

# TOWARD A RADICAL MYCOLOGY

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*Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect.*

—CHIEF SEATTLE, 1854

All life is interconnected. This is the primary lesson that fungi teach. Through their mycelial networks—those decentralized webs of white tissue often found beneath logs and rocks—mushrooms and other fungi permeate the world, connecting and turning its innumerable cycles to demonstrate that every act carries an immeasurable chain of effects. Possessing traits and abilities not found amongst plants, animals, or other microbes, fungi fill unique roles in the stewardship and evolution of Earth. And as builders of the soil web and grand healers of the land and sea, they lie at the heart of the world and offer a perspective that cannot be equated.

Through the mycelial lens, the haste of modern human life slows, exposing Nature's most refined principles, which our ancestors understood so well. When one offers the fungi time for study, even their smallest moments expose lessons on how to embody these principles, and thereby find new means for respecting and connecting with the natural world. Along with these insights, the benefits of integrating fungal cultivation into daily life can enhance the design of one's home and town in ways that are more supportive of the culture and environment at large. To those able to see them clearly, the fungi offer these and many other vital gifts.

Working with fungi is not a new chapter in the human story, but an ancient relationship woven into our foods, medicines, and customs. They are the world's greatest and oldest teachers, timelessly spawning a wisdom that can just as readily uplift habitats as unite a community. Many of their solutions are practical; others are philosophical. But considering the youth of mycology, all of their offerings present an untold potential for enhancing the health and resilience of any living system.



# A Neglected Megascience

Two facts become quickly apparent for anyone studying mycology: 1) fungi are incredibly important and fascinating and 2) nobody knows about number 1. For no clear reason, fungi have been largely dismissed amongst westerners—a mere oddity to be feared and forgotten. Whereas plant growth and the concept of “germs” and bacteria are taught to children at a young age, mycology is essentially absent from grades K–12 and above. Even at the graduate level, when fungi are presented in natural science courses it is often with a cursory assessment that emphasizes their misunderstood actions as “pathogens.” With minimal representation in the media, this mycological knowledge gap tends to remain in place outside of one’s schooling, leaving many westerners uninformed and unaware<sup>1</sup> of the untold potential that mycology offers. Thus, as those in the west never hear, learn, think, or talk about fungi, these organisms become increasingly easy to ignore and buried beneath layers of maligned mystery.

In the academic world, this problem is almost worse. Paradoxically, fungi are recognized for their ubiquity and importance amongst biologists, and yet mycology has remained a “neglected megascience”<sup>2</sup> throughout its short, 250-year history. Whereas most university departments are under constant threat of budget cuts, the small and scarce mycology departments in western universities face closure and a subsequent end in the transmission of local mycological knowledge. While it is notable that countries such as China, Mexico, and Brazil are contributing a significant amount of contemporary research into mycology, the majority of living and dried fungal reference collections, monographs, reference books, and key databases are still found among the declining mycological institutions of North America and Europe. In effect, the higher levels of mycological information remain tenuously locked in expensive textbooks and scattered classrooms, inaccessible to the vast majority of the world.

Where university departments do remain open, traditional whole-organism mycology has largely fallen by the wayside in the advent of genetic analysis. As research increasingly focuses on deciphering code on a computer, the tangible ecological roles of fungi, along with their field identification, loses further visibility amongst academics. Such a trend threatens many other naturalist-dependent subjects, including mammalogy, ornithology, ichthyology, herpetology, entomology, bryology, and taxonomy of vascular plants. But though these fields hold many unanswered questions, the poverty in mycology relative to its potential importance suggests that it is one of the biggest information gaps—if not *the* biggest—in the natural sciences. So as the field shrinks and elder top-level mycologists retire, the future of their knowledge and resources—and western mycology as whole—becomes increasingly insecure and at risk of ending before it has truly begun.

## THE SMALLEST SPORE

Looking at many trends in the sciences, it is clear that the decreased emphasis on whole-organism research in mycology and other fields is not simply an effect of advances in technology, but of underlying assumptions that permeate the scientific community and western culture in general. Compared to the interdisciplinary approach that fueled the research of many of history’s great scientists, today the sciences are increasingly fragmented and largely unfamiliar with the finer details of each other’s work. Many researchers in universities are so specialized within a tiny subset of their overarching department that it is difficult for them to be well-versed in the intricacies of other research projects in their department, let alone other departments, universities, or the scientific community at large.

This splintering has not been intentional amongst scientists, but has come about as the result of the *reductionist* scientific model, which attempts to understand the world by analyzing its smallest parts. Though this model has arguably created an efficient, assembly line style approach to gathering information, it has largely left behind the importance of connecting the dots that each field uncovers. In effect, reductionism is a double-edged sword, with greater knowledge accumulating on one side and incoherence spreading across the other.

