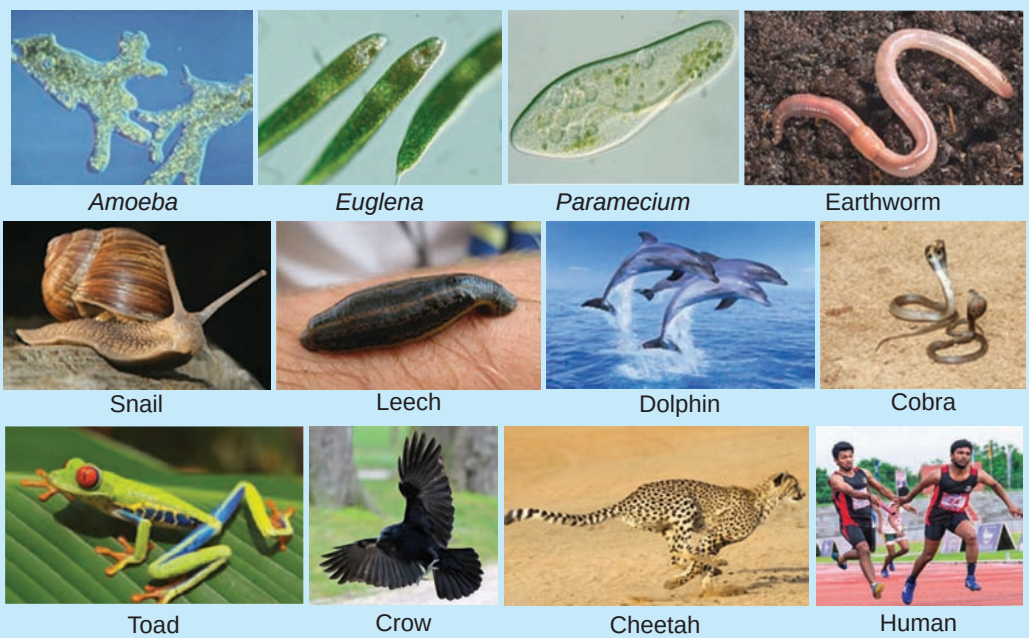


Figure 8.1 - Movements of different animals

Table 8.1 - Appendages used by animals for movements

Name of the animal	Appendages used for movements
Amoeba	False feet (pseudopodia)
Euglena	
Paramecium	
Earthworm	
Leech	
Dolphin	
Snail	
Cobra	
Toad	
Crow	
Cheetah	
Human	

Amoeba uses pseudopodia for locomotion while *Euglena* uses its flagella. *Paramecium* uses its hair like cellular organelles called cilia for locomotion.

Human beings, cheetah and toad use limbs for their locomotion. Dolphin use flippers for their locomotion. Birds such as crows use wings for their locomotion. Animals like earthworm, leech, snail and cobra do not have special appendages for their locomotion.

Animals show locomotion and most of them use muscles for their movements.

Human skeletal system | Human muscular system

Figure 8.2

8.2 Bones, muscles and joints

Invertebrates use muscles while vertebrates use both muscles and bones for their movements. Bones and muscles help not only for movements but also to maintain the body shape and rigidity (support).

Let us consider about the features of a muscle to understand how a muscle function during a movement. Several features of muscles are given below.

- The cells in a muscle are arranged as fibres.
- A muscle cell has the ability to contract or shorten.
- A muscle cell has the ability to relax.
- When muscles are relaxed or contracted they have the ability to reach the original position again.

Let us do the activity 8.2 to study how muscles help to move a bone.

Activity 8.2

You will need :- Two 5 x 30 cm sized hard cardboard pieces or wooden planks, bolt nail, hack-saw blade, cutting flyer, a broad elastic piece of 1m length

Method:-

- Prepare a model of an elbow unit by using hard cardboard pieces or wooden planks as shown in the figure 8.3.
- Contract the elastic band A without moving the wooden plank P.
- Contract B without moving P.
- Observe what happens.

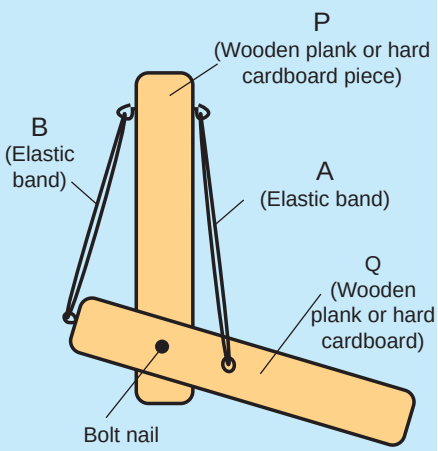


Figure 8.3

Let us use the activity 8.2 to study about how the elbow joint works.

