EARTH & SOIL

A Hands-on Exhibition
for children ages 6 to 12

Exhibition Texts

ZOOM CHILDREN'S MUSEUM

For teachers, parents, accompanying persons and adult exhibition visitors

The hands-on exhibition “EARTH & SOIL” explores various aspects related to our planet Earth – aspects that are relevant from both an ecological and a social point of view and that show us why it is so important to treat the soil carefully and sustainably.

Our interactive approach is designed to introduce the individual topics in a playful manner. The kids are given ample opportunity to contribute their own talents and skills at the hands-on stations. Discovering things at their own pace and individually exploring the topics helps build and strengthen self-confidence.

90 minutes is rarely sufficient for the kids to devote equal time to all the stations set up on our 600 m^2 exhibition space. This means that they may not be able to discover the whole exhibition, which is fine. It is more important for the kids to develop their own rhythm and speed than to try to see everything. Watching them during this process is actually quite exciting! The children create their own experiences – the learning process largely involves playing, imitating and trying things out.

Throughout the exhibition, the children learn about the Earth and the soil in a creative and playful way. In a final feedback round at the end of the exhibition, they will be guided in reflecting on what they have learned, drawing lessons on a conscious level.

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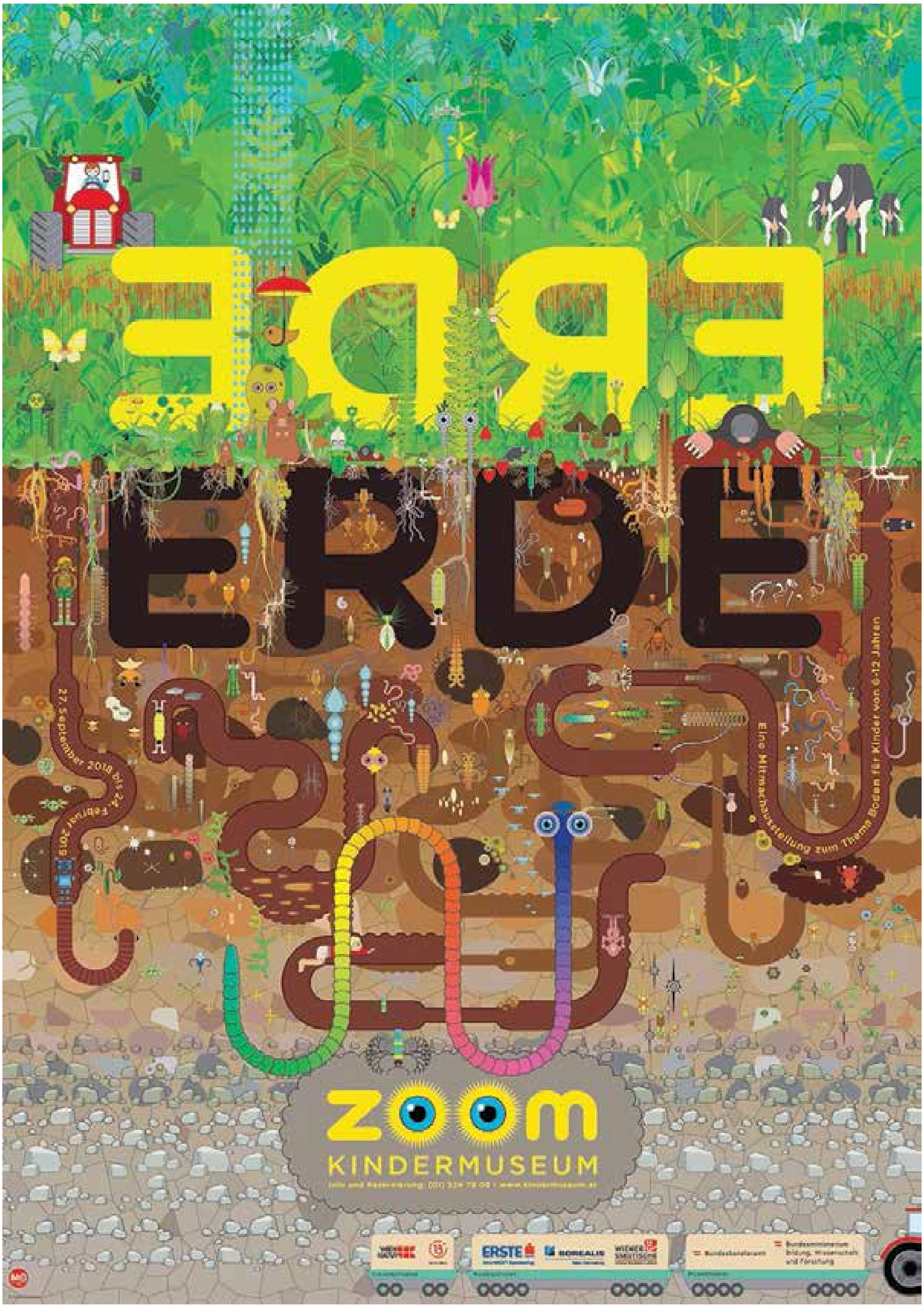
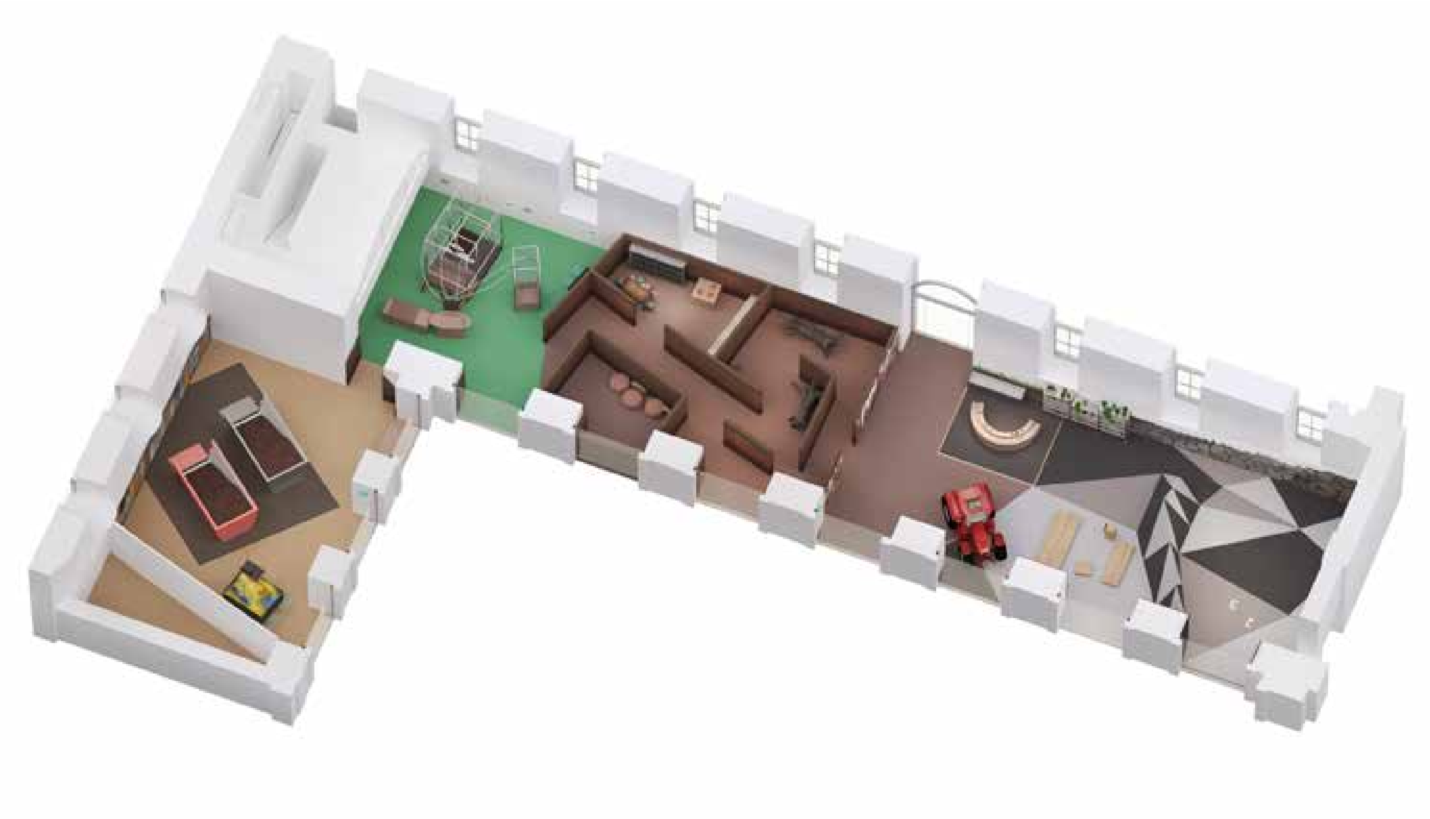
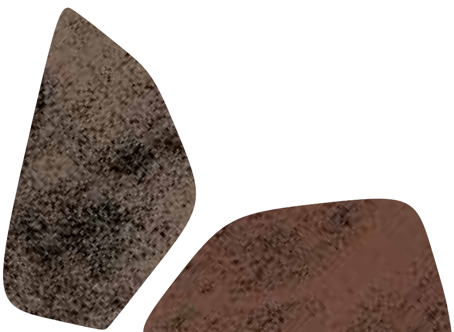


