
Radial Paths: stories on fungal tentacularity

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Abstract | This zine was produced as a part of my PhD research and explores unexpected connection between fungi's mycelia and contemporary feminist theories. It was written on the intersection between Biology, Art and Anthropology as a product which is science and science communication at once. It was made originally for the my presentation at the annual meeting of Society for the Social Studies of Science in New Orleans, September of 2019.

Resumo | Esse zine foi produzido como parte de minha pesquisa de doutorado e explora encontros entre as micélias dos fungos e algumas teorias feministas contemporâneas. Escrito nas interseções entre biologia, arte e antropologia, o produto se constitui como peça de ciência especulativa e divulgação científica a um só tempo. Foi criado originalmente para apresentação no congresso do Society for the Social Studies of Science em Nova Orleans, em setembro de 2019.

FICHA TÉCNICA

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Text and images: all text and images are original and were made by me, except when indicated otherwise

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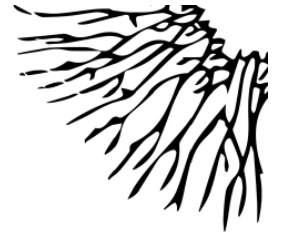
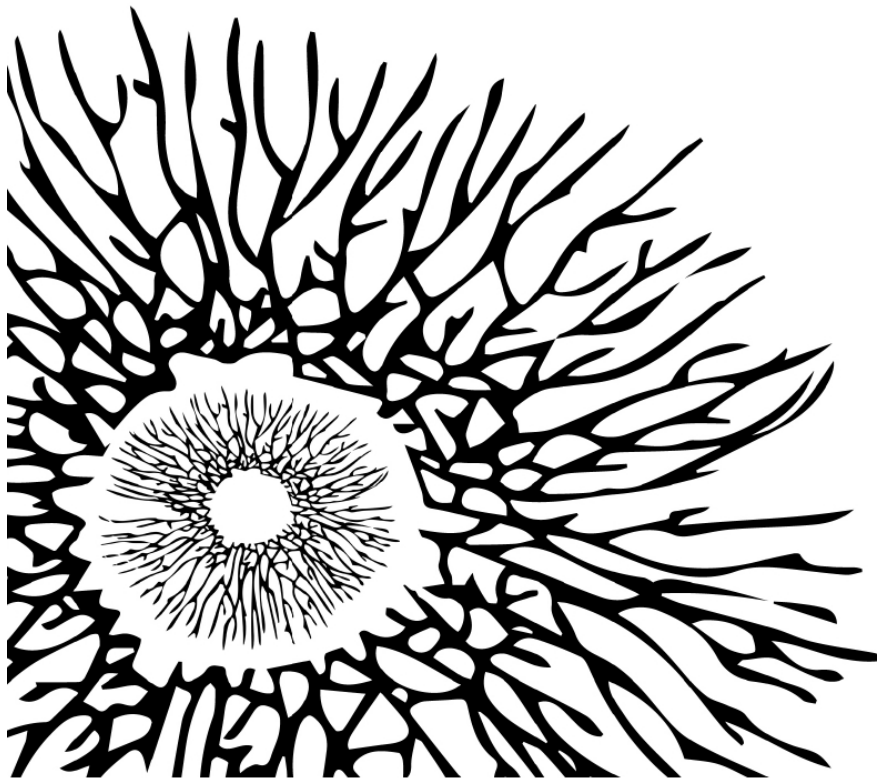
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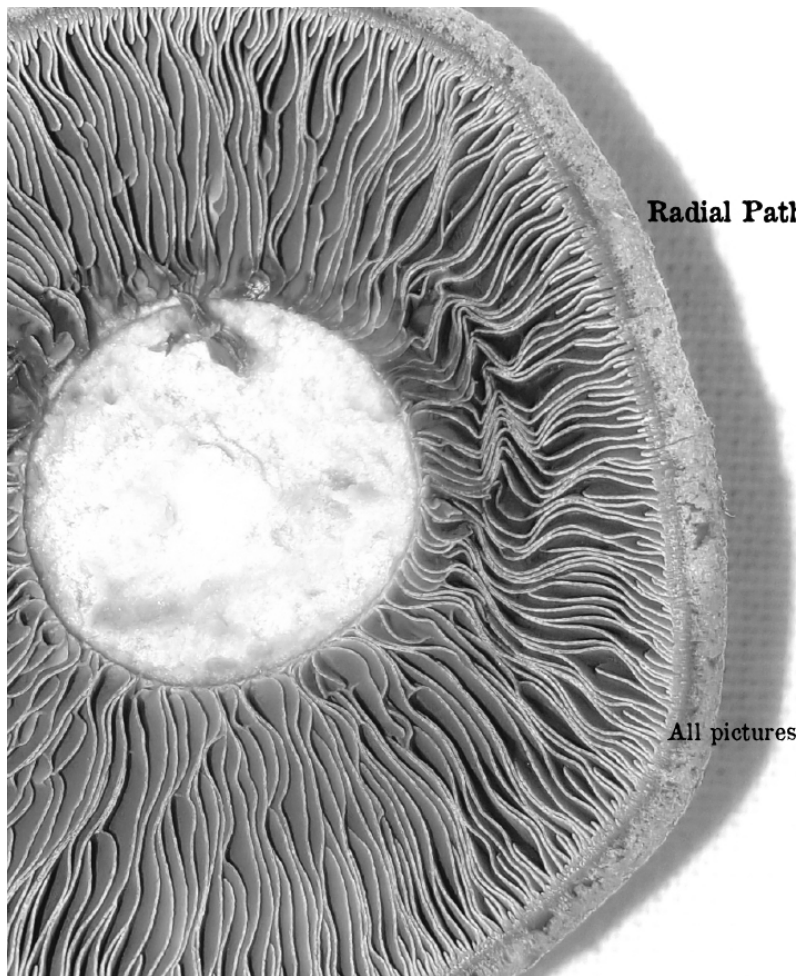
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**RADIAL
PATHS**

