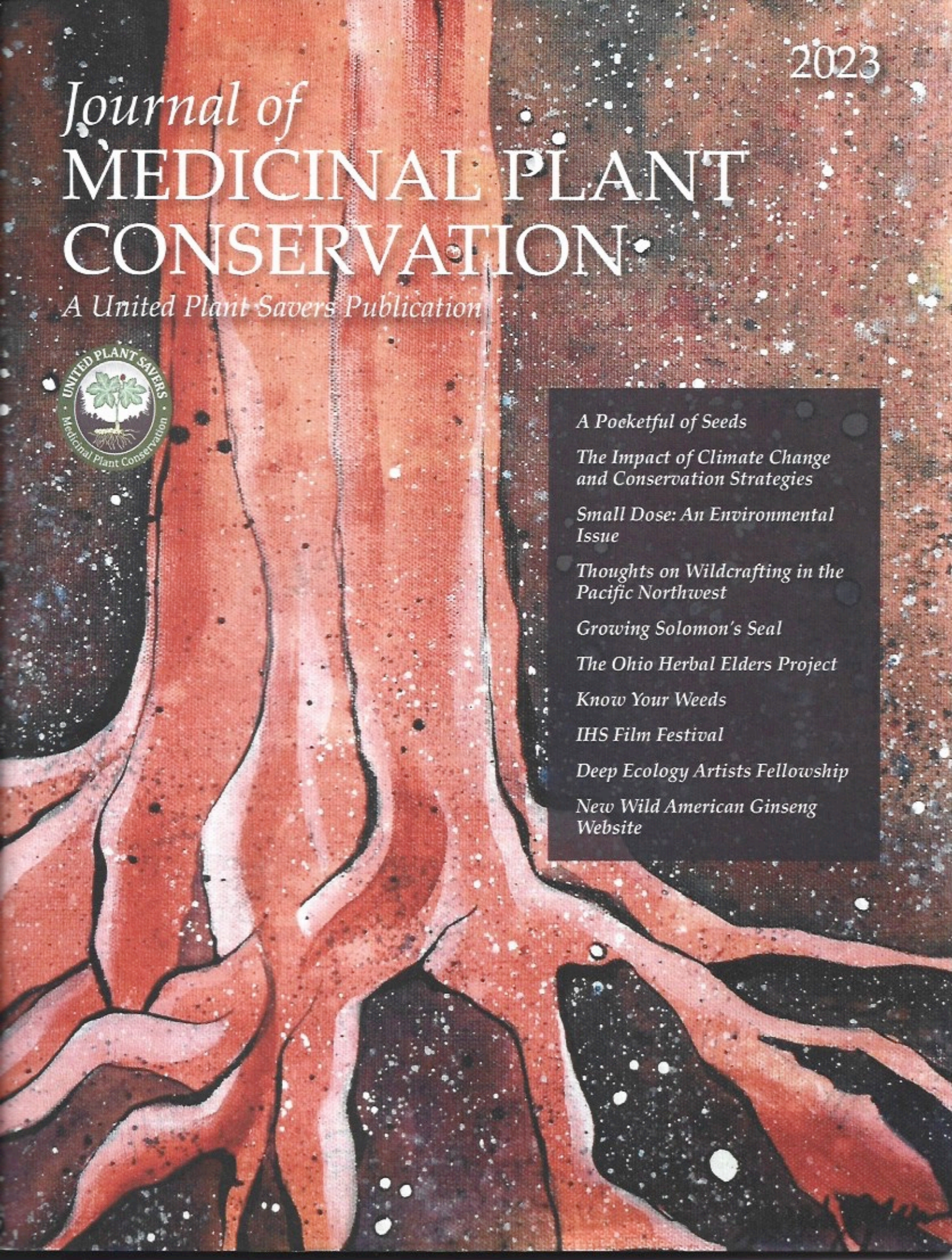

2023

Journal of MEDICINAL PLANT CONSERVATION

A United Plant Savers Publication

DEEP ECOLOGY ARTISTS FELLOWSHIP PROGRAM

Deep ecology is an ecological and environmental philosophy promoting the inherent worth of living beings regardless of their instrumental utility to human needs, plus a radical restructuring of modern human societies in accordance with such ideas. Deep ecology argues that the natural world is a subtle balance of complex inter-relationships in which the existence of organisms is dependent on the existence of others within ecosystems. Human interference with or destruction of the natural world poses a threat therefore not only to humans, but to all organisms constituting the natural order.