Exhibition rendering



Earth & Soil

“Earth,” in English, has two meanings: It can refer to the planet we all live on, or it can refer to the soil we all walk on. The planet Earth is home for us humans and as many as 8.7 million other forms of life. Two thirds of the Earth’s surface are covered by water and one third is covered by landforms, such as mountains, grassland, deserts, and fertile land. The share of fertile land comes to only 10% of the Earth’s surface and is decreasing every year. At the same time, the world’s population is growing and needs more and more food. As a result, more land is being used for farming, which increases the risk of using up the Earth’s resources. Today, we have to be more careful than ever to find the right balance. When using land for farming, we have to make sure that the Earth is “doing well” and that the nature’s ecosystem is balanced.



Poems

Poetry is among the oldest forms of human linguistic expression. Lyric poetry describes poems that are known for being short and expressive, and for following a specific format. In a lyric poem, every single element counts. This is why the poems on display in our exhibition rooms do not only describe what is happening on Earth and in our soil; they also tell us about these bustling habitats by using different poetic forms. In this room, for example, the poem you see is written in the form of a wish; in the entrance room, it is crafted like a magic spell; and in yet another room, the poem consists of a list of verbs describing the work done by soil organisms to produce humus (e.g. chopping and cutting, munching and crunching). In this way, the poems do not only speak to the visitors of this exhibition but also to the Earth and soil – the main subjects of the poems.

bitte sehr

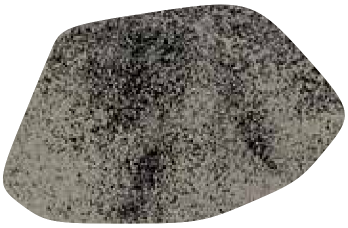
zu kalt
zu nass
zu steil
zu trocken

zu wüst
zu gletscher
zu wenig
zu meer

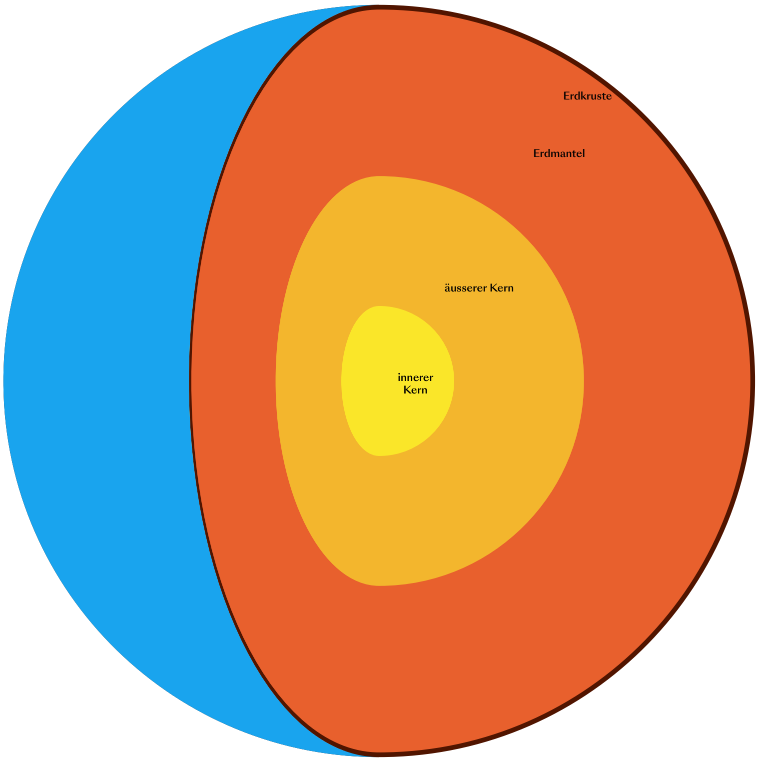
boden ist wertvoll
bitte sehr!

m.h.

What is inside the Earth?



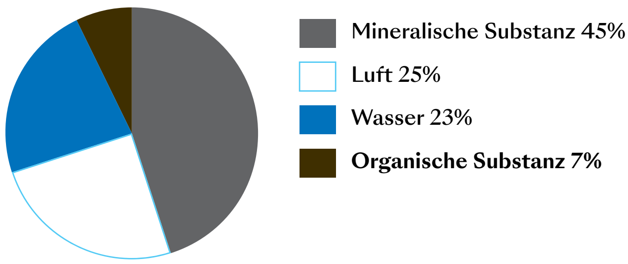
The Earth's surface is covered by a thin and solid layer, the "crust." The Earth's crust is about 30 km thick and is broken into massive pieces called "plates." For comparison, if the Earth is the size of an apple, then the crust would be as thin as the skin of the apple. The next layer beneath the crust is much thicker and is made up of hot, molten rocks. The plates float on the upper part of this layer like rafts on a lake. At the very centre of the Earth is the "inner core." The heat of the inner core makes the molten rock swell up under the crust, which in turn makes the plates atop the molten rock move in different directions. Along the edges of where the plates meet or slide past each other, volcanoes often form. This is also where the majority of earthquakes occur.