Stories on fungal tentacularity



Radial Paths: stories on fungal tentacularity

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All pictures, drawing and text by Yama, except when indicated otherwise.

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Stories in a bag

Ursula K. Le Guin wrote the essay "The Carrier bag Theory of Fiction" by the end of the 1980's. One of its many great insights is a thought on how we tend to turn every story into stories of heroes. Intensely linear, heroic stories are narrated with introduction, a central conflict and its violent resolution. The conflict is the center of the plot. The story of the Hero is the story of hunting, killing, competition and nature dominance by human purposes only. Le Guin invites us to move both the Man, capital M, and the conflict away from the center. She invites us to tell stories that are not only not-heroic but anti-heroic. Stories with no inclination to the forward march of progress. Stories about collecting stories. Nor the Man for human or the conflict as a universal narrative (and sometimes no human at all!). I invite the reader to read the pages to come as if you are walking through a road that opens new roads; where stories mushroom and there is no finish line.

I tell stories that can be held in a bag and not in the bloody tip of the spear.

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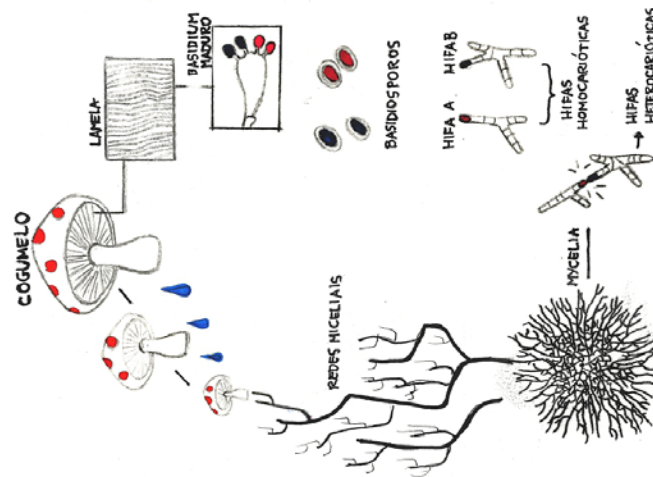


