

### ANIMAL BEHAVIOUR

**Behavior** refers to the response an individual animal makes towards a stimulus it receives, or refers to the way how animals respond to their environment and other members of the same species. I.e. What an animal does when it is interacting with its natural environment. The scientific study of animal behavior is called **Ethology**

**Behavioral ecology** refers to the investigation of ultimate causes of behaviors, the evolutionary basis for behaviors as mechanisms that enhance reproductive success.

**Proximate cause**; is the immediate explanation for an organism's behavior. The interactions of an organism with the environment or the particular environmental stimuli that triggers a behavioral response in an organism.

**Ultimate cause**: The evolutionary cause of behavior.

### Development of behavior

#### i) Animal Genes:

Every animal has genetic information locked up in it for coding for certain behaviors. Therefore it is the potentiality of behavior that is inherited. These code anatomical and biochemical characteristics of any animal. They also lead to the formation of structures and organs involved in behaviour development

#### ii) Environment:

- A set of genes has to interact with a certain range of environments during the development of an animal in order to produce the expected behavior
- The interaction with the environment provides the process of growth and development
- Environmental selection favors individuals with certain genes but removes others.
- If surviving individuals in a population are adapted to the environment, their genes will be retained. If not, the individuals die out and their genes are removed.
- Behavior has therefore evolved under influence of natural selection.
- Each species is adapted to meet different conditions
- Differences in behavior between closely related species must have a survival value e.g. some animals are social others are not; some are monogamous others are not.
- The process by which animals alter their behavior through learning or hormonal mediated changes in order to cope with inevitable changes in the environment is referred to as **adaptability of behavior**.

### Types of behaviors in animals

1. Innate behavior
2. Learned behavior.

### INNATE BEHAVIORS

It is a behavior that appears to be performed in virtually the same way by all the members of a species. It implies that the animal is genetically programmed with the response which is automatically triggered off in certain environmental circumstances. This behavior is said

to be **stereotyped** since when the same response is given to the same stimulus on different occasions. Innate behaviors include;

- Instincts
- Simple reflexes
- Biological rhythms
- Territorial behavior
- Mating behavior
- Courtship behavior
- Aggression
- Social organizations
- Social hierarchies
- Altruism

**(i) Instincts:** This is a pattern of behavior that is found universally among the members of a species and occurs without the need for prior learning and experience, and which is relatively constant.

- **Instinctive behavior** is a behavior that consists of rigid stereotyped patterns of movement which are similar in all individuals of one species.
- These are inherited behavioral patterns that occur in response to a particular stimulus for the first time an individual is exposed to that stimulus.
- A response is said to be instinctive as long as there is no learning process identified with its development but is coordinated by the central nervous system.
- The importance of instinctive behavior generally recedes with advancing age in higher animals. This is because it is biologically important for the young to be protected by instinctive behavior than older animals which will have had time to learn.
- Instinctive behavior is also of great advantage in animals with a short life span. Higher animals however have got a large brain that allows for greater learning and flexibility in behavior.
- The instinctive responses that appear readily in such animals include: Copulation in insects, nest building in birds, feeding of the young etc.

### **(ii) Simple reflexes (reflex actions)**

**A simple reflex** is a quick automatic response to stimulus. A reflex action is behavior in which a stimulus produces a specific short lived response. Simple reflexes are the simplest form of innate behavior (*....read coordination in animals for more information*)

### **(iii) Orientation**

This is a type of behavior that involves the movement of motile organisms in response to external stimuli. This behavior is critical in maintaining an organism in a favorable environment. E.g. when wood lice are exposed to light, they quickly scatter and disappear under any available cover hence repositioning themselves in dark damp favorable microhabitats.

#### **Types of orientations**

- **Kinesis** is the random movement of an organism in which the rate of movement is related to the intensity of stimulus, but not to its direction. There are two main types of; **orthokinesis**, which involves changes in speed of movement; and **klinokinesis**, which involves changes in the rate of turning.
- **Taxis** is a movement of an organism in response to the direction of stimulus. Movements towards a stimulus are positive; those away from a stimulus are negative.