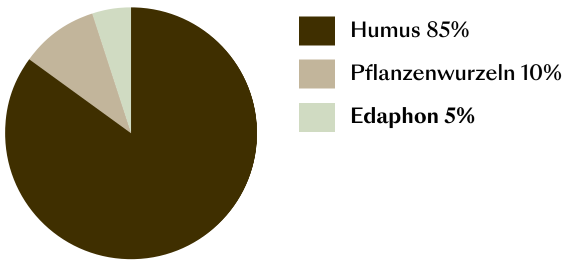
What is soil made up of?

Soil is made up of living and non-living parts. The non-living parts include sand, clay, minerals, water, and air. There are also many living things in the soil, such as plants, animals, fungi, and bacteria. These living things help to make the soil fertile.

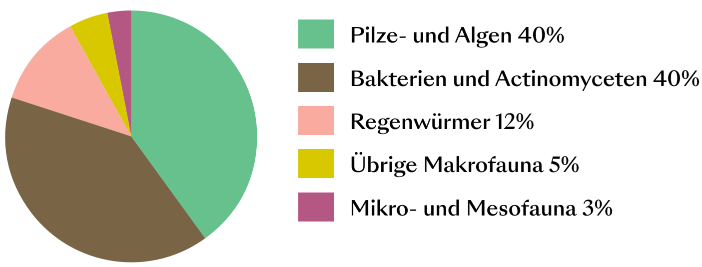
Erdboden



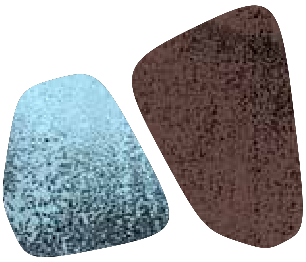
Organische Substanz



Edaphon

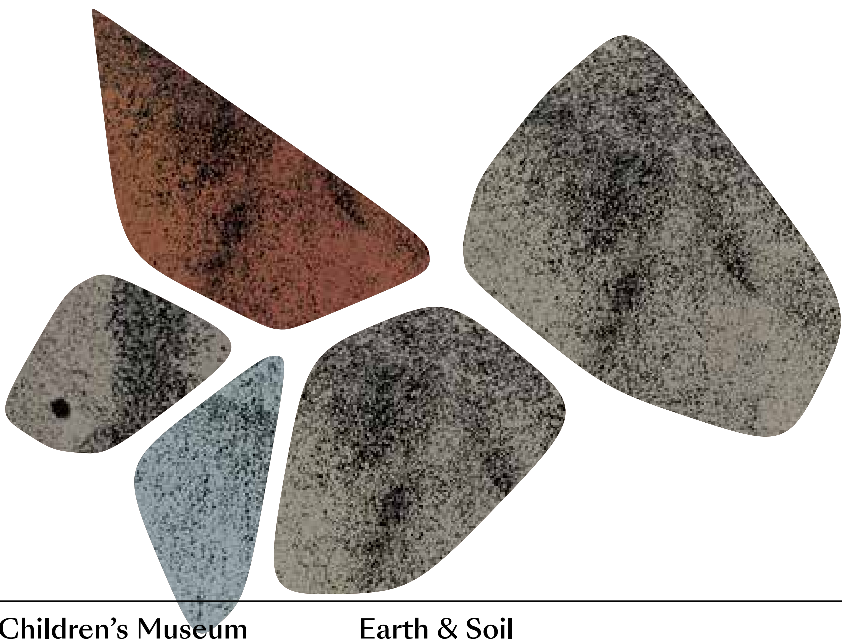


Why is it important to protect the soil?



In Austria, an area as big as 30 football fields or one large farm is covered with concrete every day, making it impossible for the soil to “breathe” and store water. Eventually, this will lead to natural disasters because the soil is unable to fulfil the tasks it usually does in nature: The soil filters harmful substances, absorbs water, and regulates the climate. Humans use soil for agriculture and forestry, to produce raw materials, and to build houses and streets on it. Above all, however, soil is used to grow food.

Unfortunately, the rising population does a lot of damage to the soil because people use up the Earth’s resources and pollute the environment. You might now wonder what our world will look like in the future? Well, one thing is for sure: If we do not take care of our soil, we will not be able to feed our growing population.



Why are plants important?

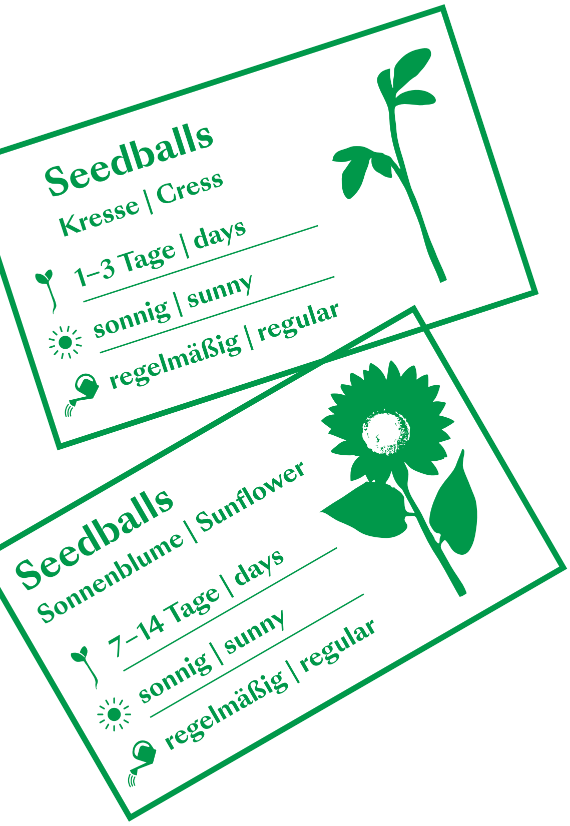
All living things on Earth need plants to live. Plants release oxygen from their leaves, which humans and many other animals need to breathe. Plants also provide us with food. We eat their seeds, fruits, roots, and flowers. We use the remains of plants in the soil to produce energy, and plant fibres to make paper, cloth, or rope. We even use plants to make cosmetics and medicines. About 95 % of our most important medicines are produced from plants, even though only 5 to 10 % of all plants on Earth are known to us today.

How do plants grow?

Most plants reproduce through seeds that contain nearly everything a plant needs to grow. During its early stages of growth, the little plant relies upon the food supplies stored in the seed until it is large enough to produce its own food. Examples of seeds include grains that grow from the seeds of grasses, such as wheat, rye, or barley. Other examples of seeds that you certainly know include peas and beans.

This time-lapse video shows a bean growing into a plant. Watch how the seed germinates, the roots develop, and the first leaves grow toward the sun. Beans are fast-growing climbing plants. This is why they grow upward in a spiralling shape, searching for objects to climb on.

Make your own seed balls



Originally from Japan, seed balls were a quick and easy way to replant and beautify bare areas with flowers and other plants. To make your own seed balls, all you need is clay, potting soil, and seeds.

Ingredients:
1 part seeds
3 parts clay powder
5 parts compost
1 part water (maximum)

Create the clay mixture:
Mix 1 part seeds with 5 parts compost and 3 parts clay powder.

Add water and knead
Slowly add water and keep kneading the dough. Do not add too much water – after all, you do not want the seeds to start growing just yet.

