

Learning from Mycelium

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INSTRUCTIONS

1 Go and pitch a tent next to a mushroom* or toadstool and watch them grow.

While the task is pretty straightforward, a certain amount of preparation is needed and the right conditions must be met. You need to prepare accordingly for what could be a day or three in the wilderness. Or not. Mushrooms grow all over the planet most of the year. Exceptions are very arid and very cold regions. These regions will see seasonal flushes of mushrooms, rather than continuous growth of different mushroom species throughout the year. Speaking of species, not all mushrooms grow at the same speed: some grow very slowly over the course of many months or years, others grow within a few hours from primordia¹ to the total decay of the fruitbody. A dramatic example of the latter would be Inkcaps,² which can be found in European parks alongside Champignons during summer.

* This is the tricky part. Actually, you do not need to find a mushroom, but a primordium, a baby mushroom, in simple words. They vary from species to species, but are usually quite small and low on the ground. Thankfully, some mushroom species grow in clusters, so where there are already mature toadstools, you can also find primordia.

¹ Fruitbodies are only the sexual organs of the fungi. Fungi live, often hidden from sight, in the form of a mycelial network within the substrate on which they feed. The network is made up of hyphae. Hyphae are microscopic threads that are the cells of the fungus. The fruitbody is also made from the same threads and some specialized cells that make the spores. When a fruitbody forms it starts with a small knot in the network that eventually grows into a “baby mushroom” called a primordium. See: Jennings, D. H.; Lysek, G. 1999. *Fungal Biology: Understanding the Fungal Lifestyle*, 2nd ed.; BIOS; Springer: Oxford, UK; New York, USA

² Inkcaps get their name from the way they disperse their spores. While many toadstools spread their spores in the form of dry dust, Inkcaps autolyze (self-digest) their caps into black goo. This black goo contains their spores and reminds humans of black ink. See: Laux, Hans E. ‘Schopf-Tintling 2019’ In *Der große Kosmos Pilzfürher*. Franckh-Kosmos Verlags-GmbH & Co. KG p. 288

As you can see, it does not need to be overnight in the bush: spending a day or two in the park with snacks on a blanket might be just right. Mind, that in parks, other humans often vandalize mushrooms out of mycophobia.³ Do not be frustrated: the underground fungal network (mycelium) is probably fine. I believe in a world in which mushroom gazing will be as common and refined as Hanami⁴ one day, as it illustrates the impermanence and flow of life just as good, or even better than cherry blossoms, as fungi are the main recyclers in most ecosystems.

So, either way, bring a tent or a picnic blanket and as much food, snacks, and drinks as you need to be nourished and comfortable. In addition, arrange for the comfortable and environmentally conscious disposal of waste.

Depending on the legislation in your area, you might not be allowed to stay overnight on state property. In other countries, you are well within your rights to do so. Nature reserves have different laws so be sure to check legislation before camping. Do not trespass on private property, always ask if you are allowed. There is a good chance that the owners will let you camp on their grounds if you ask politely and explain your project, especially if the owners are mushroom lovers themselves. Minimize your impact on your surroundings, use fire safely and contained, and do not litter: these are things that should be common sense, not only in a camping situation.

When you observe a toadstool in a public city park, you cannot stay overnight. In national parks there might be designated areas for you to camp. I do not advise breaking the law, but I mention that a bivouac bag is less visible than a tent.

³ The irrational fear of mushrooms. Like all phobias, this fear is abnormal and unwarranted: mushrooms are not a danger to humans. Further reading: Morris, Brian. ‘The Folk Classification of Fungi.’ *Mycologist* 2, no. 1 (January 1988): 8–10. [https://doi.org/10.1016/S0269-915X\(88\)80112-5](https://doi.org/10.1016/S0269-915X(88)80112-5)

⁴ The practice of gazing at cherry blossoms (or plum blossoms) in spring (while eating snacks) originated in Japan.

2 Set up camp

The first thing to do is mark the position of the mushroom with something that increases visibility. A little flag, a tiny fence, or just putting a large object in proximity to the mushroom, to keep yourself and others from accidentally stepping on them. Do not cover them with a bowl or glass: you do not want to influence the toadstool in this way. Also, carefully search the ground around the primordium and give them some space as other primordia might emerge from the ground close by. Then set up camp as usual. Place blankets and cushions near the mushroom so that you can observe them comfortably and effortlessly. Have water and snacks nearby, so you can hydrate and nourish yourself while making observations. Refrain from using your phone, other than for emergencies. An important part of mushroom gazing is to attune yourself to the time of the toadstool. When you use your phone, you catapult yourself into super-accelerated human time.



