

Entangled Life: How Fungi Make Our Worlds, Change Our Minds and Shape Our Futures by Merlin Sheldrake. London: Penguin Random House, 2020, 380 pages, \$18.00 paperback.

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The line between science and fiction is never settled or easy to draw. On the one hand, there is “science fiction” such as Herbert George Wells’ *The War of the Worlds*. On the other hand, we have “fiction science” as enacted by colossal promissory ventures such as Henry Markram’s *Human Brain Project*. In between, or somewhere in a third dimension, one can sometimes come across science told in such a way that it surpasses fiction itself, without losing any of the grounding that makes it scientific.

In his first and outright successful book, *Entangled Life: How Fungi Make Our Worlds, Change our Minds and Shape Our Futures*, the English biologist Merlin Sheldrake submerges us into the alien worlds of fungi. His is arguably one of the most fictional non-fiction books ever written. Sheldrake reveals a myriad of mind-blowing life forms hidden in plain sight. They are thriving everywhere, from the underground to the air, all the way around and inside our bodies.

Even if we could never really know *what it is like to be* a fungus, we can try. And, in doing so, we gain a renewed perspective on what it is like to be a human. This is precisely what science often lacks, and what the layperson so eagerly wants. Sheldrake serves as a kind of academic shaman, guiding and facilitating a reading experience that is not only informative but transformative. *Entangled Life* is a guide to get lost, and then find oneself again, rather puzzled, in a new world.

In his own words: “I wanted to understand fungi, not by reducing them to ticking, spinning, bleeping mechanisms, as we so often do. Rather, I wanted to let these organisms lure me out of my well-worn patterns of thought, to imagine the possibilities they face, to let them press against the limits of my understanding, to give myself permission to be amazed — and confused — by their

entangled lives” (p. 24). In the presence of Sheldrake’s knowledge and love for fungi (one may call it “mycosophy”), our curiosity is turned into reverence, and the longing for certainty is transmuted into a sense of gratitude for being part of this strange and wonderful world. In our own bewilderment, we are uplifted. Inspiring and revelatory, we contemplate the beauty of strangeness. The unfamiliar becomes intimate.

Structure of the Book

The subtitle of the book (*How Fungi Make Our Worlds, Change Our Minds and Shape Our Futures*) encapsulates the three major points made in the book. *How Fungi Make Our Worlds* is described mostly in the first chapters.

In “A Lure” (Ch. 1) we marvel at the world of truffles as they play “hide & seek” with us. They do not have or need noses or brains. In “Living Labyrinths” (Ch. 2) we dive into the networks (and networking) of mycelium and their ability to solve their own fungal problems (and also ours, as in the design of train networks), leaving the swarm analogy obsolete. In “The Intimacy of Strangers” (Ch. 3) we are introduced to the fluid identities of lichens. Symbiosis turns out to be what it always was: more than a merely interested way of collaborating when one cannot compete. Some popular versions of Darwinism are just less about Darwin and more about “ism.”

As we peep into their worlds, these creatures start to *change our minds*. In “Mycelial Minds” (Ch. 4) we come across a disturbing realization: “It is likely that fungi have been manipulating animal minds for much of the time that there have been minds to manipulate” (p. 109). In some spectacular cases, one could say that in “physiological, behavioural and evolutionary terms, the ant becomes fungus” (p. 119). Plainly put, fungi can “wear our minds.” We have virtually no clue as to how they do it. The current renaissance of psychedelic laboratory research, in addition to the tradition of do-it-yourself mushroom cultivator guides, are two powerful contemporary ways to bring us closer to the mystery that mushrooms enact. What’s in it for psilocybin? We are not sure either.

In “Before Roots” (Ch. 5) Sheldrake explains that algae were able to move from water to land thanks to their relationship with fungi. Moreover, “[b]y hosting fungi within their roots, plants gain hugely improved access to these sources of nutrients. They, too, get fed” (p. 139). In fact, mycorrhizal fungi are the foundation of all life that then conquered the land. Who is in control of the relationship, plant or fungus? Neither and both. We cannot think of plants without thinking about fungi.