Roll the seed balls
Take small bits of the clay mixture and roll them between your palms to form walnut-sized balls. They should be soft and smooth, not crumbly. If you do not want to plant the seed balls right away, wrap them in newspaper. This way, you can safely store them for several years.

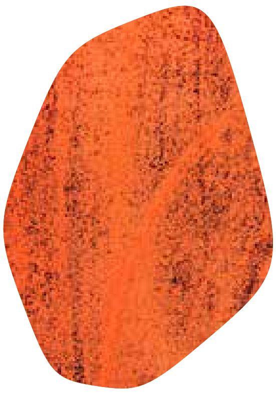
Plant the seed balls
The last step is planting the seed balls in the desired location. You can achieve the best results by placing them halfway into the soil and watering them for the first few days.

What is fertile soil?

Plants only grow well in soil where they find everything they need to thrive. To grow well, some plants need a lot of sun, others a lot of shade, and still others a lot of water. In general, plants are very picky when it comes to the nutrients they take from the soil. Each species of plant has its favourite nutrients – much like a favourite dish. For example, some plants like to have a lot of calcium, while others prefer a lot of nitrogen. Some are hungry all the time and need rich, nutritious soil. Others are less demanding and therefore satisfied with barren soil. Still others are particularly fussy about their food, looking for certain substances that are present in very small amounts in soil.

A fertile soil contains all the major nutrients that plants need to grow strong. It provides plants with water and air, and has a diverse and active soil life, with many other tiny organisms living in it as well. On a fertile soil, farmers can grow highly nutritious crops, such as grains, vegetables, or plants used to feed animals or produce energy. As crops grow, however, they remove nutrients from the soil. This is why farmers use fertilisers to put back into the soil the nutrients that have been removed. Farmers may also use crop rotation, by which different crops are planted in a regular sequence. This way, a crop that removes one kind of nutrient from the soil is followed during the next growing season by a crop that returns that nutrient to the soil.

Why do we throw away so much precious food?



About 800 million people of the 7.6 billion people in the world go to sleep hungry every night. At the same time, we throw away 1.3 billion tons of food every year! In industrial countries, tons of food are wasted simply because people buy more than they really need. In some developing countries, however, tons of food are regularly thrown away as well. Not because people do not need it, but because there are not enough storage rooms, streets, transport vehicles, and packaging materials to keep the food fresh. As a result, a lot of the food goes bad before people can actually buy it.

Tips to reduce food waste

- Seasonal and regional fruit and vegetables are not only good for the climate and the environment; they also stay fresh much longer! They are therefore less likely to be damaged during transport and less likely to be thrown away.
- Make sure to store food properly and use up the food that goes bad quickly first!
- Note upcoming expiration dates on food and use it up before it expires!
- Leftovers can often be put to good use – be creative!
- Use grocery lists, and do not go shopping when you are hungry. This way, you are less likely to buy things you do not need, which saves money at the same time!

Working in farming

Living and working on a farm has many rewards and challenges. Farmers provide food for the population, help to preserve nature, and take care of the landscape. Today, many farmers produce food using farming techniques that protect the land, the animals, and the people. This is called sustainable farming. Many farmers also offer people to spend relaxing holidays on their farm.

How has farming changed?

A long time ago, people learned how to grow a variety of crops from planting seeds in the soil. This was the beginning of farming. Back then, the population's growing need for food was met by expanding the land used for growing crops and raising animals. With the help of new farming techniques, it was suddenly possible to produce large amounts of food. Farmers changed, for example, from a mixture of crops to a single crop (monoculture) and started to use machinery, mineral fertilisers, and chemicals to protect plants.

150 years ago, 75% of Austria's population worked in farming. They were self-sufficient, which means they relied on themselves for what they needed. Food came from the surrounding fields, and what was left over after the harvest was sold on the market or exchanged for other goods.

However, these changes did not only have advantages. They also brought about a lot of disadvantages by interfering with sensitive natural cycles: In order to produce machines, fertilisers, and plant protection products, enormous amounts of water and energy reserves are needed. If farmers use chemicals to grow their crops, the chemicals will go into the soil, polluting the environment and harming the balance of nature.

Both now and in the future, it is important to develop sustainable strategies to produce food for the world's growing population and to protect the soil needed for food production.

The tractor

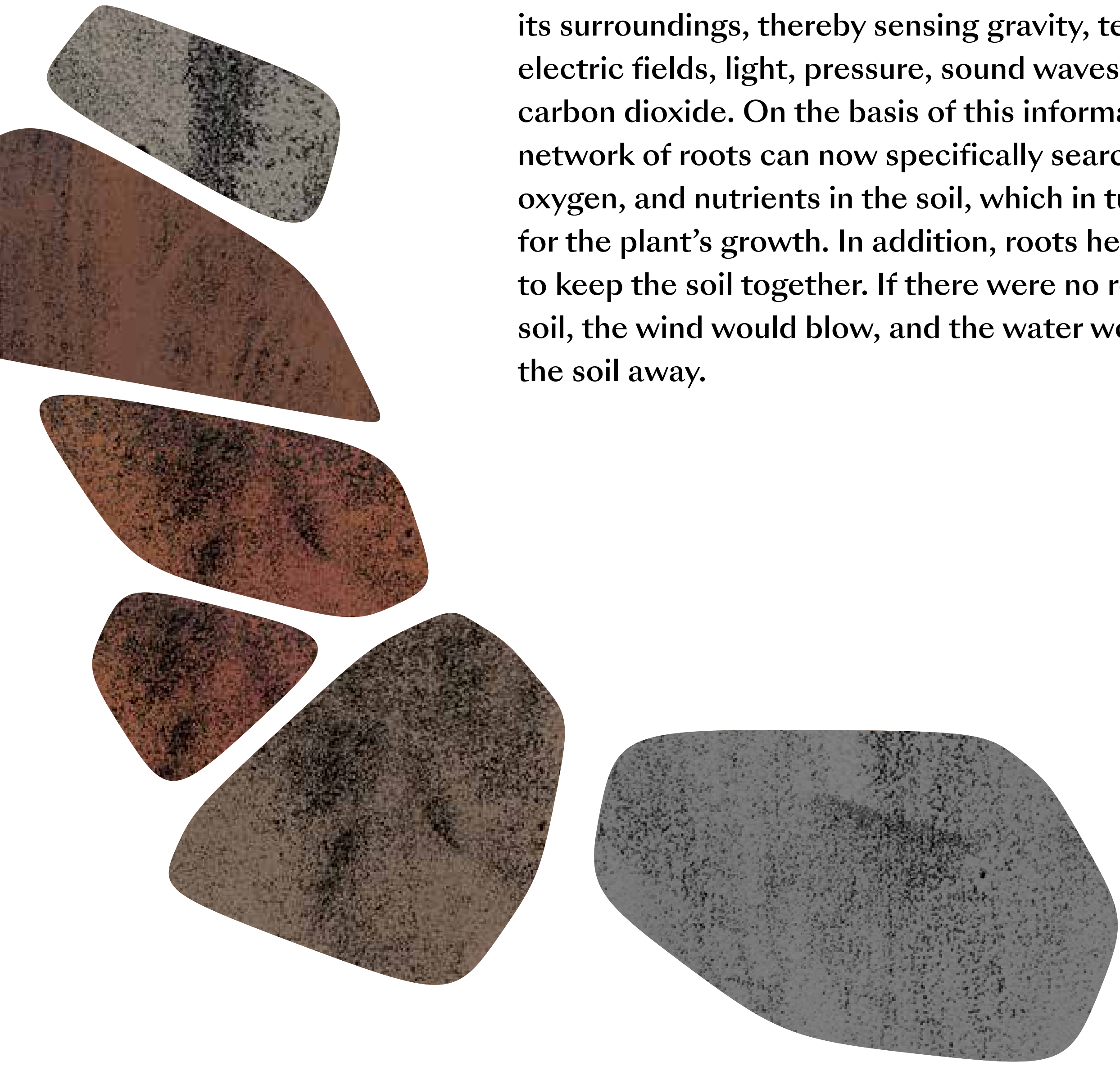
Horses and oxen were the most useful animals for farming until the tractor was invented some 100 years ago. Since then, tractors have become increasingly important in farming and have become much more advanced. Originally powered by steam engines, they have developed into high-tech farming machines, equipped with precise measuring instruments that can even detect whether a plant is lacking certain nutrients.

