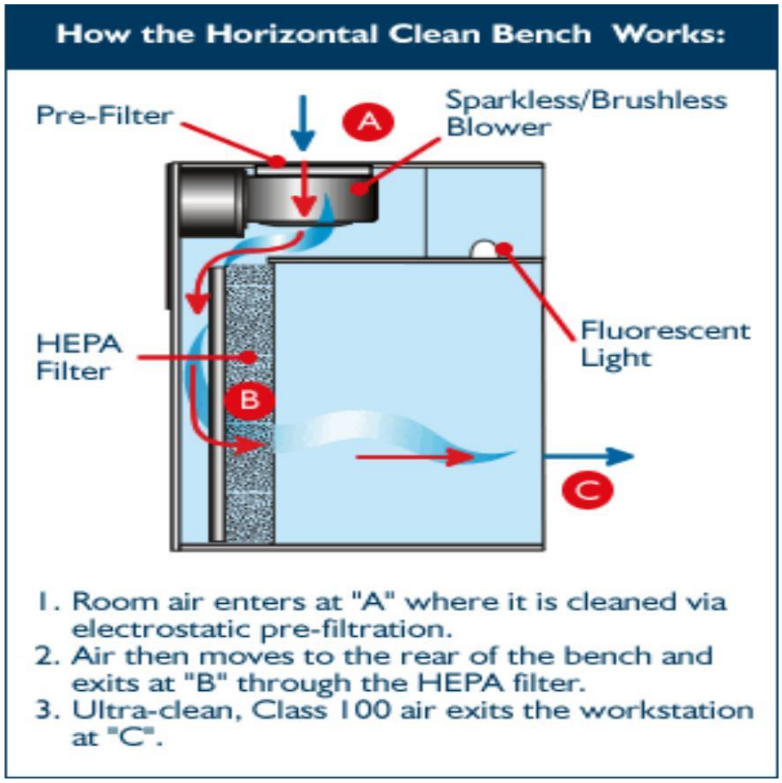
3) Filtration.

Following filtration techniques are used for the of air borne organism.

a) Use of cotton plug
b) Air filter

4) Laminar- Airflow system

A new kind of technology for controlling the microbial flora in closed spaces (cabinets or rooms) is known as laminar airflow system.



MICROBIOLOGY OF SOIL

SOIL

The region of earth's crust where geology and biology meet is called soil. The characteristics of the soil environment vary with location and climate soil differs in depth, chemical composition, physical properties and origin.

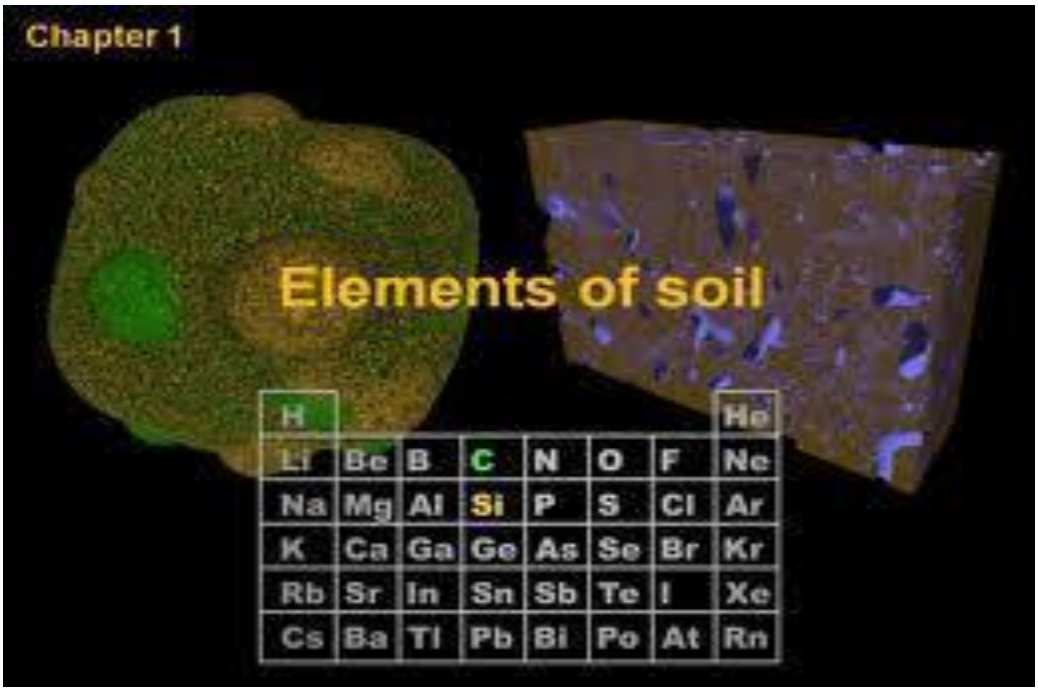
Soil Constituents

There are 5 major categories: Mineral particles, Organic residue, water, Gases, Biological systems.

