

## «HUMUS sapiens – open soil research»

A collaborative project of:  
*The mikroBIOMIK Society*  
*The Global Hackteria Network*  
*Gasthaus: Fermentation and Bacteria*

We believe that diversity is the key to creativity, innovation and a healthy soil. Scientists, biohackers, artists, makers, educators, ecologists and farmers work together to investigate the hidden ecologies in the ground beneath our feet. We facilitate transdisciplinary collaborations, create, collect and curate online-content and organize events where everyone gets the chance to explore the world of humus, roots and microbes in an atmosphere of playful productivity.

«HUMUS sapiens» represents a compilation of soil explorations emerging from the networks of *mikroBIOMIK*, *Hackteria* and *Gasthaus* - with the ambition to bring DIY (do it yourself) and DIWO (do it with others) approaches as well as an open source based 'hacker spirit' into soil ecology. We invite you to reflect on current scientific discourses and critical societal challenges through hands-on tinkering and curiosity driven research.

### Soil – a Shared Habitat

Far more than just the dirt under our feet, soil is a truly complex and dynamic ecosystem. It is a constantly changing mix of minerals, living organisms, decaying organic matter, air and water. It is the living skin of our planet, allowing new forms of life to come into being, incorporating the nutrients left there by organisms of the past. Soil is bursting with life and can be vastly different from one square cm to the next. From plants, earthworms, insects and fungi to the invisible amoeba, nematodes, algae and bacteria – each creature provides their own essential role in the soil ecosystem.

The shared nature of the soil habitat manifests not only through the highly interconnected so-called *soil food web* - which is mainly driven by microbial metabolism - but also in regard to humans and their dependence on the productivity of edible plants. It is this dependency that motivates *Homo sapiens* to manipulate natural ecosystems, while at the same time failing to understand them.

Transdisciplinary collaboration: HUMUS sapiens retreat 2019



Human impact on the soil, especially intensive agricultural practices (deforestation, overgrazing, use of agrochemicals, etc.) and urbanization, leads to compaction, loss of soil structure, nutrient degradation and contamination - ultimately breaking down these ecosystems and eroding the soil to infertile desert.

### The soil food web

Microbes are at the beginning and end of every food-chain. The relationship between the different organisms that live in the soil is so interconnected that it makes sense to speak of a tightly woven food web. While larger organisms like earthworms and insects are important for the macroscopic structure and physical properties of the soil, microorganisms are mainly responsible for nutrient cycling and transformation. All terrestrial plants actively engage in the cultivation of a suitable microbial ecosystem near their roots (in the so called rhizosphere) by excreting a variety of substances to the ground.

**Bacteria** break down all sorts of organic waste and even liberate minerals from inorganic compounds like sand or stone, thereby making them available for plants and fungi. Some are specialized on complicated tasks like converting atmospheric nitrogen into ammonia - a chemical challenge that only works if there is no oxygen around. Plants support these important bacteria by excreting sugary compounds into the soil and in extreme cases even by giving them a home inside their roots.

**Fungi** have several very important ecosystem functions: They improve soil structure, decompose wood and other hard-to-digest materials and protect plants from drought as well as root pathogens. Mycorrhizal fungi extend the roots of plants with their extremely fine mycelium network, thereby enabling them to access water and minerals in a more efficient way. At the same time, they connect the plants of an ecosystem into a structure sometimes referred to as the 'wood wide web' - allowing an exchange of nutrients and information between individuals of the ecosystem.

**Nematodes and Protists** (e.g. rotifers, ciliates and amoeba) usually feed on smaller organisms, like bacteria, algae and single-celled fungi. This extremely

complex predator-prey relationship is a major source of nutrient release and therefore essential for plant productivity. Since every species has its individual food preference, a high diversity of nematodes and protists helps to keep the microbial ecosystem in balance.

**Earthworms and larger insects** dig their way through the soil and thereby not only optimize water distribution and ventilation of deeper layers, but also facilitate the transportation of nutrients as well as microbes. Organic matter like fallen leaves or manure is shredded by insects and then ingested by earthworms, a process that significantly accelerates humus production.



Sharing knowledge: HUMUS sapiens workshop in Paris (2019)

What might be the role of *Homo sapiens* within this complex ecosystem? Short-term interests and a lack of understanding currently shapes the way we interact with our most important resource. But more and more gardeners and farmers begin to see the benefit of using natural synergies and some have started to develop (perma)cultural techniques and holistic agricultural philosophies.

The «HUMUS sapiens» project supports these movements by performing open research in transdisciplinary networks and a reflection on current scientific and societal discourses from a wide spectrum of topics related to soil ecology.

More Information:

<https://mikrobiomik.org/humussapiens>