The tractor displayed in this exhibition is part of the “T.E.” art project by Elisabeth Falkinger who introduces us to an Austrian farming community that used to live in Teresva, Ukraine. Back then under the Austro-Hungarian Empire, wood was valued as a rare resource, which was why many families from Upper Austria decided to move to the area rich in forests in present-day western Ukraine. There, they settled down in a valley, engaging in forestry and farming. Even to this day, the Upper Austrian dialect is spoken in this region. Elisabeth Falkinger went to Teresva, bought the tractor displayed in this exhibition, and drove back to Upper Austria. While being on the road, she was sketching tractors against the backdrop of the slowly changing scenery she drove through.


NACH

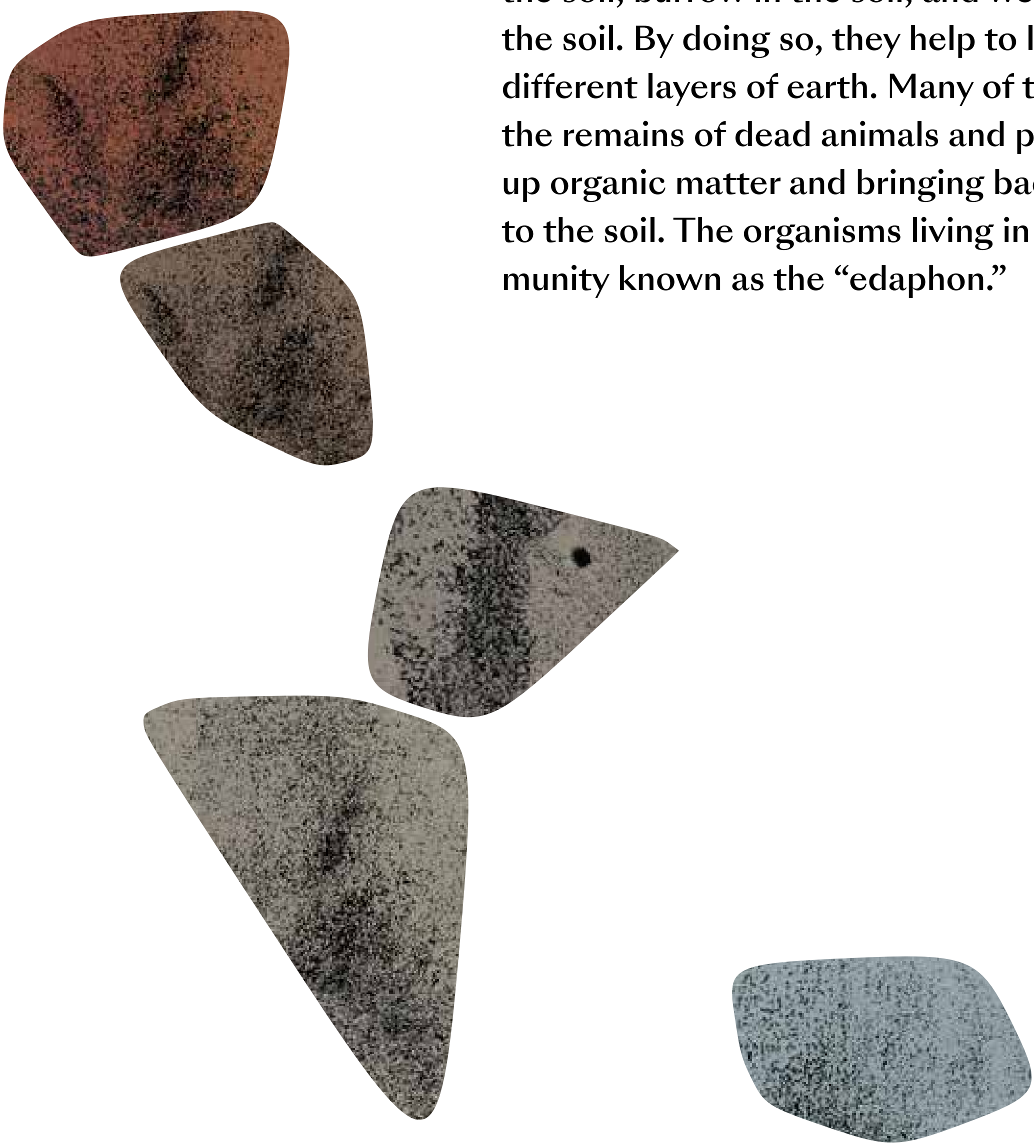
What do a plant’s roots do?

Roots are an important part of plants. They take up water and nutrients that the plant needs to grow from the soil. Attached to every root are millions of tiny “root hairs” that spread out in the soil, looking for water and nutrients. The tip of a root is called the “root cap.” Its job is to push its way through the soil and explore its surroundings, thereby sensing gravity, temperature, electric fields, light, pressure, sound waves, oxygen, and carbon dioxide. On the basis of this information, the network of roots can now specifically search for water, oxygen, and nutrients in the soil, which in turn are needed for the plant’s growth. In addition, roots help to keep the soil together. If there were no roots in the soil, the wind would blow, and the water would wash the soil away.



What lives in the soil?

Soil is a bustling habitat. Just a few centimeters below the soil's surface, you can find thousands of different organisms. In fact, a handful of soil has more living organisms than there are people on our planet! Living organisms present in soil include earthworms, woodlice, mites, beetles, insects, algae, bacteria, and fungi. They mix up the soil, burrow in the soil, and weave their way through the soil. By doing so, they help to loosen and aerate the different layers of earth. Many of the organisms feed on the remains of dead animals and plants, thereby breaking up organic matter and bringing back important nutrients to the soil. The organisms living in the soil form a community known as the "edaphon."

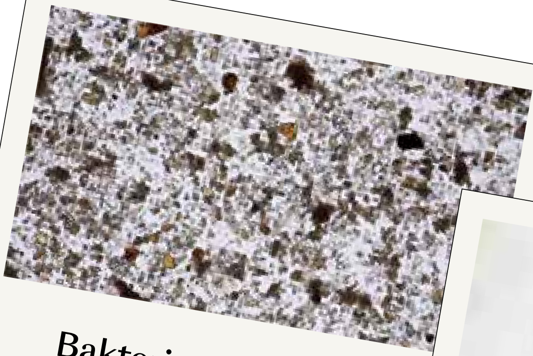


Why are soil organisms important?