2022 Deep Ecology Artist Fellows

Celeste Amparo Pfau – Alabama
Visual Artist – Mixed media
Instagram: @amparo_creative_house

Cheryl Durgans – Ohio
Visual Artist – Mixed Media

Clara Haizlett – West Virginia
Videographer, Plant Journalist
Instagram: @clarahaizlett

Danica Marsh – Oregon
Visual Artist – Mixed media

Delilah Miske – Pennsylvania
Visual Artist – Mixed Media
Instagram: @adapt.tarot

Gabriella Ceberville – Michigan
Visual Artist – Photographer, Writer, Mycologist

Grant Adams – Colorado
Visual Artist – Painter, writer

Heather Wood Buzzard – North Carolina
Writer, herbalist

Katherine Ziff – Ohio
Visual Artist – Painter, flower essences
Instagram: @briarwoodstudiosfloweressences

Marie Despres – Massachusetts
Visual Artist – Painter, weaver

Nina Lawrin – Michigan
Visual Artist – Ethnobotanist
Instagram: @lovern_collections

Ryan Eilbeck – Ohio
Musician, Writer
naturalsway.bandcamp.com

Sarah Greenman – Oregon
Visual Artist – Creative Alchemist, painter
Instagram: @sarah.greenman.creative

Shay Clanton – Virginia
Visual Artist – Watercolor

Nastassja Noell – Southern Appalachians, Cherokee Territory
Visual artist – Lichenologist
Instagram: @beinglichen

Sara Riegler – Vermont
Visual Artist, Mixed Media
www.saraelenariegler.com

EMERGENCE

By Nastassja Noell

The year, 1895; the place, Ohio. Fruticose lichens dangle like hairs from oaks and maples, breathing in air and sunlight and breathing out lichen. Naturalists wander the forests, collecting a few lichens, placing them in herbarium packets—little did they know that they were creating time capsules for us in the future.

Years stretch forward. Smoke rises on the eastern horizon as factories and smelters march inland from the coastal cities. The smoke chokes the lichens. Blue green lichens fade to yellow and pink and then fall from the tree, disappearing just as they have in London and New York City. Soon, coal mines, power plants, and farms will replace the broad expanses of Ohio's forest and meadows.

In 1987 lichenologist Cliff Wetmore rambles around Cuyahoga Valley National Recreation Area in northern Ohio looking for the lichen species that were documented so long ago, but he can't find most of them. Twenty-one percent of the lichen species documented from 1895-1920 had disappeared. Extirpated.

Failure. I watch myself grow through my teens and 20s and 30s with a repeating pattern—starting off on the right foot on the right path, but then something shifts. Loss and failure descend over and over again, like a vortex, like a black hole.

In the 1970s the Clean Air Act and its amendments paved the way for regulatory requirements that reduced toxic emissions from the most egregious air pollution sources. According to data from the National Park Conservation Association (some of which I helped assemble during a long break from lichens), the worst emitters of SOx and NOx air pollution in the United States are fossil fueled power plants. But in southeast Ohio, fossil fuels like coal and natural gas are the major economic engine (source), the same trap of economics vs environment playing out around the world.

Kneeling atop a limestone cliff in the Great Basin Desert, I swing a hammer and chip away tiny chunks of rock, gently placing each lichen specimen into a cushioned bin and then move onto the next species—one specimen per species. Chip, chip, clunk, clunk. The horizon is growing dark. Wind is rushing in. I cup my hand around the bins of lichens, but a gust blows dust under my sunglasses, blinding me, and I stumble. Lichens fall out of my hands, skittering and shattering down the side of the cliff. Liberated. Liberated to repopulate their home instead of living the rest of their lives asleep in an herbarium. I pick up the few specimens I can find and then make my way through the waving sagebrush back to my basecamp.

Since the inception of the Clean Air Act, Ohio lichenologist Roy Showman has been monitoring the return of lichen species in Ohio, particularly in areas near coal power

The galaxy beneath our feet - Oil on birch panel - by Nastassja Noell

plants. The return has not been linear. Some areas have recovered faster than others, but very few locations have improved enough to be reclaimed by air sensitive species like *Pseudocyphellaria* and *Sticta* or old growth forest species like *Usnea angulata*. Fifty years is not enough time to clean up the damage of 70 years. The patience required for change is overwhelming.

After a number of years doing field work in the Great Basin Desert, I'm back in the Southern Appalachian forests that called to me when I was in my 20s, back when I had dropped out of college and hopped on freight trains to get down to the fir lined ridges and rhododendron coves.

When the Southern Appalachians call, the earth shakes along ancient fault lines. These mountains opened my young eyes to understanding plants as people, but after my work in the Great Basin Desert, I return blind. Mentally blind. I can't see the lichens past their names. Names, names, names. Blocking my sight, like a massive wall. Blocking my heart, my touch.