#### (iv) Biological rhythms

These are cyclical activities that are a basic characteristic of animal life. i.e. regularly repeated behavioral patterns. These are behaviors or developments that occur as part of a life cycle. They can occur often, like sleeping every night, or can occur once, like an insect developing from a larva.

Biological rhythms can be:

- ❖ **Internal (endogenous)** - controlled by the internal biological clock e.g. body temperature cycle
- ❖ **External (exogenous)** - controlled by synchronizing internal cycles with external stimuli e.g. Sleep/wakefulness and day/night. Many terrestrial insects appear to be controlled by exogenous rhythms which are related to periods of darkness and light. E.g. drosophila emerge from pupa at dawn whereas cockroaches are most active at the onset of darkness and rest at dawn.

#### Forms of biological rhythms

**Circadian rhythms:** endogenously generated rhythms with a period close to 24 hours.

**Diurnal rhythms:** a circadian rhythm that is synchronized with the day/night cycle.

**Ultradian rhythms:** biological rhythms (e.g. feeding cycles) with a period much shorter (i.e. frequency much higher) than that of a circadian rhythm.

**Infradian rhythms:** biological rhythms with a cycle of more than 24 hours (e.g. the human menstrual cycle).

#### (v) Displacement activity:

It is an irrelevant behavioral response an organism sometimes gives when confronted with two alternative courses of action.

#### Examples

- If a bird is sitting on its eggs is suddenly confronted by a predator, it may be torn between fleeing the nest and attacking the predator. So it does neither and instead, it preens its feathers.
- Two birds fighting may suddenly peck at the ground or get into roosting position. The two opposing alternatives that the birds have are to fight or escape.
- In sticklebacks, a male may suddenly adopt a vertical position with its head downwards and start digging the sand in the course of a fight.
- In man stroking of the forehead, scratching behind the ear, biting of finger nails etc.

#### (vi) Vacuum activity

This is a behavioural sometimes given out by a frustrated animal in absence of a normal release. It is when motivation builds up, but no right stimulus is provided to cause an appropriate behavior. In this case a normal response is produced but directed towards an inappropriate object or situation.

#### Example

- A cock deprived of a mate displays a courtship dance to an innominate object such as a bucket.

- A bird may go through the motion of building a nest even if no nesting materials are available.

**(vii) Social behavior**

It is a form of behavior that involves interactions between two or more animals of the same species. It is most clearly seen in animals which organize themselves into social groups called **societies**. **Advantages of social behavior**

- Better protection against predators, due to improved detection and escape systems
- Better use and defence of limited resources
- Increased feeding efficiency
- Increased reproductive efficiency
- Increased survival of offspring through communal feeding and protection
- Saving of energy by endothermic animals as a result of being together
- Saving of energy by moving fish and birds which can take advantage of vortices created by others in a group.

**Disadvantages**

- Increased competition for water, space, food mates and others resources
- Increased susceptibility to diseases and parasites
- Higher risks of being harvested by humans
- Higher risks of predation on young by cannibalistic neighbours.

**Forms of social behaviors 1) Territorial behavior (Territoriality)**

**Territoriality** is the defense of an area occupied by relatively exclusively by an animal or a group of animals.

**A territory** is an area that an individual defends, usually to the exclusion of other members of the same species.

Territories are typically used for feeding, mating, rearing young or a combination of these activities.

It is fixed in location, its size varying with the species, the territory function and the amount of resource available.

**Advantages of territoriality**

- Reduces competition for resources such as food, space, etc.
- Conserves energy during critical periods
- Prevents over-crowding and exhaustion of food supplies
- Enhance bond pair formation which facilitates reproduction in most animals
- Strengthens and maintain bond pairs by associating the animals within a territory
- Permits improved defense of nests, nestlings and adults
- Guarantees food supply to young ones by keeping off all other animals that would feed on it.
- Limits mating to fit individuals and hence increase the overall fitness of the population.
- Minimizes epidemics since contact between animals and population density are limited.