1) Mineral Particles:

- The dominant mineral particles are compounds of Aluminum, Iron and Silicon.
- Less dominant are Calcium, Magnesium, Potassium, Sodium, Nitrogen, Sulphur, Phosphorous, Titanium, Manganese etc.
- Mineral constituents of soil range in size from small particles (0.002mm or lesser) to large pebbles and gravel.
- Soil can be classified as:

a) Organic soil (having very less inorganic solids but much of organic materials e.g., soil of marshes).



Water

The amount of water depends upon the amount of precipitation and other climate conditions, soil composition, drainage and the living population of soil.

Water is retained as:

- Free water in the spaces between soil particles.
- Absorbed to the surface of particles.
- Various organic and inorganic components of soil are dissolve in soil water and thus are made available as nutrients for soil inhabitants.

Gases

Gaseous phase of soil consists of mainly carbon dioxide, Oxygen and Nitrogen. Small amount of the gases are dissolved in water but much is present primarily in spaces between soil particles.

- The root systems of higher plants.
- Many small animals e.g., rodents, insects, worms etc.
- Tremendous no. of microbes.

Microbial Flora of Soil

1) Bacteria:

- Bacterial population is highest in both number (as several! billions/gm) and variety than all the other groups of microbes.
- Autotrophs and Heterotrophs; mesophiles, thermophiies and Sulphur oxidizers; nitrogen fixer and protein digesters and other kinds of bacteria are all likely to found in soil.

2) Fungi in Soil:

Their numbers range from thousands to hundreds of thousands, Fungi are active in decomposition of cellulose and lignin of plant tissue. The mould mycelium penetrates the soil and forms a net-work which entangles soil particles and forms water stable aggregates. This gives the soil its crumb structure, which is of considerable agricultural importance. Thus fungi a1so improve the physical condition of the soil. Of the other hand, yeasts are generally not found in large numbers except in soils of vineyards and orchards

3) Algae in Soil:

Algae are generally found on the surface of moist soils, where there is sufficient light for their photosynthetic reactions. The major types present are green algae Chlorophyceae, and the diatoms (Bacillariophyceae),
Their total numbers vary from several hundreds to several thousands. In some situations their number is quite large and brings about beneficial changes, especially desert soils. They fix nitrogen in paddy soils used for cultivation of rice.

4) Protozoa in Soil:

