ily cere-
cahier

toward a symbiotic way of thought

vincent zonca

Lichens

Toward a Minimal Resistance

Vincent Zonca

Translated by Jody Gladding

Preface by Emanuele Coccia

polity

a few of your iodized ink spots (September
the dahlias in the gardens classes about to begin again
and all the buzzing difficulties of this year
of the unexpected
Marie-Jo returns the car the trunk already empty)
like yellow and gray lichens on the granite
[...]
pages
lines thighs and time
spots lichens[60]

The organic model for describing the way text functions is not new, but the symbiotic model is. It allows a dialogic ideal, both intertextual and intermedium, to be formulated, permitting reciprocal "transits" between two artists united in the ecosystem of the page.

A "Third Place"

The nineteenth-century concept of "symbiosis" (the "algo-lichen hypothesis") made it possible to describe the double nature of lichen, observed on the microscopic level. It allowed for the transition from a unified and universal concept of the biological individual (the "lichen being") to a plural and shifting definition, an ensemble of parts.

This deconstruction of lichen has resulted in its fragmentation into something like building blocks. There are the fungus, algae, yeast, and microbes that cohabit in the same structure, each with its own specialist in the scientific world. This interpretation, though necessary for better understanding lichen, has had the gradual effect of favoring the perspective of the fungus. The lichen is supposedly only a "nutritional strategy" for the fungus, a "fungal intention" in the same way as other fungi might cohabit with tree roots or decomposing matter. In 1961, this *reductionist* positioning, made possible by the microscope, resulted in the

classifying of lichen within the kingdom of fungi: these were "lichenized fungi" and lichens were named according to the name of the fungal partner. Henceforth, lichen as the whole ensemble went nameless; it had no name as such but bore the name of the main fungus that was part of it. In designating the whole by one of its parts, the scientific names of lichens are, in fact, synecdochical – they have thus become partial in both senses.

This has its virtues on the level of taxonomy (the classification of species) and general understanding. Now "lichenized fungi" are integrated into one clear realm, separate from plants, and are distinguished into twenty thousand species of fungi, each with its own phylogenetic path.

Such a postulate raises certain questions however. First of all, this reductionist bias is ... reductive. Lichens are just as much algae (which are themselves plants), they bridge the wide gap between the realms. Taxonomy does not allow lichen to be classified as one entity, but only from the perspective of the fungus on a microscopic level. Moreover, the prevalence of the fungus within the symbiotic whole may be debatable. Although it represents the largest part of the biomass and often gives the lichen its form, although it may be the one who pulls the strings in this suspect mutualism (through enzymes), although, finally, it allows for more precise classification (more than twenty thousand species of fungi as opposed to one hundred algae identified within lichens), these criteria are relative. Lichen could also very easily be viewed from the perspective of the algae. Algae play a major role in how lichens function (they are responsible for photosynthesis). Furthermore, the species of lichenized algae have a greater autonomy than the fungi. These single-cell green algae can live in the absence of their mycobiont. That is the case with those of the *Trentepholia* type that are seen on the leaves of bushes (coffee trees, pepper plants) or as reddish crusts on moist walls of houses. These same algae can also participate in symbiotic associations with other living beings (liverwort, water fern). Lichenized fungi themselves cannot live alone. In a similar fashion, the photo-symbiotic partnership is

necessary only for the Roscoff worm, which cannot live without its algae, whereas the algae can live alone in a marine environment.

From this perspective, the lichenic whole is no longer a "species" in the biological sense of the word, except as reduced to its mycobiont. The taxonomic notion of species does not allow for conceiving of this type of symbiotic organizations, of unities on this scale.

Nor does the reductionist perspective allow for thinking effectively about lichen holistically, for considering it as a coherent system that differs from the sum of its parts.

