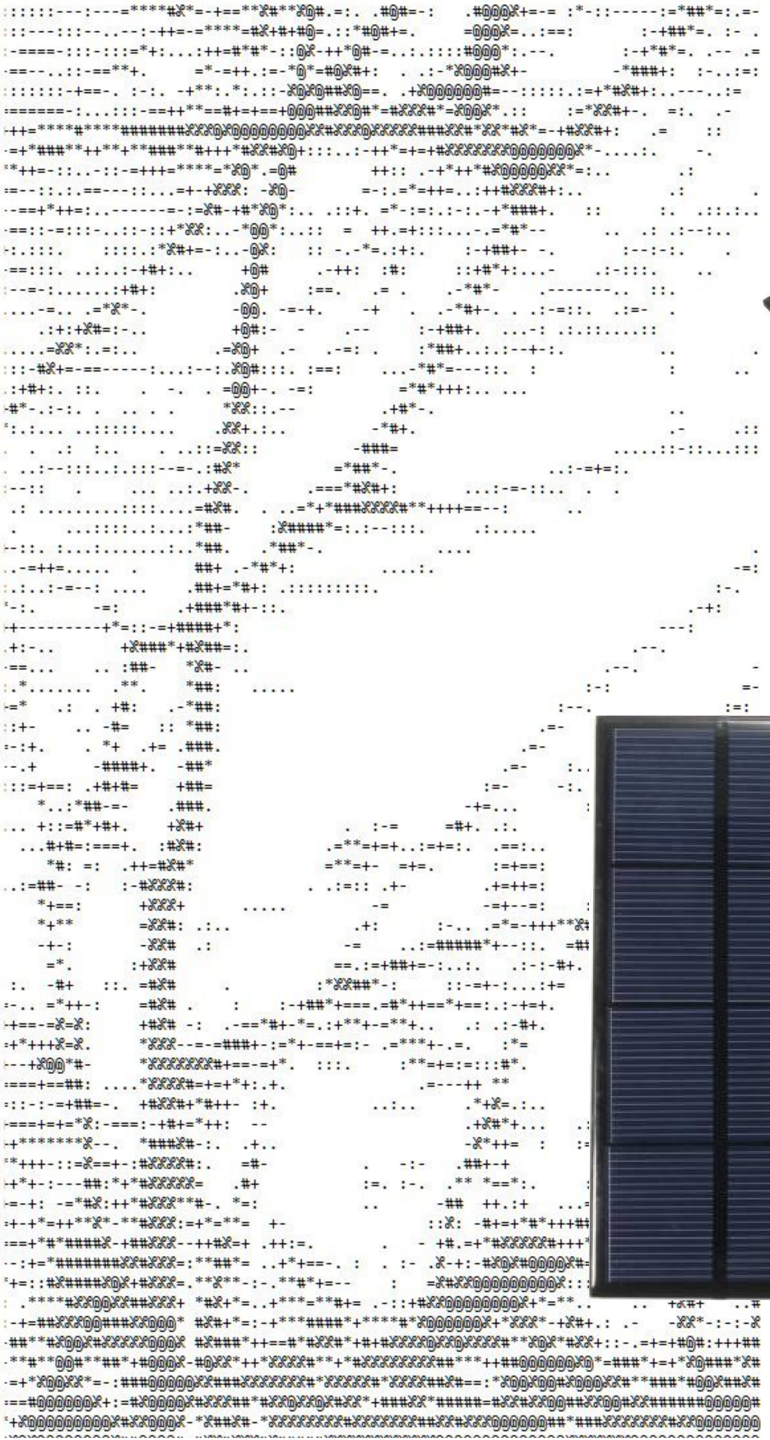
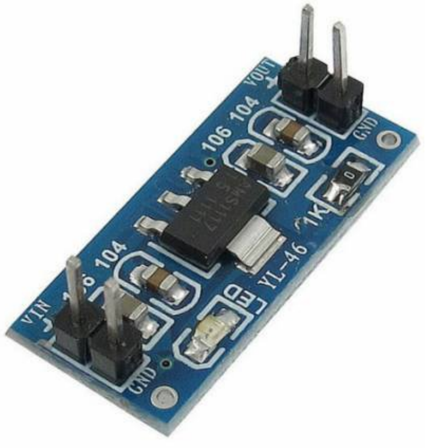
FIBER
Reassemble Lab workshop
PRACTICING PERMACOMPUTING #3
30.11. - 1.12. 2023 Amsterdam