Lichens are named after the fungus—not the algae, nor the emergent symbiosis of the two bionts (the partners in a symbiosis)—just the fungus. Mycologists and botanists have always assumed that the fungus was a parasite on the algae. In the gentlest of these terms, some lichenologists have described lichens as fungi that discovered agriculture. But these perspectives say more about our culture than it does about the lichen.

Since the early days of lichenology, researchers have tried to reproduce the lichen symbiosis in a petri dish. They would separate out each of the bionts, wash them off thoroughly, and then place each one into a petri dish filled with delicious nutrients. And guess what happened? Those fungi did not go and enslave the algal cells, nor farm them. On one part of the petri dish, the algae grew into a green slick, while on the other, the fungus formed lumps of white fuzz. With each successive experiment, the normalization of exploitative economics seemed to crack.

Things got interesting when researchers decided to expose the petri dishes to environmental stress such as drying conditions and lack of nutrients—in short, mimicking *place*. In these conditions, the fungus reached out towards the alga, and the alga welcomed in the fungus. It is a heartening story about people coming together in times of crises. But such activity is not a given. Not all fungi engage in mutualistic behavior with algae. Molecular research has demonstrated that at least five different lineages of fungi independently evolved the genes for lichenization, while many other fungal lineages lack these abilities. It is heartening to remember that some lichenized fungi lost the ability to lichenize during their evolutionary history and then relearned it, kind of like us modern humans. If genes are like stories, maybe a big part of our learning is uncovering those lost stories and incorporating them into who we are now.

Sitting at my microscope, the Southern Appalachian cove forest waves to me through the windows of my home lab. I duck my head and continue flipping through lichen flora from other lands. Another lichen specimen isn't fitting into a tidy species concept, and I won't let myself go outside until I finish. Hours leak by on each specimen, as thousands more specimens sleep nearby in their packets, waiting for names. The reality of my overwhelming situation crashes over me again and again, and I run from the microscope in tears, finding refuge in spreading paint across canvas. I'm breaking. Cracks are forming through my entire being. I don't know it yet, but something else is emerging.

The forest as a cross section of a lichen - Colored pencil on paper - by Nastassja Noell

Raised by pathologists, dinner conversations were about that day's diagnoses: non-Hodgkins lymphoma, breast cancer, liver cancer. "Another female with breast cancer, stage IV, only 33." Slurp, slurp of spaghetti and tomato sauce.

I learned early on that a wrong identification meant unchecked metastasis and death or unnecessary organ removal, chemotherapy, or radiation. It's no wonder that, in my family innocent mistakes were equated with death, the loss of career, or shaming. The mental overwhelm of my parents' work spread like a disease amongst our family. Their projections requiring perfection, else shame, cracked us kids open and ripped our psyches apart.

As I panic about another wrong lichen ID, the realization dawns that my family's cycle is repeating in my own life with these lichens. The choice becomes dismally clear. The cycle must end with me.

Packing up my microscopes and lichen floras into the back of a closet, my ego screams to me: You're jumping off a cliff. Nodding, I agree, and imagine jumping off the side of a cliff. It's a tiny jump, but the cliff is a mile high and as gravity swallows me, my belly rises into my throat. When I hit the ground, my bones crumble. And then, my bones reassemble. Looking around, I find myself at the bottom of a cavern with a watery creek running through it. I stand up on the moist sandy soil and walk alongside the creek, following the tracks of songbirds, coyotes, and deer. Each day I repeat the imagination and jump off the side of this cliff until I don't need to anymore.

Months turn into years, and I'm finally seeing the lichens themselves again. On a walk in the Southern Appalachian cove forest of my new home, I stop to look at an Usnea lichen lying on the leaves, its arms and legs reaching out into the world. I pick it up and weave the Usnea's limbs around the twigs of a young oak. I whisper to them: Grow together....

Lichens are the prototypical symbiosis. The concept of symbiosis (under the term "dual hypothesis") was first conceived by botanist Simon Schwendener to describe what he was seeing in lichens. But like so many holistic perspectives that invert the concept of the individual, Schewendener's concept was scorned as "pure fantasy." Equally important is the concept of emergence—the idea that this individual symbiotic organism is more than the sum of its parts. The lichen is a self-sustaining entity that is made up of algae and fungi but exerting its own individual influences onto them. It's like magic— from thin air, a living being, with its own prerogatives, its own experience of the world suddenly comes into being—while simultaneously, the fungus and alga are having their own individual species experiences.

The idea of emergence isn't so foreign to humans. Since the 1960s, neuroscientists have been exploring the idea that consciousness is an emergent property. And it's not such a leap to broaden this concept to the web of life. In a 2011 paper "The Ubiquity of Consciousness" for the European Molecular Biology Organization, Anthony Trewavas and Frantisek Baluska conclude their paper

with a quote by Charles Minot, "Plant behavior is active, purpose-driven, and intentional. In its capability for self-recognition and problem solving, similarly to the other organisms described in this article, it is thus adaptive, intelligent, and cognitive."