A very brief story on mushrooms life cycle

Fungi are amazingly diverse. When it comes to their biology almost every rule has plenty of exceptions. As distinct as their fruiting bodies forms, fungi grow in varied and inventive ways. The reproduction among some mushrooms can involve tens of thousands of different mating types and can create real challenges for scientists in naming individuals, colonies and species. Most mushrooms are part of the division Basidiomycota, which is one of the two divisions of higher fungi. Mushrooms are fruit bodies and sexual beings that spread spores around. Inside their cap, there are microscopic structures called basidia, which produce the spores that will be spread around through the gills under the caps. The winds, rain and other forms of water, animals and many other things and beings might help spore spreading for long distances, even if unintentionally. Humans included. Under certain conditions spores become hyphae and the colonies of hyphae are the ones called mycelia. It is from mycelial networks that mycorrhizae and new mushrooms sprout. Mushrooms with their own basidia, which produce spores that are spread around through the gills and make the cycle alive again and on and on.



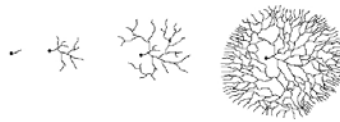
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Micélias

It matters which words we choose to tell stories. In Portuguese, as in other Romance languages, plural and neutral word forms are always masculine. Mycelia, which is plural of mycelium in Latin, is a masculine word in Portuguese: "o micélio". I use the neologism "as micélias," which is feminine and plural, in my research. Feminist colleagues, scholars and activists taught me we must be combative to the sexist and racist heritages of our language in our everyday communication. Besides that, the plural form fortifies the idea of mycelia as complex and diverse beings that change themselves constantly by what Donna Haraway calls *making kin*.



But what are the micélias? Answers abound. A fungal colony; the collective of hyphae; an underground network for nutrients transportation; a stage in the life cycle of mushrooms; mushrooms' roots; the largest living organism; filaments that connects the trees through mycorrhizae; subway and highway for bacteria; the bridge between the dead and the alive in the soil; nature's internet; or the "Wood Wide Web". All these answers are partially true and each emphasize an aspect of the micélias. Perhaps, it is combining them that we will find even more interesting meanings.

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Staying with the Trouble

Donna Haraway invites us to stay with the trouble. When we think linearly we walk the way of the heroic story and we follow the road of what Anna Tsing called the "forward march of progress". While refusing to be dragged in line by progress, we stay with the trouble to think-with and move on. To think-with means thinking together and beyond anthropocentrism. Thinking-with demands partnerships beyond the human relations and demands living with the ruins around us. The pragmatic cynicism and political ambition of *problem-solving* is, more often than not, the politics of purification. As Ursula K. Le Guin taught us, purification by violent means. The politics of purification stress that whatever cannot fit in the forward march of progress must be left out. We jump from emergencies to emergencies hearing the capitalist mantra "There is no other way". When you can only know and only got the time to walk one way, how can we look in other directions? How can we see the invisible paths around us? Violent purifications are made in the name of the Anthropos, the capital m Man, the *homo economicus* and many other generalist and masculine names that try to violently purify what it is to be human and, by extension, what counts as non-human.