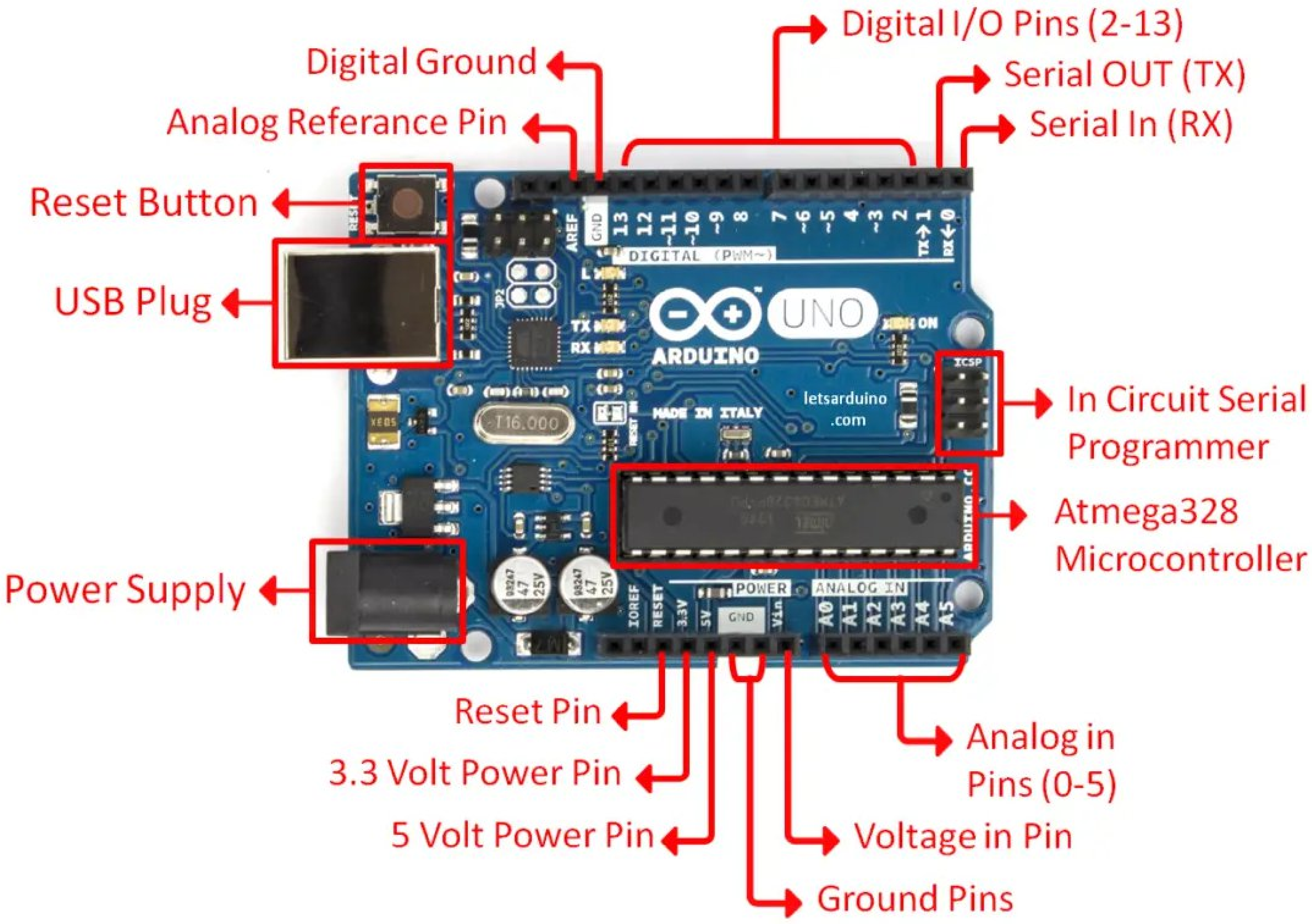
Brendan Howell, Michal Klodner

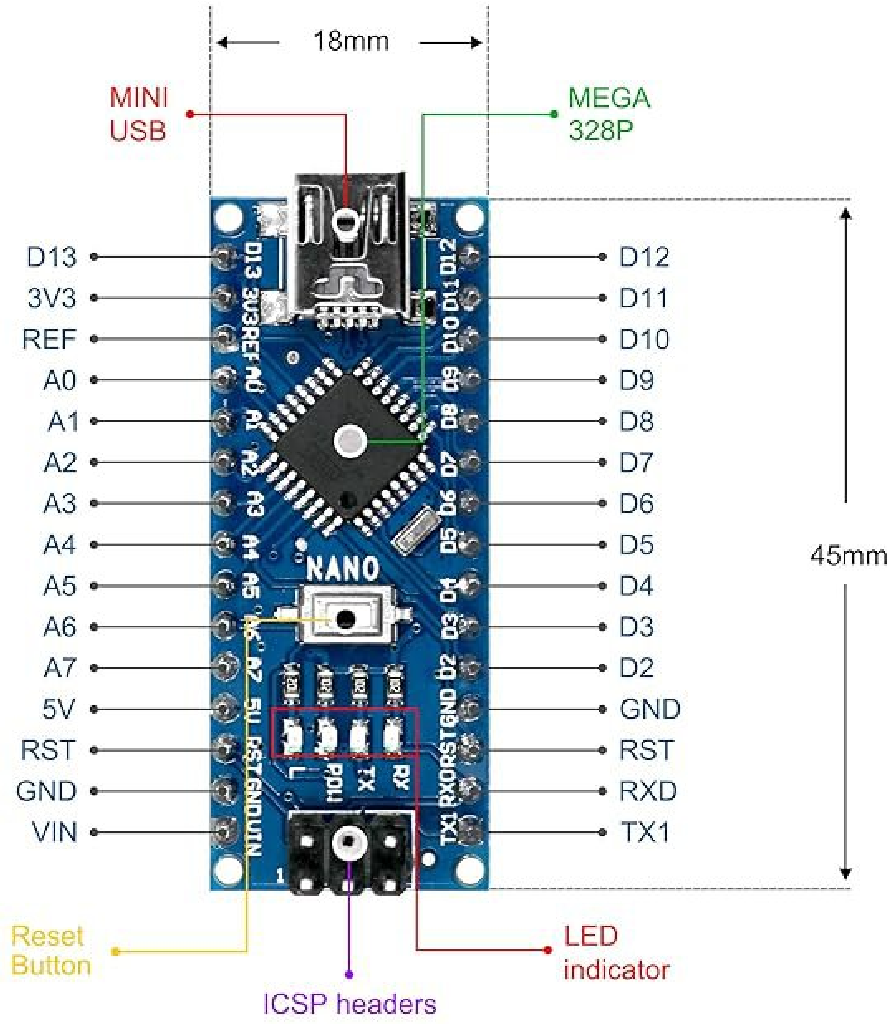


Výstupní napětí: 6V
Výstupní výkon: 1W
Výstupní proud: 0 - 200mA



Výstupní napětí: 6V
Výstupní výkon: 3,3W
Výstupní proud: 0 - 550mA
Hmotnost: 82 g





Uno R3	50 mA (5V)
Nano	30 mA (5V)

