

# Ethology

V Semester B.Sc. Zoology – Core Course VII

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# INNATE BEHAVIOUR



# BEHAVIOUR

- **OUTWARDLY EXPRESSED REACTIONS OR COURSE OF ACTION OF ORGANISMS, PRODUCED IN RESPONSE TO THE STIMULI FROM A GIVEN SITUATION.**
- **BEHAVIOUR IS THE RESPONSE OF AN ORGANISM TO SIGNALS FROM ITS ENVIRONMENT.**

# Adaptive value of behaviour

- Adaptive – adaptational package necessary for survival and success of organism – helps organism to obtain food and water; establish territory; to maintain home-range, avoid enemies; protect them from unfavourable conditions; get mates for sexual reproduction and racial propagation.

# Adaptive value of behaviour

- Homeostatic – in temperature regulation – fluffing of feathers in birds; shivering of human body – low temperatures
- High temperatures – sweating of human body; panting in dogs
- Poikilotherms regulate body temperature by behavioural adaptations – lizards warm by basking; cool by shrinking or seeking shades.

# PATTERNS OF BEHAVIOUR

- INNATE BEHAVIOUR
- LEARNED BEHAVIOUR

# INNATE BEHAVIOUR

- INBORN, INHERITED AND GENETICALLY PROGRAMMED BEHAVIOUR, GOVERNED BY SPECIFIC GENES
- MOSTLY STIMULUS BOUND
- MAJOR COMPONENTS –
  - 1. ORIENTATION
  - 2. SIMPLE REFLEXES
  - 3. INSTINCTS

# ORIENTATION

- **ORIENTATION IS THE DIRECTIONAL MOVEMENT OF ANIMALS, INDUCED BY EXTERNAL OR INTERNAL STIMULI AND INITIATED BY ENDOGENOUS ACTIVITY**
- **IT INVOLVES THE POSITIONING OF WHOLE BODY OR PARTS OF IT, IN RELATION TO THE EXTERNAL ENVIRONMENT.**
- **ORIENTATION OCCURS BY ROTATION OR MOVEMENT OF THE BODY AROUND LONGITUDINAL, TRANSVERSE AND DORSO-VENTRAL AXIS.**



# ORIENTATION

- ROTATION IN LONGITUDINAL AXIS – **ROLLING**
- TRANSVERSE AXIS – **PITCHING**
- DORSO-VENTRAL AXIS – **YAWING**
- PRIMARY AND SECONDARY ORIENTATION
- **PRIMARY ORIENTATION** – ESTABLISHMENT OF BODY'S BASIC POSTURE IN SPACE
- **SECONDARY ORIENTATION** – POSITIONING AND MOVEMENT OF BODY IN RESPONSE TO VARIOUS STIMULI
- LOCOMOTOR ORIENTATION - TAXES & KINESES

# TAXES OR TAXIC MOVEMENT

- DIRECTIONAL ORIENTATION OR LOCOMOTOR MOVEMENT OF AN ANIMAL TOWARDS OR AWAY FROM THE SOURCE OF THE STIMULUS
- IT IS CONTINUOUSLY AND SPECIFICALLY GUIDED BY EXTERNAL STIMULI.
- DIRECTION OF MOVEMENT DETERMINED BY DIRECTIONAL EXTERNAL STIMULUS
- TAXES IS STIMULUS-BOUND RESPONSE

- **TAXIS** – LOCOMOTOR MOVEMENT – protoplasmic streaming, extrusion of body parts, locomotor structure
- **TROPISM** – GROWTH MOVEMENT OF A PART – PLANTS

# TAXES - CATEGORIES

- TWO CATEGORIES
- 1. POSITIVE TAXIS – MOVEMENT OF ANIMAL TOWARDS THE STIMULUS
- 2. NEGATIVE TAXIS - MOVEMENT OF ANIMAL AWAY FROM THE STIMULUS

# TAXES - TYPES

- PHOTOTAXIS – LIGHT
- CHEMOTAXIS – CHEMICAL
- THERMOTAXIS – TEMPERATURE
- THIGMOTAXIS – TOUCH/ CONTACT

# TAXES - TYPES

- BASED ON RECEPTOR ORGAN THAT PERCEIVES THE STIMULUS SEVERAL KINDS OF TAXES
- KLINOTAXIS
- TROPOTAXIS
- TELOTAXIS
- MENOTAXIS
- MNEMOTAXIS

# KLINOTAXIS

- Orientation achieved by successive comparison of intensity of the stimulus in the nearby parts of the body.
- It involves lateral swinging or wavy movements of head or whole body.
- Receptor organ is unable to detect the source and direction.
- Klinotaxis exhibited by maggots of house fly and blowfly, Euglena, etc., during negative phototaxis.