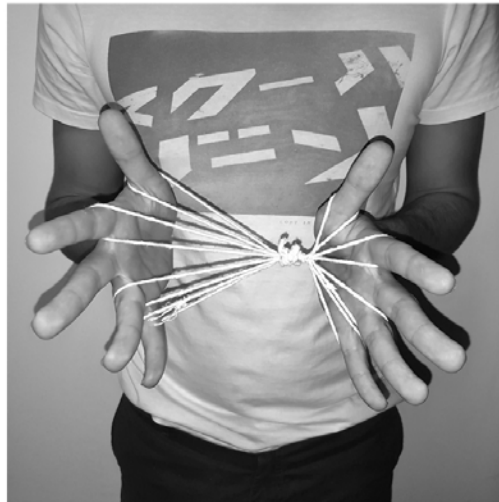
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Tentacular thinking

But if not by linear reasoning and thinking, how to reorganize thinking practices? We must think. Think we must. Haraway's approach is what she calls tentacular thinking. A tentacular body launches its appendages, which can reach only a limited number of things, within a limited range. Octopuses, spiders, medusas and string figures that reunites the theoretical principles that was already in *Cyborg Manifesto* and *Situated Knowledges*. In that sense, a tentacular body is not defined only by its form, but also by the specific and circumstantial conjunction between the body itself and everything it touches. The tentacular body does not end in the skin. Like the cyborg it keeps living through the things it touches, on its reach. It is a situated body, full of response-ability, because it only goes by as far as its tentacles can. Tentacular bodies are string figures reformulated and reknotted all the time. Thinking with tentacles is a thinking practice. Tentacular thinking is making kin. What are we going to reach, touch and think-with? What are we making kin with? String figures all!



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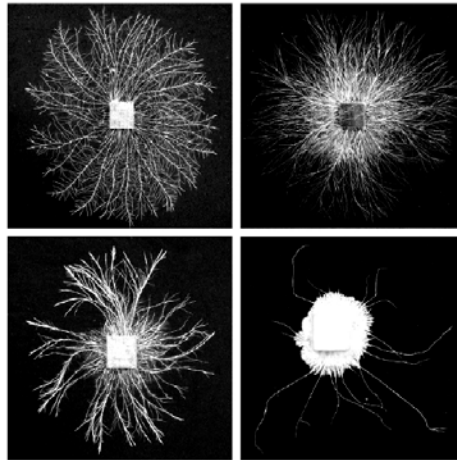
Taxonomic challenges

Many scientists claim that the largest living organism in the world is the mycelial colony of an *Armillaria*, best known by their fruiting body name, honey fungus. There is a particular colony of this fungus that is alive for at least 2400 years, weights an estimated 35,000 tons and spreads over 10 square km, in the state of Oregon. This enormous fungus (or fungi?) is good company for thinking about micélias as they fragilize biological concepts such as individuals, collectives and even species.

Micélias challenge scientific taxonomy. Their existence is grounded on making kin with living and non-living things on their way. They are a multispecies underground network that keeps making hard questions to scientists. Where does an individual starts and where does it ends? What counts as one? What is a part e what is whole in the soil? Which species is it again this mycorrhiza if it is plant and fungus at once? How to separate micélias from different species of fungus if they are entangled together?

Besides that, micélias come to be as explorers that grow differently in every place, depending on what partners they may find. Growing radially, in every direction, they are living fractals and every single cell is capable of reproducing and sending information and nutrients for the colony. Then, again, they ask the scientists: What counts as one? What is a part and what is whole in the soil?

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Pictures of mycelial cords above by Don A'Bear.