Pin current max. 20mA at VCC = 5V, 10mA at VCC = 3V

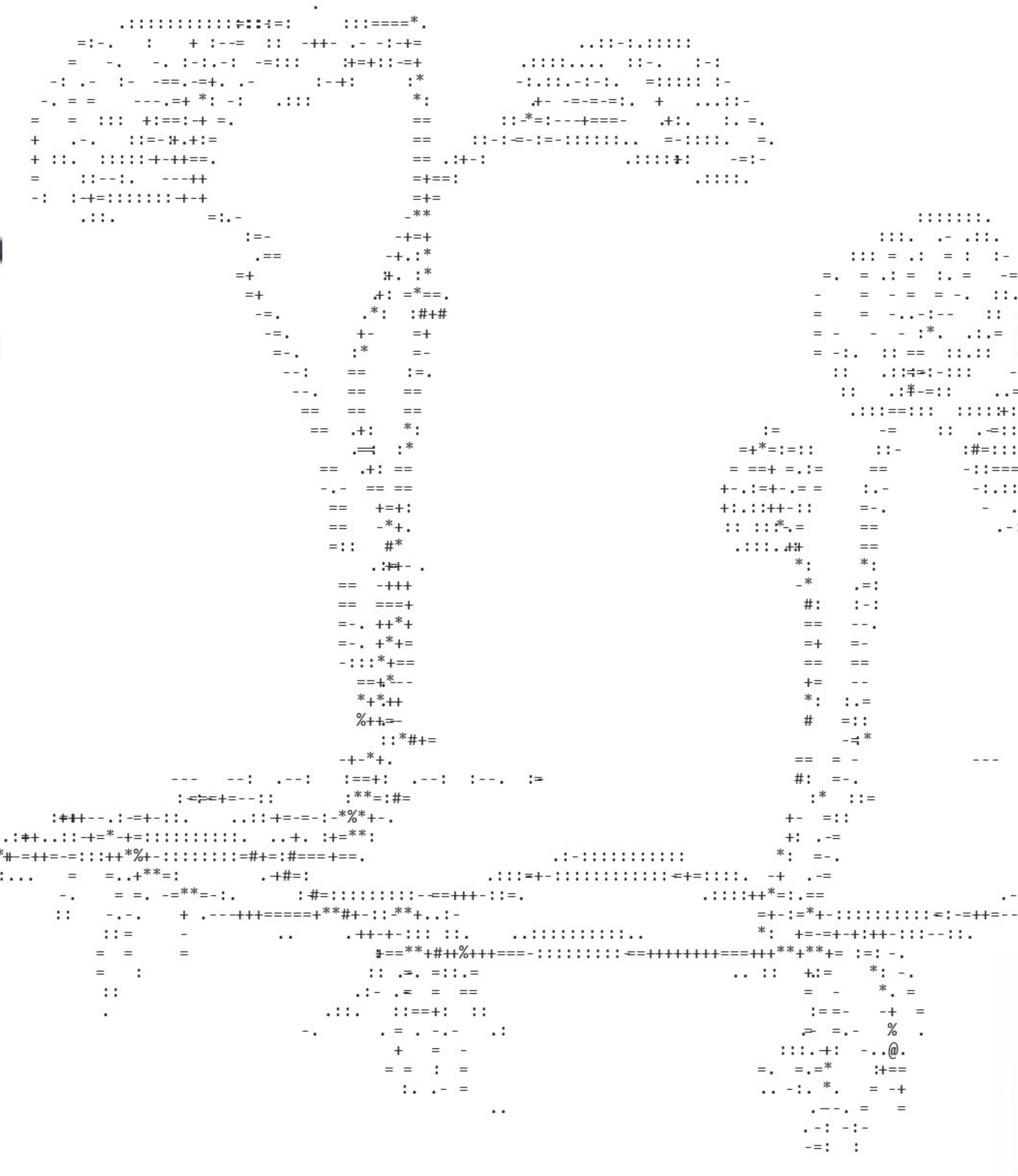
Voltage: 2.5-6V

Lift: 40-110cm

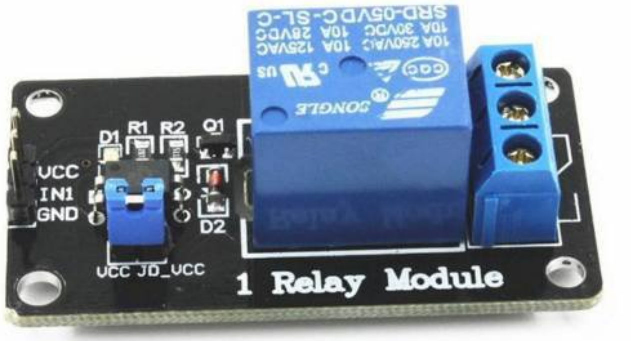
Flow rate: 80-120L/H

Power: 0.4-1.5W

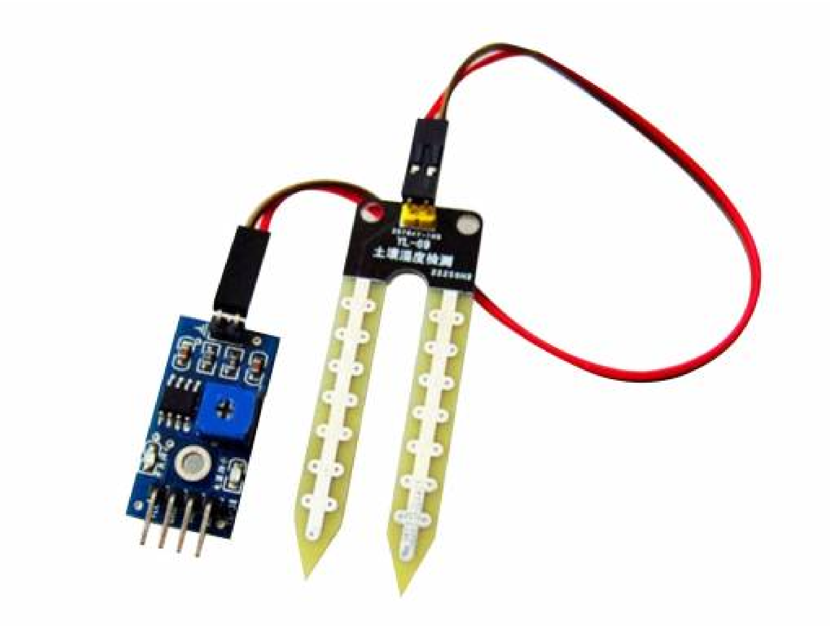
Current: 130-220MA

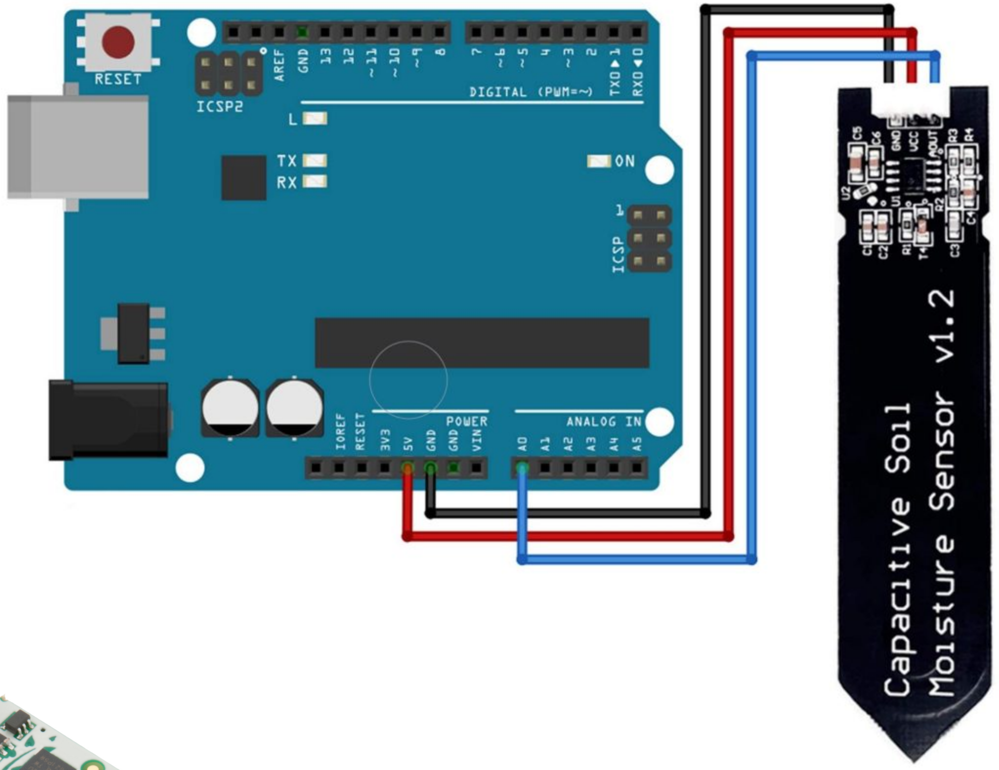


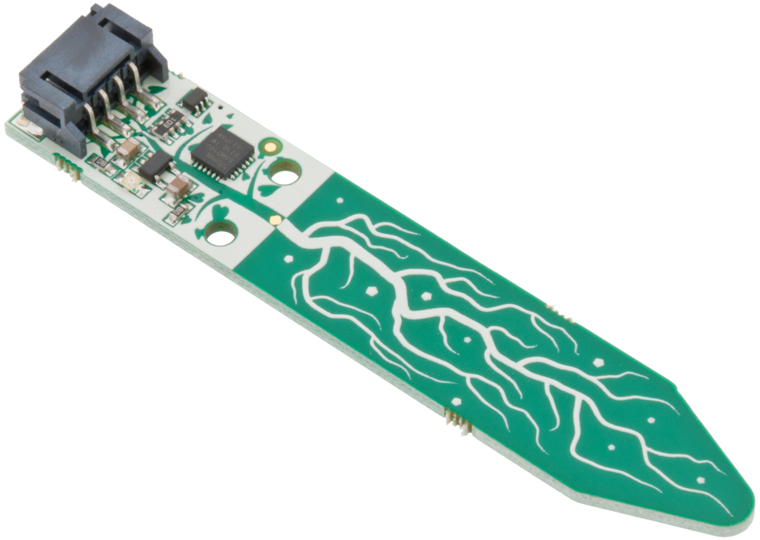
Relay: 49VAC 5A, 30VDC 5A
Input: 15 - 20 mA



Soil moisture sensors







Resistive: measures by current in the soil - eventually start to oxidize because of the exposed metal. The resistivity measurement goes up and up: need to re-calibrate code. Resistive measurements don't always work in loose soil.

Capacitive: analog / digital (I2C with temperature data)

generating high frequency voltage (1.7MHz), measuring very low current, the cheap can be faulty (especially with 3.3V), need isolation, I2C serial bus is not designed for long wires, sensitive to electromagnetic interference - need shielding
https://film.node9.org/w/sJCSaDcczWTte7c88G1RnL

Primary Principles for Functional Design:

Observe. Use protracted and thoughtful observation rather than prolonged and thoughtless action. Observe the site and its elements in all seasons. Design for specific sites, clients, and cultures.
Connect. Use relative location: Place elements in ways that create useful relationships and time-saving connections among all parts. The number of connections among elements creates a healthy, diverse ecosystem, not the number of elements.
Catch and store energy and materials. Identify, collect, and hold useful flows. Every cycle is an opportunity for yield, every gradient (in slope, charge, heat, etc.) can produce energy. Re-investing resources builds capacity to capture yet more resources.
Each element performs multiple functions. Choose and place each element in a system to perform as many functions as possible. Beneficial connections between diverse components create a stable whole. Stack elements in both space and time.
Each function is supported by multiple elements. Use multiple methods to achieve important functions and to create synergies. Redundancy protects when one or more elements fail.
Make the least change for the greatest effect. Find the "leverage points" in the system and intervene there, where the least work accomplishes the most change.
Use small scale, intensive systems. Start at your doorstep with the smallest systems that will do the job, and build on your successes, with variations. Grow by chunking.

Toby Hemenway
https://tobyhemenway.com/resources/ethics-and-principles/

Principles for Living and Energy Systems

Optimize edge. The edge—the intersection of two environments—is the most diverse place in a system, and is where energy and materials accumulate or are transformed. Increase or decrease edge as appropriate.
Collaborate with succession. Systems will evolve over time, often toward greater diversity and productivity. Work with this tendency, and use design to jump-start succession when needed.
Use biological and renewable resources. Renewable resources (usually living beings and their products) reproduce and build up over time, store energy, assist yield, and interact with other elements.

Attitudes

Turn problems into solutions. Constraints can inspire creative design. “We are confronted by insurmountable opportunities.”—Pogo (Walt Kelly)
Get a yield. Design for both immediate and long-term returns from your efforts: “You can’t work on an empty stomach.” Set up positive feedback loops to build the system and repay your investment.
The biggest limit to abundance is creativity. The designer’s imagination and skill limit productivity and diversity more than any physical limit.
Mistakes are tools for learning. Evaluate your trials. Making mistakes is a sign you’re trying to do things better.

Toby Hemenway
https://tobyhemenway.com/resources/ethics-and-principles/

Rules for resource use:

Ranked from regenerative to degenerative, different resources can:

increase with use;
be lost when not used;
be unaffected by use;
be lost by use;
pollute or degrade systems with use.

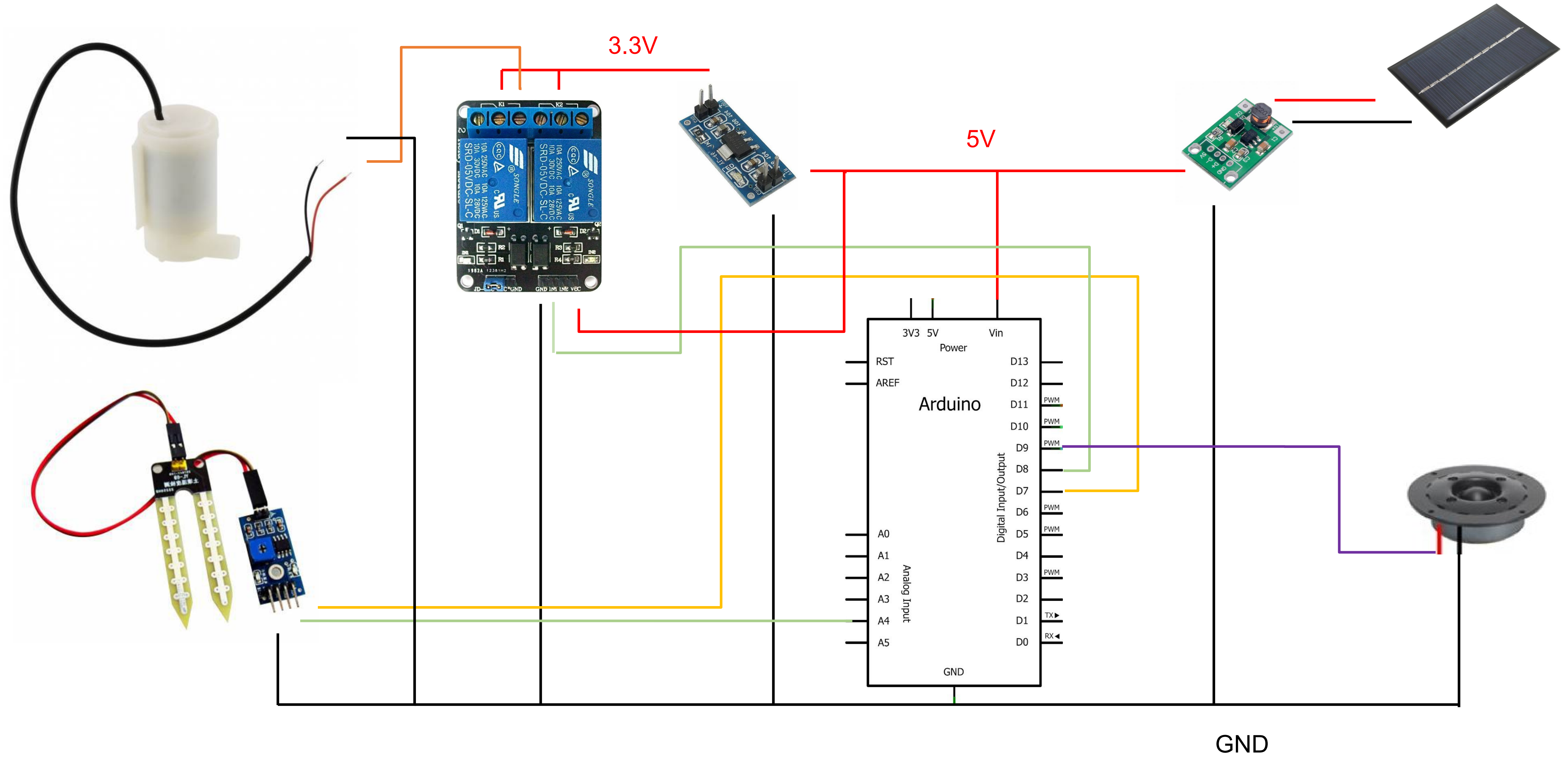
Toby Hemenway
https://tobyhemenway.com/resources/ethics-and-principles/

