**ECOLOGY**

**Lecture (1-2)**

**INTRODUCTION**

**Ecology** is the study of organisms, populations, and communities as they relate to one another and interact in the ecosystems they comprise.Or **ecology** is the branch of biology dealing with the relationships of organisms with their environment and with each other.

The word **ecology** is derived from the greek oikos, meaning house hold and logos meaning study. The word ecology is of recent origin having been first proposed by the German biologist **ERNST HAECKEL** in 1869.

**Levels of organization spectrum.**

Ecology focuses on the right-hand portion of the spectrum. That is the levels of organization from organisms to ecosystems. Any more level aids in the study of another level, but never completely explains the phenomena occurring at that level:

**Top-down**

 ⇓ nature ⇔ ⇅ ⇑

 ⇓ [landscapes](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/landscape.html) ⇔ ⇅ ⇑

 ⇓ [ecosystems](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/ecosyst.html#ecosyst) (biosystem) ⇔ ⇅ ecosystem (biosystem) ⇑

 ⇓ [communities](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/ecosyst.html#comm) (biome) ⇔ ⇅ ⇑

 ⇓ [species](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/sp.html) ⇅ ⇑

 ⇓ [populations](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/pop.html) ⇔ ⇅ energy population system ⇑

 ⇓ organisms (individual) ⇔ ⇅ organismic system ⇑

 ⇓ [organs](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/morph.html) ⇔ ⇅ organ system ⇑

 ⇓ [cells](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/cell.html) ⇔ ⇅ cell system ⇑

 ⇓ subcellular organelles ⇔ ⇅ ⇑

 ⇓ [genes](https://hosho.ees.hokudai.ac.jp/tsuyu/top/dct/gene.html) ⇔ ⇅ matter genetic system ⇑

 ⇓ molecules ⇔ ⇅ ⇑

 **Bottom-up**

**Keywords of ecology**

* **Population:** a group of people include groups of individuals of any one kind of organisms.
* **Community**: all the populations occupying a given area.
* **ecological system or ecosystem**: The community and the non-living environment function together.
* **Biom**e is a convenient term in wide use for a large regional or subcontinental bio system characterized by amajor vegetation type or other identifying landscape aspect as ,for example, the temperate deciduous forest biome.
* **Autoecology** is the [ecology](http://en.wikipedia.org/wiki/Ecology) of a single [species](http://en.wikipedia.org/wiki/Species), that is the relations between that species and its environment, how the species affects the environment and how it is affected by the environment. Autoecology includes for example [population ecology](http://en.wikipedia.org/wiki/Population_ecology).
* **Synecology:** the branch of ecology dealing with the relations between natural communities and their environments.
* **Biosphere** : the portions of the earth that support life including the land waters and atmosphere.

## It is important to study Ecology because:

1. Environmental Conservation:
2. Resource allocation.
3. Energy Conservation.
4. Eco Friendliness

**THE RELATIONSHIP BETWEEN ECOLOGY AND OTHER SCIENCES**

* **Physiology:** The Ecology needs Physiology to understand how the organisms work and how this way of work acts on the relationship between the living beings.
* **The chemistry**, that can help on the study of the chemical reactions involved on the environment and on the organisms, support us on this kind of study too. Helps on the study of how the living beings evolved through the years and how these same living beings are supposed to change on the future, with all the environment changes that are happening.
* **Genetics** are fundamental to this kind of study too.
The Ecology is closely related to other biological disciplines.
Evolution.
* **Epidemiology**: Using statistics' help, the epidemiology study the development of epidemics on the populations and support the Ecology.

**CONCEPT OF THE ECOSYSTEM**

Any unit (a biosystem) that includes all the organisms that function together(the biotic community) in a given area interacting with the physical environment ,so that a flow of energy leads to clearly defined biotic structures and cycling of materials between living and non-living parties an ecological system or eco system.

The ecosystem is the basic functional unit in ecology since it includes both organisms and abiotic environment ,each influencing the properties of the other and both necessary for maintenance of life as we have it on the earth.

**The term ecosystem** was first proposed in 1935 by British ecologist A.G.TANSLEY.

In general there are two types of nutrition in ecosystem autotrophs and heterotrophs.