Diagram by Tata Banana Frenkel

DISCUSSION

If you are lucky, you find a primordium on a camping ground, like I did.

That happened many years ago, around 2018.⁵ It was on a camping ground in Lithuania. By then I was just traveling through Poland, Lithuania and Latvia to visit friends in Estonia.

This was many years before I would set up the lab,⁶ or even any lab, even before I would go myself down the road of working with other-than-humans. I was then preparing my master exams in visual art, which was a music album with improvisations on detuned and broken pianos that I encountered. This is also specifically tied to the Baltic countries, as the first such piano I encountered was in Pärnumaa on a family farm. The music was accompanied by a collection of descriptions of dreams I had over the years, printed on posters.

I was relying a lot on intuition⁷ back then, which I still do today, but I handle and use it differently. Back then there was only intuition. I

⁵ At this time I was interested in site specific installation, especially minimally invasive installation that would blend right into the exhibition spaces. I was already concerned with the sustainability of materials I used though. So I either used “natural” materials that I would return to the places I took them, rearranging found materials on site, or bought materials from charity shops that I then would return again so they could be sold a second time (in a way renting the materials). Although I had worked with a similar method before, this marked a novel approach. Before I would do an installation I would go to the venue (back then often abandoned factories that became temporary art venues as I was involved in a lot of art festivals during this time), and just be there for a couple of hours, sometimes days, to “soak” up the atmosphere. I would meet with former workers of the factories and research in local archives if they were available. To become a part of the now sleeping place. To become a chair that stands there. Not an actor. Later to act of course.

⁶ In 2024 I opened the Research Base for Artistic Biotechnology in the New European Bauhaus Research Centre @ Vilnius Art Academy. The goals of the lab are to investigate the morphological expressions of certain fungi to certain stimuli such as changes in chemical composition of the medium they grow in, ambient pressure etc. I also teach Undergraduate and Graduate students there. The research base is committed to sustainable ethical research practices, like me and the NEB Research Centre.

⁷ I understand intuition as accessing knowledge and coming to conclusions without active reasoning in my mind. This knowledge is tacit, I did not acquire it via means of active conscious learning. Intuition is a moment of clarity. I personally would describe it as a moment of breaking the water surface with my head, to breath and look around for a brief second, before my head submerges again. I found the most overlap with my personal understanding of intuition in East Asian Buddhism under the concept of Jianxing or Kensho. See: Wright, Dale S., and Steven Heine, eds., 2000. *The Koan: Texts and Contexts in Zen Buddhism*, Oxford University Press.

followed some kind of magic script. Everything was enchanted. Intuition is embedded, tacit knowledge. I would even say there is no such thing as intuition, it is body knowledge, gathered maybe at the edges of dreams. It is not accessible like academic knowledge. Now intuition is not the end, it is the beginning of a long chain of going back and forth. An instrument in an orchestra of many different methods, from natural sciences, design and engineering. It is the beginning, and still the guiding light, but it now has to play along with other methods.

The experience of being with the mushroom was calming and exciting at the same time. Knowing that something was going on, and being aware at the same time that I would not miss it, if I took the time myself. Before becoming an artist, I saw processes in nature and thought to myself: “that is art!” I would formulate it differently today, but I would still say, watching the mushroom grow was like watching a very long artistic piece, like No theater, or a Baroque opera. Both are several hour long performances. Baroque operas would span a whole day sometimes, during the Baroque period, of course, not today. The excitement of watching something, of witnessing the sublime. Like watching Sakura trees flower.

I was allowed to witness, without having to share, without having to be also seen, without having to act. This doing something, being submerged into it, concentrated, but still having free capacities in my mind that I let wander, has become a new method for me. It lets me get things done, while my mind can idle, close to the thing I am doing. Then my mind connects the dots and throws something at me, the solution to a problem I was working on for a long time, or some weird epiphany about the world. Hard to explain. It is doing something to get an answer to a question in my mind by not thinking about it. As if falling and missing the ground makes you fly.⁸

So I was used to quietly observing, and then acting or adding something to the place, or rearranging, adding a sound etc. This time, I could just be there. This was, and is, a big revelation. I can just witness a great and sublime piece of art, by an artist that does not even intend it for me to see, nor understands themselves as an artist.