Computing questions

Increase yield - Increase biodiversity

Material and raw mineral use - Biomass care

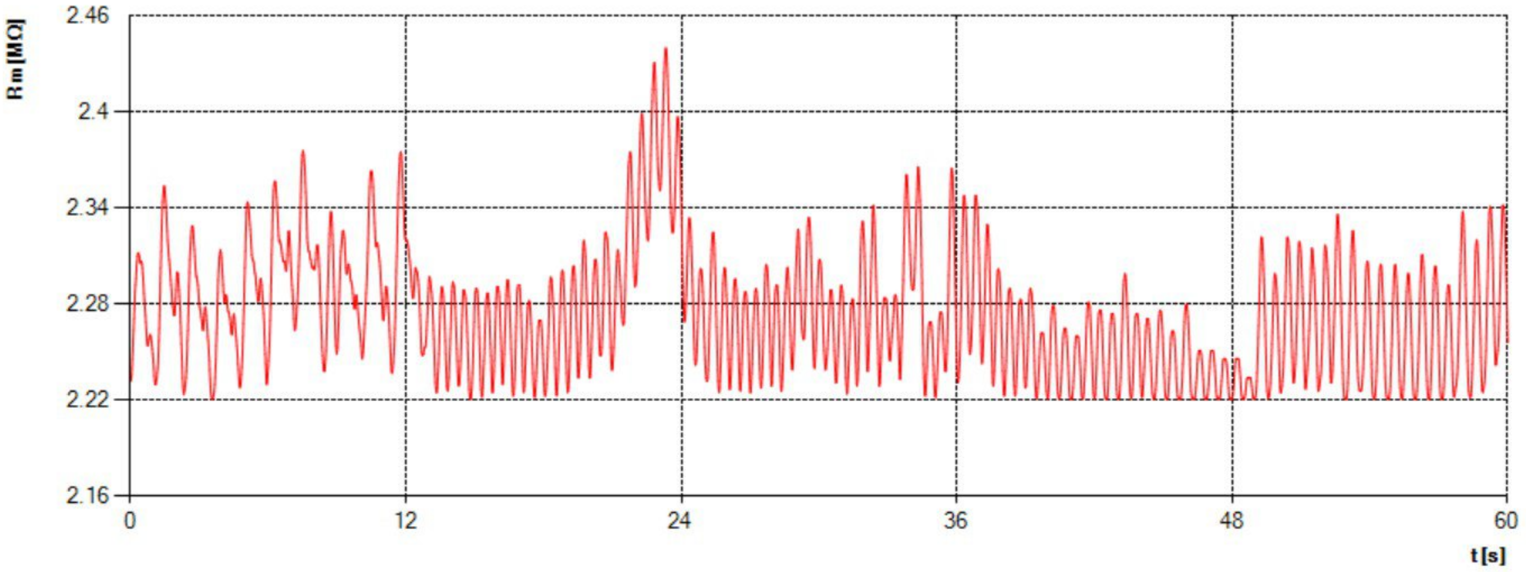
The entire example circuit



Workshop repository of Arduino code: https://codeberg.org/node9/permacomputing.plants

Follow-up:

Electric ecology of plants



Rm [MΩ]
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2.34
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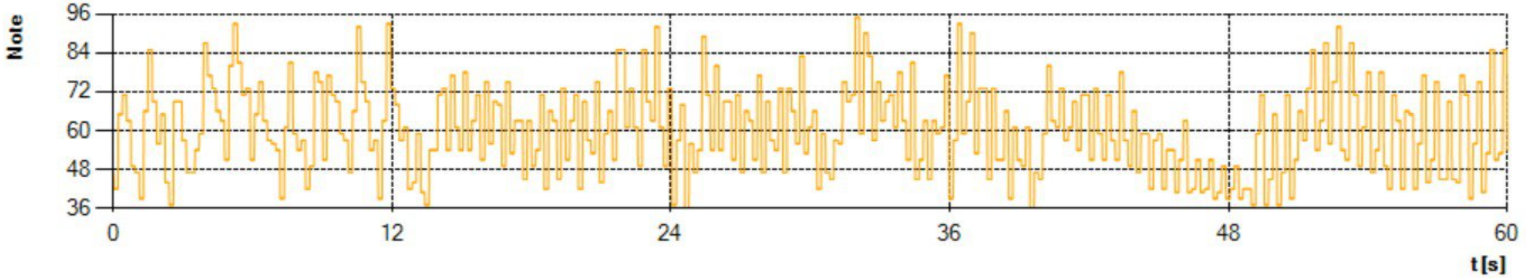

