**BEHAVIOR**

Is the outwardly expressed course of action produced in an organism in response to stimulus from a given situation

It modifies the relationship between the organism and its environment.

*Adaptive significance of behavior*

To perpetuate the organism in terms of survival and reproduction.

***Ethology***: is the scientific study of animal behavior, particularly when that behaviour occurs in the context of an animal’s natural environment.

**TYPES OF BEHAVIOR**

***1. Innate / instinctive behaviour:*** natural, inborn patterns of behaviour e.g. suckling in newborns.

***2. Learned behaviour:*** behaviour acquired through experience / practice.

**INNATE BEHAVIOR**

Natural, inborn behaviour that is genetically programmed hence inherited.

It includes; orientation (kinesis and taxism), simple reflexes and instincts

***Characteristics of innate behavior.***

* It is inherited not acquired
* It is similar among members of a species though slight differences occur between males and females.
* It is sequential, the completion of one activity results in start of another.
* It is unintelligent, the individual does not know the purpose of the behavior

**CATEGORIES OF INNATE BEHAVIOUR**

**1. Reflex:** This is an involuntary stereotyped response of part of an organism to a given stimulus. It is a simple, automatic response of a body to a stimulus that involves no conscious control e.g. Pull hand away from hot surface, baby feeding, horse tail swatting at flies. They are determined by the inheritance of specific patterns of neurons forming cranial and spinal reflexes.

Neurons are concerned with flexion or stretch. Flexion responses code for withdraw whilst stretch responses code for balance and posture. There may be an overlap of innate and learned behavior when the brain modifies reflexes according to circumstances. These are called conditioned reflexes e. g. blinking the eye in response to sudden movement.

**2. Orientation behaviors**

These are coordinated movements (walking, flying, swimming, etc.) that occur in response to an external stimulus. These behaviors have adaptive value for survival by helping the insect locate (or avoid) the source of a stimulus.

**a. Kinesis:** This is a non-directional orientation behavior where the rate of movement is directly proportional to the intensity of a stimulus.

***Example***: Woodlice move around rapidly and randomly when exposed to light until they find better conditions then they stop moving or move slowly.

**b. Taxis:** This is a directional movement of a whole organism in response to an external directional stimulus. If the movement is towards the stimulus, it is positive, if it is away from the stimulus it is negative. Some orientations involve maintain a dorsal light reaction in which the dorsal side is usually uppermost e.g. in fish such as Plaice.

***Example:***

Fly maggots move away from light sources (negative **photo taxis**)

Direction of stimulus is detected by moving the head which bears the major sensory organs. This enables symmetrically placed receptors on the head to detect stimulus. It is called klinotaxic response.

**INSTINCTIVE BEHAVIOR (Fixed Action Patterns)**

This is a collection of complex, inborn, stereotyped behavior patterns of immediate survival value to the animal, produced in response to sudden changes in the environment.

* They are unique to a species and hence are called species characteristic behavior.
* Its more common in insects and in vertebrates
* It’s a neuronal economy measure; providing organisms with already made set of behavioral responses.
* The already made responses undergo natural selection and confer survival significance.
* The animal performs such behavior without a period of learning.

**TYPES OF STIMULI**

* **Releasers/ sign stimulus.** These are simple stimuli or sequence of stimuli produced by a member of a species which evokes a behavioral response in another member of the same species. These stimuli elicit particular responses when the animal encounters them e.g. sight of food
* **Motivational stimulus.** Provide the goal or drive to prepare the organism for activity. For example, a depleted food reserve in the body during hibernation prepares the body for awakening. These stimuli determine the animal’s state of responsiveness. e.g. being hungry
* **Terminating stimulus.** Is an internal or external stimulus that terminates a behavioral response. For example; a visual stimulus of a completed nest will terminate nest building. The internal satiety of a full stomach will terminate feeding. Also internal satiety accompanying ejaculation terminates mating.
* Continuity of behavior is upon the presence of such stimulus. Classification of responses in case of interruption of the fixed action patter

**DISPLACEMENT ACTIVITY**

* An irrelevant activity produced by an excess of one or more conflicting drives in an organism. Displacement activities occur when an animal experiences high motivation for two or more conflicting behaviors, the resulting displacement activity is usually unrelated/ irrelevant/ out of context to the competing motivations

***Examples***

* Birds may peck at grass when uncertain whether to attack or flee from an opponent.
* A human may scratch his or her head when they do not know which of two options to choose.
* A bird may pick up nesting material from the ground and throw it away on being disturbed from the nest.
* Sticklebacks suddenly dig in the vertical position during a boundary clash.

**VACUUM ACTIVITY**

This is a type of displacement activity in which an animal with motivation to perform a behavior but deprived of its appropriate releaser performs in the wrong situation performed without apparent need or stimuli.

