

## TWELVE READINGS ON THE LICHEN THALLUS

# I. Face in the Mirror

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**Figure 1.** *Vulpicida canadensis*: fungal farmstead? Photo by Tim Wheeler.

*“Lichens are fungi that have discovered agriculture.”*

**I** REMEMBER it well, that sunny autumn afternoon down in the canyon, about an hour from home. I had been resting awhile under an old pine tree on an open grassy hillside and, happening to look up, I noticed a brilliant yellow clump of *Vulpicida canadensis* clinging to a dead branch just overhead. Lichenological sunshine.

Who can say why certain questions come to visit when they do? I know I can't. What I *can* say is that the existence of this particular lichen on this particular branch somehow struck me as deeply enigmatic. A lichen, after all, is part fungus and part alga, the first a denizen of the dark, the second a citizen of the moist. And yet here they both were, a fungus and an alga, hanging out in lichen guise on a sun-bathed pine branch on one of the driest slopes in the Clearwater

Valley. And not just making do, mind you, but positively *thriving* – as witness all those big brown apothecia staring back at me. What kind of relationship between a fungus and an alga could possibly make such a thing possible?

This wasn't the first time I had found myself asking questions of this kind. My best says-I-to-myself response to date was that a lichen must be a kind of fungal greenhouse, say an “elegant culture chamber for photobiont cells,” as Rosmarie Honegger was later to put it. And yet I'm bound to admit I was never quite satisfied by this way of putting the matter. Two reasons, I suppose. First because it seemed to give all the initiative to the fungus, none to the alga. And second because it seemed to imply a kind of genial environmental stability quite out of touch with the wild micro-

climatic fluctuations that constitute the basic operating environment of most lichens – and that seem to be required for their establishment in the first place.

So anyhow there I was, nested on that particular grassy slope on that particular afternoon in late September, staring up at that particular lichen thallus: *Vulpicida canadensis*. The only sound, I recall, was the sound of rushing water from somewhere below. Then suddenly it came to me, suddenly I had it, satisfactorily for the moment, and more or less problematically ever since. Suddenly I “knew” that what I was looking at, the secret fraternity within the thallus, the thing staring me in the face, could really only be one thing: a fungal farm. Lichens were fungi that had discovered agriculture.

That was in 1990. A few years later, in 1992, I floated my little epiphany in the popular field guide, *Plants of Coastal BC*. Nothing. In 1993 I published it again, then in 1994 yet again – this time in slightly expanded form in an article for *Nature Canada*. Still nothing. Only in the late '90s did the lichens-as-fungal-agriculture analogy finally begin to take off – thanks largely to its inclusion in the much-visited Lichens.com website created by Sylvia and Steve Sharnoff for their *Lichens of North America* project with Ernie Brodo. From there it found its way, in 2001, into Vernon Ahmadjian's fascinating paper, “*Trebouxia*: reflections on a perplexing and controversial lichen photobiont,” as well as into William Sanders' classic piece on lichens as fungal “plants.” Nowadays one notices it popping up all over – both within lichenology and outside of it, as for example in Don MacKay's collection of essays on nature poetry, *Vis-à-Vis*, and in Richard Dawkins' masterwork, *The Ancestor's Tale*.

All this would be gratifying in the extreme, except for one small detail. I no longer see the world – and lichens in particular – quite the way I did back in the early '90s. Nowadays I doubt if anybody would catch me describing lichens as fungi that have discovered agriculture. To be clear, it's not that I no longer think lichens are basically fungal farms – I find it hard to think of them any other way – rather it's that I no longer think of lichens as fungi. Fungal, yes. But fungi? I think not.

Forgive me, but here I need to introduce a certain age-worn analogy about a chocolate cake. (If you passed Philosophy 101, please go directly to the next paragraph). A chocolate cake, of course, is made up of certain ingredients in certain proportions: two eggs, a cup of flour, a half cup of milk, four tablespoons of cocoa, and so forth. But few of us, if asked to imagine

a chocolate cake, would conjure up a thought bubble consisting, for example, of two eggs, a cup of flour, a half a cup of milk, and four tablespoons cocoa. What would come to mind instead would surely be the full meal deal: a cake. My point here is that our tendency to think cake rather than ingredients is strictly speaking neither right nor wrong: it's simply a matter of emphasis, a question of perspective. In the case of a chocolate cake, age-worn tradition – enshrined in fact in our language – inclines us to emphasize the whole rather than the parts. In a certain very limited sense one might almost say that what we're focusing on here is emergent property: something that not only arises from its parts, but is somehow something *other* than the sum of its parts. Now try thinking fruit cake instead.