### Disadvantages of territoriality

- Limits the population density that can be attained by an area ➤ Denies weak individuals chances to mate.
- Encourages inbreeding which may reduce the overall gene strength of genes in the population

### Examples of territoriality

- In antelopes the most basic form of territoriality is that shown by forest antelopes in which a pair forms a territory to breed. These forest species do not use vocal and visual displays but rather live in a world of scent, marking their territories by means of their prominent scent glands and dung piles.
- The Agamid lizards have a dominant male with several females and subdominant males. The dominant male of Agama is very conspicuous with a bright orange head and a blue tail in contrast to the subdominant ones. Subdominant males resemble the brown females. It is only this dominant male that defends the territory by displaying its bright colours.
- The Uganda Kob has a territory system in which a buck occupies an area which supplies almost all its needs except water. Breeding takes place throughout the year on permanent mating grounds called **Leks**. Such grounds are stamping grounds on which the male defecates, urinates, rolls, guzzles the grounds and rubs his face marking it with its facial gland. The male normally makes its presence known by a powerful/whistle which usually results in an answerable chorus from the females. Each ground has its owner and as a doe passes through these ground patches, the hopeful owner prances towards her but loses interest as soon as she crosses his limits to the next territory. If she stays, mating takes place; each consummation being announced by a boastful whistle to his neighbors. After this, the male may lie down or quit the female instantly, to try and impress another.
- Many species of weaver birds rest in colonies and the nests are built by the males which display noisily to the females by hanging beneath their nests and flapping their wings vigorously. Each male builds several nests and if he succeeds in attracting more than one female, each female uses a separate nest. The male defends a small volume of air around his nests including nearby twigs and chases away any other male who attempts to intrude. However all birds form a colony and mix freely while feeding.

## 2) Courtship and Mating behavior

**Courtship** is the heterosexual reproductive communication system which leads to the consummatory sexual act of mating. It usually occurs into two phases of **pair formation** and **copulatory behavior**.

Attracting a mate is often a big problem for animals because they have to respond to hormonal changes within their bodies and changes in the environment.

Many auditory and visual displays have only evolved in order to solve the problem of finding a mate. This is why animals sing, dance, exude scents, change colour etc.

### Functions of Courtship

- Courtship reduces male aggressiveness, suppresses the attack and flight and increases the sexual tendencies

- Courtship causes synchronization or coordination of the time pattern of mating that ensures fertilization of eggs.

**Reproductive isolation:**

This is the avoidance of mating with members of different species (hybridization). Interspecific mating would lead to the disturbance of delicately balanced growth patterns. Intraspecific mating is ensured by each species developing different courting methods.

- It ensures defence to the mates during the mating seasons. (*Read about courtship in sticklebacks*).
- It synchronizes breeding with environmental conditions that can favour proper growth of offspring. For instance, in most species of herbivores reproduction takes place at the onset of wet seasons to ensure constant supply of food to the young ones.

**3) Aggression/Agonistic behavior.**

This is a group of behavioral activities including rituals, physical attacks on the organism but not associated with predation. It is behaviour which is associated with conflict or fighting or contests involving two individuals. It involves both threatening and submissive behaviors which determine which competitor gains access to some resource such as food, nesting sites and mates. Fights rarely end in death but may result in serious injury. They are highly ritualized and resemble tournaments. This is because killing or seriously injuring the loser would be disadvantageous because the loser may **not** necessarily be less healthy or weaker but may not be mature. Serious fights occur in animals which have weapons that can inflict motor injury but most of the time the loser is capable of quick flight. Fighting immediately stops when the loser turns away or surrenders thus assuming a submissive posture.

**Examples**

- In wolves, the throat which is the most vulnerable part is exposed to the opponent. This inhibits further attack. □ In birds, some species turn the back of the head to the opponent and the rival stops fighting.
- In cichlid fish, the fish lie side by side and beat each other by tails. If they cannot decide who has won, they face each other pull and push by the jaws until the loser folds the dorsal fin.
- Deers match side by side eye each other on the corner of the head, face each other and clash the antlers (horns). If one exposes the posterior view, the rival waits until they face each other again and fight.

**Aggression/Fighting serves an important function:**

- Spacing out individuals and promoting distribution of a species. Spacing out is achieved by natural hostility
- In ground breeders e.g. gulls, spacing out is a means of defense against predators because a great concentration of prey in case eggs or chicks would attract the predators. Hence territorial fighting keeps individual groups far apart.
- Competition for mates by fighting selects fitter individuals for propagation of the species.