In “Wood Wide Webs” (Ch. 6) we discover that some plants can quit photosynthesis with the help of fungi. Mycorrhizal fungi provide them with nutrients and carbon. They “might pass between plants via a fungal pathway” (p. 166), from large to small plants, from dying to healthy ones. This leads to the idea of plants

as entangled rather than separable units; the so-called *wood wide web*, whereby plants are nodes and fungi are links (an analogy, however, that betrays a certain excess of phyto-centrism). After all, even when avoiding zoo-centrism, it is hard to keep a myco-centric point of view. Anthropocentrism, even (and especially) when dressed under the cloth of objectivity, is always lurking at the door.

In “Radical Mycology” (Ch. 7) it is made more explicit how fungi could *shape our futures* (more below in *Fascinating Fungal Facts*). While “fungi have long been lumped together with plants, they are actually more closely related to animals” (p. 10). For instance, penicillin defends both fungi and humans from bacteria. “Fungal solutions” go beyond human health and percolate as environmental remedies. “Might it be that we can’t adjust to life on a damaged planet without cultivating new fungal relationships?” (p. 196), Sheldrake asks. Mushrooms may save the world in many ways (or at least our own survival in it).

In “Making Sense of Fungi” (Ch. 8), the last chapter of the book, Sheldrake comes back to what we can say about what it is like to be a fungus. “The ways in which we try to make sense of fungi often tell us as much about ourselves as the fungi we try to understand” (p. 233). The metaphors we necessarily use do not come out of the blue but grow in a certain ideological box, which entails an inescapable cultural bias. Bias is not necessarily a bad thing, unless we forget (or negate) that we always have some. Moreover, not all metaphors are made equal: the familiar clockwork, and even the contemporary internet, are images that serve their purpose and soon fall short. Fungi suggest new ways to look at the world and at ourselves in it.

The epilogue (“This Compost”) is an ode to ceremony. Sheldrake announces that “[n]ow that this book is made, I can hand it over to fungi to unmake it” (p. 251). In order to continue its creative advance, life must leave room for destruction, its twin ally. Sheldrake will seed a copy with fungi and, when they have eaten it and grown oyster mushrooms out of it, he will eat them. Similarly, he will ferment the pages into beer, and drink it. If you Google it, you can see that he actually did so (see Sheldrake, 2020). As in the *Last Supper*, Sheldrake eats the mushrooms and drinks the beer of the *logos*. His own words are made flesh. What a powerful way to end, and to start anew.

Fascinating Fungal Facts

Sheldrake’s account is a sustained thin rain of baffling facts about the incredible feats of fungi. Let us try to do justice to some of them here:

(i) We often forget that yeast and other fungi perform the “natural miracle” of turning dough into bread and sugar into wine. And yet, considering fermentation as “domesticated decomposition” (p. 229), it is worth conceding that it is yeast that has actually domesticated us.

(ii) Fungi are ubiquitous and abundant: “Tens to hundreds of species can exist in the leaves and stems of a single plant” (p. 5). Actually, “if one teased apart the mycelium found in a gram of soil — about a teaspoon — and laid it end to end, it could stretch anywhere from a hundred meters to ten kilometers” (p. 52). The numbers blow our minds, since “the total length of mycorrhizal hyphae in the top ten centimeters of soil is around half of the width of our galaxy” (p. 142). Furthermore, “lichens encrust as much as 8 per cent of the planet’s surface” (p. 83). We also teem with bacterial and fungal life. We carry around more bacteria and fungi than our own cells.

(iii) Fungi are varied and virtually unknown. It is estimated that there are “between 2.2 and 3.8 million species of fungi in the world — six to ten times the estimate number of plant species” (p. 11), and yet they remain in the dark for us since “more than 90 per cent of their species remain undocumented” (p. 3). Over the last 400 million years, “[l]ichens have evolved independently between nine and twelve times” (p. 97).

(iv) Fungi can also be huge and very old. For instance, “the sprawling networks of honey fungi ... are amongst the largest organisms in the world. The current record holder, in Oregon, weighs a hundred tonnes, spills across ten square kilometers, and is somewhere between two thousand and eight thousand years old” (p. 4)... while “[t]he oldest one [lichen] is over 9,000 years old” (p. 95).