The funny thing with mushrooms is that they are actually incredibly fast compared to plants, for example. But they are still slow

⁸ Adams, Douglas. *Life, the Universe, and Everything: The Hitch Hiker's Guide to the Galaxy* 3. PAN Original. Pan, 1982.

compared to a human running around. So watching a mushroom gives me the feeling of having time, and slowing down, while I am watching an organism that is just marginally slower than me. It showed me that time is relative to its frame of reference (I don't mean space time relativity), but since humans do not have a dedicated organ that keeps track of time precisely, like a quartz crystal in a watch does, the cues that we use to deduce time can be tuned to other frames of references, within limits. I think I was doing the same as with the places for installations, but instead I tuned myself to the mushroom.

This relates to how I wrote the instruction in “set up camp.” I am drawing from Leary's concept of *set and setting*^{9, 10} that has emerged in the exploration of psychotropic substances, but can and has since then expanded to non-substance related exploration, as in this case. With *set* being short for *mindset*, the state of mind one is in before the experiment and also during it, the *setting* being the place the time and with whom this experiment is attempted. While it has different applications in substance explorations, it is still very much applicable for our purpose here. If you are preoccupied in your mind with work, or if you are just having a fight with your loved ones, if your child is sick, etc. has an influence on how you are going to perceive the experiment. These are just simple examples to point out the importance of *mindset*. The *setting* is more obvious. Going to sit and camp with a mushroom by a busy road, in a public park, on a camping ground at a music festival or in the safe space of a private garden is obviously going to give you different results. Another thing I consider important, while not part of the initial *set and setting* concept, but mentioned by Leary is the way the experience in the experiment is documented.¹¹

I am notoriously bad at documenting while doing. It goes all the way back to school, I could either participate in the lessons, *or* take notes. Not both at the same time. Documenting while doing something expels me from the moment. It gets between me and the experience. Also there is the thing that as soon as I write something down, I “write

⁹ Hartogssohn, Ido. ‘Constructing Drug Effects: A History of Set and Setting’. *Drug Science, Policy and Law* 3 (January 2017): 2050324516683325. <https://doi.org/10.1177/2050324516683325>.

¹⁰ Zinberg, Norman E. *Drug, Set, and Setting: The Basis for Controlled Intoxicant Use*. Yale University Press, 1986.

¹¹ Timothy Leary. ‘Programmed Communication During Experiences With DMT’. *Psychodelic Review*, no. 8 (1966).

it out of my mind.” I prefer to keep it in my memory to be able to work on and with the experience.

I have collaborated with Nastio Mosquito, a South African artist, since we met during the Documenta 14 radio programme that we both participated in.¹² Our last piece was commissioned for KANAL Centre Pompidou in Brussels.¹³ The programme *Folsom Fungus* explores the



The reception of the Ambassador. Left to right: Sturzenegger, Glöckner, the Ambassador Oryzae and Werder. Photo: Silke kleine Kalvelage

presence of a fungus in a bioreactor. The name is a reference to Johnny Cash performing in Folsom Prison.

In the case of *Folsom Fungus*, Nastio and I address the ambiguity that is also present in the name. The first part of the five episode series is always a gesture towards the fungus, housed in a ninety-liter bioreactor made from glass. We address this fungus as “*Their Excellency the Ambassador Oryzae*” and the gestures are framed as the official reception

¹² Bonaventure Soh Bejeng Ndikung, dir. Savvy Funk-Documenta 14 Radio. Deutschlandfunk Kultur, Savvy Funk worldwide, n.d. Accessed 6 September 2025. <https://www.documenta14.de/en/public-radio/13778/savvy-funk>.

¹³ See: <https://theythethemarewe.com/projects/>

of this diplomat. In the second part of the episodes Nastio and I reflect on what we just did. As the ambassador themselves remains silent, we have to discuss their possible viewpoints and the overall naive motivation that drives us. We question our motives as artists, who imprison an organism for their art.