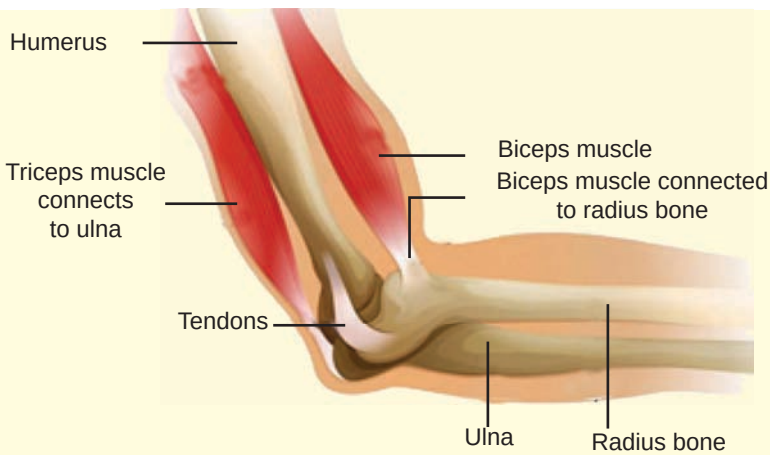


Figure 8.4 - Human elbow joint

Elastic band A represents the biceps muscle in the elbow joint. When biceps muscle is contracted the hands bends and lifts up.
Elastic band B represents the triceps muscle in the elbow joint. When triceps muscle is contracted the hand is stretched. Then, the biceps muscle comes to its original resting position.

8.3 Support and movements of plants

Support of plants

Just like in animals, tissues are present within plants for the purpose of mechanical support. Figure 8.5 shows the garden Balsam plant. You may have noticed on sunny days these plants get withered and the stem is bentdown. This is due to lack of water supply to the plant.
To keep non-woody plants erect and alive it is vital to have water inside the plant. Where as woody plants can be kept erect in low water percentages due to presence of various chemical substances such as cellulose, lignin deposited in the walls in heartwood of the plant. They give a rigidity to the plant (figure 8.6).

Figure 8.5 - Non-woody plant (Balsam)

Figure 8.6 - Woody plant (Mango)

Movements of plants

Growth of a part in a plant as a response to a stimulus or change of the location due to a turgor change , is known as a movements of a plant.

- Tropic movements
- Nastic movements

Tropic movements

Tropic movements are growth or movement that occurs due to a direct influence between the direction of stimulus and direction of response. Tropic movements occur due to the effect of growth substances. Response may be towards or away from the stimulus. Positive tropism occurs towards the stimulus. Negative tropism occurs away from the stimulus.

Some of tropic movements are described below.

- Positive geotropism - roots growing towards the ground
- Negative geotropism - stem of the plant growing away from the ground
- Positive phototropism - stem growing towards the light
- Positive hydrotropism - roots moving towards the water source
- Positive chemotropism - growth of the pollen along the tube towards the ovule
- Positive thigmotropism - clinging of the coiling of tendrils in Passion fruit with the support

Let us do activity 8.3 to study about tropic movements.

Activity 8.3

You will need:- Two pots, some green gram seeds

Method :-

- Plant 5 soaked seeds in each pot.
- After seed germination keep one healthy plant in each pot and uproot all the other plants.
- Keep one pot vertical and the other toppled down as in the figure 8.7.

Figure 8.7

- Observe the growth of pattern of root and shoot after one week.
- Identify and study tropic movements.

In both pots, root grow towards ground. That means movement of a plant root is positive geotropic, and movement of a plant shoot is negative geotropic (figure 8.8), as it move.

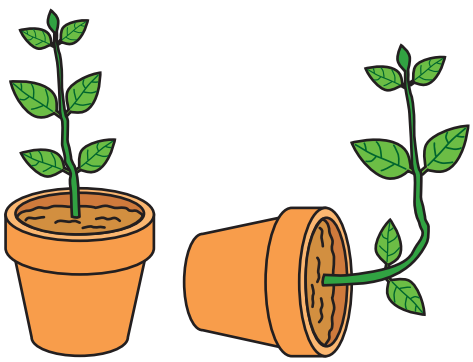


Figure 8.8

Nastic movements

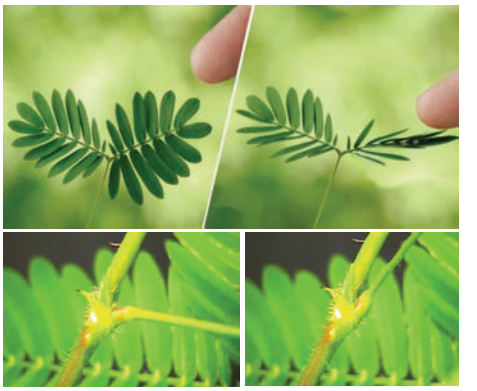


Figure 8.9 - Shrinking of *Mimosa* leaves

In Nastic movements, response of the direction does not depend on the direction of stimulus (The direction of these movements are specific). Response is always towards a specific direction; irrespective of the direction of stimulus. This reaction is not related with growth substances triggered by external stimulus. Most of them are movements due to turgor change. In legume plants, structure called pulvinus is located as a swelling at the base of a petiole or leaflet. It contains paranchyma cells, which move according to the changes in turgor pressure.

Some of Nastic movements are as follows.

