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# The sound of home soil

Switzerland, our home turf. Literally, the ground beneath our feet. What does it sound like?

Listen closely and you will hear an underworld cacophony. No deathly silence at all. But if the soil does fall silent, we should start to worry. Scientists are now trying to gain a better understanding of our subterranean soundscapes.



The "Swiss Review" expedition in familiar surroundings. Listen to the soil and you soon run out of verbs to describe all the sounds.

Photo: Danielle Liniger

MARC LETTAU

Our adventure began with a simple hypothesis: home is the ground on which you stand. But what if we put our ears to the ground and find out what "home" actually sounds like? Our first stop was a vegetable allotment on the outskirts of Berne. We were armed with a good pair of headphones, a hypersensitive microphone, a soil sensor to record the sounds, and a great deal of curiosity.

## Eardrums almost burst

What is there to hear? Absolutely nothing at first. But then a crash and a bang almost loud enough to perforate both eardrums. The reason? A blade of grass swaying in the light breeze brushes the microphone. The device amplifies this faint contact into a fortissimo. Hypersensitive indeed. The second attempt is less painful. Delicate movements in the damp earth underneath the shady pumpkin leaves. A slight rumble and crackle.

## Not enough verbs

Evidently, something is happening in the soil. With each backyard experiment, it becomes increasingly apparent how astonishingly rich the acoustics beneath our feet are – and how difficult they are to describe. Dogs bark, horses neigh, crickets chirp and cows moo. But what are the tiny creatures doing in this compost-rich earth? There are simply not enough verbs. Creak, crackle, nibble, cheep, rumble, jolt, bang, rattle. Or even chew and gargle?

## Röstigraben

Now for a more auspicious patch of land: the "Röstigraben" (or rösti divide). That imagined and much-discussed cultural border between German- and French-speaking Switzerland. Off we trot to a potato field on the cantonal border between Berne and Fribourg. It has to be a potato field. We carefully insert the microphone. What do we hear? Zilch. Not a hint of squabbling. A lifeless frontier?

## Patriotic soil

What about the soil at Rütli, Switzerland's most important meadow? Heavy, persistent rain puts paid to our experiment at the cradle of the Confederation. How about that other patriotic landmark, the Federal Palace? Verdant greenery dominates in front of its southern facade. Again, we pick up those familiar movements from the moist soil below. They sound much more refined than some of the bickering in parliament opposite.

## "What are you doing?"

The passer-by who approaches us has a friendly, forbearing tone of voice. People are used to strange sights in this day and age. "What are you doing?" she asks. We say that we are eavesdropping on the Federal Palace worms. Only when the lady puts on the headphones does her scepticism give way. "Well, isn't that incredible? Everyone needs to listen to this. It is teeming with life!"

## Orchestral manoeuvres in the dark

We end our expedition on marshland near the edge of a forest in the Alpine foothills. Microphone in and headphones on again. The tranquillity is promptly shattered. Immersed in a hitherto secret world, our perception shifts. We thought it was quiet, but now we hear a raucous orchestra of myriad elements.

## A citizen science project

Since summer 2019, men and women around Switzerland have been sticking microphones into the ground during the warmer months of the year. They are taking part in Sounding Soil – a research project (see box) driven by input from experts and wannabe experts like us. This grassroots approach – pun intended – has helped to complement scientific findings.

## The biologist's view

Mites, fly larvae, woodlice, earthworms, spiders, centipedes, springtails and beetles are just some of the tiny creatures making these sounds. But which sounds does each one make? Biologist Sabine Lerch of the Biovision foundation is responsible for the Sounding Soil project, but even she cannot give a definitive answer. “We don't know. We are the first project worldwide to bring the sounds of the soil to life in this way. But our research has only just begun.” It is all about the fundamentals for now. “The more varied the sound, the more diverse the range of creatures. The more intensive the sound, the more active the mesofauna and microfauna.”



Minute springtails (collembola) crawling through the compost – just one element in a subterranean orchestra consisting of mites, fly larvae, woodlice, earthworms, spiders, centipedes, beetles, grasshoppers, cicadas, etc. Photo: Marie Louise Huskens

## A new scientific discipline

Diversity and intensity. "Both these factors say something about the presence and activity of organisms in the soil," says Lerch. By the end of 2021, the aim is to see whether these twin factors can be used as parameters to gauge soil health. If they can, this would be a breakthrough for the emerging and burgeoning scientific discipline of ecoacoustics, one of whose most prominent exponents is Swiss scientist Marcus Maeder. Ecoacoustics could one day become a tool for measuring and assessing biodiversity.

## Our soils are suffering

Maeder's original specialism was musicology. "A field of organically grown oats sounds acoustically richer than a field of conventionally grown potatoes," he says. However, Maeder is less interested in artistic criteria. What matters is soil health. Many Swiss soils are in poor condition, says Sabine Lerch. "Our soils are suffering in many ways. We are either covering the earth with concrete and asphalt, or we are working the soil very intensively and with increasingly heavy machines." We are also polluting the soil with chemicals such as pesticides and fertilisers.

## Scratching the surface

"The question of what happens to soil has barely entered the public or political consciousness," she adds. Many of us view the dirt under our feet merely as the "surface". Even conservationists prefer to study biodiversity above ground, not underground. "And I can understand why. We focus on what we can see, what immediately stirs our emotions," says Lerch.

## Giving the soil a voice

Aside from the research, Sounding Soil is also an avowed attempt to raise awareness. "We want to give the soil a voice," says Lerch. Because what happens below ground ultimately affects us all. "For example, think about how important soil is for water management and food production." In the best-case scenario, putting our ears to the ground will not only deliver a scientific outcome but will also encourage a new appreciation of the very soil on which and from which we live. In the worst-case scenario, the microphones that Marcus Maeder developed will simply record the soundtrack of climate change and the decline of biodiversity.

An organically farmed Alpine pasture. An intensively farmed field. What do they sound like underground? What noises emanate from the forest floor? For a selection of subterranean sound recordings, visit [www.revue.ch](http://www.revue.ch).



## Sounding Soil

Sounding Soil is an interdisciplinary research project focusing on the sounds that occur in soil. Put simply: the project, due to run until 2021, aims to investigate the acoustics of soil ecosystems and better understand how differences in land use affect these acoustics. The conclusion so far: the greater the variety of living organisms in the soil, the more complex the sound.

Sounding Soil is jointly sponsored by the following institutions: Zurich University of the Arts (ZHdK), Biovision Foundation for Ecological Development, Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Swiss Soil Monitoring Network (NABO), ETH Zurich (Institute of Terrestrial Ecosystems) and the Research Institute of Organic Agriculture (FiBL).

Further information:

[www.soundingsoil.ch](http://www.soundingsoil.ch)

Acoustic soil recordings:

[www.soundingsoil.ch/en/listen](http://www.soundingsoil.ch/en/listen)