The evolutionally process whereby the displays become modified to form social signals is called **ritualization**. **Ritualization** is the use of displays/symbolic activities so that no serious harm is done to either combatant.



#### 4) Dominance Hierarchies/Peck Order

**A dominance hierarchy** is a social ranking of each member in a social group. **It refers to social rankings of each member within a social group according to status.**

It can also be defined as a form of animal social structure in which a linear or nearly linear ranking exists, with each animal dominant over those below it and submissive to those above it in the hierarchy. Such a hierarchy is common amongst species of fish, birds like hens and mammals like baboons, wolves, etc.

If several hens unfamiliar to one another are put together, they respond by pecking each other. Eventually the group establishes a clear peck order hence a linear dominance hierarchy. In such a group, one individual is the tyrant and dominates and controls behaviour of all others by threats.

The next is subordinate only to the tyrant but subdues the rest. The third is subordinate only to the above two and dominates the rest and so on, down the line to the lowest. In such cases, learning often reduces the amount of fighting because each individual learns which of its companions is stronger and thus must be avoided or which members are weaker and can therefore be intimidated.

Such a continuous order of hierarchy is referred to as **peck order or dominant hierarchy** and it reduces the amount of actual fighting. Male individuals who do not learn their place and avoid their superiors are always at disadvantage because they receive more fights.

E.g. Wolves live in packs and within the pack a dominance hierarchy exists among females. The top female controls mating of others. When food is abundant, the top female mates and allows other females to do so. When food is scarce, she allows less mating hence making more food available for her own young.

#### **Establishment of Dominance Hierarchies**

Dominance hierarchies are often established through ritualized displays or mild fighting, rather than all-out battle. The loser in a battle for dominance typically moves away from a choice habitat or a disputed mate. Among primates, dominance conflicts frequently involve no more than the display of enlarged canines, sometimes through yawning. Bears, also, will roar or wave their open mouths at social inferiors. Behaviors like these do not require fighting, but do result in the prominent exhibition of potentially formidable fighting weapons. In other cases, as in elephant seals, there actually can be prolonged, often bloody fighting. However, once the hierarchy is established, subsequent fighting is less frequent. In many cases, there is a strong correlation between dominance and large size.

Dominance hierarchies have to be reestablished when certain individuals feel prepared to move up within the hierarchy, or when new individuals are introduced into an area. During such time a series of challenges may occur.

This can be a stressful period for all individuals involved.

#### **Advantages of social hierarchies.**

- Facilitate the sharing of resources to occur such that fit ones survive
- Increase genetic vigor in the group by ensuring the strongest and genetically fit individuals have higher reproductive advantage
- Decrease the amount of individual aggression associated with feeding, mate selection and breeding site selection

- Avoids injuries to stronger animal that may occur if fighting would be necessary to establish a hierarchy.

#### **Disadvantages of social hierarchies**

- Encourage inbreeding which may lead to expression of undesirable characteristics.
- Increase chances of starvation of weaker individuals since stronger ones feed first leaving the weaker ones to feed on left overs.
- Increased reproductive disadvantage in subordinates since mating is restricted to tyrants
- higher levels of stress hormones in high ranking individuals lead to high metabolic rates that demand large amounts of food that may result to quick starvation of the whole group in case of food shortage.

#### **5) Altruism:**

This is a form of social behavior whereby an organism puts itself at a risk or personal disadvantage for the benefit of the other members of a species. The animal acts in the interest of others at a cost of one's self in terms of chances of survival and reproduction. **Examples**

- (i) Some animals give alarm calls which warn others of the approach of a predator e.g. ground squirrels. The alarm caller is most likely attacked because when it calls, the others run into the burrows with it going down last.
- (ii) A female baboon protects and cares for its offspring for almost six years
- (iii) Female birds protect their nestlings from unfavorable weather conditions such as rain (iv) Female monkeys care for young ones of others.

#### **Significance of altruism**

- Ensures survival and protection of weak and young ones.
- There is increased chance of survival of young ones.
- It increases allele frequency of a particular organism.