As this trend proceeds, those uneducated in the sciences are left with few resources to easily

validate a given field's latest finding or to determine if it is considerate of the multiple other sciences and natural phenomena it may influence or be influenced by. This double-checking amongst *citizen scientists* is needed, for if a given conclusion is not holistic in its analysis, it may be used to justify public and private policies with unforeseen and potentially detrimental effects. And yet, such validation efforts are demanding as a thorough investigation of a given subject implies sorting through a large amount of scientific literature written in inaccessible language and contained within expensive journals and databases. With little time to interpret and integrate this data—let alone develop a rigorous interdisciplinary review—the average person becomes more inclined to leave its analysis to the experts.

Even amongst top-level researchers, problems can be created due to the reductionist method. The splintering of knowledge often creates nuanced, field-biased perspectives that can lead to conflicting interpretations of data sets, common phenomena, or the larger meta-systems that govern the details researchers pick apart. Such discrepancies may remain unresolved for years, even amongst experts in the same field. This is especially common when new findings contradict longstanding models. In many instances, scientists well-versed in an accepted theory will reject a radically new paradigm—regardless of its logical or empirical validity—simply because the new model goes against what has long been taught.

In effect, the whole of science moves forward slowly, often at the rate at which one generation replaces the last one and updates the textbooks. In the interim, challenging research is unable to gain a seat at the theoretical bargaining table, leaving the uninformed non-scientific community to model their worldview with potentially outdated paradigms. In the globalized culture afforded by the internet, this continuity is further reinforced by the coverage and acceptance that some theories obtain, regardless of their lack of rigor or potential long-term impacts on the health of a people or the planet.

## WHERE TO LOOK?

The cultural effects of such a narrow perspective are many. By presenting the world as a collage of fragmented subjects, the connections between ideas, humans, and the environment become increasingly difficult to perceive. Reductionism creates an unnatural separation effect in the mind in which objects and topics that are inextricable from one another in the real world can be intellectually split apart. In the sciences, this enables humans to act as though they are separated from Nature by attempting to study it from the outside. For the culture at large, reductionism can justify actions that imply human superiority over the rest of the world, an anthropocentrism in which exploitation of the environment can be interpreted as a necessary act.

Over time, the heavy-handed voice of reductionism comes to drown out traditional perspectives, customs, and cultures. While at the same time, the fast tracking of social, environmental, and economic models codified by science increases the potential for flawed theories to slip through the cracks of intellectual filters. Though some of these new models may come from well-intentioned scientists and policy makers, others may be devised by commercial ventures seeking to replace the fading customs with an imposed culture based on consumerism and the unsustainable extraction of natural resources. Such imposed cultures tend to reinforce the reductionist mindset that enables them to flourish, often with an increased dependence on technologies that reduce necessity for the direct transmission of knowledge or other real world interactions. In the end, an unnatural framework is built into the mind of humanity, one in which the universe can be seen as a machine, forests can be replaced with monocultures of chemical-dependent crops, and fungi can be rejected for a lack of any apparent value.

When a culture becomes fragmented, the potential develops for its structure to be reinterpreted and its pieces repositioned. Such redefining of society occurred when cultural theorists and global oligarchs used Herbert Spencer's (1820–1903) interpretation of Darwin's evolutionary model to describe society as nothing more than a struggle for the “survival of the fittest.” Through the reductionist mindset, this interpretation was used to justify the segregation and separation of people from each other as well as through imposed degrees of rank. The resulting concept of

“social Darwinism” was later used as a scientific justification for class divisions, anthropocentrism, hierarchical governmental structures, and the rise of neoliberal free market economics in which only the strongest survive.

Such unnatural human-designed models quickly lose validity through a study of the ecological roles of fungi. Just as anarchist philosopher Peter Kropotkin (1842–1921) pointed out nearly a century ago, the concept that life is a constant fight for the next rung in the evolutionary ladder is contradictory to the everyday experience of Nature. Communication and collaboration amongst animals, plants, and microbes is vital to the health of each individual as well as to the entire ecosystem on which they all depend. As the natural world’s grand connectors, mycelial networks exemplify this universal principle of mutual aid. They act as a clear model for connecting communities and ideas to help reverse the problems of reductionism. For though reductionism provides valuable and unique means for measuring the world, it is, like all belief systems, inherently lined with limitations, unexamined assumptions, and design flaws. To complement its benefits, reductionist frameworks must be balanced by the insights provided by alternative modes of learning.

