SHORT NOTES

1. Mayr's Closed and Open Programms

Ernst Mayr (1974) divided behavioural patterns in to two categories :

1. Closed Programmes : Behavioural programmes or patterns that cannot be modified by learning are called **genetically closed.** Experience plays no role. Any changes that occur in behaviour involve changes in the genes. **Simple reflexes, taxes** and **kinases** are closed programmes. Stereotyped innate behaviour patterns are closed programmes. In closed programmes, any particular behaviour results from species stimuli.

2. Open Programmes : Behavioural patterns that can be modified by learning or by experience are called **open programmes.** These behavioural patterns are not inherited. The ability to learn appropriate responses to various stimuli is inherited.

However, a behaviour usually has both open and closed components. In an otherwise closed programm learned insertions are introduced by changes in the nervous system and not in the genes. Similarly, both programms have genetic basis because in open programmes the ability to learn appropriate response to various stimuli is inherited.

2. Innate Releasing Mechanism (IRM) : Sign Stumuli *(Kanpur 2001)*

Innate releasing mechanisms are special neurosensory mechanisms that elicit specific behaviour in response to specific sign stimuli. Much more stimuli or

information is potentially available to an animal than it could register and respond to. It means animals are selective and respond to those events that are important and ignore others. This is called **stimulus filtering.**

Lorenz suggested that there must exist a means of filtering out stimuli so as to produce the correct behavioural response. Animals possess an inbern **neural centre** called **innate releasing mechanisms** (IRM) that respond to sign stimuli or releasers. The releaser acts as a cue and is associated with the object of response. Presumably, there is only one cue for each object.

The innate releasing mechanism centre may occur centrally within the central nervous system or peripherally at the receptors. A sign stimulus acts on this centre to elicit FAP. For each FAP, there is a separate IRM.

Examples :

1. **Schneider** found that chemoreceptors on male moths antennae are sensitive to the sex-attracting chemicals (pheromones) produced by the females of their own species and not to those of other species.
2. Scallops move away from the vicinity of starfish which is their predator. When water taken from an aquarium containing starfish is poured over these scallops, they elicit the same escape behaviour.

3. Action Specific Energy (ASE) or Specific Action Potential (SAP)

The concept of action specific energy (ASE) or specific action potential (SAP) was advanced by **Lorenz.** The energy required for carrying out a partiucular FAP is called **action specific energy. Lorenz** advocated that energy for specific action is constantly produced in the animal's central nervous system. But it is kept under control by some inhibitory mechanism, until the appropriate sign stimulus releases this energy. This energy then releases a FAP.

Lorenz proposed **'psycho-hydraulic model'** or **'flush toilet model'** to explain correlation between sign stimulus, innate releasing mechanism, action specific energy and fixed action pattern. The sign stimulus (SS) acts on IRM neural centre which allows ASE to flow from reservoir to carry out specific FAP.

$$SS \rightarrow IRM \rightarrow ASE \rightarrow FAP$$

In the absence of sign stimulus, ASE is accumulated and its own pressure may push open the valve to release FAP.

7. Astronavigation

Migratory birds have the ability to learn a route and its landmarks. Some migratory birds navigate by the stars. They may use only one star, a few constellations to become oriented in the right direction. For example, when warblers are kept in a planetarium building at migration time, they orient in the direction in which they normally migrate at that time of the year. When planetarium sky is rotated 180°, the birds all swing around and face randomly.

In other planetarium experiment on indigo buntings it was observed that birds do not use only one or even a few stars or constellations to navigate but are sensitive to the entire sky. They oriented them in right direction as long as they could see a good portion of the sky. However, prominent star clusters are more important.

The sense of direction is said to be inherited in some birds at least. For example, young **Pacific golden plover** fly thousands of kilometers over the open sea every year without the guidance from experienced birds. **Manx** fly from British Isles and Scandinavia to Brazil across 9,600 km (5,760 miles). Pacific golden plover fly over 3800 km nonstop and cover the distance in abou 37 hours.

The migratory birds are regarded to have **phylogenetic memory** by which they are able to navigate to certain location by the help of stars, sun or moon for navigation.

Altruism

Reduction of personal reproduction in order to favour the reproduction of other related animals is called altruism. Behaviour that reduces the Darwinian fitness of performing individual while increasing that of the recipient is altruism. Darwin had imagined that individuals behave for their benefit alone. Lewontin in 1970 observed in rabbits in Australia that related rabbits helped each other. Sometimes one rabbit sacrificed food or shelter for another related rabbit. This is a good example of altruism.

Eusociality

When one sacrifices its own reproductive privileges to promote reproduction in another related individual it is called eusociality.

Birds of the same flock mob the snake, moneys of the same group face the predator collectively. It is easier for a group of animals to catch a prey instead of

catching it alone. Related animals help each other at the time of need. **Cooperative brood care** is seen in birds and monkeys. **Cooperative hunting** is common in wolves, wild dogs, crocodiles, seals, walruses and many such predatory animals. **Cooperative defense** is also common among related animals. Cooperation is done together and benefit in drawn simultaneously by individuals.