The organisms living in the soil have one important task to do: recycling the remains of dead animals and plants. This means that they “decompose,” or break down, organic matter, such as leaves or other parts of dead plants and animals. For a leaf to decompose fully, it has to be broken down several times by different organisms. One organism, for example, digests the leaf, and excretes certain parts of the leaf in the soil, which then serve as food for other organisms. During this process, larger organisms and smaller organisms, also called “microorganisms,” depend on each other. By breaking down organic matter, organisms produce nutrients, such as minerals, that living plants need to grow. It is also minerals that are responsible for the soil’s characteristic dark color.

Microscopy laboratory

Most of the organisms living in the soil are so small that they cannot be seen with the naked eye. In the laboratory, microscopes allow you to zoom in on the truly tiny organisms and discover what they look like and how they have adapted to the living conditions in the soil.



Bakterien

wissenschaftlicher Name: *Bacteria*

Von allen Lebewesen im Boden bin ich das allerkleinste. Mich kannst du selbst mit einem sehr starken Mikroskop nur ganz schwer erkennen – meist nur, weil ich mit vielen tausend Freunden auf engem Raum zusammenlebe. Da die meisten von uns im trockenen Boden nicht überleben können, bauen wir Erdklumpen aus Sandkörnern zusammen und speichern darin das überlebensnotwendige Wasser und Nahrung. Wir Bakterien sind immer hungrig und fressen abgestorbene Pflanzenteile und Tierabfälle. Dabei sind wir so gründlich, dass von den Resten nur mehr die mineralischen Anteile überbleiben. Und die holen sich dann oft die Pflanzenwurzeln und Pilze, aber das ist eine andere Geschichte!

Cyanobakterien

wissenschaftlicher Name: *Cyanophyceae*

Ich kann mit Stolz sagen, dass ich eines der ältesten Lebewesen bin, die es auf der Erde gibt. Ich bin winzig klein und eigentlich mehr Pflanze als Tier, da ich meine Nahrung mithilfe von Sonnenenergie, Wasser und Kohlenstoffdioxid selber herstellen kann. Als Abfallprodukt entsteht dabei Sauerstoff, der sich in der Luft ansammelt. So habe ich mit meinen Freunden viele Millionen Jahre lang dafür gesorgt, dass Tiere und Menschen den lebensnotwendigen Sauerstoff zum Atmen haben. Wir Cyanobakterien hängen uns manchmal auch zu langen Fäden zusammen. Wenn wir das machen, trocknen wir langsamer aus und wir können uns damit sogar wie ein Bohrer durch den Boden schrauben.

Regenwürmer

wissenschaftlicher Name: *Lumbricidae*

Ich bin wohl eines der bekanntesten und wichtigsten Bodentiere. Ich kann bis zu 30 Zentimeter lang werden und grabe Rohrsysteme und Höhlen in den Erdboden. Dabei vermische ich verschiedene Bodenschichten und sorge dafür, dass der Boden atmen kann und das Regenwasser gut abrinnt. Wenn ich Hunger habe, ernähre ich mich meistens von Pflanzenabfällen. Da ich diese nicht selber zerbeißen kann, lasse ich sie von anderen Bodentieren wie dem Springschwanz und Bakterien zerkleinern und vorverdauen. Erst dann verspeise ich den Pflanzenbrei genüsslich samt Bakterien und Erdkörnern. Mein Kot ist dann ein ganz hervorragender Bodendünger für die Pflanzen, die darin viele wichtige Nährstoffe zum Wachsen finden.

…ntoffeltierchen

…schaftlicher Name: *Paramecium*

…Namen habe ich bekommen, weil mein Körper …antoffel (Hausschuh) aussieht. Ich bestehe aus …Zelle und bin winzig klein. Wie viele andere …Freunde, bin ich ein Wimperntierchen, lebe …asser und ernähre ich mich von Bakterien. …terien hebe ich mir als Nahrungsvorrat in …er auf, um sie zu einem späteren Zeitpunkt

Makrofauna
groß

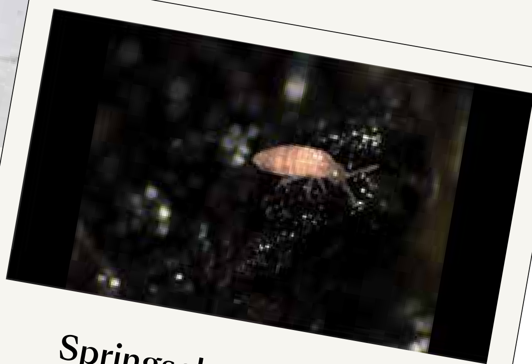
- Regenwürmer
- Schnecken
- Ameisen

Mesofauna
klein

- Tausendfüßer
- Hundertfüßer
- Milben
- Asseln
- Springschwänze

Mikroorganismen
winzig

- Rädertierchen
- Fadenwürmer
- Bärtierchen
- Glockentierchen
- Pantoffeltierchen
- Wimperntierchen
- Wechseltierchen
- Grünalgen
- Kieselalgen
- Bodenpilze
- Cyanobakterien
- Bakterien

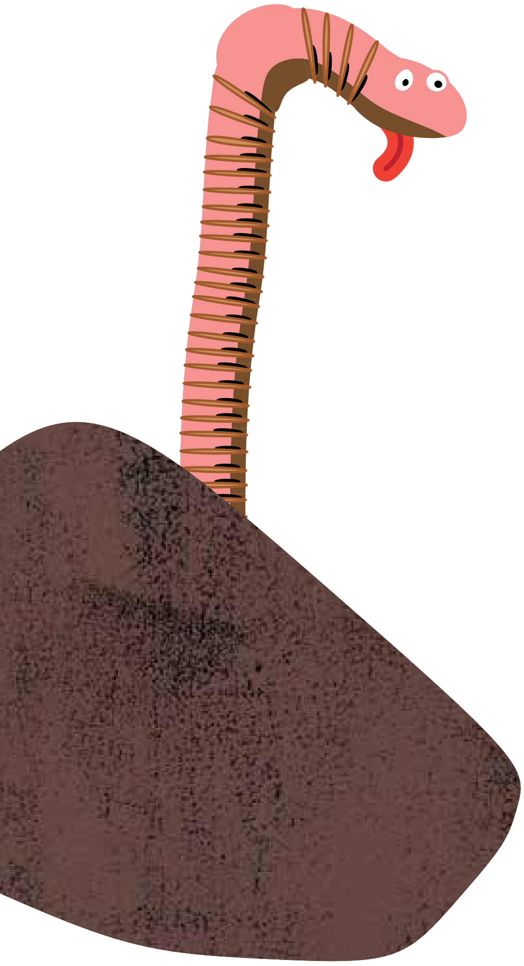


Springschwänze

wissenschaftlicher Name: *Collembola*

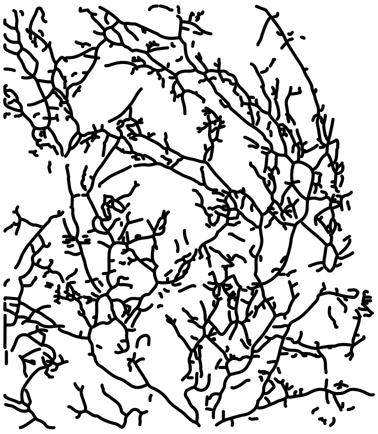
Auch wenn ich meist nur wenige Millimeter groß bin, kann ich sagen, dass ich zu den wichtigsten Tieren im Boden gehöre. Denn ich ernähre mich von vielen Abfallresten und helfe mit, die mineralischen Stoffe aus der Nahrung zurück in den Boden zu bringen. Diese mineralischen Stoffe brauchen dann wieder die Pflanzen, damit sie wachsen können. Besonders stolz bin ich aber auf meine Sprungkraft: Bei Gefahr kann ich mit einem Salto vor- oder rückwärts, zirka 400 mal so weit springen wie ich groß bin. Ist das nicht cool? Könnte ein Mensch so gut springen, würde er ohne Probleme über den Stephansdom hüpfen können.