***Examples***

* Even if there are no insects, a bird snaps at imaginary insects in the air, no reason to do so but just exercising instinctive action pattern.
* Domestic squirrel raised in a metal cage will go through the entire sequence of nut-burying activities as if it were in the bush.
* Birds deprived of a mate will display to an inanimate object such as a bucket

**TIMING OF BEHAVIOUR**

* ***Circannual*** - occurs on a seasonal / annual basis. ***Examples***: hibernation in bears, frogs, toads, salamanders bury themselves in mud during the winter.
* ***Circadian*** - This is a 24-hour, light-regulated, sleep/wake cycle of behaviour. Circadian rhythms are controlled by genes, yet are also influenced by factors such as jet lag and shift work.

**TERRITORIAL BEHAVIOUR / TERRITORRIALITY**

A **territory:** a physical space an animal defends against other members of its species.

**The main reasons for territoriality**

* Control food supply
* Retreat; shelter; nest,
* Access to mates;
* space for sexual display; courtship

Animals that have territories mark and defend their space by **singing** e.g. birds, **urinating** e.g. mammals, **constantly standing guard** e.g. carpenter bees, **releasing pheromones** e.g. some insects

**ADVANTAGES OF TERRITORIAL BEHAVIOUR**

* Males able to hold on to resources show their evolutionary fitness and are attractive to females.
* Exclusive access to food, particularly at times of shortage.
* Exclusive area for breeding and raising young.
* Space for sexual display and courtship.
* Spacing of animals avoids competition.
* Reduces aggression / conflicts.
* Improves local knowledge of predators and resources.
* Exclusive place to retreat and shelter.
* Dispersion of nests reduces predation.
* Higher survival rates.

**DISADVANTAGES OF TERRITORIAL BEHAVIOUR**

* Cost of defending territory including risk of physical contact, and displays of strength.
* Defending territory is time that could be feeding or mating.
* Vocal or visual communication of territory ownership makes the individual vulnerable to predation.
* Difficult for smaller animals to hold territory; i.e. more likely to be attacked than larger animals
* Difficult to move if resources exhausted.
* Importance of territory size. If too large, then hard to maintain resources for effort of defending.
* Higher risk of predation if territory within predator’s territory.
* Easy for predators to find.
* Ever present threat of take-over as surplus of animals without territory.
* Extra vigilance required at certain times of the year (e.g. breeding season).

**MIGRATION**

**Animal migration** is the relatively long-distance movement of individual animals, usually on a seasonal basis. It is the most common form of migration in ecology. It is found in all major animal groups, including birds, mammals, fish, reptiles, amphibians, insects, and crustaceans.

**Causes of migration**

* Resource availability changes depending on seasonal fluctuations, which influence migration patterns.
* Different species also might migrate for reproductive purposes. Pacific salmon is an example of a species migrating to reproduce. Every year pacific salmon travel upstream to mate and then return to the ocean.
* Temperature is also a driving factor of migration that is dependent on the time of year. Many species, especially birds, migrate to warmer locations during the winter to escape poor environmental conditions.
* In circadian migration clocks of both circadian (daily) and circannual (annual) patterns are utilized to determine the birds’ orientation in both time and space as they migrate from one destination to the next. This type of migration serves as being advantageous in birds that during the winter remain close to the equator

***Examples of migration***

* Some species of Gallinaceous and raptorial birds migrate from valley to mountain peaks
* Some sharks, whales (northern oceans for calving, southern areas for breeding) and other marine mammals - engaged in long distance oceanic migrations
* Salmon return to native streams to breed after several years at sea
* Deer and Caribou, African ungulates - mammals engaged in overland migrations

**CUES THAT ANIMALS USE TO NAVIGATE**

1. ***Endogenous*** - hormonal
2. ***Exogenous*** - external cues from the environment

***Examples:***

* Sun compass - movement of sun; angle of sun; polarized light (pattern of light based on sun’s position and reflection on water)
* Geomagnetic compass - sensitivity to magnetic North and the earth’s magnetic field
* Star compass or position of moon
* Other visual cues - patterns of waves; cloud patterns; landmarks
* Smell
* Sound
* Electric
* Young animals may learn when and where to migrate by following their parents

**Advantages of migration**

* Return to specialist site for breeding that does not need all year round food supply, and often no (or few) predators.
* Move to where food/prey available when not breeding, particularly with young (i.e. maximize feeding opportunity).
* Stationary can mean increased predator risk.
* Constant temperature conditions: escape bad weather and lower temperatures (and greater risk of death), especially to give birth.
* Able to have specialist breeding site (e.g. no predators) and another site for feeding.
* Flexible strategy - some members of the species can migrate and others not depending on where live.
* Stationary animals risk exhausting food supply using it all year round, particularly if competition from other species.
* Opportunity for different members of the species to meet, and greater breeding variety
* Ideal when specialist food required because the earth’s resources are not evenly distributed.
* Birds migrating at night usually safe from predators as few day-time birds of prey adapt to night-time hunting.

**Disadvantages of migration**

* Large amount of energy required to travel long distances.
* Problems and risks of navigation.
* Risk of forgetting sites or not being able to find again.
* Leave home territory empty allowing for invaders, and then fights on returning.
* Risk at temporary stopovers from lack of local knowledge about predators.
* Vulnerable to weather changes or poor conditions in one year.
* Many decisions required including optimal fuel load and optimal time of departure.
* Other risks like the change from salt to freshwater or vice versa for some fish.
* Evolutionary maladaptive behavior in some cases; e.g. green turtles feed on eastern coast of South America but breed on Ascension Island (south Atlantic).