(v) Fungi are ecologically indispensable, as “more than 90 per cent of all plant species depend on mycorrhizal fungi” (p. 138). Actually, “[n]o plant grown under natural conditions has been found without these fungi; they are as much a part of planthood as leaves or roots” (p. 5). They are key evolutionary enablers of other kingdoms of life as well, since plants could not have survived when coming out of the water without their fungal collaborators.

(vi) Fungal sex is alien too. And their relations are fluid. It turns out that “[s]ome fungi have tens of thousands of mating types, approximately equivalent to our sexes (the record holder is the split gill fungus, *Schizophyllum commune*, which has over 23,000 mating types, each sexually compatible with nearly every one of the others)” (p. 39). Furthermore, “[t]he mycelium of many fungi can fuse with other mycelial networks if they are genetically similar enough, even if they aren’t sexually compatible. ... Self can shade off into otherness gradually” (p. 39). The concept of individual is blurred, and species look like tenacious (but surmountable) habits of life.

(vii) Fungi reproduce in manners that are also perplexing: they “produce around fifty megatonnes of spores each year — equivalent to the weight of 5000,000 blue whales — making them the largest source of living particles in the air” (p. 6). Also, “[s]ome species discharge spores explosively, which accelerate 10,000 times faster than a space shuttle directly after launch, reaching speeds of up to a hundred kilometers per hour” (p. 6).

(viii) Fungi enjoy a wide range of superpowers. They are strong, reaching pressures up to eighty atmospheres. If the long branching filamentous structure of

fungi “was as a human hand, it would be able to lift an eight-tonne school bus” (p. 59). They are also “one of the most radiation-resistant organisms ever discovered” (p. 5). In fact, “[a]fter Hiroshima was destroyed by an atomic bomb, it is reported that the first living thing to emerge from the devastation was a matsutake mushroom” (p. 202). In addition, lichens can “mine minerals from rock.” They also challenge our notions of near-death, as they can survive extreme conditions in a state of suspended animation and be “successfully resuscitated after ten years of dehydration” (p. 95). Fungi can filter polluted water and transform pollutants, restoring contaminated ecosystems. We could use them to break impossible things. We could also use fungi to build impossible structures. Their properties as materials are plenty: lightweight, fast-grown, insulating, water-resistant, fire-retardant, compression-resistant, stronger than concrete when bent. Perhaps it is time that we, humans, *go fungal*.

Although most of the mechanisms behind such phenomena are yet to be discovered and understood, Sheldrake’s descriptions enact that maxim of Goethean science (Amrine et al., 1987; Seamon and Zajonc, 1998), reminding us not to compulsively look behind the phenomena, as they, *explananda* in themselves, already are a great deal of the *explanans*. In other words, *Entangled Life* is the seat of a wealth of information that, instead of winding wool to be knitted as future mechanistic explanations, it weaves a rich cloth where things simply “appear to view” (the etymology of the word “phenomena”). Such disclosing is sufficient by itself, and in itself. In a way, Sheldrake’s book has the virtue of suspending the urge to search for *explanans* by remaining present to the wonders of *explananda* as such.

An Exhibit of Poetic Prose

Sheldrake’s pen is simultaneously austere and prosperous. His style is not only flawlessly factual but also compellingly poetic. A few more quotes are due: “Mycelium is polyphony in bodily form” (p. 61), “a body without a body plan” (p. 55). “Lichens are, in some sense, micro-planets — worlds writ small” (p. 93), they are “stabilized networks of relationships; . . . verbs as well as nouns” (p. 99). Psilocybin mushrooms “occur in abundance wherever mycologists abound” (p. 133). “[P]lants are socially networked by fungi” (p. 13). From cover to end, the book is a genuine blend of science and literature. As the French philosopher Henri Bergson (winner of the 1927 Nobel Prize in literature) put it, “the writer’s art consists above everything in making us forget that he is using words” (Bergson, 1920, p. 57). Sheldrake (who was born on the same day, different year, as Bergson) is blessed with the gift.