#### **6) Social Organization**

Ants, bees and termites are social insects living in colonies and have an organization based on a **caste system**. Individuals often assume specialized roles which increases the overall efficiency of the group. The roles include; food finding, reproduction, offspring rearing and defence.

Cooperation between members of the society, sharing and division of labour depend on a stereotyped pattern of behavior and effective means of communication. In insect societies, differences in body structure and reproductive potentials affect their roles within the society a feature called **polymorphism**.

**Polymorphism** is the existence of organisms of different species in different forms e.g. termites include the queen, king and workers. In bees, there are; queens, workers and drones. These forms are known as **polymorphs** or **castes**

### **ANIMAL COMMUNICATION**

**Communication** is the transfer of information from one animal to another. Communication in animals occurs when one individual uses intentional, specially designed signals or displays to modify the behaviour of others.



Communication can occur within species (intraspecific) or between species (interspecific). The former are mostly important in reproductive success while the latter mostly includes warning signals. Therefore communication involves passage of information whose effect may be to:

- ❖ encourage approach
- ❖ performance of a corporate act
- ❖ Prevent attack or induce withdrawal in animals.

There are four different communicative channels:

- Visual
- Auditory/Acoustic
- Olfactory/chemical
- Tactile

### **Olfactory communication.**

This is the use of odors/scents, which are diffused and persistent in space and time. Unicellular organisms with chemoreceptors can recognize members of their own species using olfactory means.

Chemical signals are well developed in insects, fishes, salamanders, and mammals. They often reveal the animals' underlying physiological and sexual states.

Chemicals that are synthesized by one organism and that affect the behaviour of another member of the same species are called **pheromones**.

Pheromones are secreted by a number of species: Ants during their trailing behaviour, Silk moth, Female cockroaches, Species that perform territorial marks by urine & dung. In honey bees, the Queen secretes substances that are quite outstanding in complexity and playing role in the social organization of the colony. There is an acid called Ketodecenoic acid from the queen's mandibular glands and it is spread throughout the colony by the workers by leaking the Queen's body and regurgitating the materials back and forth to one another in a colony. It evokes three separate effects:

- It stops workers from rearing larvae into new queens
- It stops the development of the ovaries of the workers
- It acts as a sex attractant.

Differences in the chemical structure of pheromones may be directly related to their function. Pheromones used for marking territories and attracting mates usually last longer because of their higher molecular weight.

Airborne signals have lower molecular weights and disperse easily.

### **Visual Communication**

This is a directional kind of communication based on sight. It is always associated with displays which involve facial and ear expressions, hair erections, tail post position and general body posture. Almost all-animal coloration is protective either by being concealing or by warning.

**For example;** most predators watch movements of the prey and the prey that keeps still until the last moment undoubtedly rely on its color to protect it from being seen.

Visual communication is important to many animals because a large amount of information can be conveyed in a short time but may have some **disadvantages**:

- Various objects in the environment may block the line of sight
- Signals may be difficult to see over a long distance
- Signals not effective at night
- Signals may lead to detection by predators

### **Vocal/Acoustic/Auditory Communication**

Sound allows much information to be communicated in a short time. Acoustic communication is also exceedingly abundant in nature, likely because sound can be adapted to a wide variety of environmental conditions and behavioral situations. Sounds can vary substantially in amplitude, duration, and frequency structure.

There are two categories of sound in animals:

- i) Call notes:** that are species specific and inherited. (A call notes is a brief sound whose function is to give warning about the presence of an enemy).
- ii) True songs:** that are partly inherited and partly learned. (True songs are usually for attraction and serve an important function in mate selection and bonding between parents and juveniles).

### **Tactile Communication**

This refers to communication between animals in physical contact with each other. The antennae of many invertebrates and the touch receptors in the skin of vertebrates function in tactile communication. Some examples of tactile communication include:

- Birds preening the feathers of other birds and
- Grooming in primates.
- Fighting (the last resort of tactile Communication).