This brings me to the sixty thousand dollar question: Why do lichenologists find it so exceedingly difficult – impossible might be more like it – to provide a good, clear, watertight definition of the word “lichen”? (The most intuitively satisfying definition to come across my desk to date is that lichens are whatever gets studied by lichenologists). Many would argue it is simply because lichens, far from being a taxonomic group, the way mosses are, or mammals, are in fact an ecological one: a dietary strategy, say, on the part of certain fungi for certain algae and/or cyanobacteria.

Point taken. And yet surely the trouble with lichen runs a little deeper than that. For my money, it at least partly resolves to the interesting fact that lichens, being dual “organisms,” occupy an intermediate position along the continuum of integration that separates organism from ecosystem. On this subject I'll have more to say in a future essay; but for now let me simply call attention to the no less interesting fact that eukaryotic organisms are likewise ecosystems, or at any rate ecosystemic – every mitochondrion, say, being a genome within a genome – and as such necessarily occupy a place along the same continuum. But of course with this difference: that whereas the composite nature of most macroscopic life lies buried deep within the cell, in lichens it lies just below the surface, for any and all to see.

The sheer conceptual beauty of the lichen enterprise – also its challenge to human perception – seems to me to reside in the kaleidoscopic ease with which it lends itself to being thought about from multiple perspectives: lichen as dietary strategy of certain fungi; lichen as range extender for photocells; lichen as controlled parasitism; lichen as mutualism; lichen as fungal agriculture; lichen as fungal greenhouse; lichen as gall; lichen as culture chamber; lichen as symbiotic pheno-

type; lichen as organism; lichen as ecosystem; lichen as emergent property. It was Ludwig Wittgenstein, I believe, who first famously called attention to the arresting incapacity of the human mind to entertain two perspectives simultaneously – as witness, for example, his drawing of the duck-rabbit (Figure 1). Toggle back and forth as often or as rapidly as we will, the result is always the same: what comes into focus for us is duck *or* rabbit, never both together. True, the perceptual difficulties posed by the lichen consortium tend to be more conceptual than visual, yet I do think the duck-rabbit drawing illustrates what I take to be a curious, yet perhaps defining feature of the human condition: our unselfconscious propensity for emphasizing the single perspective over the many possible ones: a cornerstone, surely, of all human cultural identity.

Researchers working nowadays within reductionist traditions are naturally inclined to contemplate the lichen consortium largely in terms of its component parts, whether fungus or alga or cyanobacterium. And granted it's not hard to justify our current majority emphasis on the lichen fungus – at the expense, notice, not only of the photopartner, but more particularly of the lichen as a whole. Still we would do well to consider the possibility that we have been predisposed to this emphasis at least in part by a seemingly tacit assumption that having majority status in terms of biomass confers upon the lichen fungus majority status in terms of function. Yet is it really true to say that

a lichen is just a fungus? Consider this: that were the lichen consortium more fully integrated, more fully organismic in its inner presentation, we would surely be much more inclined to give at least equal weight to its emergent existence as a composite organism. As a cake, that is, and not merely the flour, eggs, milk and so forth that went into its making.

It is sometimes said – with good reason, I think – that definitions can reveal as much about those who posit them as they do about the things being defined. Next time you pause to contemplate a lichen, consider the strong likelihood that whatever it is you see staring back at you – fungus, alga, thallus, parasitism, mutualism, agriculture, gall, growth chamber, or farmstead – in some way reflects the particular mindset you bring to it; that what you're looking at is really a face in the mirror; and that the face in the mirror is very much your own.

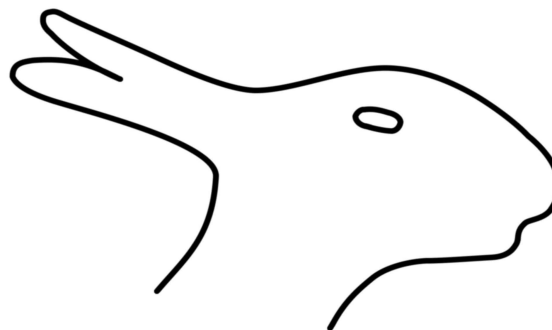


Figure 2. Duck-rabbit image