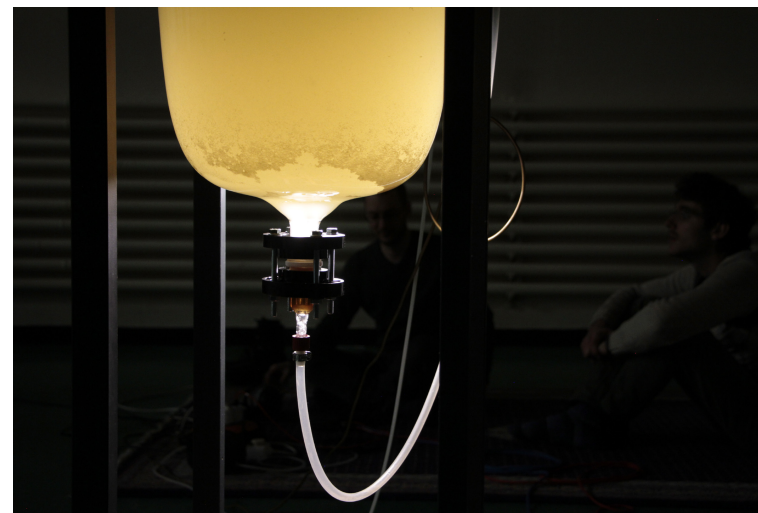


Photo: Silke kleine Kalvelage

Folsom Fungus marks the first instance in which I brought my practice as a radio-artist together with my practice as a researcher in Artistic Biotechnology. I ceased to make installations or physical objects around 2016–2018, and focused on radio transmissions and what I now call “wet choreographies” in opposition to Ars Electronica calling my first such choreography “living sculpture” in their catalogue of 2019. A radio transmission either leaves our planet (FM) or bounces between ionosphere and earth (AM) until it fades. Such art works are free: they cannot even be cared for if I wanted to. They have a body, as they are encoded in the natural radiosphere of our planet (and beyond), yet they do not manifest their own corporeality. In Artistic Biotechnology I use and invent tools that remain after the wet choreographies in which I use them, together with my fungal dancers, are over. The dancers come

and go. No useless artefacts remain. The tools can be reused, or later resold and utilized by someone else for other biotechnological purposes. They are made from materials that are themselves resources that can be reused, like metal and glass.

In the ruins of socialist production in East Germany, I mainly used the remnants of production, sometimes literally trash from the streets. In Estonia I took cut birch twigs and returned them after the exhibitions to the place of origin. Looking back now these were maybe futile and naive attempts. After all, I was still burning gasoline to transport the twigs around and back to the forest. Art is deeply incorporated in capitalism, and, at least western art, deeply entangled with colonial practice and heritage. One way to address this question was to move into radio-art and music. Radio-art is very anti-capitalist, so much so that it actually never pays the bills. It is in a way so niche that many artists and art institutions might not even know or recognize radio art as art. But that is another topic. It surely solved my uneasiness with materials that came out of capitalist production.

This oddly resonates with anti-design, a movement at the university in Kassel, where I studied. In design we would work on a topic or theme, and instead of springing to action and designing a product that solves the issue, consciously decide to not do that. Considering that another product will not solve any issue, but produce more garbage and make the world a more complicated place was, and I think is more than ever, a valid stance. For example, funding was obtained for designing a prototype race car that would decompose within two years. The research went on for three years. After three years the team decided a car should not decompose in two years. It should last as long as possible and then they stopped the car's development.

There is no such thing as neutral material. All materials are political. If I use a certain material as a designer or artist in my work, I cannot deny the systems that produced or extracted the material. Even if the materials in question are used or second hand, or even found materials, their history cannot be denied. Materials obtained through colonial, capitalist and exploitative practices retain these origins. So how to deal with these inherited properties of materials?

Instead of pragmatic non-extractivism, I would call what I described earlier as attempts on non-violence. I am trying very hard to make non-violent art, conduct my research in a non-violent way and teach my students non-violence in a non-violent way. Healing is the

next step, firstly, do no harm. I am trying to incorporate the concept of Ahimsa, the concept of non-violence present in many religions, but predating them, into contemporary research ethics.

Ethical frameworks in artistic research are underexplored. They are often inherited from other disciplines, and seldom, if at all, address the specific situations in which researchers find themselves and their research subjects in. Working with and updating these inherited frameworks is always a botched job in my opinion.

I instead propose an ethical framework kit based on the core principle of Ahimsa: non-violence. I say kit, because every researcher encounters ethical dilemmas and questions that are different from each other. An ethical framework is not a set-and-forget thing, it is to be constantly doubted, updated and changed to strive to be the best possible. The foundation of this ethical kit is Ahimsa, non-violence.