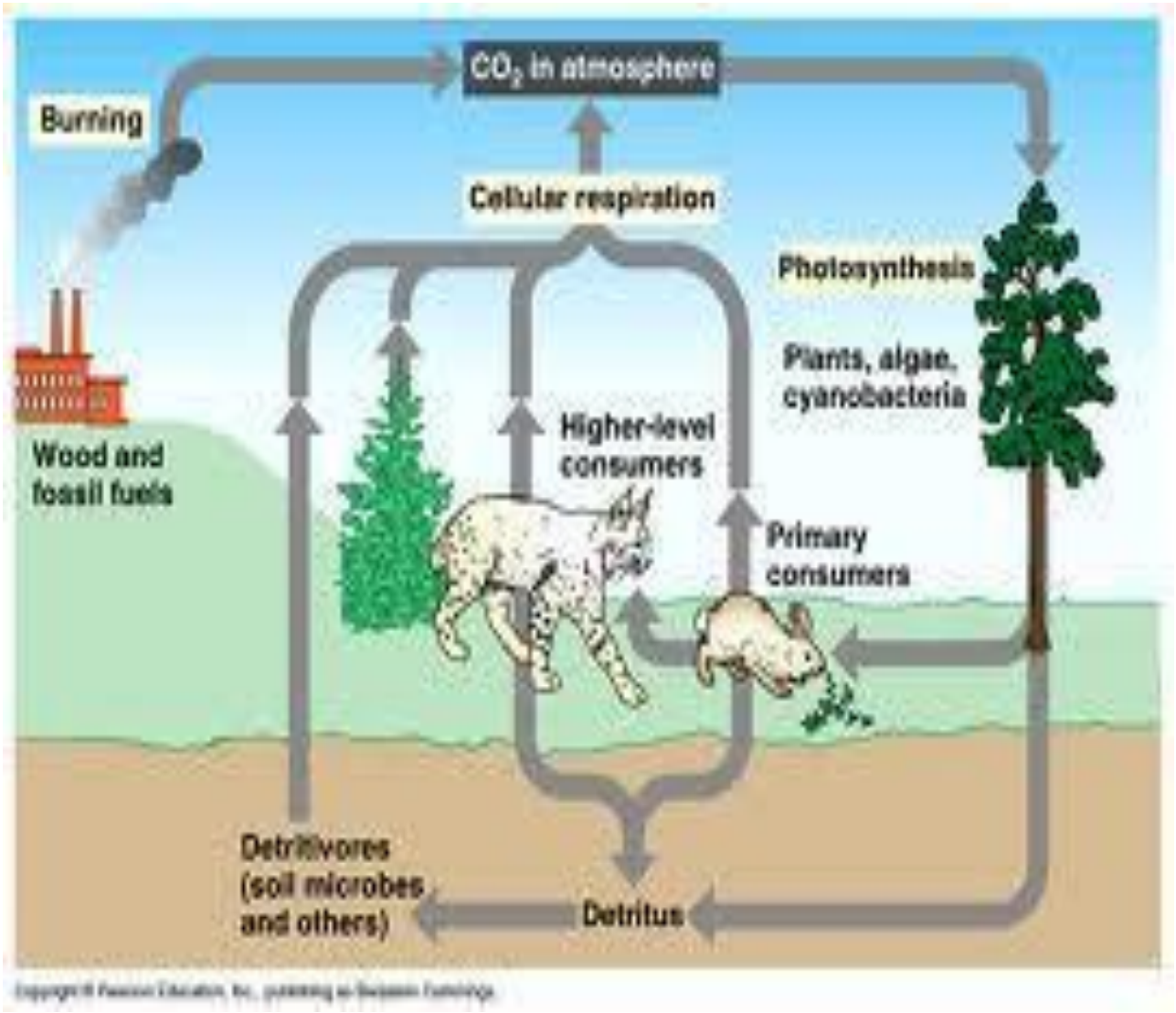
Many types of Protozoa are found in the soil, but flagellates and amoebae usually outnumber the ciliates. Their total numbers may range from a few hundred to several thousands. Depend-ing upon the conditions of the soil the Protozoa may exist as vegetative or cyst forms they use decaying organic matter for food and consume both dead and living bacteria. Since Protozoa do not ingest all bacteria, they maintain some equilibrium of the bacterial flora of the soil.

Roles of Soil Biota:

- Recycling of the energy, carbon, and nutrients in dead plant and animal tissues into forms that are potentially useful for living plants is the key role of soil microorganisms. Thus for the processing of materials that maintain life on earth, these organisms are quite important.
- Human activity has polluted the environment with a wide variety of synthetic or processed compounds. Many of these hazardous or toxic substances can be degraded by soil microorganisms.
- Soil microorganisms are also responsible for transformations of elements between various forms