- Nyctinastic movements - sleeping or shrinking of leaves of 'Kathurumurunga' / 'Agaththi', tamarind, *Mimosa* and 'Nelli' / 'Nellikkai' leaves when dark falls.
- Haptonastic movement - sleeping or shrinking of *Mimosa* leaves, when the stimulus is touched.
- Seismonastic movement - exhibiting sleeping movement during a shock.
- Photonastic movement - blooming of flowers, with the sunrise

Let us do the activity 8.4 to study about responses of plant parts.

Activity 8.4

You will need:- *Mimosa* plants

Method :-

- Touch the leaves of a *Mimosa* plant.
- Make a vibration without touching the leaves.
- Report your observations.
- Report if there are any special features in the plants for these movements.

When you touch a *Mimosa* plant the leaves show the sleep movement. It is a haptonastic movement. When you create a vibration without touching, the leaves of the *Mimosa* plant show the sleep movement. It is a seismonastic movement.

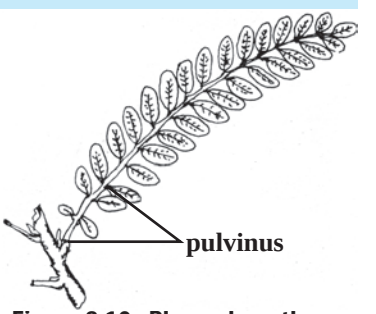


Figure 8.10 - Place where the pulvinus located

The **pulvinus** located at each leaflet and petiole base help for these movements of the plant. Pvlvini are also present in plants showing sleeping movement as dust with the decrease of sunlight.
e.g. 'Kathurumurunga', Tamarind, 'Nelli'

For extra knowledge

Tactic movements

In addition to tropic movements and nastic movements there is a type of movement known as tactic, which is related with the direction of stimulus. In tactic movement, the whole organism responds to the stimulus.

e.g. *Chlamydomonas*

In-situ Conservation

Although plants show movements they cannot locomote like animals. Animals can avoid external hazards by locomotion.

Plants grow in a habitat, where all necessary external factors, needed to growth are present. Hence plants can be get destroyed in its habitat, due to external hazards. Therefore, it is essential to conserve plants, in its own habitat. Conservation of an organism, in its living environment is known as **in-situ conservation**. Strictly reserved forests which protect indigenous plants like ebony, satinwood, vitex are examples for in-situ conservation. These species of organisms can be protected by conserving sensitive zones of environments.

Figure 8.11 - 'Vilpattu' reserve

Summary

- Animals use pseudopodia, cilia, flagella and muscles for their locomotion.
- Chordates use bones and muscles connected to the bones for movements.
- For a movement to take place muscles must have the ability to contract, stretch and recoil to their original resting length after stretched or contracted.
- Skeleton system and the muscles give the body a shape and a rigidity.
- Even though plants do not show locomotion they show movements.
- Movements of plants are categorized as tropic movements and nastic movements.
- Conservation of an organism, in its living environment is known as in-situ conservation.

Exercise

01) Select the correct or most suitable answer.

1. The appendages used by the snail for locomotion is
   1. Flagellum 2. Pseudopodia 3. Cilia 4. Muscular foot
2. What helps to maintain rigidity of non-woody plants ?
   1. Water 2. Air
   3. Different deposited materials 4. Plant nutrients
3. Human movements need,
   1. Only the bones.
   2. Only the muscles.
   3. Both bones and muscles.
   4. None of above.
4. The leaves of *Mimosa* plant show sleep movement when touched. This movement is known as,
   1. Haptonastic movement 2. Nyctinastic movement
   3. Photonastic movement 4. Positive geotropic movement
5. The growth of the stem towards the light is a
   1. Positive phototropic movement 2. Negative geotropic movement
   3. Haptonastic movement 4. Nyctinastic movement

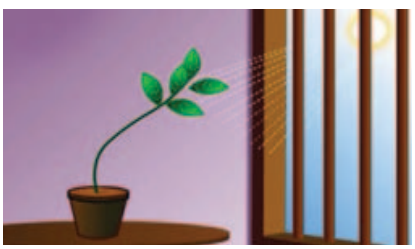
6. A tropic movement is
   1. a movement with a response directed towards the direction of the stimulus
   2. a movement with a response directed opposite direction of the stimulus
   3. a movement with a response independent of the direction of the stimulus
   4. a movement with a response directed towards or opposite the stimulus

7. The figure shows the demonstration of
   1. Positive geotropic movement
   2. Positive phototropic movement
   3. Hydrotropic movement
   4. Haptonastic movement

02) Following figures show some activities and their observations used to demonstrate the plant movements. Write the name of the movement demonstrated in each activity.

a.

b.



c.

d.

Technical Terms

Support	-	සන්ධාරණය	-	தாங்குதல்
Tropic movement	-	ආවර්තී චලන	-	திருப்ப அசைவு
Nastic movement	-	සන්නමන චලන	-	முன்னிலை அசைவு
Tactic movement	-	සාර්වසර චලන	-	இரசணை அசைவு
In-situ conservation	-	ස්ථානීය සංරක්ෂණය	-	உள்நிலைக் காப்பு