It took me almost the whole doctoral studies to find the principle of Ahimsa. So it is very new for me and I am exploring it and trying to incorporate or uncover Ahimsa in my practice.

I was searching in all kinds of philosophical and religious systems for evidence that any of these would recognize fungi. More specifically, any evidence that would respect the life of fungi, and the right to be unharmed. But everywhere I looked the line was drawn at sentience. Which is, from my point of view, doubly ridiculous. First of all, humans are animals, so we can recognize animal sentience in other animals. The western culture had a very hard time recognizing sentience in other-than-human animals, for the simple reason that it is easier to exploit and be cruel to animals if they are declared non-sentient.

That aside, by now, through the works of Jane Goodall and many many others, we know that all animals are sentient. But can we recognize, or sense sentience that is fundamentally different from animal sentience? Plant sentience? Mushroom sentience? Crystal sentience? We cannot. But absence of evidence is not evidence of absence. So, humans are not fit to judge if someone is sentient.

Apart from that I really do not think sentience should be the excluding factor for the right to remain unharmed. This is already a very violent and exploitative perspective to me. If you are not self-conscious, am I allowed to injure you? Seems very wrong and selfish to me.

By going back further in time, I found the ancient philosophical principle of Ahimsa, which is interpreted by Hinduism, Buddhism (all

flavors) and Jainism in different ways. It is a simple principle: humans should not harm *any* life form.¹⁴ This excludes self defense, e.g. taking a medicine to defend yourself against an attack by a bacterium or defending yourself against a military aggressor.

I said before uncovering, because this is the reason why I only work with fungi, while other practitioners in the biological arts work with all kinds of organisms and critters. Fungi are totipotent. It means from every single cell the whole organism can regrow. So when I clone a fungus, and work with them in my dance pieces, I do not displace the whole organism, as it remains at their original place of origin and continues living there. It is also less crucial if single cells die during the processes I subject fungi to: as long as some cells remain the whole organism can regrow. After the research is finished I take great care to return the fungus to its original site, where it can reunite with the rest of its identical body. It is for me the most non-violent way to work, while I acknowledge that there are violent acts in my research. This is not a set-and-forget solution, but a continuous struggle. I think this is the way ethical considerations are and should be. They are to be constantly rethought and made better.

For clarification: I am not appropriating the principle of Ahimsa from Indian philosophy. I am a non-violent person by nature, and through my own personal and family history. I was born in Germany. Since 961 Germany has participated in 124 wars, conflicts, uprisings, crusades, and whatever acts of violence these acts may be classified as.¹⁵ In all these acts of violence, Germany has always been an aggressor, never acting even once in self-defence. My great grandfathers and grandfathers participated in the First and Second World War. My father was the first one lucky enough not to have to fight in a war while being a conscript in the German army. Me and my brother were the first in my family to obtain non-combatant status under the International Covenant of Civil and Political Rights¹⁶ as conscientious objectors. Instead of being part of the military-industrial complex, we

¹⁴ Kothari, Valchand P. 1975. *The Law of Non-Violence (Ahimsā) and Its Relevance for All Times*. Sholapur: Jaina Saṃskṛti Saṃrakṣhaka Sangha.

¹⁵ For an extensive list and for the wars fought before 961 see Wikipedia, 'List of wars involving Germany', accessed 23 September 2025, https://en.wikipedia.org/wiki/List_of_wars_involving_Germany

served our communities in the Red Cross and the local hospital. But instead of only arguing from my personal position, I found it more beneficial to look for the oldest trace of thoughts on non-violence in philosophy, which happens to be in vedic texts. I expanded on these original thoughts, as for my purposes they were not inclusive enough, as they do not encompass plants or fungi.

The core research preposition is to do research, but to do it as non-violently as possible. I think this is where different disciplines are having different urgencies. Medical research and artistic research clearly differ. Maybe it is also about privilege: artistic researchers can afford to be non-violent, medical researchers maybe cannot afford this as they need to test medications and treatments on animals instead of humans in early phases. My proposition, that we can afford to be non-violent, was spurred by seeing that my peers in the biological arts are employing extremely violent methods, and that their results do not warrant their methods.

¹⁶ International Covenant on Civil and Political Rights (1976) https://en.wikisource.org/wiki/International_Covenant_on_Civil_and_Political_Rights

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