 For green plants in general(algae, higher plants) water is oxidized with release of gaseous oxygen and the carbon dioxide is reduced to carbohydrate (CH2O).

 Sun light

CO2*+H2O--------🡪 (CH2O)+O2*

**ENERGY: THE ENTROPY LAW**

**Energ**y is defined as the ability to do work. The Behavior of following laws:

1. **The first law of thermodynamics**, or the energy conservation law, States that energy may be transformed from one type in to another but is neither created nor destroyed. Like light transformed to heat.
2. **The second law of thermodynamic**s or the entropy law: no process involving an energy transformation will spontaneously occur unless there is a degradation of the energy from concentrated form in to a dispersed form. ex: heat.





**PRODUCTIVITY**

**The primary product**ivity is defined as the rate at which radiant energy is converted by photosynthetic activity of producer organisms to organic substances.

1. **Gross primary productivity** G.P.P.: is the total rate of photosynthesis, including the organic matter used up in respiration during the measurement period. This is also known as total photosynthesis or total assimilation
2. **Net primary productivity**: Is the rate of storage of organic matter in plant tissues exceeding the repiratory use by the the plants during the period of measurement.

Net + Respiration = Gross Productivity

1. **Secondary productivity**: is the rate of energy storage at consumer levels . S.P. should not be divided to gross or net.



**Ecosystem**

**An** **ecosyste**m is a community of living organisms in conjunction with the nonliving components of their environment (things like air, water and mineral soil), interacting as a system. These biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows.

**An ecosystem** includes all of the living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun, soil, climate, atmosphere).

**All ecosystems consist of the following basic components:**

1. **Abiotic Components:** Ecological relationships are manifested in physicochemical environment. Abiotic component of ecosystem includes basic inorganic elements and compounds, such as soil, water, oxygen, calcium carbonates, phosphates and a variety of organic compounds (by-products of organic activities or death). It also includes such physical factors and ingredients as moisture, wind currents and solar radiation. Radiant energy of sun is the only significant energy source for any ecosystem. The amount of non-living components, such as carbon, phosphorus, nitrogen, etc. that are present at any given time is known as standing state or standing quantity.
2. **Biotic Components:** include all living organisms present in the environmental system.

**The biotic components can be grouped into two basic components:**

* 1. Autotrophic components: The autotrophic components include all green plants which fix the radiant energy of sun and manufacture food from inorganic substances.
	2. Heterotrophic components: The heterotrophic components include non-green plants and all animals which take food from autotrophs.

**Biotic components of an ecosystem can be described under the following three heads:**

1. **Producers (Autotrophic elements):** The producers are the autotrophic elements—chiefly green plants. They use radiant energy of sun in photosynthetic process whereby carbon dioxide is assimilated and the light energy is converted into chemical energy.
2. **Consumers:** Those living members of ecosystem which consume the food synthesized by producers are called consumers. Under this category are included all kinds of animals that are found in an ecosystem. **There are different classes or categories of consumers:**
* **Primary consumers:** These are purely herbivorous animals that are dependent for their food on producers or green plants.
* **Secondary consumers:** These are carnivores and omnivores. Carnivores are flesh eating animals and the omnivores are the animals that are adapted to consume herbivores as well as plants as their food.
* **Tertiary consumers:** These are the top carnivores which prey upon other carnivores, omnivores and herbivores..
* Besides different classes of consumers, the parasites, scavengers and saprobes are also included in the consumers.
1. **Decomposers or reducers and transformers:**

They are the living components of the ecosystem and they are fungi and bacteria. Decomposers attack the dead remains of producers and consumers and degrade the complex organic substances into simpler compounds.

**Function of Ecosystem:**

In any ecosystem we have the following functional components:

* 1. Inorganic constituents (air, water and mineral salts)
	2. Organisms (plants, animals and microbes), and
	3. Energy input which enters from outside (the sun).

**Thus the principal steps in the operation of ecosystem are as follows:**

1. Reception of radiant energy of sun,
2. Manufacture of organic materials from inorganic ones by producers,
3. Consumption of producers by consumers and further elaboration of consumed materials; and.
4. After the death of producers and consumers, complex organic compounds are degraded and finally converted by decomposers and converters into such forms as are suitable for reutilization by producers.

