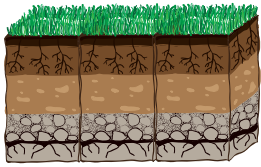


# The Transformation of Matter

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*The soil, that brown or black material in which we have our gardens, is itself part of a much larger system, the totality of which is highly complex. It is a system that works non-stop in the transformation of organic matter, in the processes of decomposition and recycling of all the elements, compounds and nutrients of the Earth that give rise to the cells of all living beings.*

Starting in the soil, the processes that take place within it occur thanks to a close relationship between the solid state of the Earth (lithosphere, the rocks), the gaseous state (the atmosphere) and the liquid state (the hydrosphere, seas, rivers, lagoons, rain, the water contained in organisms), while interacting with the many organisms that inhabit the globe: the biosphere. They are bacteria, fungi, plants, mosses, lichens, herbivores, omnivores, carnivores.

The pedosphere (fig. 1) is in between 4 dimensions (mineral, aqueous, gaseous and organic) as it is formed from all of them and keeps them interacting interdependently in a network of infinite flow. That is why the transformation of organic matter is a complex system, where all the elements have the same importance since each one depends on and functions thanks to all the others.

The relationships and interactions that give rise to the pedosphere promote, at a first level of action, *the decomposition of organic matter*, since this is the source of energy (food) and raw material (basic chemical elements) for the formation of new compounds, cells, genetic material, tissues, vitamins, enzymes, etc.

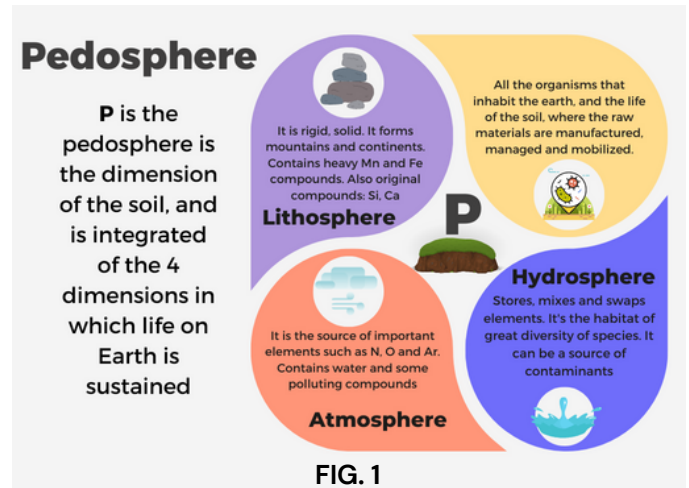


FIG. 1

The transformed organic matter is converted into small molecular pieces: proteins remain as short chains of amino acids and nucleic acids. Large sugars such as starch become small simple carbohydrates. In this way, life has the possibility to 1) restructure itself into new components, new tissues and new living things (**humification**) or 2) to degrade almost completely (**mineralisation**).

**\*Humification** is the process where organic matter accumulates and transform into *humus*, through the degradation of macromolecules, oxidation of compounds; condensation, polymerisation and nitrogen fixation. Soil bacteria is essential for this phase, not only because of their activity, but mainly because the composition of their tissues is fundamental for the formation of humic acids.

In humification, the inorganic compounds mix and infiltrate with the soil components and form highly stable compounds, which, when transformed into new tissues, mucus, cell walls, etc., become fixed in the organisms.

**\*Mineralisation** compounds are completely degraded to their mineral constituents. In the case of carbon, they enter cellular respiration and degrade to the form of carbon dioxide and water. Organic nitrogen, on the other hand, degrades to the form of ammonium, both of which are more unstable forms and tend to be lost through leaching and as gases.

When we seek the transformation of organic matter to maintain the health of our soils, it is imperative to look for a diversity of resources, stimulating the presence of the greatest diversity of microorganisms, to promote a greater amount of humifying processes, keeping our fields healthy and our food nutritious.

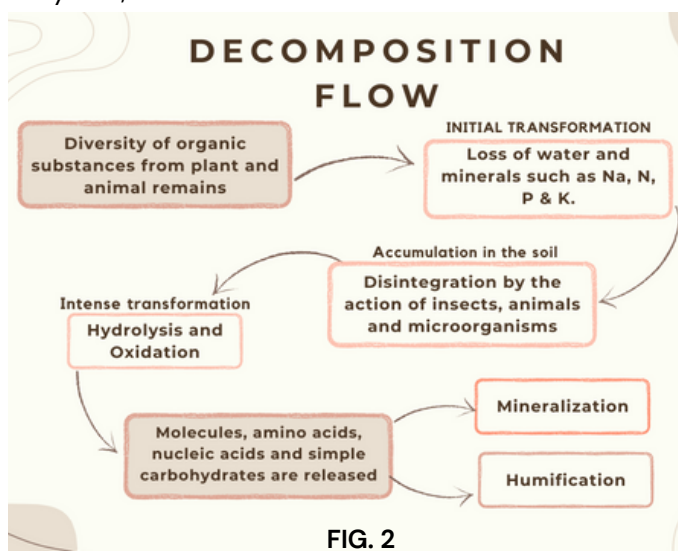


FIG. 2

Organic matter (fig. 2) comes from the dead remains of plants and animals. Initially this material undergoes a first transformation by losing water and minerals such as sodium, phosphorus, nitrogen and potassium. The materials accumulate in the soil where they are disintegrated by the action of insects, animals and micro-organisms such as fungi and bacteria. All those disintegrated materials go through an intense stage of transformations thanks to chemical processes such as oxidation and hydrolysis.