Note
96
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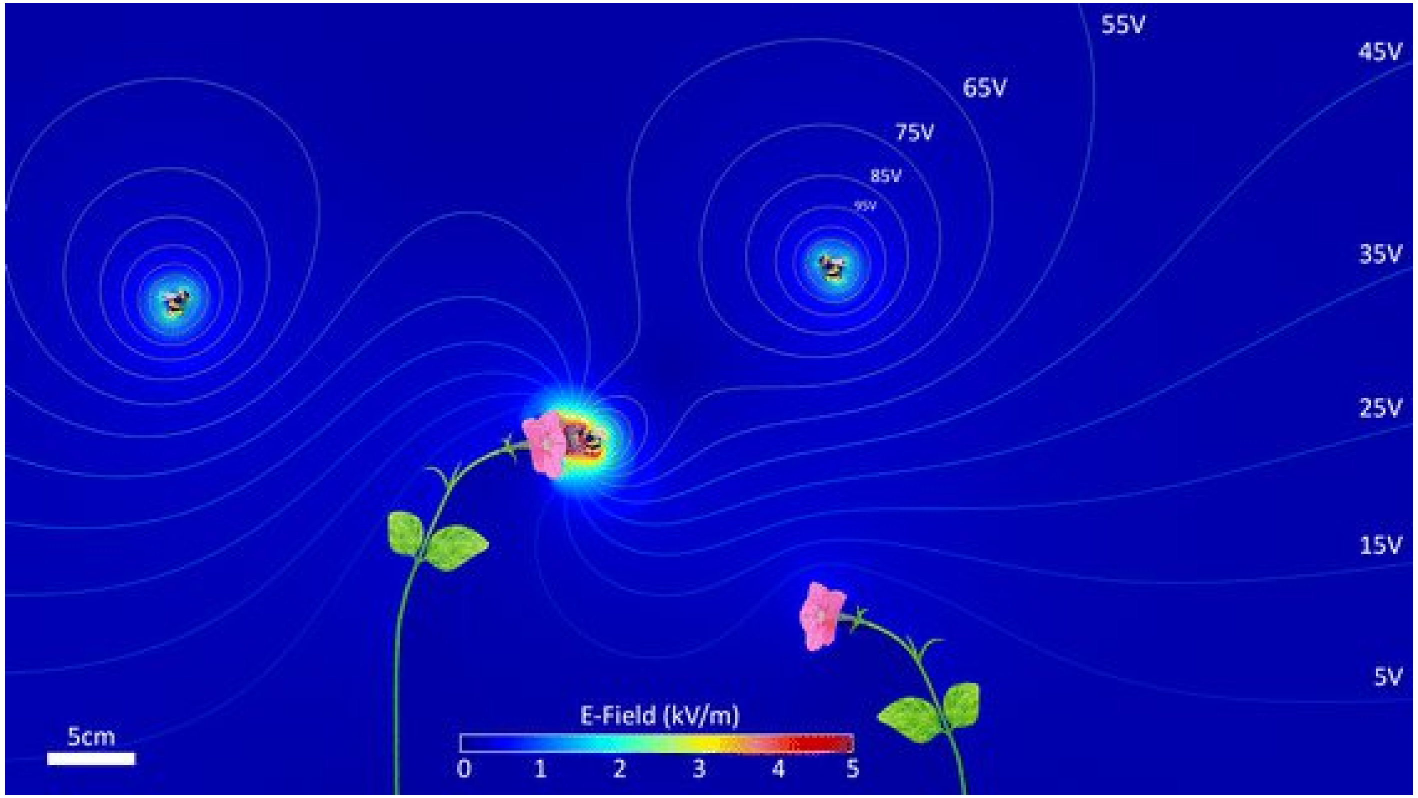
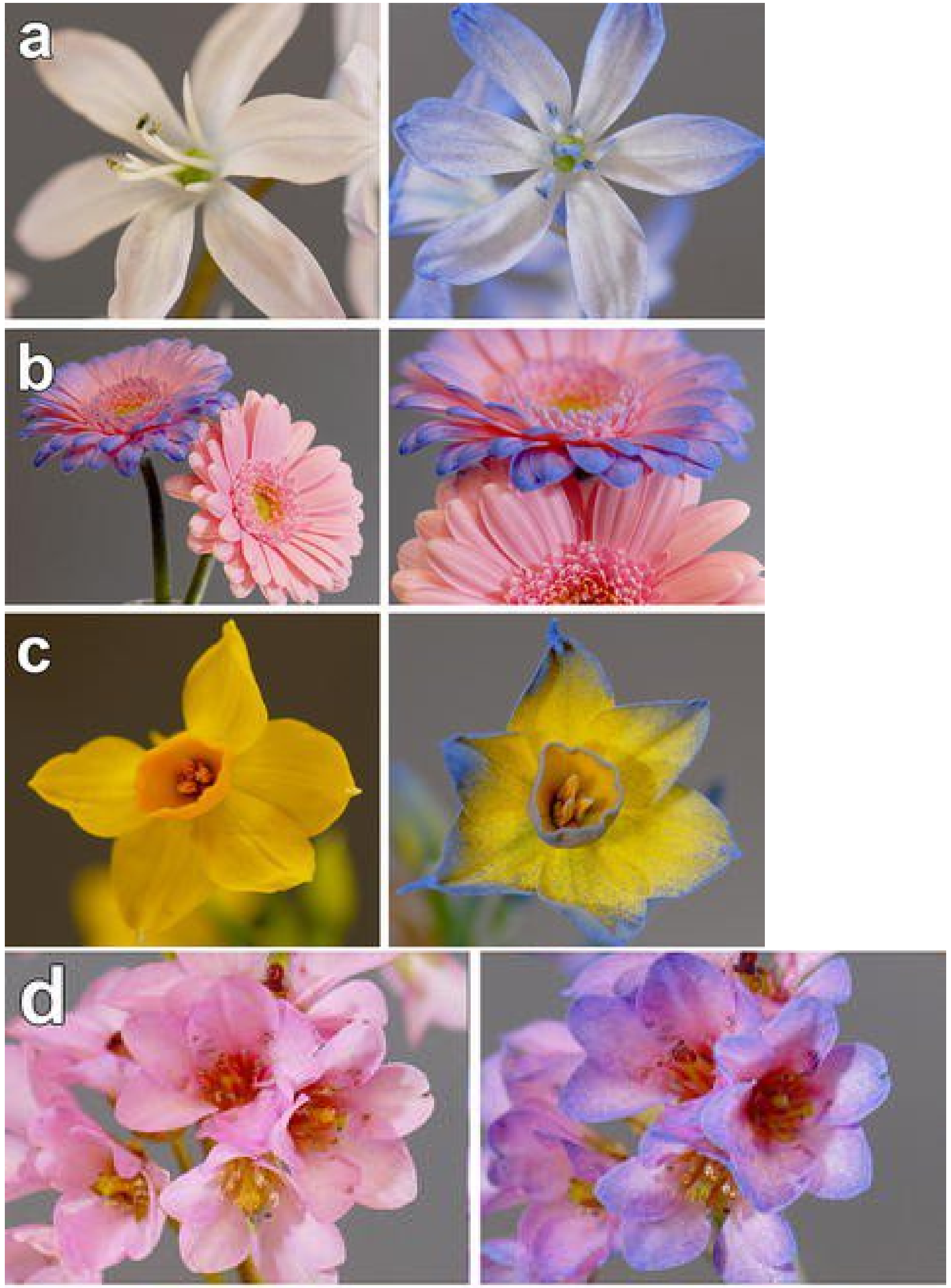
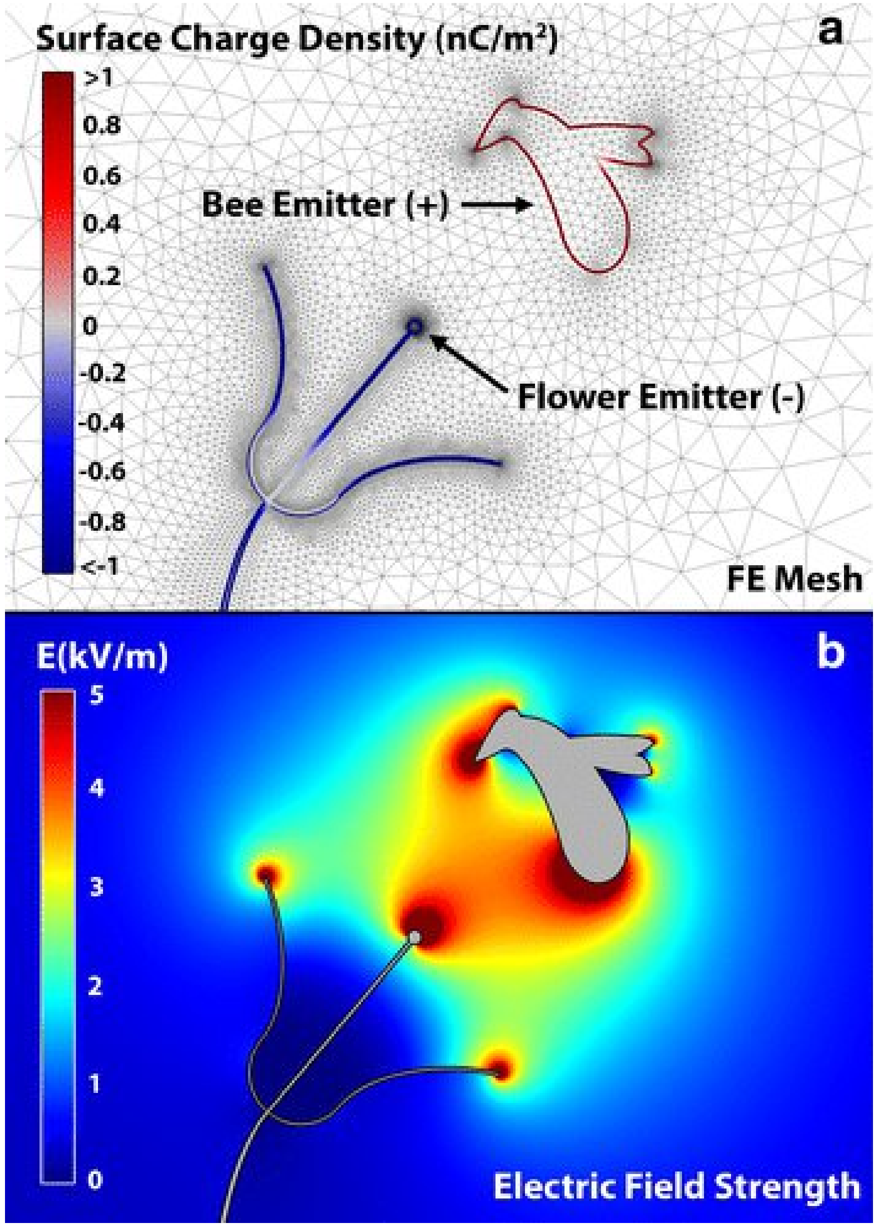


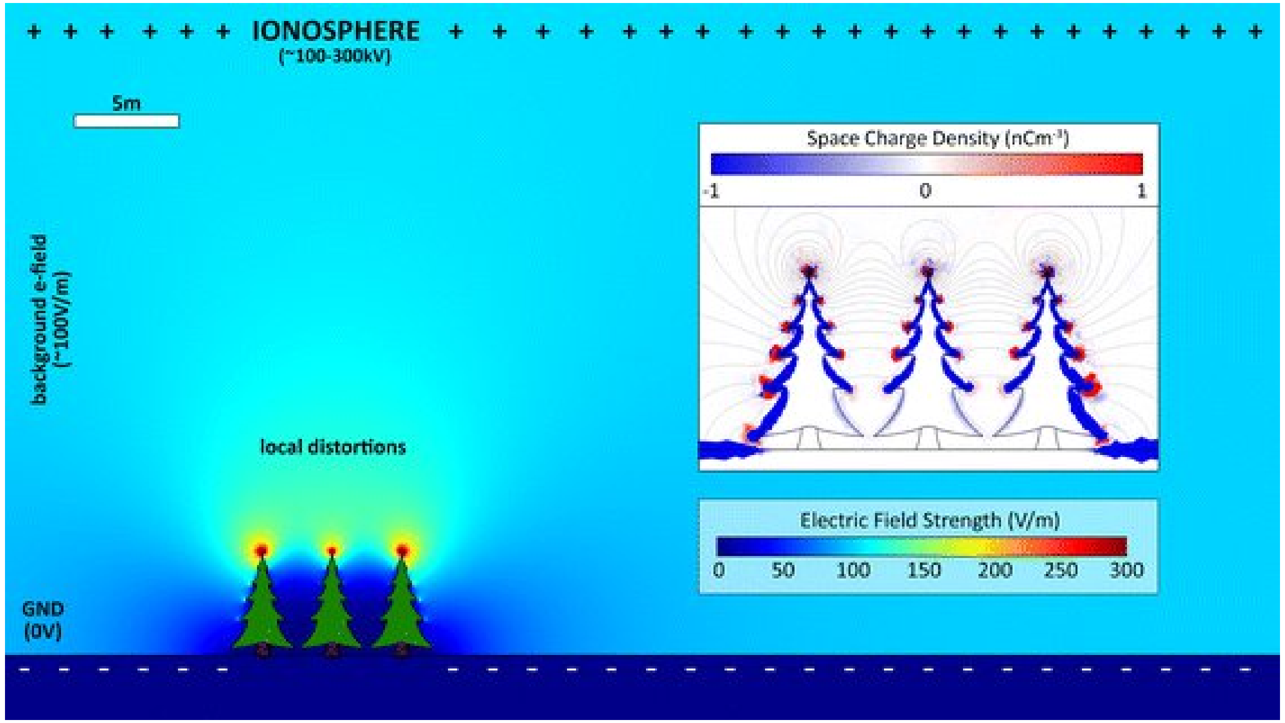
Visualising electric ecology. Finite-element model of electric interactions between positively charged bumble bees and grounded petunias (*Petunia* sp.) against the background of the atmospheric potential gradient.