### **Significance of communication signals**

Communication signals also play an important role in:

- Conflict resolution, including territory defense. When males are competing for access to females, the costs of engaging in physical combat can be very high; hence natural selection has favored the evolution of communication systems that allow males to honestly assess the fighting ability of their opponents without engaging in combat.
- Communication signals are often critical for allowing animals to accurately identify their own young.
- Warning systems. Communication signals are warning systems that convey information about the environment are often critical for allowing animals to relocate and avoid danger (predation, climatic catastrophes, anthropogenic)
- Maintaining group cohesion. In group-living species that form dominance hierarchies, communication is critical for maintaining ameliorative relationships between dominants and subordinates.
- Communication systems also are important for coordinating group movements.
- Reproductive success. Some of the most extravagant communication signals play important roles in sexual advertisement and mate attraction. Successful reproduction requires identifying a mate of the appropriate species and sex, as well as assessing indicators of mate quality.

## LEARNED BEHAVIORS

**Learning:** is the capacity to record specific experiences and modify behavior in the light of those experiences thus learning is an adaptive change in behavior resulting from past experience. Learned behavior is therefore acquired during the life time of an individual as a result of constant experience.

Learning is characterized by flexibility and the resultant behavior can be modified if the environment changes. Learning depends on the genetic constitution of an animal. Each stage of development depends on the proceeding stages and the interaction between animals with their environment to show the ability of animals to learn. The differences in behaviour, may reflect differences in sensory and motor functioning in animals. Learning allows an animal to respond quickly to changes in the environment. Once an animal learns something, its behavioral choices increase. Learning in animals is diverse and ranges from habituation (the simplest form of learning) to insight learning (the most complex form) that involves cognitive processes.

### Types (classes) of learning

- |                            |                     |
|----------------------------|---------------------|
| (i) Habituation            | (iv) Imitation      |
| (ii) Imprinting            | (v) Latent learning |
| (iii) Associative learning |                     |

**(i) Habituation:** Is the loss of response to a constant stimulus after repeated exposure. Thus habituation is a form of learning in which repeated exposure to a stimulus results in decreased responsiveness.

#### Examples;

- A sudden loud noise causes a horse to bolt on initial exposure, but if it is subjected to repeated noise, the responsiveness decreases.
- A snail scrolling across the board can be made to withdraw into its shell by hitting the board firmly, repetition of this action result in a snail ignoring this stimulus.
- Hydra contacts when disturbed by a slight touch; it stops responding however, if disturbed repeatedly by such a stimulus
- A scarecrow stimulus will usually make birds avoid a tree with ripe fruits for a few days but they later become habituated to it and they may even land on it on their way to the fruit tree.
- In species that rely on alarm calls to convey information about predators, in this case animals stop giving alarm calls when they become familiar with other species in their environment that turn out not to be predators.

Once habituated to a stimulus, an animal still senses the stimulus, but the animal learns not to respond to it. It is believed that habituation is occurs as a result of synaptic blocks somewhere in the reflex arc. In some circumstances, loss of responsiveness to a stimulus may result from **fatigue** or **sensory adaptation** rather than habituation.

### Significance of habituation to animals

- It enables animals to avoid wasting time and energy responding harmless stimuli that do not threaten their survival or and reproduction.
- It allows an animal's nervous system to focus on stimuli that signal food, mates, or real danger that may be beneficial to its survival.

**(ii) Imprinting:** This is learning that is limited to a specific time period in an animal's life and that is generally irreversible or is a form of learning that occurs during a brief, genetically determined **critical period** in the lives of animals, usually shortly after birth. A particular stimulus becomes permanently associated with a particular response.

One result of imprinting is the formation of a strong bond between two animals, often between a new offspring and its parent. The limited phase in an animal's development when the learning of certain behavior can occur is called **sensitive period**.

#### Examples of imprinting.

- Shortly after giving birth, a mother goat is sensitive to the smell of her kid for about an hour. During this critical period, a few minutes contact with any kind, is sufficient to accept it as her own.
- Nestling respond to their parents' calls a few minutes after hatching
- Mother birds and mammals are able to recognize their young ones shortly after birth.

### Significance of imprinting

- Allows an animal to learn the characteristics of its parent so that it can recognize its parents and other members of its species.
- Enables adult animals to recognize their own offspring.
- Allows effective communication between parents and offspring to take place.
- Enables the migratory salmon fish to trace their way back to fresh water streams to spawn.
- It plays an important role in song development in birds.

