TOPIC: Basics of Classification

▪ **A basic principle of taxonomic art is that its results should be useful.**

There are three basis subsidiary principle are:

1. The basis of the classification should be the most biologically significant relationships among organisms and should bring as many of those as is practicable.
2. Classification should be consistent with the relationship used as its basis.
3. Classification should be as stable as it can be without contravening the two preceding principles.

- Classification is an absolutely essential means of conceptualization, communication and storage of information about animals.
- Despite the fact that a bewildering variety of species with different structures and forms exist out there, organisms share some common features among themselves. These similarities are the basis of classification.
- Classification is the systematic arrangement of things around us for easy identification and study. The basis of classification can vary according to the purpose of the classification.
- A biological classification generally pins out the morphological and evolutionary similarities as its basis. **A consistent evolutionary classification is one whose implications drawn according to stated criteria of such classification., do not contradict the classifier's view as to the phylogeny of the group.**
- The principle kinds of criteria, used to draw up an evolutionary classification and to study their implications are:

  1. Criteria related to objectivity, reality, arbitrariness, and the like.

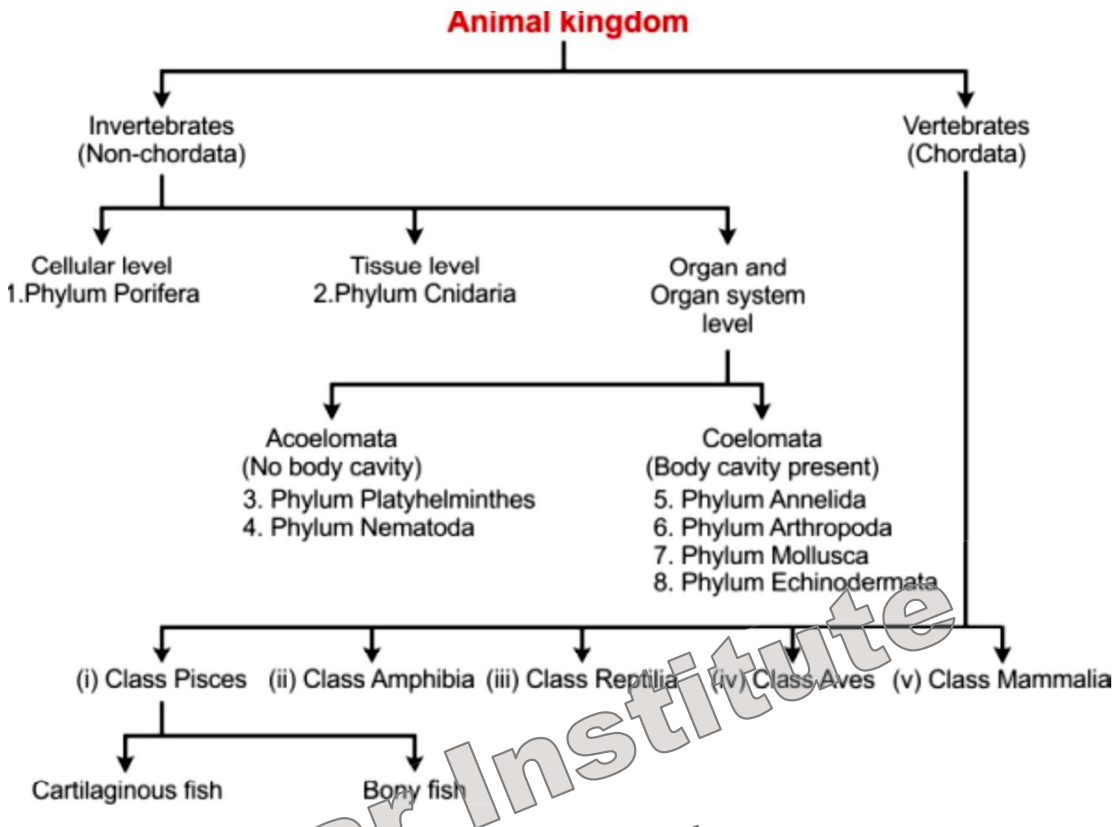
  2. Criteria related to monophyly, polyphyly, clades and grades .