It is worth remarking that *Entangled Life* can be equally consumed by laypeople as well as by the most expert amongst mycologists. At the end of the book one finds a good forty pages of generous *Notes* in small font. Another forty pages of technical bibliography follow. There is so much more material to dig in.

Suspending Polemics

Not only does Sheldrake speak *about* the data, he also manages to make the data speak *to us*. Sheldrake has the rare ability to weave a net of descriptions that make the point without forcing the argument. The reader does not need to be convinced if they can decide to be converted. The argument, then, is somehow self-made and, much like mycelia, propulsive in every direction. Sheldrake does not (need to) engage in fight, polemics, preaching, strawmaning or clickbait statements. He is not trying to sell us anything; he is offering a gift.

In discussing psilocybin mushrooms in the context of the idea of the extended phenotype, Sheldrake crafts a remarkable paragraph, an exemplar of elegance, and an opportunity to read between the lines. It is worth quoting it entirely:

As Dawkins reminds us, how far we're willing to go depends on how far we're willing to speculate. How we speculate in turn depends on how we arrange our biases. "You think the world is what it looks like in fine weather at noon day," the philosopher Alfred North Whitehead once observed to his former student Bertrand Russell. "I think it is what it seems like in the early morning when one first wakes from a deep sleep." In Whitehead's terms, Dawkins speculates in fine weather at noon day. He takes pains to ensure that his speculation about extended phenotypes remains "disciplined" and "tightly limited." He is clear that phenotypes can extend beyond the body, but they can't be too extended. By contrast, McKenna speculates at dawn. His requirements are less stringent, his explanations less tightly limited. Between the two poles lies a continent of possible opinion. (p. 125)

A Sociological Remark

If neuroscience is in its adolescence (with its rapid growth, identity-seeking crises, niche-building varieties, ego-boosting attitudes, new tools craving, absurd conflicts and sweet confusions) then, as Sheldrake remarks, mycology may very well be in its infancy. Mycologists, much like teenagers living with their parents, still often have to share university departments with scientists studying other kingdoms of life. At the same time, one should not discount those amateur scientists who, like nineteenth-century natural philosophers — before the science and philosophy split-up, and before both became jobs, for better and worse (Lazebnik, 2018) — push the edges of knowledge outside academia, untouched by its pervasive and pernicious selection forces. Sheldrake's overwhelming account of what is known about fungi precisely reveals that virtually everything remains to be done. It is puzzling to realize how long the hiatus of research activity has strangely followed and preceded some of the most incredible discoveries about fungi. Playing a bit with the book's subtitle, we may say that *funding* too makes our worlds, changes our minds, and shapes our futures.

World Blindness

Sheldrake's book is literally about worlds hidden in plain sight, and how to see them. Referring to plants and mycorrhizal fungi, he remarks that "[w]e are unthinkable without, yet seldom do we think about them" (p. 138). Indeed, any theory of life is entangled with a theory of knowledge. The artist Ed Steed nails it in one of his cartoons: three human painters and a tree all paint a human skull on a stool; the humans paint the skull, the tree paints the stool. We see what is familiar, what interests us. How can we then experience other worlds? Is anthropocentrism doomed to anthropomorphism?

No matter how open and intendedly unbiased, scientific questions stem from our human "Umwelts" (the proper plural in German is *Umwelten*). The word *Umwelt* was used by the zoologist Jakob von Uexküll to refer to the "meaningful environment" of each living organism (von Uexküll, 1909). The concept is to be contrasted with the *Umgebung*, which denotes the "physical surroundings" (which are human abstractions). For instance, a lake is filled with H₂O (*Umgebung*) while the water in it is breath-able for the fish and drink-able for the cow (*Umwelts*).

James J. Gibson was inspired by von Uexküll when he articulated his theory of "affordances" as "opportunities for action" (Gibson, 1979). Perception is not of external objects independent of the perceiver, but of the actual relationship between both. The tree is climb-able for the squirrel, and cut-able for the carpenter. One can think of *Umwelts* as multiple universes. They are not parallel universes, though. They partially overlap. To put another example, the world of a squirrel and the world of a carpenter are tied together but differ greatly. They are different because for a carpenter a tree is an opportunity to make a chair, whereas for a squirrel it is a place to hide. They are entangled because if the carpenter cuts the tree, the squirrel must leave. *Umwelts* are often spatially nested too: we, humans, eat animals that eat plants that exchange nutrients with fungi all around and within them.