- It swings its head from side to side alternatively exposing left and right photoreceptors to the light behind.
- When left receptor stimulated animal responds by bending to the right or vice versa.



# TROPOTAXIS

- Orientation in which there is simultaneous comparison of the intensity of stimulus received at two or more receptors.
- Bilateral receptors used
- Negative phototaxis shown by Planarian worms – instead of bending from side to side take a fairly direct course away from light

# TELOTAXIS

- Directional taxic movement which does not rely on the simultaneous comparison for two receptors.
- Of two sources of similar stimuli animal chooses one and ignores the second one
- Example dragon fly towards its prey

# MENOTAXIS

- Light compass response in which orientation towards the source at definite angle to the direction of stimulus
- Example – navigation of insects, fishes and birds

# MNEMOTAXIS




- Memory –Based Orientation – Animal follow same path all the time for its orientation
- If memory path disturbed it will not proceed forward – stop proceeding forward – until it locates a familiar land mark
- Analogy between Mnemotaxis & baby reciting poem
- Mnemotaxis found in water shrew

# KINESIS

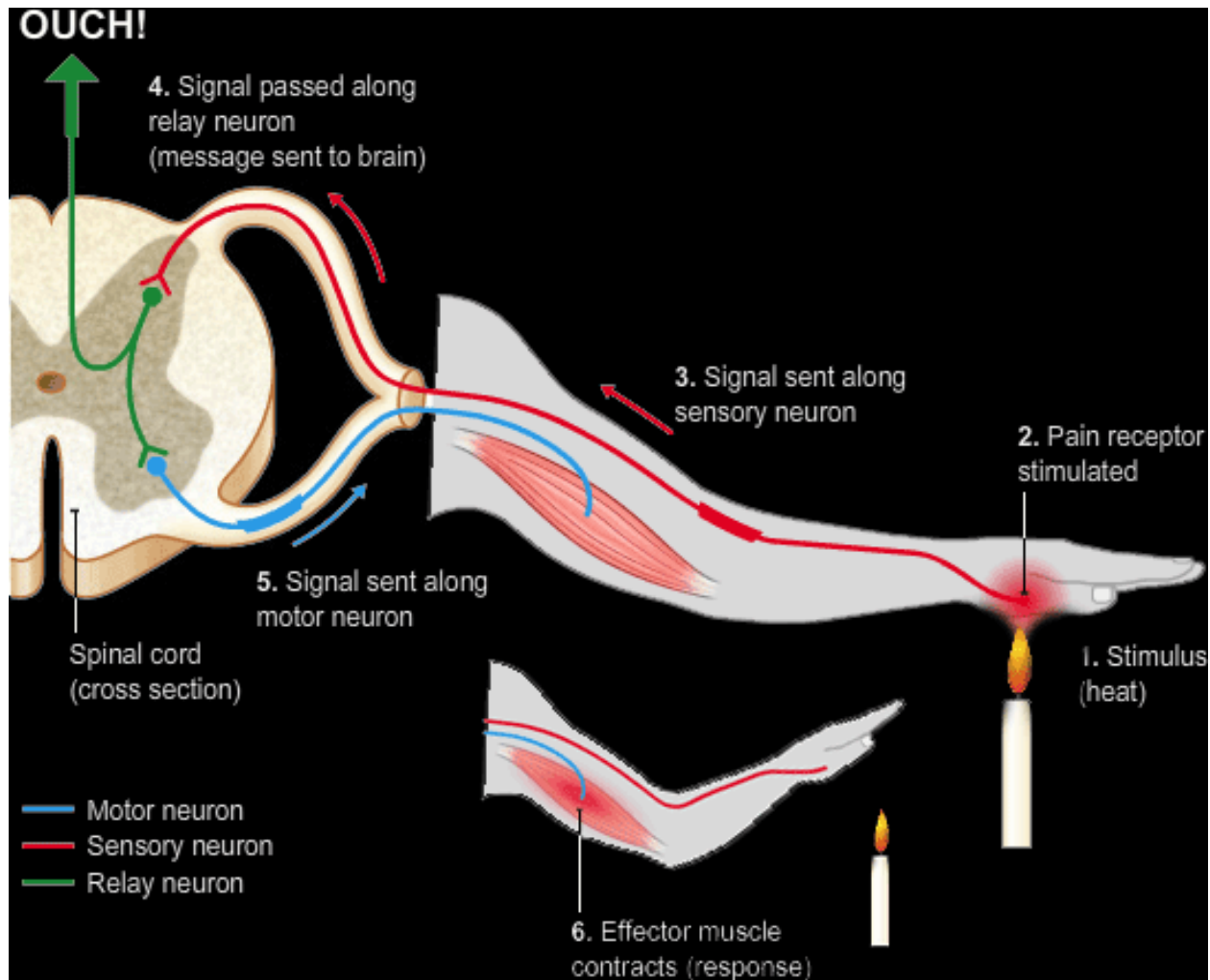
- Random, non directional orientation of the animal in which the **rate of movement** is determined **by the intensity of stimulus** rather than by direction.
- Example – movement of woodlouse
- It moves quickly at dry places and slowly or does not move at all in damp conditions