Experimental visualisation of floral electric field using electrostatic dusting. Flowers are shown before (*left*) and after (*right*) dusting with positively charged coloured powder



Finite-element modelling and visualisation of bee/flower electrostatic interaction in pollen transfer.



The surface of the earth behaves rather like a single plate of a capacitor, where the opposite plate is the high-voltage layer of upper atmosphere and the dielectric is the air. Any object that is conductively linked to earth accumulates negative charge at its surface in this way. The further into the field this object extends, the greater the potential difference between its upper surface and the surrounding air (~100 V for every meter). This effect results in large concentrations of charge that, in turn, produce their own electrical forces, generating local distortions in the otherwise uniform atmospheric electric field

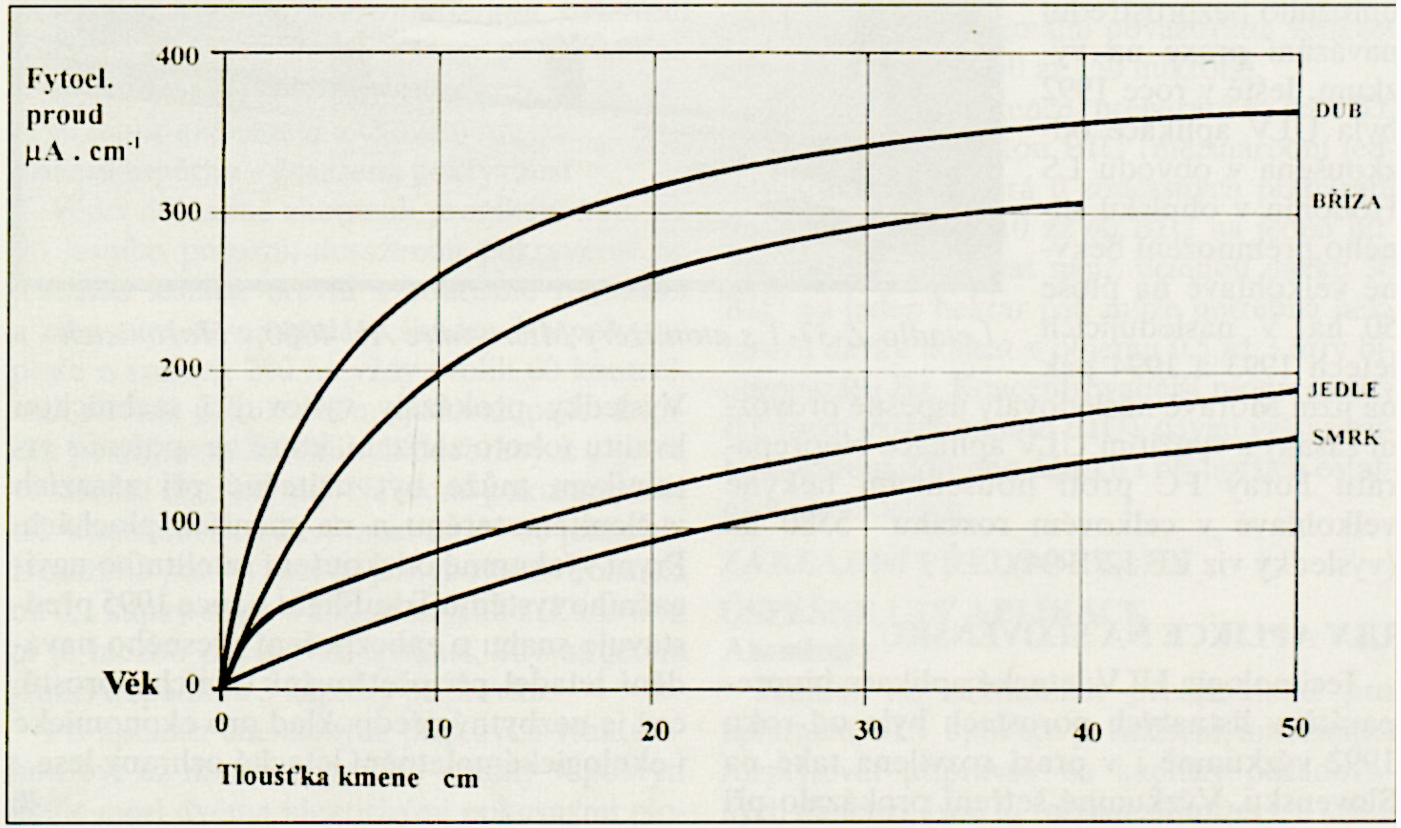
https://link.springer.com/article/10.1007/s00359-017-1176-6

Typical phyto-electric current of tree species in relation to trunk diameter

Vlevo: dub (d_{13} = 40 cm) - ED vitalita 53,1 %, defoliace 50 %; vpravo: dub (d_{13} = 131 cm) - ED vitalita 25,0 %, defoliace 80 %; foto V. Rajda

Tree vitality - healthy 100%, dry 0-10%

Obr. 1: Pravidelná závislost fytoelektrických proudů na věku u několika druhů zdravých dřevin



Lesnická práce

časopis vydávaný Čs.maticí lesnickou a věnovaný lesnické vědě a praxi

...

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Přejít na periodikum

Ročník

Rok vydání **1997**

Ročník **76**

Přejít na ročník

Číslo

Datum vydání **1997**

Číslo **1**

Následující číslo 2 (1997)