Earthworm box



In this box, you can observe the superheroes of all organisms living in the soil as they go about their daily business. Earthworms weave their way through the cavities and pores of the soil, mixing up different layers of earth. The tunnels made by earthworms are lined with mucus, which makes them more stable and allows water and air to enter the soil and reach the roots of plants. Earthworms mainly feed on the remains of dead plants and small organisms, also known as "micro-organisms." Usually, you have to watch for earthworms at night. This is when they forage for leaf litter and organic matter, which they take into their tunnels.
By doing so, earthworms do not leave their tunnel completely; the tip of their tail always stays in the tunnel. After having gathered leaf litter and organic matter, the earthworms let it sit for some time, allowing other organisms to break it down into small pieces. This means that earthworms wait for their food to be prepared before digging in. While enjoying their meal, earthworms also take in fungi, bacteria, and other small soil particles, parts of which will be excreted after digestion. Earthworm castings are a rich, natural fertiliser that provides the soil with important nutrients. By weaving tunnels and fertilising soil, these superheroes therefore play an important role in keeping our soil fertile.

Fungi

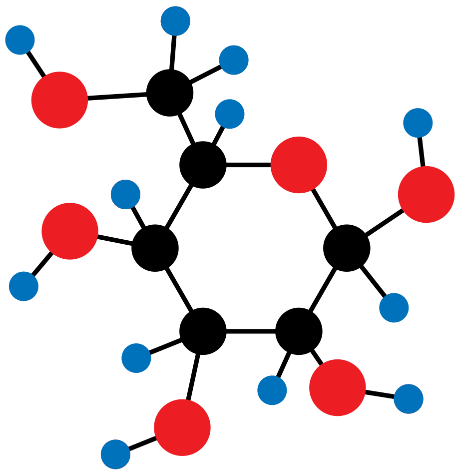


The forest is the most important habitat for fungi: over two thirds of the native fungus varieties grow there. Fungi play a central role in the complex ecosystem of the forest. They decompose wood, leaves, and coniferous litter, and thus keep the nutrient cycle going. And for insects, small small mammals, and snails, they are themselves a source of food. What we call a fungus is merely the fruiting body. The mycelium grows hidden from us in the ground or wood.

Many fungi live with the trees in a symbiosis, a biocinosis that profits both partners. These fungi, so-called mycorrhizal fungi, supply water to the tree's roots, improve the supply of nutrients, filter certain harmful substances, and protect the roots from disease. In return, they receive nutrients from the tree and energy in the form of sugar.

However, there are also fungi that, as parasites, harm animals and plants, and even cause them to die.

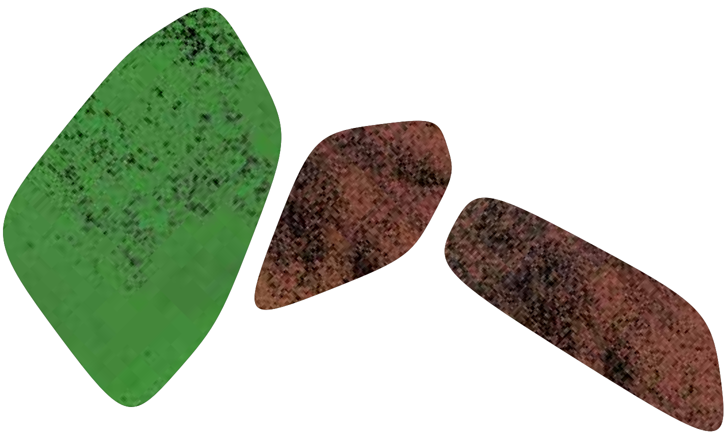
What do plants need to grow?



For growth, plants need many building materials. Some of these the plant can produce on its own: for that, it needs water that it absorbs through the roots, and carbon dioxide which it breathes in from the air through the leaves. With the help of energy from the sun, it produces sugar and oxygen from it. The oxygen is released with the aid of the leaves, it serves us humans for breathing. The sugar the plant needs itself as a nutrient and building material for growth. But it can also store the sugar in its roots, bulbs, fruit, leaves, or seed.

To grow, plants need minerals from the soil. There are many different minerals, the most important are nitrogen for growth, phosphor for the development of blossoms and fruit, potassium to regulate water supply and to give taste to fruits and vegetables. Plants have varying nutritional requirements. One plant takes more nitrogen from the soil, another needs more potassium or phosphor.

Intensive farming withdraws minerals from the soil. If there are not enough minerals in the ground, the plant cannot grow properly, or may die.



What is a hermetosphere?

An hermetosphere is an hermetically sealed container with nutrient-rich soil, plants, and microorganisms (tiny creatures), air, and water. If the hermetosphere receives sunlight, it functions like a miniature version of the Earth's ecosystem: the water evaporates and condenses. During the day, the plant uses the air gas carbon dioxide for making food, and the tiny creatures living in the ground ensure that the plant gets nutrients, and the plant in turn returns a part of the nutrients to the creatures. In some way or another, everything depends on each other!

The nutrient cycle

All living creatures need nutrients. These are in the ground, are absorbed by the roots, and used as building material for leaves, blossoms, or seeds. Many plants serve as food for other living creatures. Once these die, they are broken down by soil animals and microorganisms such as bacteria and fungi in the ground, and in this way the nutrients remain available in the ground. The plants can now once again absorb the nutrients. Most plants on Earth are not eaten. They end up directly in the ground and decompose, and thus form a smaller cycle.

The water cycle

Without water, there wouldn't be any life on Earth. The Earth has a certain amount of water available which moves in an eternal cycle between oceans, the air, and the ground. Therefore it is possible that a water molecule in your body perhaps was, many millions of years ago, part of a dinosaur. When it rains, water falls down to earth from the clouds. Here, it ends up for example in rivers that flow into the sea. The surface of the sea warms up. Water evaporates and transforms into clouds. These produce rain.

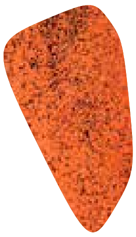
The carbon cycle

Carbon is the vital basic material for all living creatures. There is a certain amount of carbon in the world, and it always gets reused. The plants absorb gas carbon dioxide from the air, and transform it into food and nutrients. Since plants in turn are food for many living creatures, these take in the carbon through the food. The surplus carbon is breathed out as carbon dioxide, and thus ends up back in the atmosphere.