Every species has its own *Umwelt*, and one could even say that every individual organism within a species has its own *Umwelt* too. In humans, for instance, one can look at a partita and perceive a melody, whereas for a music illiterate person, it is just a gibberish bunch of lines, dots and weird symbols. How I see "the world" is not exactly how you see it. Much conflict, but also magnificence, stems from this. Our human ways of seeing easily hide the fungal ways of seeing the world, and their ways of acting in it. Indeed, some *Umwelts* are more alien than others.

Even if we have no way to experience what it is like to be the non-human living organism we study in the lab or in the wild, this is precisely one of the six impossible things before breakfast that any biologist worth their salt has to attempt at some point. Sheldrake reminds us that "McClintock emphasizes how important it is to acquire 'a feeling for the organism,' to develop the patience to 'hear what the material has to say to you.' When it comes to fungi, do we really

stand a chance? Mycelial lives are so other, their possibilities so strange. But perhaps they aren't quite so remote as they seem at first glance" (p. 76). Later in the book, Sheldrake asks: "Are we able to stand back, look at the system, and let the polyphonic swarms of plants and fungi and bacteria that make up our homes and our worlds be themselves, and quite unlike anything else? What would that do to our minds?" (p. 193). He is talking about scientific empathy, that is, about Johann Wolfgang von Goethe's tender empiricism (Wahl, 2005). Tender, delicate and gentle in contrast with Francis Bacon's unkind, harsh, even brutal predicament to torture nature until she spits out all her secrets. In his own words: "For you have but to follow and as it were hound nature in her wanderings, and you will be able, when you like, to lead and drive her afterwards to the same place again. . . . Neither ought a man to make scruple of entering and penetrating into these holes and corners, when the inquisition of truth is his sole object" (Bacon, 1620, p. 296).

Sheldrake's capacity to communicate all those "Fungwelts" makes him the modern von Uexküll of mycology. Sheldrake is a naturalist with the gift to make us experience, even if fleetingly (like when waking up from a dream we can barely remember but still taste it on our tongue), what it is like to be another creature. The challenge is "to talk about the life of other organisms without either reducing them to an it, or borrowing concepts traditionally reserved for humans" (p. 46), to understand them in their own terms. *Entangled Life* is literally a foray into the alien worlds of fungi.

Just by virtue of reading Sheldrake's book one is thus afforded a sort of epistemic prophylaxis (and treatment) against our very human biases when looking at nature. Truth then looks more like a kind of playful ecological adequacy than a self-absorbed pursuit of univocal correspondence.

Laboratory Life, City Life

Sheldrake presents a lucid appraisal of the contrast between laboratory life and science in the real world: "Lab biologists spend most of their time in charge of the piece of life they study. Their own human lives are lived outside the flasks that contain their subject matter. Field biologists rarely have so much control. The world is the flask and they're inside it. The balance of power is different. Storms wash away the flags that mark their experiments. Trees fall on their plots. Sloths die where they planned to measure the nutrients in the soil. Bullet ants sting them as they crash past. The forest and its inhabitants dispel any illusions that scientists are in charge. Humility quickly sets in" (p. 13). And yet real worlds are often not that real either. For those of us who have lived in the city during most of our lives, trees have unwittingly become a kind of urban *attrezzo* linearly planted every three vehicles so as to provide a minimal amount of greenness to the soulless tones of the inert ground and edifices that throng the landscape. We grow and

live (and die) disconnected from nature, only to frantically drive to it and dive in it during weekends or holidays.

The story does not look more promising when it comes to organisms from the different kingdoms of life. Not only have plants become a kind of water-demanding decoration in the eyes of the average contemporary person, but animals are either pets or simply resources (food supply, experimentation, avatars). When it comes to fungi, they are barely more than noticeable dirt (except when we eat their fruiting bodies in pizza or pasta). In turn, we see ourselves as more akin to erect animals than to fallen angels. We struggle through our own disenchantment with nature. The world used to be a garden crowded with wonders. It has now become a global supermarket for our own narrow consumption wants.