Jazyk

Čeština

Nakladatelské údaje

Kostelec nad Černými lesy: Čs. matice lesnická, 1922-

Typ dokumentu

Noviny

Klíčová slova

Lesnictví

Lesní hospodářství

Odborné časopisy

Lesnická práce

Les

Jazyk

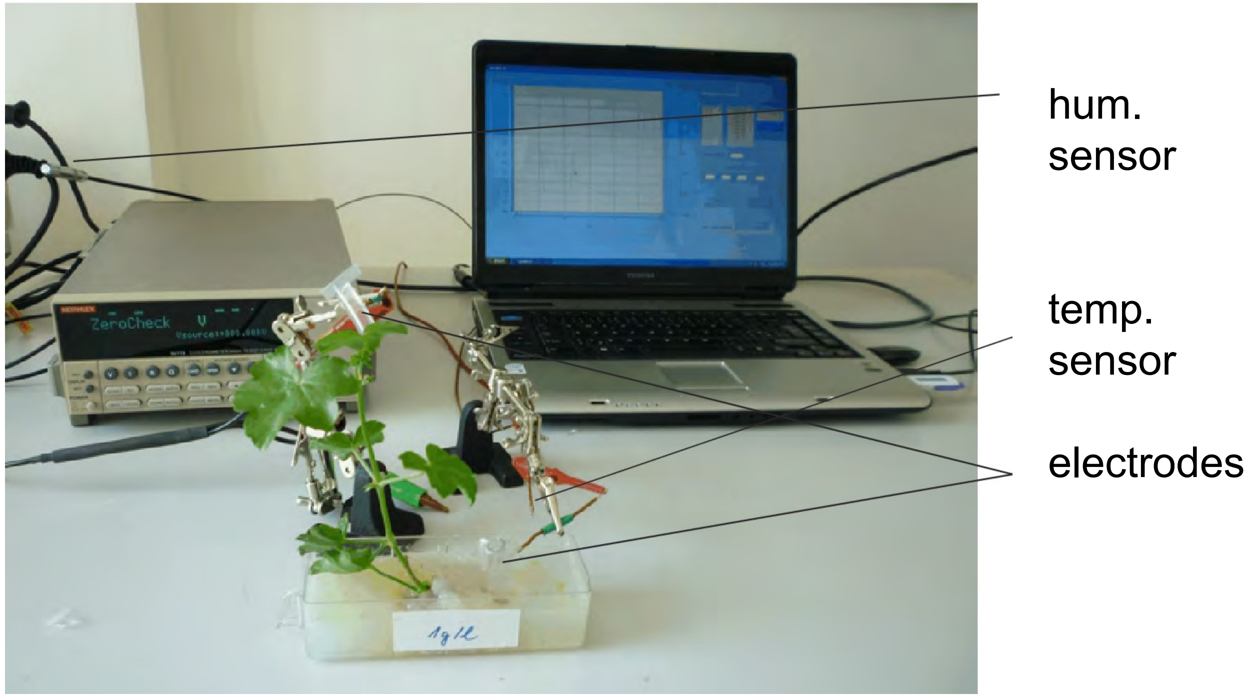
Čeština

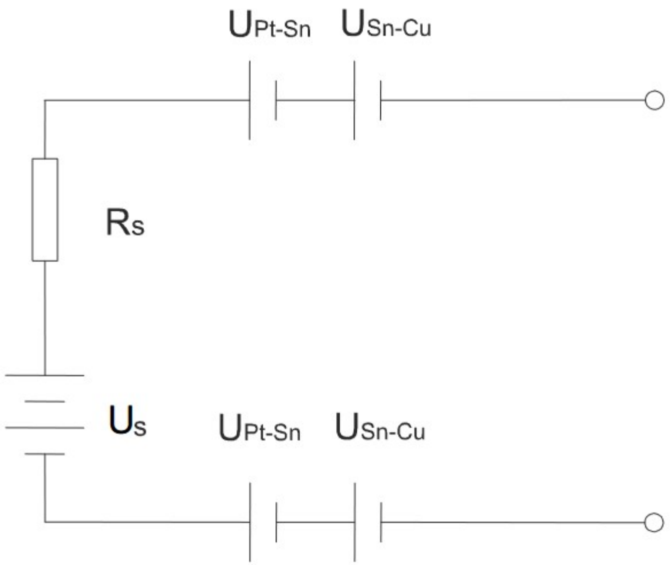
Fyzický popis

Rozsah: ^^^sv. ; 30 cm

Abstrakt

Odborné články z oblasti lesního hospodářství, prvotního zpracování





signals in plant:

action potentials (AP)

non-damaging stimuli (e.g. cold, mechanical and electrical stimuli)

variation potentials (VP)

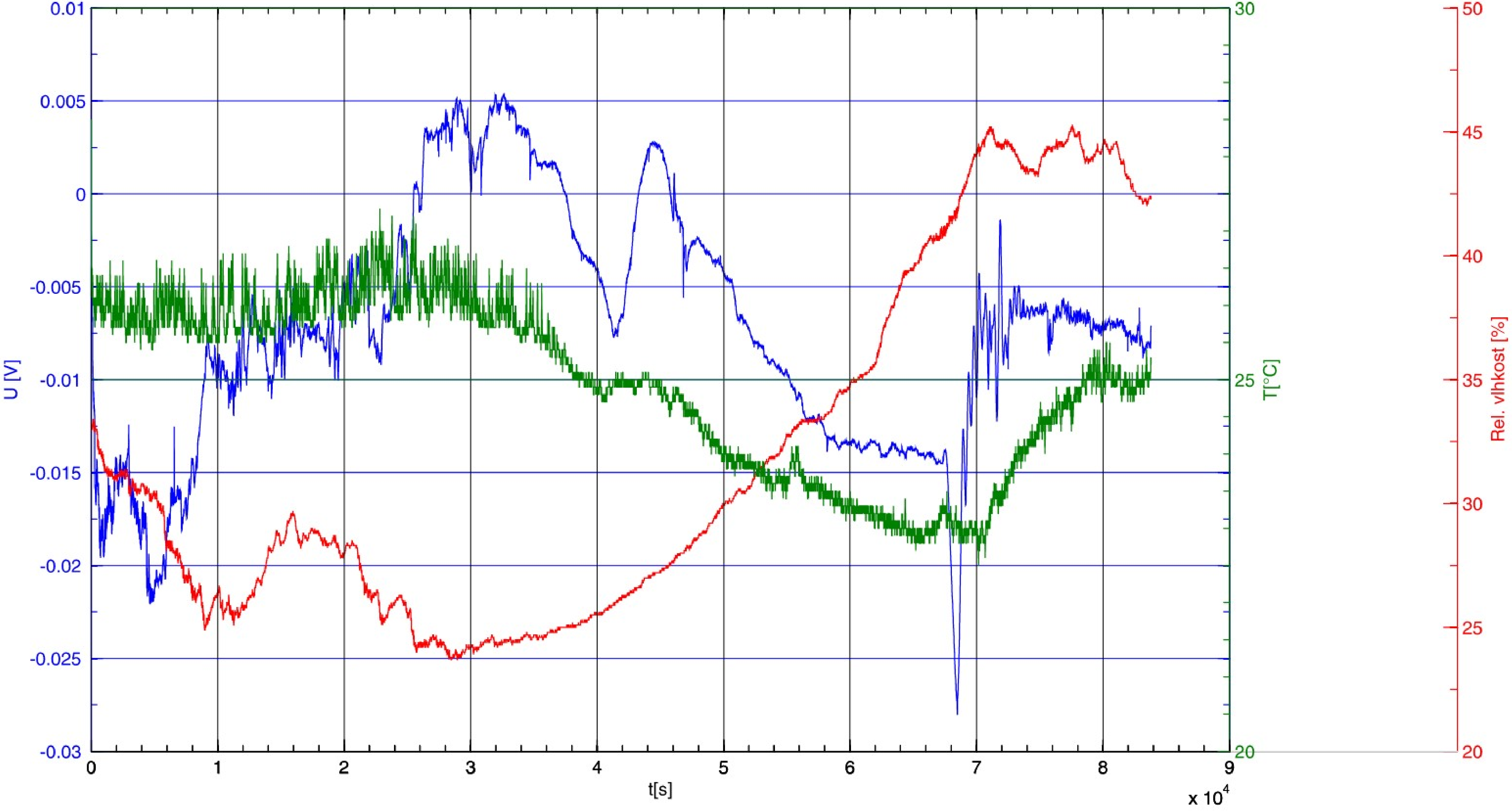
damaging stimuli (e.g. burning and cutting)

system potentials (SP) or electric potentials (EP)

response induced by changes in environmental factors, e.g. soil moisture, water, fertility, light, air temperature and humidity, circadian rhythm, sap flow

What influences measuring

- substrate humidity and fertilizer concentration (chemical composition)
- electrochemical potential on electrodes (electrode metal vs. solution)
- wire resistance and capacitance between wires
- electromagnetic interference and electrostatic fields (shielding, grounding)
- thermoelectric potential between metals



U [V]
T[°C]
Rel. vlhkost [%]
t[s]
x 10^4
0.01
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-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
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40
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30
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20
0
1
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9

Music of the Plants
Damanhur Italy (spiritual community)
https://www.musicoftheplants.com/

PlantWave
DataGarden U.S. (music company)
https://plantwave.com

SCÍON
Instruo Scotland (synth music company)
https://www.instruomodular.com/product/scion/

PhytlSigns
agriculture/science
Vivent Switzerland (startup)
https://vivent.ch/

Get inspired:

Random projects working with electronic systems and moving image in environmental art

Image - Pulsa, brain waves make music, Harmony Ranch, 1970
by Pulsa Group

Favorite Share Flag

> Pulsa described gardening as equal in significance to their more public projects and further emphasized the symbiotic relationship between their creative and agricultural work.

In working with wave energies, part of Pulsa's work dealt with often invisible or inaudible materials like heat, sound, and light. For instance, in early 1970, Pulsa held an **installation** in New York City at the Museum of Modern Art's Outdoor Sculpture Garden. In the MoMA garden, Pulsa aimed to gather "environmental information," including sound, light, movement, and heat, using microphones, infrared sensors, and photocells. They then fed that information back into the garden using strobe lights, infrared heaters, and loudspeakers. Pulsa's installation persisted 24 hours a day for two months, in the winter of early 1970, so even in the middle of the night, a strong gust of wind, the headlights of a passing car, or falling snow would trigger a response within the garden. And since Pulsa's MoMA garden was receptive to heat, the mere presence of a body walking through the garden would be detected by infrared sensors and responded to with strobe lights and loudspeakers.

Pulsa Installation for Spaces Exhibition, Museum of Modern Art Sculpture Garden, NYC, 1970 (**source**)

Pulsa Gardens Harmony Ranch 1970

by Pulsa Group

By displaying the Krefeld Sewage Plant's murky discharge, officially treated enough to return to the Rhine River, Haacke brought attention to the plant's role in degrading the river. By pumping the water through an additional filtration system and using the surplus water to water the museum's garden, he introduced gray-water reclamation.