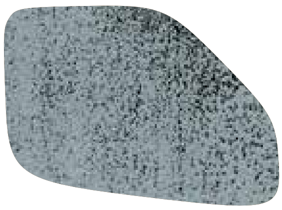
Humans have created a second carbon cycle. In plant-based fuels, carbon is trapped. Once it is burned, carbon dioxide is also released and ends up in the atmosphere. This leads to an imbalance of carbon dioxide in the air, which leads to global warming.

When did life begin?

The answer is 3.8 billion years ago. When the earth came into being 4.6 billion years ago, it was a lifeless ball of molten rock, surrounded by poisonous gas, and was bombarded by meteorites. It was very dark and hot, and there was no water. Only millions of years later did the first traces of life appear, which slowly, very slowly developed into today's plants and animals.



Imagine the development of Earth could happen in just one day. One minute would stand for 3 million years, and 1 second for 50,0000 years!



Midnight: The Earth comes into being
The molten rocks of the Earth start to cool down, and a firm earth crust develops. With the aid of volcanic gases, the atmosphere develops. It starts to rain and the seas come into being

03:57 am: Slime!
The first forms of life appear – small slimy things called bacteria start to spread in the seas. One kind of bacteria starts producing oxygen from the water.

9:07 pm: Animal explosion
The sea begins to fill with plants and strange creatures, like sponges, corals, jellyfish, bony fish, water scorpions, giant isopods, the so-called trilobites.

9:40 pm: Plants ashore
Near the water, plants start to grow ashore. It will take millions of years until these clumps of moss are replaced by grasses and leafy trees.

10:05 pm: Animals ashore
The first animals crawl from the water ashore. They develop legs and learn to breathe air. Insects and reptiles appear.
11:06 pm: Dinosaurs
A group of large reptiles, dinosaurs, rule the world. After a few million years, a meteorite hits the Earth, and dinosaurs become extinct.

11:39 pm: Mammals
Small mammals survive. All kinds of species in all sizes develop from them. Apes walking upright appear from African forests and start to use tools and fire.

23:59:46 pm: Modern humans
Only 14 seconds before midnight in the history of the Earth do more intelligent humans appear in Africa and start their journey around the globe.

What will happen next?

Little space for a lot of people

In the middle of 2018, more than 7.6 billion people inhabit the Earth. But that is just a snapshot, because the world's population is growing by 2,26 people per second. That is 157 each minute, 10,000 per hour, 230,000 per day. So every year, the population of the Earth increases by more than 80 million, with far-reaching consequences:

- Since 1950, the world's population has tripled – to 7.4 billion in 2016.
- More than half of the world's population lives in cities.
- Today, we use ten times more resources than we did in 1900.
- 5% of the world's population require 25% of all available resources.
- Energy consumption is five times higher than it was in 1950.
- 80% of energy consumption is due to only 20% of the world's population.
- Grain production has almost quadrupled since 1950.
- Despite increases in food production, 800 million people in the world are malnourished.
- 1.3 billion tons of food are thrown away every year.
- Water consumption is five times higher than it was in 1950.
- Due to the climate disaster, a third of the land area is in danger of becoming a desert.

What is a soil profile?

In order to examine the different layers of soil in the ground precisely, we must look into the ground. To do that, a large hole is dug, so that at the wall of that hole we can view the layers exactly. These layers of soil are called a soil profile. Some soil profiles are a few metres thick, others just a few centimetres. Every ground is different, unique in its own way, and something truly special.

What is soil erosion?

Strong rains or fierce gusts of wind can wash or blow the valuable, nutrient-rich topsoil away. The experts call that erosion, and it is a global environmental problem. Fertile soils cannot be quickly produced artificially! Nature needs about 200 years to remake 1 cm of ground!

Even though erosion cannot be avoided completely, there are means of protection:

- Ploughing the fields diagonally to the slope so that rainwater doesn't run down the slope, bringing soil particles with it.
- Broad tires on tractors lessen the pressure on the ground, and therefore soil compaction.
- Crop rotation makes it possible to shorten the periods when the topsoil is exposed.
- Leave plants remnants and crop residues on the ground.
- Sow directly, before ploughing beforehand.
- Erect wind barriers, for example walls, fences, or plant hedges that protect from the wind.

Planet Earth

- Age: almost 4.6 billion years
- Diameter: 12,756 km (at the equator)
- Weight: about 6000 sextillion tons
- Duration of circling the sun: 365 days, 6 hours, 9 minutes, 9.54 seconds
- Speed of circling the sun: 29.8 km/s (107,280 km/h)
- Duration of the rotation of the Earth around its own axis: 23 hours, 56 minutes, and 4,1 seconds
- Rotation speed of the earth around its own axis: 465 m/s (1,674 km/h) at the equator
- Surface of the Earth (land and water areas): 510,100,000 km^2
- Water percentage: 71% (97.5% salt water and just 2.5% fresh water)
- Land percentage: 29% (Asia 29.7%, Africa 20.2%, North America 16.6%, South America 11.9%, Antarctica 8.9%, Europe 7%, Australia & Oceania 5.7%)
- Distribution of the land area: agriculture 36.11%; forests 29.77%; other areas (deserts, fallow land, mountains, areas covered by buildings) 30.54%; inland waters (lakes, rivers) 3.38%
- People living on Earth: about 7.5 billion (78 million more each year)
- Highest mountain: Mount Everest / Himalaya (8,848 m)

- Lowest land point: shore of the Dead Sea (–422 m)
- Lowest point in the sea: “Vityaz Depth 1” / Mariana Trench (–11.034 m)
- Distance to the earth’s core: 5.150 km to 6.370 km
- Temperature at the earth’s core: circa 5,000 degrees Celsius
- Atmosphere: 78.1% nitrogen, 21% oxygen, 0.93% argon, 0.04% carbon dioxide, 0.002% neon, and traces of other gases like methane, ozone, sulphur dioxide
- Border to space: 100 km
- Distance to the moon: 384,400 km
- Distance to the sun: ca. 149,600,000 km

Terraforming

The power of water changes the landscape. At every snowmelt and rain, each drop carries off a little soil. Rapid streams and rivers wash large amounts of gravel and sand off the mountains. They release their load in the plains or in the seas. This has happened year in, year out, for many thousands of years.

The weathering of rocks can, bit by bit, make the mountains lower. So why haven't they flattened out completely by now? Because mountains can also grow! Enormous energies that come from deep inside the Earth push mountain ranges upwards. When we walk about in the landscape, we don't notice any of these changes. They only happen in small steps and take much longer than a human life. Only in cases of landslides, earthquakes, and volcanic eruptions are we reminded that the Earth's surface changes all the time.

What does our landscape have to do with the Ice Age?

Our landscape has emerged about 10,000 years ago in the last Ice Age. At that time, large parts of Austria were under an enormous plain of ice, and mighty glaciers reached from the mountains far into the land. Glaciers move, and when it stays cold for a long time, they grow and advance into the landscape. If it gets warmer, the ice melts, and the glaciers retreat. And wherever glaciers move, they shape the landscape: stones locked in the ice grind rock from the ground (rather like abrasive paper) and take the rubble with them, only to dump it somewhere else when they melt. During your next excursion into nature, observe how the glaciers if the Ice Age have shaped today's landscape.

Further reading

https://oebg.boku.ac.at/
http://www.ahabc.de/
https://www.boku.ac.at/humusplattform/boku-mobil/

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