Level of organization

Organization is the arrangement of the smaller components of any structure into large ones and so on in a hierarchy or a pyramid.

Living organisms show three types of organization.

1. Molecular or protoplasmic level of organization:

All the living organisms have cellular nature and may be unicellular or multicellular. A cell is a mass of protoplasm bounded by a cell membrane/cell wall. Protoplasm is formed of a number of complex organic macro biomolecules like proteins, polysaccharides, fats, etc.

These polymers are formed of simple organic compounds like amino acids, monosugars, fatty acids, etc. interlinked by specific bonds e.g. peptide bonds between the amino acids. Each simple organic compound is formed of inorganic compounds e.g. CO_2 and H_2O react during photosynthesis to form glucose in the chloroplasts of the plants. Each inorganic compound is formed of specific elements.

So molecular level of organisation has following categories:
Atoms →Molecules → Inorganic compounds → Simple organic compound → Complex organic compound → Protoplasm → Cell

2. Individual Level of Organisation (Biological Hierarchy):

A cell is the smallest living unit containing all the necessary apparatus for carrying on the life functions. Cells combine to form higher units, the tissues, which in turn, come together and constitute next higher units, the organs. The organs occur in groups, the organ systems. All the organ-system together form a multicellular organism.

So a multicellular organism with organ-system organization is with following categories:
Cells → Tissues → Organs → Organ → systems → Organism

3. Higher Level of Organisation (Ecological Hierarchy):

Ecological hierarchy includes a graded series of ecological categories.

Ecological hierarchy involves the following categories:

(a) Organism.

(b) Population.

(c) Biotic community.

(d) Ecosystem.

(e) Biome.

(f) Biosphere.

A) Organism:

1. It is the smallest level of ecological hierarchy.
2. It is most distinct and easily observable unit.
3. It performs all the life processes independently of those going on in other living organisms.
4. It always has cellular nature and may be unicellular or multicellular.
5. 5. It is a quantitative unit and can be counted or measured.
6. Organisms cannot live in isolation of one another. It shows interdependence with other biotic factors and abiotic factors of the

environment. It derives matter and energy from the environment and expels wastes out of it for its survival.

7. New organisms are produced from the pre-existing organisms by the process of reproduction which may be vegetative, asexual or sexual. This ensures the 'continuity of life'.

8. An organism is fully adapted to its environment.

9. An organism has a definite life span which involves definite series of stages like birth/hatching, growth, maturity, ageing and death.

B) Population:

A group of individuals of the same species living together in a common area at a particular time form a population of that area. All the frogs living in a giving pond constitute a population. Similarly all water hyacinth plants growing in that pond form another population. Organisms of the same kind may form several populations inhabiting different geographical areas. In a given geographical area, a population is further divisible into sub-groups called demes.

C) Biotic community:

A group of organisms belonging to several different species that live together in the same area and interact through trophic and spatial relationship to form a self- sustained unit is called a biotic community.

A biotic community has three subunits.

i. Animal Community:
It is formed of all the animal populations of that area.

ii. Plant Community:

It is formed of all the plant populations (herbs, shrubs, trees, climbers, etc.) of that area.

iii. Microbial Community:

It is formed of all the populations of microbes (bacteria and fungi) of that area.

A forest is an example of biotic community.

D) Ecosystem:

The sum of the biotic and abiotic components of a particular geographical area, collectively called ecosystem. It is so as the living organisms are not independent units but depend upon one another and also draw matter and energy from their non-living environment. It is now called biogeocoenosis.

It is a stable and self-regulating system e.g. pond ecosystem, desert ecosystem etc. Abiotic substances of an ecosystem include basic inorganic and organic compounds, and climatic factors of that area, while biotic organisms of an ecosystem include the producers (e.g. plants), macro-consumers (e.g. animals) and micro- consumers or saprotrophs (e.g. bacteria and fungi). In an ecosystem, two types of components show interactions and interdependence. These ecosystems may be natural (pond, lake, forest, etc.) or artificial (a flower pot, an aquarium, space ship, etc.)

E) Biome:

Very large ecosystem is called biomes. Variation in the intensity of light and annual variation in precipitation account for the formation of major biomes, e.g., desert, rain forest, tundra etc.

F) Biosphere:

All the ecosystems of the world together form a biosphere, or ecosphere. In other words, biosphere consists of all the living

organisms and all the regions of the earth and the atmosphere where they live. The earth layers of air, water and soil, where life exists, constitute the biosphere.

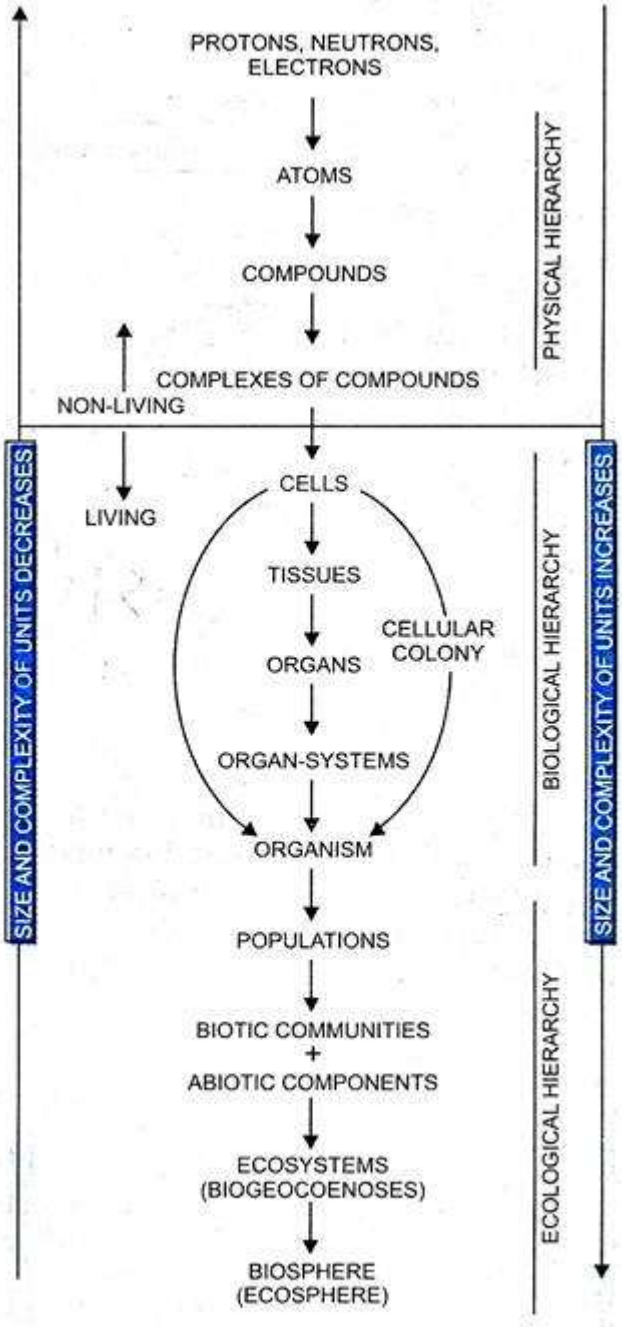

Fig. 13.2. Different types of level of organisation.

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