Carbon Cycle

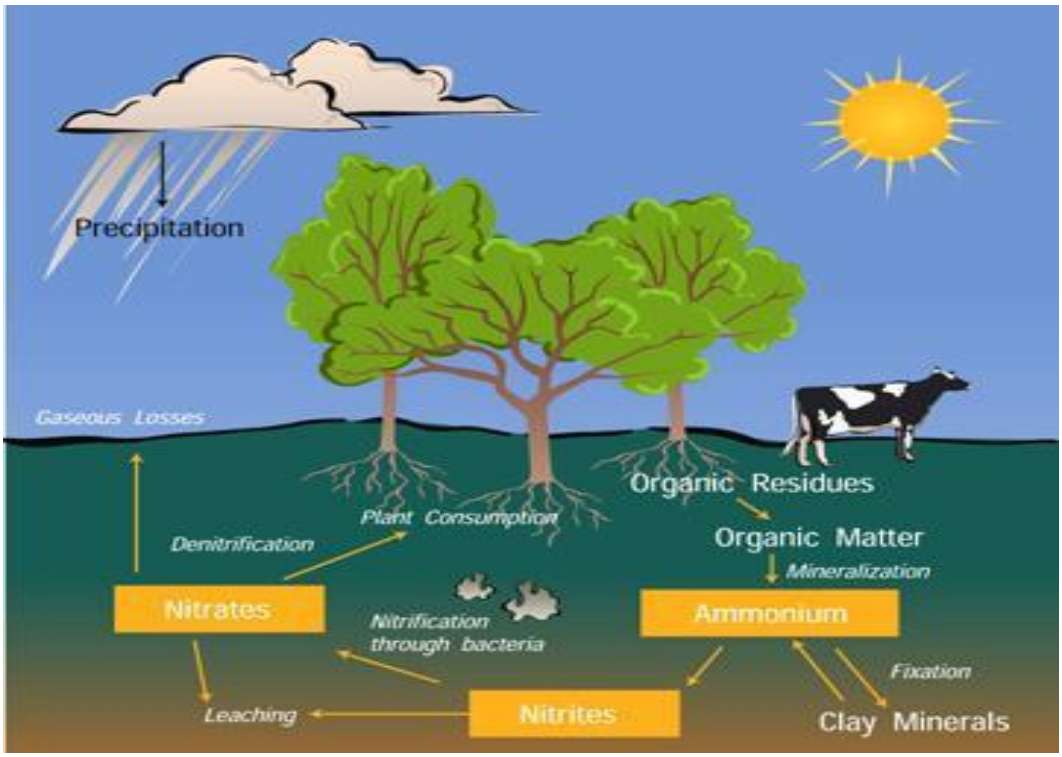
In the carbon cycle, microorganisms transform plant and animal residues into carbon dioxide and the soil organic matter known as humus. Humus improves the water-holding capacity of soil, supplies plant nutrients, and contributes to soil aggregation.



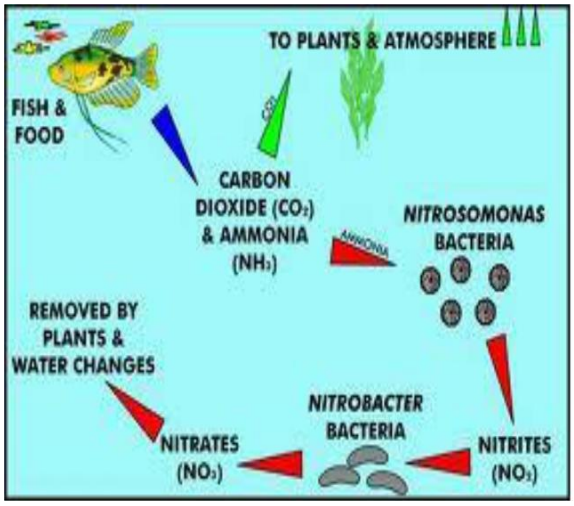
Nitrogen Cycle

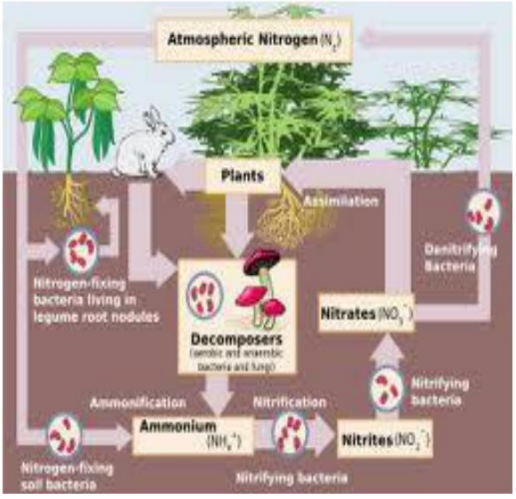
Soil microorganisms play key roles in the .nitrogen cycle. Nitrogen (N2) Fixation

The atmosphere is approximately 80% nitrogen gas (N2), a form of nitrogen that is available to plants only when it is transformed to



ammonia (NH3) by soil bacteria non-symbiotically by gram positive, spore forming, anaerobic bacillus known as Clostridium, pasteurianum and gram negative, non-spore forming, aerobic pleomorphic coccoid or rod shaped bacteria belonging, to the genus Azotobacter (Azote means nitrogen in French) and symbiotically by members of the genus Rhizobium (Rhizo means root in Greek) fix nitrogen symbiotically. These are gram negative, motile, aerobic, non spore forming bacteria. They are, mainly rod shaped, but when isolated from nodules a variety of morphological shapes are observed.





Sulphur Cycle

Cycling of sulphur is similar to that of nitrogen. Transformations between organic and elemental states and between oxidized and reduced states of sulphur are accomplished by various types of microorganisms, especially bacteria.