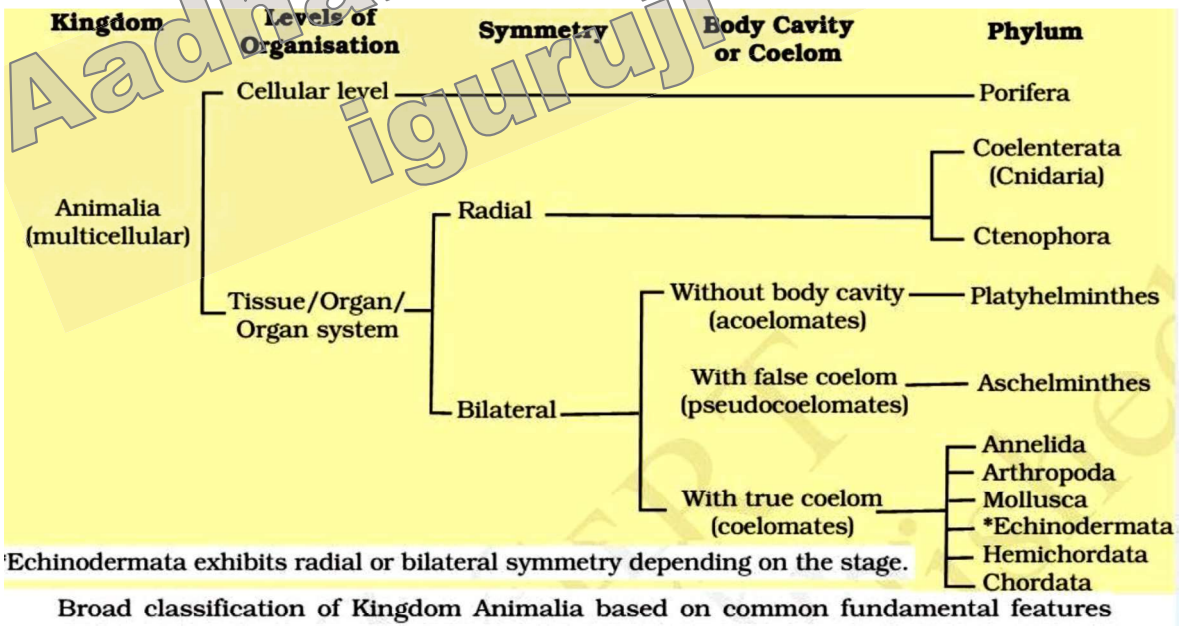
  3. Criteria related to the different kinds and degree of affinities involved in phylogeny.

  4. Criteria related to the relative antiquity of taxa.

▪ Classification of Animal Kingdom up to class in each phyla, although consider different characters in case of different phyla, but in general, the following criteria are considered for classification of animal kingdom:

1. body plan / Levels of Organisation,
2. Diploblastic and Triploblastic Organisation (germ cells)
3. Symmetry
4. Coelom development,
5. Segmentation of the body and
6. Presence or absence of Notochord
7. Larva stages
8. appendages





Broad classification of Kingdom Animalia based on common fundamental features

Levels of Organisation:

▪ Though all members of *Animalia* are multicellular, all of them do not exhibit the same pattern of **organisation of cells.**

▪ For example, in sponges, the cells are arranged as loose cell aggregates, *i.e*., they exhibit cellular level of organisation. Some division of labour (activities) occur among the cells.

▪ In *Coelenterates*, the arrangement of cells is more complex. Here the cells performing the same function are arranged into tissues, hence is called **tissue level of organisation**.