# TYPES

- **KLINOKINESIS** – rate of change of direction or angular velocity increases in proportion to increase in the intensity of external stimuli.
- **ORTHOKINESIS** – speed of locomotion is directly proportional to the intensity of stimuli and linear velocity of the body.

Behaviour	Definition	Example
Taxis	<ul style="list-style-type: none"> <li>• A response</li> <li>• Towards (positive) or Away from (negative) a stimuli.</li> <li>• The movement is direct and orientated with respect to the stimuli.</li> </ul> <p>e.g. Positive Photo-taxis : towards the direction from which light is coming.</p> <p>e.g. Positively chemo-taxis: towards the source of a diffusing chemical</p>	 <p>Planaria is a flatworm</p> <p>It will move towards food source Positively chemo-taxis</p> <p>The movement is direct and orientated with respect to the stimuli</p>  <ul style="list-style-type: none"> <li>• Euglena is a unicellular photosynthetic organism that moves in response towards light.</li> <li>• Positively photo-taxis: the movement is direct and orientated with respect to the stimuli</li> </ul>
Kinesis	<ul style="list-style-type: none"> <li>• A response to a stimuli</li> <li>• No particular direction of response</li> <li>• Increased or decreased level of activity</li> <li>• Until the organism ends up further or nearer to the stimuli</li> </ul>	 <p>Woodlouse</p>

# SIMPLE REFLEXES





# SIMPLE REFLEXES

- Involuntary responses of the parts of an organism to environmental stimuli.
- Inherited pattern of neurons in brain and spinal cord
- Two types of reflexes
  - 1. cranial reflexes – neurons of brain
  - 2. spinal reflexes – neurons of spinal cord

# SPINAL REFLEXES

- A. flexion responses – withdrawal of a part - pain
- B. stretch responses – involves the balance and posture

# REFLEXES

- TWO TYPES
- 1. tonic reflexes – slow and long lasting – maintain muscular tone, body posture, equilibrium
- 2. phasic reflexes – rapid and short living –deals with emergencies – helping animals to adjust to sudden environmental changes

# EXAMPLES

- Blinking of eyes – strong flash of light
- Knee jerking on tapping below knee
- Quick recovery of balance of body after a slip
- Pulling back of hands on touching hot objects

# INSTINCTS

- **Complex, inborn, inherited, unlearned, stereotyped and species specific behaviour patterns, produced in response to sudden changes in the environment.**
- Unlearned, species- specific motor patterns
- Provide adaptive value to organisms
- Genetically determined and governed by complex genes modified by natural selection

- Primitive than learned behaviour
- **Fixed action patterns**
- The signals which elicit instinctive responses in animals are called **releasers**.
- More prominent in invertebrates than in vertebrates

# EXAMPLES

- Migration in Birds, fishes
- Singing and nesting birds
- Courtship rituals and mating behaviour of birds and some mammals

# MATING BEHAVIOUR IN THREE SPINED STICKLE BACK

- Male chooses a mating area
- Drives away conspecific males from there
- Collects plants – makes mound
- Wriggles through – tunnel
- Slightly shorter than him – nest
- Colourful sexual attire – bright red belly and bluish white back
- Female enters – zigzagging dance – female follows



- The female **three-spined stickleback** normally follows the red-bellied male to the nest that he has prepared.
- He guides her into the nest and
- then prods the base of her tail.
- She then lays eggs in the nest.
- After doing so, the male drives her from the nest, enters it himself, and fertilizes the eggs.
- Stays near nest protects the eggs and young ones

- Although this is the normal pattern, the female will follow almost any small red object to the nest, and once within the nest, neither the male nor any other red object need be present.
- Any object touching her near the base of her tail will cause her to release her eggs.
- It is as though she were primed internally for each item of behavior and needed only one specific signal to release the behavior pattern

- For this reason, signals that trigger instinctive acts are called **releasers**.
- Once a particular response is released, it usually runs to completion even though the stimulus has been removed.
- One or two prods at the base of her tail will release the entire sequence of muscular actions involved in liberating her eggs.

# THREE SPINED STICKLE BACK



# THREE SPINED STICKLE BACK





*Thank You*