If we take that concept, and apply it to ourselves and our human bodies, each of our cells might be having their own individual experiences, while each of us is largely unaware of any individual consciousnesses that are constituent parts of our bodies. And we can extrapolate this to ecosystems as well—with trees and squirrels each having their own individual experiences, while the forest itself experiences the world in its own unique conscious way. Imagine each of us with individually rich consciousness, yet parts of the emergent consciousness of the forest around us, of the city we inhabit, of the communities and families we connect with.

"A frank unbiased study of consciousness must convince every biologist that it is one of the fundamental phenomena of at least all animal life if not, as is quite possible, of all life..." said Charles Minot 1902, in a speech to the American Association for the Advancement of Science.

The bins of art supplies and food are heavy. I lug them into the yurt at the United Plant Saver's Goldenseal Sanctuary and then head into the forest along the Medicine Trail. Most of the leaves have fallen. It's the last day of October, and the forest floor beams red and brown and yellow. But something is missing. I look around. And I can't find them. The Usneas that I'd grown so used to in the Southern Appalachians are not to be found. A fallen oak tree, its large canopy over the trail, surely they'll be there. I search the twigs of the canopy, a favorite place for lichens to grow, a sunny place where they can exalt the sun and lavish in the cloud layer that is cultivated amongst the explosion of twigs. But there are no Usneas. Or Parmotremas. Along an upper trail, I walk by a reclaimed coal mine. Coal country, of course—I had forgotten. The Flavoparmelias and Punctelia lichens that I'm seeing covering many of the younger trees are suddenly a bit brighter, a bit bluer, and glowing. You're the first to return, aren't you? I whisper this to the lichens growing on the trunk of a young poplar.

After my hike, I sit cross legged on the floor of the yurt and open the boundaries of myself beyond my body, into the forest, into the hollow and reclaimed coal mine, into the rolling hills extending to all horizons. I ask what am I here to do? An answer comes, the answer to the question I didn't know to ask. We Deep Ecology Artists in Residence are here to listen to the forest, the soil, the wind. We are here to dream futures into being. Like fly fishermen, we are flicking a line out across the span of possibility and sharing what we find in the nebulous waters around. We're casting lines for a future that is all around us, living in the present. ■

The galaxy beneath our feet (in progress at UpS Botanical Sanctuary) - Oil on birch panel - by Nastassja Noell

Nastassja Noell (she/they) is a lichenologist, who struggles to stay within the fenced pastures of science. Her fiction, which first appeared in Dark Mountain Project, has been nominated for the Pushcart Prize, and she is a recipient of the United Plant Savers' Deep Ecology Artists Fellowship. She has led lichen biodiversity research projects throughout the Americas, co-authored the book Delmarva Lichens (Torrey Botanical Press), and her writing has appeared in scientific journals as well as Radical Mycology, Patagon Journal, and NW Travel. Nastassja lives in the Southern Appalachians in a cove forest that whispers stories while she sleeps. She occasionally updates her blog: www.beinglichen.org. If you're on Instagram, she loves connecting with kindred folks: @beinglichen.

REFERENCES

1. Wetmore 1988, "Lichens and Air Quality in Cuyahoga Valley National Recreation Area, Ohio".
2. "Ranking of states by visibility impairing air pollution" National Parks Conservation Association. https://www.npca.org/reports/regional-haze
3. See a) Showman, R. E. (1997). Continuing lichen recolonization in the upper Ohio River Valley. *Bryologist*, 478-481;
b) Showman, R. E. (1975). Lichens as indicators of air quality around a coal-fired power generating plant. *Bryologist*, 1-6.
4. See "Twelve Readings on the Lichen Thallus" by T. Goward; originally published in the *Evansia*, the journal of the American Bryological and Lichenological Society, accessible online: https://www.waysofenlichenment.net/ways/readings/index.html
5. See a) Sperry, R.W., (1969). A modified concept of consciousness. *Psychological review*, 76(6), p.532; b) Wahbeh, H., Radin, D., Cannard, C., & Delorme, A. (2022). What if consciousness is not an emergent property of the brain? Observational and empirical challenges to materialistic models. *Frontiers in Psychology*, 5596.
6. Trewavas, A. J., & Baluška, F. (2011). The ubiquity of consciousness: The ubiquity of consciousness, cognition and intelligence in life. *EMBO reports*, 12(12), 1221-1225.
7. Ibid Trewavas, A. J., & Baluška, F. (2011)