▪ A still higher level of organisation, i.e., organ level [**organ level of organisation**] is exhibited by members of *Platyhelminthes* and other higher phyla where tissues are grouped together to form organs, each specialised for a particular function.

▪ In animals like *Annelids, Arthropods, Molluscs, Echinoderms* and *Chordates*, organs have associated to form functional systems, each system concerned with a specific physiological function. This pattern is called **organ system level of organisation.**

▪ Organ systems in different groups of animals exhibit various patterns of complexities.

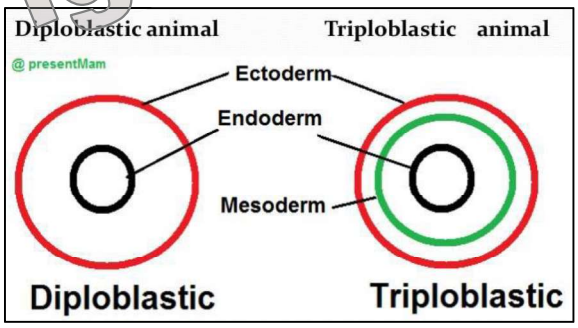
Example:

▪ The digestive system in *Platyhelminthes* (incomplete digestive system) has only a single opening to the outside of the body that serves as both mouth and anus, and is hence called incomplete. A complete digestive system has two openings, mouth and anus.

▪ Similarly, the circulatory system may be of two types: open type in which the blood is pumped out of the heart and the cells and tissues are directly bathed in it and closed type in which the blood is circulated through a series of vessels of varying diameters (arteries, veins and capillaries).

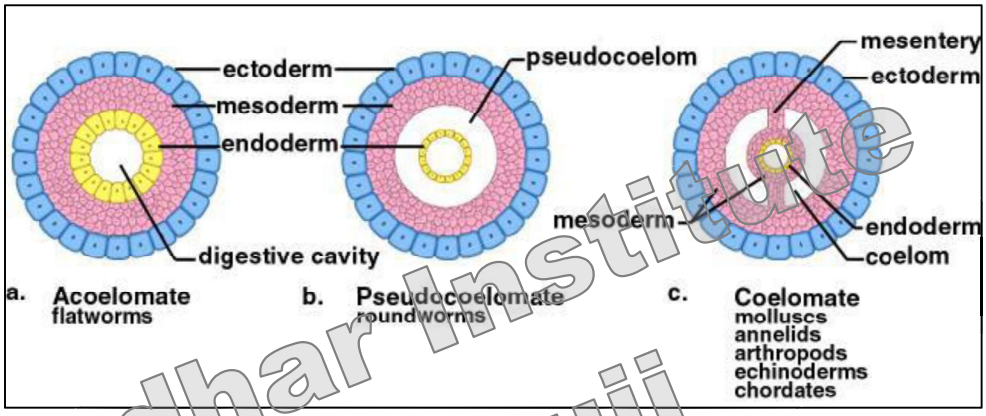
Diploblastic and Triploblastic Organisation:

- Animals in which the cells are arranged in two embryonic layers, an external ectoderm and an internal endoderm, are called diploblastic animals, e.g., Coelenterates. An undifferentiated layer, mesoglea, is present in between the ectoderm and the endoderm.
- Those animals in which the developing embryo has a third germinal layer, mesoderm, in between the ectoderm and endoderm, are called triploblastic animals (platyhelminthes to chordates).



TOPIC: COELOM:

- **The coelom** is the main body cavity in most animals and is positioned inside the body to surround and contain the digestive tract and other organs. In some animals, it is lined with mesothelium. In other animals, such as molluscs, it remains undifferentiated. Coelom is the mesodermally lined cavity between the gut and the outer body wall.
- During the development of the embryo, coelom formation begins in the gastrulation stage. The developing digestive tube of an embryo forms as a blind pouch called the archenteron. In the past, and for practical purposes, coelom characteristics have been used to classify bilaterian animal phyla into informal groups.
- It is one of the significant criteria, being considered as the basis of classification of animal kingdom.