Even Gibson, the father of ecological psychology, considered plants like furniture. One is astounded to discover that, in arguably his major (and later) work, *The Ecological Approach to Visual Perception*, his pioneering vision to the study of perception is tainted with the capital sin of zoomorphism. In the first pages we read:

In this book, environment will refer to the surroundings of those organisms that perceive and behave, that is to say, as animals. The environment of plants, organisms that lack sense organs and muscles, is not relevant in the study of perception and behavior. We shall treat the vegetation of the world as animals do, as if it were lumped together with the inorganic minerals of the world, with the physical, chemical, and geological environment. Plants in general are not animate; they do not move about, they do not behave, they lack a nervous system, and they do not have sensations. In these respects they are like the objects of physics, chemistry, and geology. (Gibson, 1979, p.7)

In sum, nearly a century and a half after Charles Darwin and his son Francis Darwin wrote *The Power of Movement in Plants* (Darwin and Darwin, 1880), we are still struggling to cure our “plant blindness” (Wandersee and Schussler, 1999), not to mention our “fungus blindness.” Plant scientists suffer the zoomorphism of neuroscientists (as the ongoing controversy in “plant neurobiology” attests) while, in turn, mycologists struggle to convince both plant and animal scientists to look at fungi from a myco-centric point of view. We could all contribute to take the fog out of each other’s eyes.

Fungi as Processes, Rather than as Things

In passing, Sheldrake makes a claim with great philosophical implications for biology writ large. When discussing mycelium, the network structures formed by most fungi, he writes that they are “better thought of not as a thing, but as a process” (p. 7). He does not explicitly elaborate further, except from brief remarks later in the book: “You can think of your life like this. The growing tip is the present moment — your lived experience of now — which gnaws into the future

as it advances. The history of your life is the rest of the hypha, the blue lines that you've left in a tangled trail behind you. A mycelial network is a map of a fungi's recent history, and is a helpful reminder that all life forms are in fact processes, not things" (p. 60). Although one would have liked to read some speculations about the tension between substance and process ontologies in science (and how fungi can tilt the balance towards the latter), Sheldrake prefers to remain concrete, abstaining from abstractions. Nevertheless, those of us who are trying to bring back Alfred North Whitehead's process thought to the future (Gomez-Marin and Arnau, 2021) are excited to see the opportunities that fungi bring to the discussion.

In sympathy with Whitehead's method of "imaginative leaps," Sheldrake remarks that:

[i]n scientific circles imagination usually goes by the name of speculation and is treated with some suspicion Part of writing up research is scrubbing it clean of the flights of fancy, idle play and thousand trials and errors that give rise to even the smallest of findings. Not everyone who reads a study wants to push their way through the fuss. Besides, scientists have to appear credible. Sneak backstage and one might not find people at their most presentable. (p. 21)

How science is actually done is hardly ever told to young researchers or to the general public.

Sheldrake's mycology and Whitehead's (1929) cosmology deeply resonate with ecology, understood as the shift of focus from organism and environment to the study of their relationship. One cannot understand living organisms devoid of their worlds. Nature is internally related. Although biologists know it, they often choose to ignore it, and then they forget it (and yet "if you look at the parts of the lichen, you don't see the lichen itself" (p. 93)). The empirical consequences of ontological and epistemic reductionism immediately follow: "Of course, biologists often destroy the organism they hope to understand" (p. 189). As Wordsworth (one of Whitehead's favorite poets) put it, we murder to dissect.

Minds Beyond Brains

Non-neural organisms are underrated. Sheldrake's book is a plea for the fascinating behaviors of brainless organisms, in particular those outside the animal kingdom. Sometimes neuroscientists seem to believe that rats are small humans and flies are cheap mice. Beyond laboratory animals and homey pets, there is just a plethora of fascinating organisms out there: slime molds, tardigrades, paramecium, octopus, *Mimosa pudica*, *Psilocybe cubensis*.