Hans Haacke – Rhine Water Purification Plant – 1972

Stansfield/Hooykaas, Labyrinth of Lines, 1978, photo M HKA

Stansfield/Hooykaas, Labyrinth of Lines, 1978, photo M HKA

◂ ▸ 25 of 33

TV Circle, 1987 Bellever Tor, Dartmoor

‘ Beyond the Tyranny of the Predictable’ Richard Cork. TSWA3D catalogue 1987

Extract on Judith Goddard's Television Circle

Since stone-age settlements still leave their trace on Dartmoor, the man made objects most closely associated with the region are megalithic stone groups. Taking such images as her starting-point, Judith Goddard has assembled a circle of seven standing cubic forms in a forest clearing. As we approach them, however, their prehistoric associations drop away. For these stern presences are made of steel, and they contain television monitors behind their shatterproof perspex screens. The rural stillness is thereby invaded by the imagery of technological communications, and Goddard stresses the most forbidding aspects of that world by scrutinising cooling towers, pylons, tower blocks and multinational companies’ headquarters, all filmed at twilight so that they appear at their most sinister. The juxtaposition of these twentieth-century power structures with Bellever Forest could hardly be more jarring, and Goddard shows where her values lie by intercutting another set of images, of ancient amber, the Greek word for which is Electron. Fragments from William Blake's *Jerusalem* are heard in its stirring hymn version on the tapes soundtrack. The video therefore returns us to the forest, a silent survivor of the primeval ‘age of innocence’ which Blake so damningly compared with the shortcomings of his own period.

TV Circle 1987, installation of 7 TV's in 7 steel cases, video 4.5min loop, Bellever Tor, Dartmoor then Museum of Art, Oxford, Leeds City Art Gallery, Centre dArt Contemporain, Paris

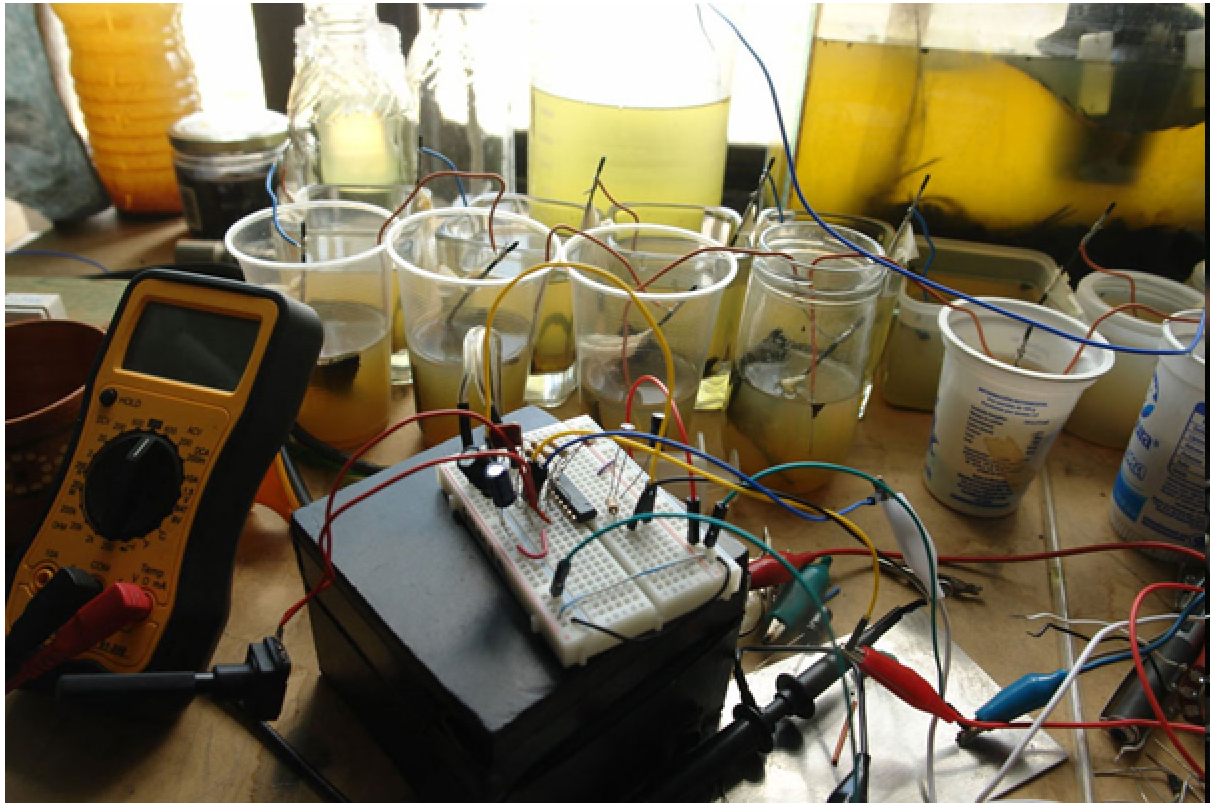
Tega Brain "Coin-Operated Wetland." 2011 - "It was an installation that recreated what I was doing as an engineer, but in a gallery space. I built a system where a washing machine was connected to a wetland. The whole installation was a closed system, where the water that was used to wash clothes ultimately ended up in the wetland and then circulated back to the washing machine. What if you show people that there is no downstream? What if you're confronted with the life forms that are directly impacted by your actions?"


Nomadic plants *Gilberto Esparza*

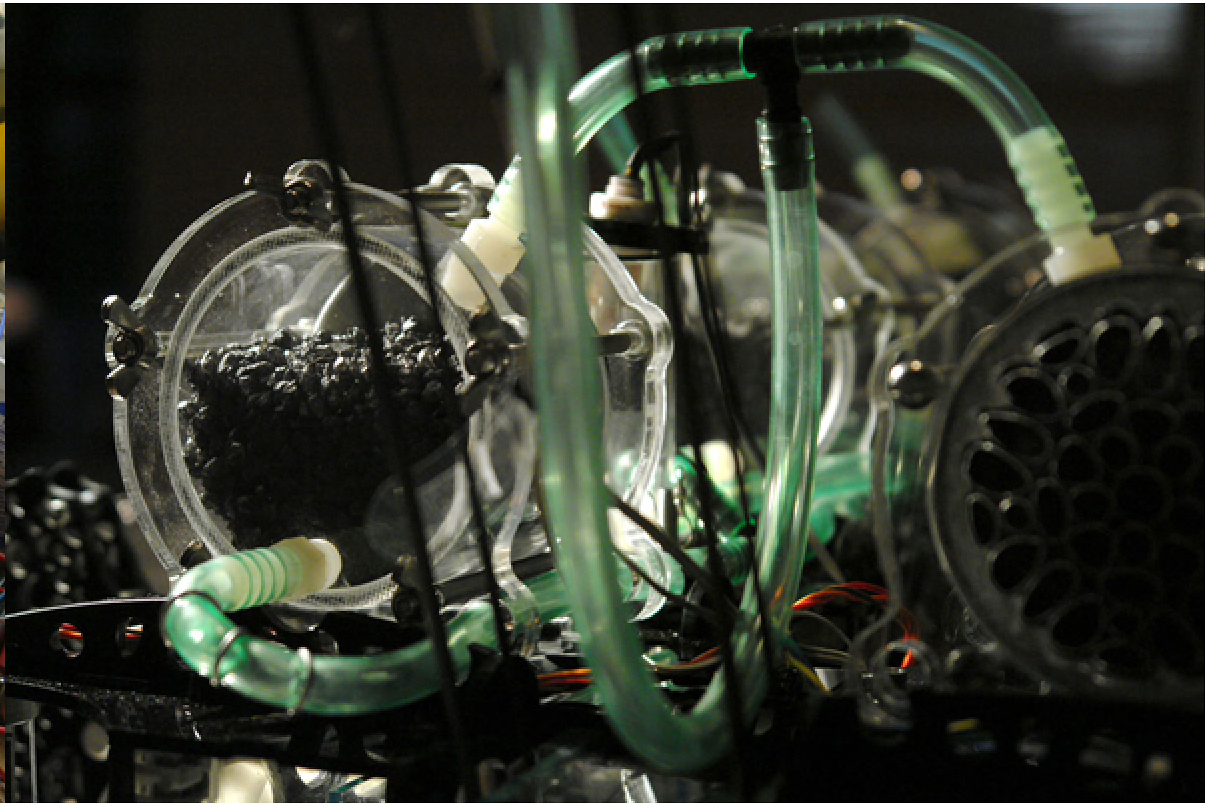
Mexico City. February, 2010

The nomadic plant is born from a reflection on the environments modified by human activity and its social and environmental consequences. These abrupt changes impact on the lives of organisms that have to adapt or disappear.

In the specific case of the nomadic plant, several organisms are reconfigured to survive in a symbiotic way, taking advantage of the nutrients that its new environment “contaminated” offers. The paradox is that this symbiosis is achieved from the union of an inorganic organism whose origin is given in the human imagination and whose manufacture is linked to the system itself that is modifying the natural environments of the earth. The nomadic plant is a species that comes from precisely the alienating processes that the planet is suffering. It is a robot of reverse understanding, whose vital processes do not obey the conditioning of the capital production structure. Its behavior, its movement and its times, are determined by its life cycle of existence, in such a way that it is an organism that exists in contradiction to the acceleration of the world that has been imposed by human dynamics.



We built the first Microbial Fuel Cells by introducing 2 graphite terminals into plastic cups with water and sediment from a pond, in these tests we obtained electrical energy ranging from 0.1V to 0.22V



We finished assembling the robot with its final circuit boards, sensors, actuators, microbial fuel cells and photovoltaic cells to carry out the first mission in the Santiago River.