ACOELOMATES:

- Acoelomates lack a fluid-filled body cavity between the body wall and digestive tract. This can cause some serious disadvantages. Fluid compression is negligible, while the tissue surrounding the organs of these animals will compress.
- Therefore, acoelomate organs are not protected from crushing forces applied to the animal's outer surface.
- Usually, the coelom can be used for diffusion of gases and metabolites etc. These creatures do not have this need, as the surface area to volume ratio is large enough to allow absorption of nutrients and gas exchange by diffusion alone, due to dorso-ventral flattening.

Example:

- Cnidarians (jellyfish and allies), and the ctenophores (comb jellies),
- Platyhelminthes
- Gastrotricha, traditionally viewed as blastocoelomates
- Entoprocta, traditionally viewed as blastocoelomates
- Gnathostomulida, traditionally viewed as blastocoelomates
- Cycliophora

PSEUDOCOELOMATE:

- ▪ **Pseudocoelomate animals have a pseudocoelom** (literally "false cavity"), which is a fluid filled body cavity. Pseudocoelomate animals are also referred to as Blastocoelomate. A pseudocoelomate or blastocoelomate is any invertebrate animal with a three-layered body and a pseudocoel.
- The coelom was apparently lost or reduced as a result of mutations in certain types of genes that affected early development. Tissue derived from mesoderm partly lines the fluid filled body cavity of these animals.
- Thus, although organs are held in place loosely, they are not as well organized as in a coelomate Thus, pseudo coelomates evolved from coelomates.
- "Pseudo-coelomate" is no longer considered a valid taxonomic group, since it is not monophyletic.
- However, it is still used as a descriptive term. All pseudo-coelomates are protostomes; however, not all protostomes are pseudo-coelomates.

Important characteristics:

- Most are microscopic parasites of almost every form of life (although some are free living), body usually covered by a secreted cuticle.
- Lack any kind of segmentation, a vascular blood system and a true skeleton, although hydrostatic pressure gives the body a supportive framework that acts as a skeleton.
- Diffusion and osmosis circulate nutrients and waste products throughout the body.
- They are often syncytial. They possibly represent pedomorphism. Larval stages are lost in some forms.

Examples:

Rotifera, Kinorhyncha, Nematoda, Nematomorpha ,Acanthocephala, Loricifera, Ecdysozoans pseudocoelomates, Nematoda (roundworms), Nematomorpha (nematomorphs or horsehair worms), Loricifera, Priapulida, Kinorhyncha, Lophotrochozoans, pseudocoelomates, Gastrotricha, Entoprocta, Rotifera (rotifers), Acanthocephala (spiny headed worms).

COELOMATE:

- **Coelomate animals or Coelomata** (also known as **Eucoelomates** – "true coelom") have a body cavity called a coelom with a complete lining called peritoneum derived from mesoderm (one of the three primary tissue layers). The complete mesoderm lining allows organs to be attached to each other so that they can be suspended in a particular order while still being able to move freely within the cavity.

Examples: According to Brusca and Brusca, the following bilaterian phyla possess a coelom: Nemertea, traditionally viewed as acoelomates, Priapulida, Annelida, Onychophora, Tardigrada, Arthropoda, Mollusca, Phoronida, Ectoprocta, Brachiopoda, Echinodermata, Chaetognatha, Hemichordata and Chordata.

Two types of coelomic development schizocoelous and enterocoelous

Difference between schizocoelous and enterocoelous types can only be seen during embryonic development, once the coelom is fully developed they cannot be differentiated.

Schizocoelous coelom : Is found in Annelids, Arthropods and molluscs.

- A single micromere or mesentoblast cell pinches off from archenteron and it multiplies and proliferates to from mesodermal patches between the developing archenteron (endoderm) and the body wall (ectoderm)