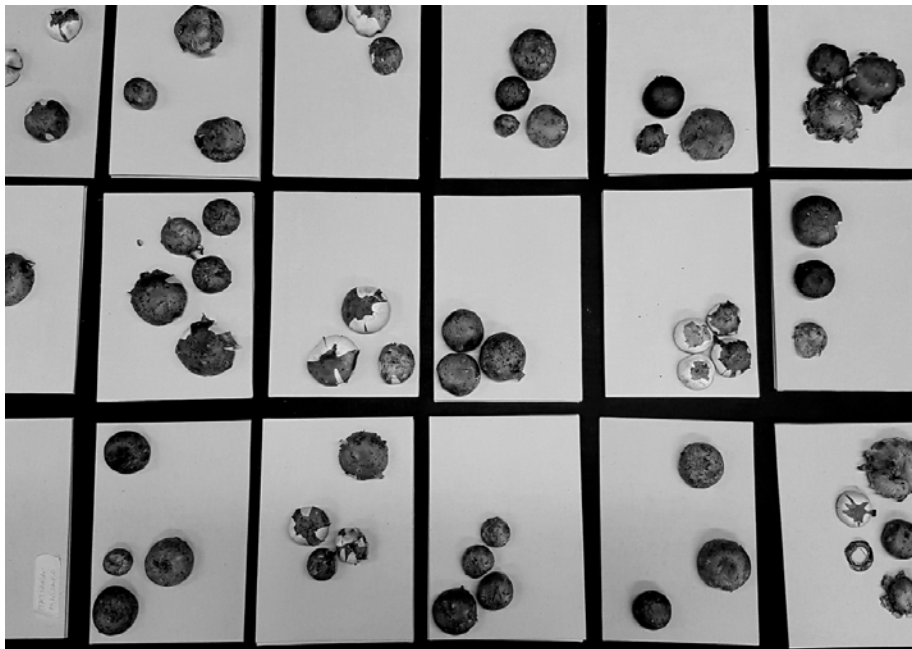
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What kind of stories refuse to end?

We have been taught the proper way of writing science. The science model demands observation, hypothesis, hypothesis testing... and a conclusion. I call it a model because it constrains what we are able to think-with. Everything that cannot fit the model must be purified in order to fit in. That does not mean we should not do science neither that we need to look for another model. What we need is to embrace diversity. We were taught that science is one and that there is one recipe for making good science. Neither of these things is true.

The model determines way more than just the form of the text, because linear thinking colonizes any diverse ways of thinking and transforms it into linearity. We learned from Donna Haraway and Ursula K. Le Guin along the way that linear thinking is not exclusive to science as it lives in each and every heroic story. Maria Puig de la Bellacasa goes even further and says linearity is the timescape of progress, innovation and technoscience under capitalism. The Hero resolving conflicts and the scientists unfolding and revealing a passive nature are two very alike images. Two very masculine approaches to nature and conflicts. The problem solver, the pragmatic thinker. Even if the humanities have already soaked up criticism on hypothesis testing as the only way to do researches, the linear model that end it all with a mighty conclusion reigns still. That is probably why Anna Tsing felt the need of naming "Anti-ending" the last chapter of her book "The Mushroom at the End of the World" and, also, the need to put a rhetoric question in one of the last pages which asks: what kind of book is this that refuses to end?

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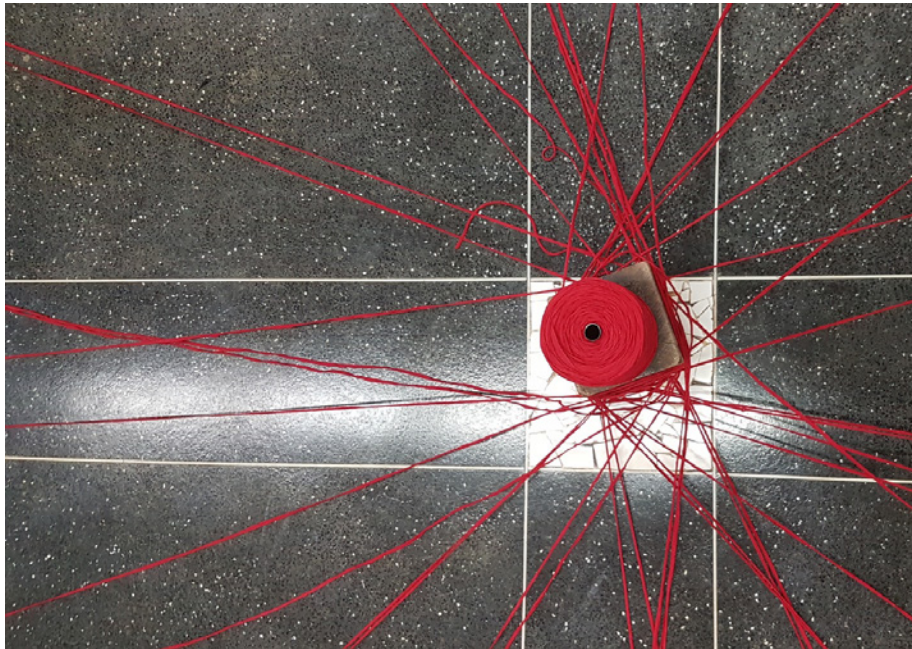