*(Read about **Lorenz Konrad's** study about imprinting in birds.)*

**(iii) Imitation:** this is learning by observing and mimicking the behaviour of others. It involves copying the behaviour of another individual, usually a member of the same species.

#### Examples;

- Nestling learn to fly by mimicking the flight of their parents
- Young predator acquire hunting skills from their parents by imitation.

### (iv) Associative learning/conditioning/association

This is a type of learned behavior whereby an animal learns to associate a particular response with a reward or punishment. I.e.an animal learns that a particular stimulus or response is linked to a reward or punishment.

#### Forms of associative learning/ condition

**(a) Classical conditioning:** This a form of learning in which a behaviour that is normally triggered by a certain stimulus comes to be triggered by a substitute stimulus which

previously had no effect on the behaviour. Therefore, it involves association between meaningless stimulus (bell) and meaningful stimulus (food) (*Read about Pavlov's experiment on dogs*)

**Features of classical conditioning**

- Involves association of two stimulus presented simultaneously
- Reinforced by repetition i.e. it is temporary
- Removal of the cerebral cortex from the animal, causes total loss of response.

**For example,** Birds learn to avoid certain brightly colored caterpillars that have a noxious taste. Because birds associate the color pattern with the bad taste, they may also avoid animals with a similar color pattern.

**(b) Trial and error learning (Instrumental/Maze learning) or operant conditioning.**

This is a form of associative learning in which an animal learns to associate one of its own behavioural acts with a positive or negative effect.

An animal's spontaneous movement may by chance produce a reward and the animal learns by trial and error to repeat the same behavioral patterns. The reward may often be pleasure of performing an action more accurately than before. This is probably the most appropriate category for the learning of new motor skills e.g.

- Predators quickly learn to avoid certain species of prey with painful experiences like porcupines □ Young mammals and birds perfect their prey catching skills,
- Humans learn to play the piano by a trial and error form of practice.

(*Read about B.F. Skinner's experiment*)

**Characteristics of operant conditioning**

- It is improved by repetition
- The associative stimulus follows the action
- It is temporary in nature
- Removal of the cerebral cortex does not result in loss of response.

**(c) Latent learning/exploratory learning.**

This is a behavioral pattern that arises when an animal stores information while exploring its environment. It involves making associations without immediate reward. It allows the animal to learn about its surrounding as it explores and this information remains latent or hidden until an obvious reinforcement is provided. Knowledge about an animal's home area may be important for its survival, perhaps enabling it to escape from a predator or capture prey.

**Example:** A bee visiting on particular flower repeatedly, learns to associate the colour and scent of the flower with its nectar, it also learns the flower's relative position to the hive and at what time of day the flower is producing most nectar.

**Ecological significance of associative learning.**

- Enhances acquisition hunting skills in a variety of predators.
- Enhances mimicry in a variety of animals to avoid predators.
- Allows animals to easily find and select food basing on associations they make in their environment.
- Increase chances of an animal's survival by avoiding undesirable stimuli.

**(v) Insight learning**

In insight learning, the animal uses cognitive or mental processes to associate experiences and solve problems. This has also been observed in chimpanzees in the wild where they use tools to accomplish certain tasks e.g. they used crumpled leaves as a sponge for drinking water, they also use long stick to fish ants out of their nests and use stones to crack hard nuts.

**(vi) Fixed action patterns**

These are behavioral patterns that are resistant to change and may not even be altered by the learning process. They are controlled by very few neurons in the central nervous system and are performed perfectly in an identical fashion.

**For example,** Yawning in primates and the two nesting habits in the parrot family Agapornis i.e. tucking of building material under the wing and carrying it in the bill. When few of such species were interbred the highbreeds failed to build nests. Those which succeeded did it after a very long time and carried the “nesting material in the beak.

**MEMORY**

This is the ability to store and recall past experiences.

**Types of memory**

**Short term memory:** This lasts for a short time. It is easily disrupted

**Long term memory:** This lasts for a long time (many years). It is relatively permanent and resistant to change.