Gilles Deleuze and Felix Guattari's rhizomes (Deleuze and Guattari, 1980) come to mind in Sheldrake's biological tales; a decentralized mode of living, not only brainless but also headless and heartless. Sheldrake is cautious here (perhaps

unnecessarily so): “Whether one calls slime moulds, fungi and plants ‘intelligent’ depends on one’s point of view.... Too often they are thought of as the inert backdrop of animal life. Yet many are capable of sophisticated behaviours that prompt us to think in new ways about what it means for organisms to ‘solve problems,’ ‘communicate,’ ‘make decisions,’ ‘learn’ and ‘remember’” (p. 17). In the face of common sense and recent scientific evidence, the null-hypothesis has turned into a dull-hypothesis. Why would only humans (and maybe some animals) achieve such feats with proper minds? Where’s the burden of proof?

Fungi and plants cannot run like animals, so they need to figure out other ways to find resources and escape from dangers. In order to go from A to B, they g(r)o(w) from A to B. It is fascinating to simply compare different modes of eating across kingdoms of life: as opposed to plants, fungi find food rather than make it; as opposed to animals, fungi digest it where it is rather than put it inside their bodies. In Sheldrake’s prose, “animals put food in their bodies, whereas fungi put their bodies into food” (p. 57). Fungi, like plants, are electrically excitable, “analogous to the electrical impulses in animal nerve cells” (p. 7). Based on Darwin’s root–brain hypothesis, the controversy in plant biology has grown in the last years (Baluška et al., 2009): roots behave as lower animals and their radicles as brain-like organs. Even more so recently, in the light of the fascinating but currently unreplicated evidence that plants can perform associative learning. Fungi are still quite under the radar, maybe because they are too weird to be put side by side with animals.

Scientists have a tendency to commit what I call “the 3M fallacy”: conflating metaphors with models, and models with metaphysics. “Are we able to release ourselves from these metaphors, think outside the skull ...?” (p. 192), Sheldrake asks. It is indeed an arduous task. *Entangled Life* should be a book compulsory for any neuroscientist, especially for those starting a doctoral program. At least the default position would not be a dogmatically narrow neural one as to the possible expressions of mind in life. “Whether in forests, labs or kitchens, fungi have changed my understanding of how life happens. These organisms make questions of our categories and thinking about them makes the world look different. It was my growing delight in their power to do so that led me to write this book” (p. 15). In turn, let us hope that the reading of this book delights scientists with the power of fungi to question their human-centric categories.

If Aliens Showed Up Tomorrow

It is not inconceivable that one of these days the news could announce that extraterrestrial life has been finally discovered. How would it feel like to be in the presence of an alien life form? Would it make such a big difference were it to come from within or without our planet? Why? Fungi is the limit case of alien life on Earth. Although they were here long before us, and sustain much of life on earth, fungi seem not to belong to this planet. Perhaps Sheldrake’s book is preparing

us for a looming alien encounter. He chose to emphasize the interconnection of living organisms rather than their weirdness. And yet his book could have been entitled *Alien Life*. If we go back to Richard Dawkins and Terence McKenna, it is worth noting that aliens are for the most part reported to be seen during the night, rather than at noon.

Let us note that what we call “altered” states of consciousness are anything that differs from our habitual, alert, caffeinated state of mind. Our social rituals in academia invariably alternate between “coffee breaks” to get going and “beer hours” to get loose. The former pumps our analytical mind when it is time to work, the latter inhibits it when it is time to mingle. And yet, neither of them actually transform our mind. We remain unchanged.

What about psychedelics, whose etymology literally means “mind-manifesting”? As McKenna (a good old friend of Rupert Sheldrake, who is Merlin’s father) would say (attributing the quote to Timothy Leary), psychedelic substances occasionally cause psychotic behavior in people who have *not* taken them. Now, thanks to Merlin’s book, if we don’t feel like eating mushrooms, we can enter into their worlds through his words. Ironically, forty years after Rupert’s book was deemed “a book for burning” by the elites of dogmatic scientism (Maddox, 1981), Merlin’s has definitely become “a book for eating.” The world teems with more light as we read. *Entangled Life* is a delightful psychedelic trip.

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