Sympoiesis

Micélias are getting growing attention from researchers and storytellers from many different fields. Through mycelial networks, living organisms can exchange nutrients and communicate. Their ways of growing make it hard to separate what is part and what is whole in the colony. Any part of the colony has what it takes for expansion, but how the expansion goes depends on what the micélias are making kin with in the soil: microorganisms, enzymes, plants, roots, other fungi, rocks and minerals, nutrients, water, dead animals and decomposing organic matter, among many other things. This very diverse underground make-kin party highlines one of micélias' features: individual and collective, fractal and highly adaptive, micélias might be a very concrete form of multispecies collective intelligence. A living collective intelligence exploring, analyzing and growing in the soils. Paul Stamets, a famous mycologist, compares them to the Gaia Hypothesis from James Lovelock and Lynn Margulis:

"I see mycelium as the living network that manifests the natural intelligence imagined by Gaia theorists. The mycelium is an exposed sentient membrane, aware and responsive to changes in the environment. (...) A complex and resourceful structure for sharing information, mycelium can adapt and evolve through the ever-changing forces of nature. (...) These sensitive mycelial membrane acts as a collective fungal consciousness. (...) Like a matrix, a biomolecular superhighway, the mycelium is in constant dialogue with its environment, reacting and governing the flow of essential nutrients cycling through the food chain".

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Collecting is science

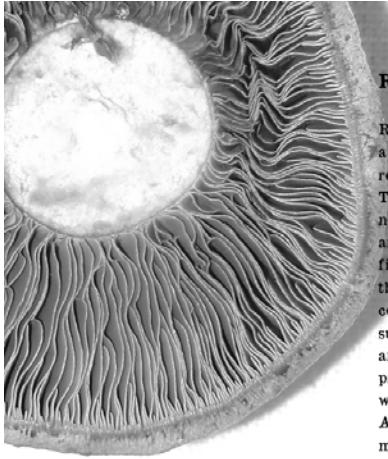
"To listen and to tell a rush of stories is a *method*. And why not make a strong claim and call it a science, an addition to knowledge? Its research object is contaminated diversity; its unit of analysis is the indeterminate encounter".

This quote was written by Anna Tsing in "The Mushroom at the End of the World". There is a strong kin between the Carrier bag Theory of Fiction, storytelling as science and collecting as scientific methodology. Ursula K. Le Guin claims the first cultural artifact was not the spear but the bag. Armed with bags, women would bring home nuts, mushrooms, fruits and stories. They would walk between the trees, opening paths never before explored. Bags are all about ongoingness. Whatever is held in the bag keeps parts of the trail and its stories. The trails matter and the more we go out for collecting the thicker it gets in meaning. Sometimes we will cruise again old trails and sometimes we will open new ones. Holding stuff in a bag does not mean we don't keep some things, but it does mean that we keep a limited number of things and the things that matter the most. Bags are open and create never-ending new beginnings, while the spear cut the flux and put things to an end. Does every story need closed ends and conclusions?

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Radial paths, radial paces

Radial motion is more than just a geometric representation. It is a lesson by the fungi. "Radial" is the concept I use for a fungal reading of Donna Haraway's tentacular thinking and Le Guin's and Tsing's collecting methodology. Forget geographic and colonial notions of center and periphery. Radial is the fungal way of growth and contamination. One single originating spore gives birth to the first phase of mycelial growth, when new paths rises radially from the center, creating navigable ways where stories of kin-making come and go. Ongoing ways. This ongoing flow, attentive to the surroundings, explores each and every possibility of kin-making and holds the promise of a novel way to organize thinking practices. Alternative ways to think outside the linearity model, with no commitment to chaining reason. The Hero, the Man, the Anthropos are all out for they cannot navigate through the multiple radial paths. The only path they know is the one-way road towards the conclusion. Instead, our radial paths are occupied by multispecies cyborgs and tentacular beings, educated by fungal and feminist lessons. The human/non-human duality gives way for the much more interesting fungus/non-fungus, where the half-fungus, the temporarily fungus and all oddness are welcome.