This is no small order. Acceptance of the reductionist model has become so fundamental to modernity that its vast influence is largely invisible—a form of conditioning that hides in plain sight. Indeed, to even question its infallibility is likely to receive mockery and condemnation from people within and outside of the scientific community. But to hold close to reductionism, or any belief system, automatically precludes the ability to consider opposing views. And as one becomes increasingly affirmed in a singular mode of thinking, they also tend to become decreasingly tolerant of alternative perspectives, an inverse relationship that is inherently self-limiting to one’s intellectual freedom.

When we confront the foundations of our systems of learning and challenge the assumptions that underlie the design of culture, new opportunities for engagement between people and their environment are found waiting. Windows into the world’s unlimited potential open, revealing that mediation of experience is untenable and the only limiting factor to innovation is creativity. Indeed, experimentation is always needed to find better alternatives. Without risk-taking, we’ll never discover what’s possible. Just as any historian of science knows, major advances in science are not made in small steps, but by leaps and bounds that are largely guided by intuition, chance, and a willingness to challenge dogmas. Often, these shifts come about by curious hobbyists. As Aristotle once stated, “It is the mark of an educated mind to be able to entertain a thought without accepting it.” Or, in other words, one should be both skeptical and open-minded, just not so open-minded that their brain falls out.

Just as many of history’s greatest civilizations have likely thought of themselves as the pinnacle of existence only to later collapse,<sup>3</sup> so too must the superiority of reductionism as an epistemological model be amended, lest it topple under the weight of its own assumptions. Ultimately, there are many facets of the universe that humans cannot measure, have no conception of, and will never understand, a fact that questions the very notion that one can truly come to know anything. The willingness to be humble in the face of such mystery is perhaps the greatest challenge in the scientific community, where many suffer under what cosmologist Hermann Bondi referred to as the “lure of completeness”: a craving for certainty that leads to irrational and blind dogmatism.<sup>4</sup> Such shortcomings must be overcome by all who wish to develop new cultural paradigms that recognize, honor, and integrate the patterns and principles of Nature—laws of the universe that fungi express completely. This is not always an easy process but, as when overcoming any challenge, often results in many unforeseen and far-reaching positive effects.

## **Mycology for the New Millennium**

In the field of mycology, this open-mindedness is crucial. As one of the youngest natural sciences, discoveries are constantly being made about fungi that dispute long-held beliefs. As this science continues to develop over the coming decades, mycologists entering the field must recognize that this limited understanding of fungi provides anyone with some degree of training the unique opportunity to significantly add to this growing knowledge base. Unlike most sciences, mycology is

one of the few fields that the citizen scientist can actively contribute to.

Over the last 50 years, the major interface between academic mycology and the general public in North America has been through the devout efforts of amateur (from the Latin *amare*, “to love”) mycological societies. During that time, these stewards of knowledge have significantly helped maintain public interest in mycology amongst westerners, while also spawning generations of committed field mycologists. Today, mycological societies are making concerted efforts to document the ecology and distribution of macro fungi (mushrooms), a valuable form of citizen science that almost anyone can support. But as these efforts heavily rely on the support of mycology departments in universities and botanical gardens, mycological societies also face a degree of insecurity due to the tenuous state of their supporting institutions. And with few resources for learning about fungi beyond mushroom identification readily available, many become disheartened to discover that, apart from the information provided by these societies, there is no easy means for becoming a mycologist—there is no royal road to mycology.

It is for this reason that the Radical Mycology project developed a decade ago: to create a people’s mycological movement that is not only versed in the cultivation of fungi and the applications of mycology, but also in how to actively and significantly contribute to the advancement of the science as a whole. Whereas humans have been cultivating plants and tending animals for at least 10–12,000 years, mushroom cultivation only began around 2,000 years ago in China. Refined, lab-based practices developed less than 100 years ago, and some of the advances in kitchen-based cultivation described in *Radical Mycology* are less than a decade old. Further, these developments in home mycology have made the science more accessible and less dependent on expensive and centralized technology than ever before.

With such an exponential growth in our ability to work with fungi, it is impossible to imagine where this field is heading. To keep such potential inaccessible—or worse yet, to limit the variety of perspectives with which to view fungi—is an imposed cultural limit that stifles the health of current and future generations. Just as when electricity was first discovered and no models existed to explain its novel phenomena, so too will the mycologists of today be central in the creation of unprecedented paradigms for not only understanding fungi, but also the individuals, ecosystems, and life cycles that fungi sustain.