**AGONISTIC BEHAVIOURS**

Ritualized behaviors that substitute for physical contact and fighting e.g. yawn of baboons, dogs baring their teeth, cats raising their fur, birds raising their feathers, fighting and physical contact in wolves, coyotes, seals, etc. 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. It 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.

Aggressive behavior is used to intimidate another animal of the same species. Animals fight or threaten one another in order to defend their young, their territory, or a resource such as food. In animals, usually the oldest or strongest wins the argument.

**DOMINANCE/ SOCIAL HIERACHY**

A ***dominance hierarchy*** isa form of social ranking within a group in which some individuals are more subordinate than others. The ability to form a dominance hierarchy is innate, but the position each animal assumes may be learned.

The term ***pecking order*** comes from a dominance hierarchy that is formed by chickens. The top-ranking chicken can peck any other chicken. The chicken lowest in the hierarchy is pecked at by all the other chickens in the group.

**Features of dominance hierarchies**

* Individuals carry out specific roles in the society
* There are pecking orders; there is a chain of command in the colony
* Position in the hierarchy is determined by the level of agonistic behavior, size, strength and aggressiveness.
* Highly determined by ability of an individual to learn and recognize those in higher ranks of the hierarchy
* Levels of testosterone or estrogens determines order in the hierarchy

**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 defense.

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**

**SOCIAL ORGANISATION IN BEES**

* Roles are unchangeable among members of a group due to genetic differences conferring differences in body structure- **polymorphism** giving rise to queens, drones and workers.
* Organization is based on a caste system.
* Perform **dances** as visual orientations for communication.
* Grooming and licking activities are in form **trophallaxes** transmitting chemical odors and pheromones.
* Honey bee dancing is performed by a worker bee that has returned to the honey comb with pollen or nectar, informing other workers about both the distance and direction where the food is.

**1. Round dance:** Communicates only distance from the food source (less than 50 meters from the hive). It involves running around in narrow circles, suddenly reversing direction to her original course.

**2. Sickle dance:** Communicates only distance from the food source (between 50 and 150 meters from the hive). This dance is crescent-shaped and represents a transitional dance between the round dance and a waggle dance.

**3. Waggle dance (wag-tail dance):** Communicates both distance and direction. Is performed by bees foraging at food sources that are more than 150 meters from the hive.

**Altruism:**

This is a form of social behavior whereby on 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**

* 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.
* A female baboon protects and cares for its offspring for almost six years
* Female birds protect their nestlings from unfavorable weather conditions such as rain
* 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.

# REPRODUCTIVE BEHAVIOUR

# COURTSHIP AND MATING BEHAVIOR

**Courtship Behavior:** is a set of [display behavior](https://en.wikipedia.org/wiki/Display_behaviors) in which an animal attempts to attract a mate and exhibit their desire to [copulate.](https://en.wikipedia.org/wiki/Mating) It is a complex behavior designed to stimulate organisms into sexual activity.

***Examples***:

* Singing in male birds
* Peacocks display flamboyant [plumage](http://birding.about.com/od/birdingglossary/g/glossplumage.htm) colors and prominent tail feathers
* [Preeni](http://birding.about.com/od/birdbehavior/a/Preening.htm)ng (sit with their bodies touching one another to show that they are not intending to harm their partner)
* Dancing in birds
* Building nests in birds

### **Significance of courtship behavior**

* It involves formation of a pair bond – relationship between male and female of same species which means they recognize each other as individuals and avoid aggression.
* It advertises sexually receptive individuals
* Brings both mating partners to reproductive readiness simultaneously
* It ensures that members of the same species find each other and mate e.g. at dusk, different species of fireflies flash distinct light patterns. However, female fireflies of one species respond only to those males exhibiting the species-correct flashing pattern.
* Maintain distinct species
* Reduction of escape tendencies of the female.
* Synchronization of gonad development so that gametes mature at the same time.
* Reinforcing altruistic, territorial and agonistic behavior

**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.

**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 change the behaviour of another organism.

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 signal 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 such as:

* 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:

1. **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).
2. **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 BEHAVIOURS**

**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 mortal 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**

1. Habituation
2. Imitation
3. Imprinting
4. Latent learning
5. Associative learning

**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.

**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 kid, 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.

**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.

**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**

1. **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.

1. **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 behavioral 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.

**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.

1. **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 of 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.
* **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.

1. **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 Agapormis i.e. tucking of building material under the wing and carrying it in the bill. When few of such species were interbred the hybrid failed to build nests. Those which succeeded did it after a very long time and carried the “nesting material in the beak.

## **ROLE OF HORMONES IN BEHAVIOR**

* Hormones may affect growth of nervous connections in the brain
* They can alter sensitivity of peripheral receptors e.g. male hormones in rats; increase sensitivity of the penis.
* They may suppress or increase the performance of effectors for example; hormones causing degeneration of muscles.
* They directly affect nerve cells and synapses in the central nervous system by blocking inhibitory pathways or opening up excitatory pathways