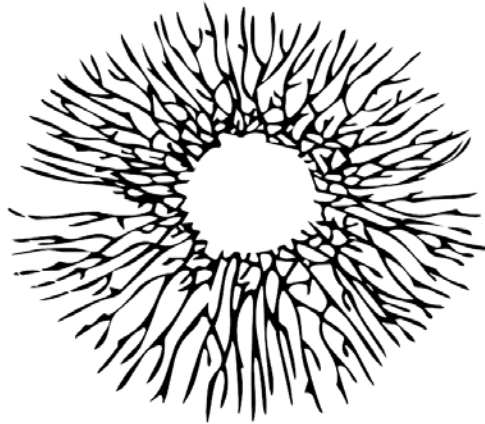
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The pace of tentacular experimentation

It is always a challenge thinking about how to apply tentacularity to writing. What I have been doing in my research is experimentation based mostly on listening to the micélias. Learning new methodologies with them. Relearning how to tell stories and make relations by observing how the micélias make it. Reuniting fabulations. Mycelial fabulations. Avoiding an impossible individuality, the written work is put together as a colony, where the comes-and-goes through the stories emulates the radial paths opened up by micélias. In times that Maria Puig de la Bellacasa described as "marked by a linear imperative of progress versus fears of regression", these comes-and-goes can be revolutionary for those who do not fear going back and forth through the many paths out there - and not just forward.

The form of the text should be expressed by the very source of thought that inspired it, and not by a pre-set model that promotes the purification of ideas. We should take the tentacular thinking, the carrier bag, the stories collected and... let it rot. At least once let the fungi transform our concepts and ideas into something else. Rotting takes time. Transformation takes time. Times incompatible with the forward march of progress. It is a matter of embracing a rotten text, full of rotten ideas with no ambition of complete understanding of anything. Understanding is always partial. Embracing the idea that a small part of a mycelial colony is and is not the whole colony at once. Embracing the idea that one of thirteen stories is and is not the whole zine at once.

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Making kin with radial companies

When we stop for a moment and look around us, there is plenty of things without an end and with no inclination to linearity. Radial motions, movements, beings and things are just one of the alternative possibilities. Radial beings vary in size, scale, time and modes of living and dying. The galaxies expand as radially as the microscopic initial micélias. String figures, spiders and their webs, octopuses, medusas, *Victoria amazonica*, explosions and drops of water irradiating. It matters what we are going to make-kin with. Marilyn Strathern taught us that "It matters what ideas we use to think other ideas." Donna Haraway expands this principle radially, tentacularly, mycelially, so we can see how important it is to know what are we making kin with. Those who we choose to make kin with are those we are thinking-with.

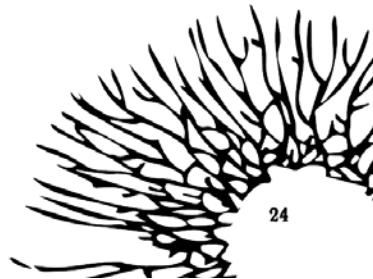
"It matters what thoughts think thoughts. It matters what knowledges know knowledges. It matters what relations relate relations. It matters what worlds world worlds. It matters what stories tell stories".

Donna Haraway in *Staying with the Trouble*.

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May the spores be with you.



Referências Bibliográficas

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This zine was produced as a part of my PhD research at the University of Campinas, for the specific purpose of my participation on the Annual Meeting of Society of Social Studies of Sciences in New Orleans.

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