Along with various practical skills, the Radical Mycology perspective presents means to thoroughly integrate the habits of fungi into one’s way of being. Fungi challenge us to look beneath the surface, live on the edge, explore the unknown, adapt, respect imperfections and differences, and to always look for another way forward. Through the mycelial lens, one can regain the ability to see the world as a whole derived from various influences and perspectives—different branches in the network assessing hidden bonds. As one learns to see innumerable connections in the world, the tools for addressing complex challenges can no longer be placed in isolation, just as perspectives of seemingly opposing forces can be found to complement one another, especially when both seek remedy in the world.

Radical Mycology is thus a mycocentric approach to building the three major pillars of social change: education and awareness building around important issues; resisting, slowing, and stopping ineffective or disastrous social systems; and designing functional and appropriate alternative systems that increase quality of life. Through enacting these facets, Radical Mycologists stand as a voice for the Earth and for the fungi. Such acts help reduce the disempowering guilt that can come from participating in western culture’s luxuries. Instead, Radical Mycologists spread the *mycopsychology* of living devoted to and bonded with Nature in a way that is affirming, intelligently self-guided, and resilient against unforeseen and inevitable change. This must be an intentional act, however. For though the fungi can show us how to grow, they cannot change the false paradigms that have steered humanity off course. Only humans can make those changes, and often only with significant effort.

*Radical Mycology* is therefore a solutions-based approach to tackling these challenges through a framework that is ethical, pragmatic, technical, cultural, and philosophical. By creating greater access to mycology and, to various degrees, the other sciences that mycology intersects, this text is intended to support individuals, families, communities, and social movements that actively seek a higher quality of life through prefigurative politics. To advance any social movement, an under-

**PREFIGURATIVE POLITICS:** Modes of organization and social relationships that strive to reflect the future society being sought by the group.

standing of the various sciences that influence daily activities must be understood. As one of the most overlooked tools in the change-maker hardware store, mycology stands as one of the last uniting factors in the design of better living and social systems—a spore whose time has come.

## **RADICAL MYCOLOGISTS WITHOUT BORDERS**

Though the information in this book can be applied in a variety of ways, one of the most historically inaccessible skills presented is the means to cultivate fungi year-round on nearly any urban or agricultural waste. Fungal cultivation leads to improved management of finite resources, the production of whole foods and high quality natural medicines, greater support for local food movements and economies, job training and employment opportunities for low-income youth and urban residents, means to transform vacant tracts into productive spaces, and the ability to reduce the effects of pollution in contaminated sites. Cultivation also reinvigorates the historical connections to food that humans once commonly shared through foraging and tending crops. In effect, local mushroom cultivation systems reduce dependence on imports and the normally high cost of mushrooms, while also producing wealth, diversity, means for exchange, and the preservation of memory.

When Radical Mycologists work together to form groups, they can share these skills with various facets of their community and enhance the overall resilience of the local culture. Mycology is a uniting science, one that I am constantly surprised to find draws people from all backgrounds together. By working with strangers, neighbors, friends, and symbiotic organizations, Radical Mycologists can use their knowledge to not only increase food or reduce pollution, but they can build new intersections in their community—new mycelial webs—that string together once-distanced people across a town, bioregion, or planet.

Through these connections, greater efforts can build within the community to appropriately apply mycology in efforts of mitigating pollution in the environment to regenerate damaged habitats in both rural and urban environments—burgeoning applications of fungal cultivation that need to be refined by grassroots organizations. Such projects, along with educational workshops and forays, enable Radical Mycology groups to raise awareness around the importance of fungi as well as to place that knowledge in a context that is relatable, tangible, and overall effective in creating positive change.

To spread these benefits most effectively, Radical Mycologists must determine where their skills are most needed. This requires the ability to first identify the challenges that face present and future generations and to address them in a manner that is critical and honest as well as constructive and inspiring. Once a problem has been articulated and its terms defined, resources and skills can be drawn together to create viable alternatives and solutions. Undoubtedly mistakes will be made along the way, but by trying new models and learning-by-doing, one may discover solutions hiding where they were least expected.

Radical Mycologists of today stand on the shoulders of innumerable mycological giants, graced with the inheritance of knowledge gathered over the last few centuries and the duty to protect, honor, and build upon this fragile science. Fungi act as central agents in all cycles of life, and it is time that they begin to form a central role in all aspects of human life. As this knowledge and need ripples out, I envision teams of Radical Mycologists Without Borders travelling the globe, sharing their skills and discovering new means of working with fungi. Where one Radical Mycologist trains ten, those ten can train a hundred, and from them, a thousand—so it is that the mycelium spreads.

Thus, from this humble position on the edge of the unknown, let us now dive into the world of fungi to find that it is not a complex puzzle that can or will ever be entirely solved, but rather a place of rich complexity waiting to be experienced, explored, and embraced.