In his thesis published in 1964, Gilbert Simondon (1924–1989) reflected philosophically on lichenic symbiosis in his revision of the concept of "individuation" (he drew on the works of Schwendener and nineteenth-century thinking on "association," contrasting it to parasitism). He sought to reinscribe the individual in time and space: no longer as substance, monad, but as process, act, product of an environment. Fungus and algae appear reciprocally as the "external environment" of the other symbiont in the lichenic ensemble. The vital functions of each are not dissolved within the whole, because the fungus and algae are able to revive them if they are accidentally separated from the consortium. The study of symbiosis, which makes the case for organic "societies" or "colonies" (lichens, corals, sponges), allowed Simondon to demonstrate that individuality is multiple and scalar:

> Here, association constitutes a kind of second individuality superimposed over the individuality of the associated beings, without destroying it. Here, there is a reproductive system of the society as a society, a reproductive system of the Fungus as Fungus. The association does not destroy the individuality of the individuals who compose it.[61]

It is a question of conceiving lichen as well on the level of this "second individuality," of this lichenic ensemble. Lichen really is much more than a fungus that has learned how to farm; it

allows both fungus and algae (and other symbionts) to develop new potential. Symbiosis is a relationship of the "additive" type. As Simondon writes, "the total quality of the organization of beings thus constituted goes far beyond that of a single individual [...], the activity of each being is conveyed through the much greater capacity for activity of the partnership, [...] which leads to an increase of capacities for the whole ensemble."[62] In effect, symbiosis cannot be reduced to the juxtaposition of the properties of the partners (1 + 1 + ...), instead, the interaction allows for a "second individuality" (1 + 1 = 1) to earn new so-called "emergent" properties (1 + 1 > 2). That is what permits lichen to develop its incredible resistance, as well as what allows numerous plant and animal species to better adapt to different diets or to protect themselves from predation through associations of microbial and fungal symbionts. The morphology of the fungus is directly altered through its association with the algae, which carries out photosynthesis. Generally composed of two layers of cortex protectors surrounding the layers of photosynthetic algae and an aeriferous zone (the medulla, where the gases circulate), the form and structure is that of a leaf. Lichen thus invented the leaf well before "higher" plants! Moreover, it is possible to cultivate in the laboratory the mycobiont by itself, but from then on, it presents a very different amorphous structure. Finally, symbiosis allows lichen to synthesize "lichenic substances" that protect the association from external aggressions. In the case of *Xanthoria parietina* (or, should I say, the lichen that includes this fungus), the parietin pigment, which gives the fungus its name and the thallus its color, offers protection from the sun and herbivores (it is toxic to them). And these substances (some seven hundred of them) are found to be practically absent from fungi that are not lichenized (only fifty of them).

Recent studies have shown that the fungi of lichens can alter their nutritional "farming" strategies over the course of their lives by changing algal partners in order to better withstand very diverse climatic conditions.[63]

As Canadian biologist Trevor Goward (born in 1952) points out, it is a matter of not remaining bound to the reductionist (Schwendernerian) approach that emerged in the nineteenth century and to thinking of lichen dialectically, on these two levels at the same time, or even beyond them.[64] The holistic level is empirical: in our experience of lichen, we see it as one. Its popular names are now the only ones to name it in its totality: parmelia designates a lichen; *Xanthoria parietina* its principal mycobiont.[65] So that is the positive side of blindness, of returning to an age before microscopes. It allows us to consider lichen from the perspective of its macroscopic morphology, and notably, to see how it can respond, by more than genetic factors (the internalist perspective), to environmental disturbances. As Trevor Goward writes, within a single "species" of lichens, there exist no two identical thalli, as each bears the trace of interactions with the environment in which it lives. It would be a matter, then, of drawing concurrently on the contributions of traditional (morphological) and modern (genetic) botany, "of authorizing two systems of nomenclature – one that targets the lichen fungus and emphasizes phylogeny more than morphology; and the other that applies to the lichen as a whole and emphasizes morphology ["phenetic" taxonomy] more than phylogeny." It is a matter of looking at reality with a double focus, the two planes nurturing one another reciprocally (the discovery of microscopic symbiosis allows for better understanding the physiology of lichen).

*

Being neither species nor individual, how then to represent lichen? Don't all species have their own retinues of symbionts? How to designate unities of living beings?

It might be tempting to apply the concept of "ecosystem" (or "micro-ecosystem") to the lichenic ensemble. This word was thus defined by English botanist Arthur George Tansley (1871–1955), pioneer in the study of plant ecology, in 1935: "the totality of the system [...] including not only the complex of organisms

but also the whole complex of physical factors ... the factors of habitat in the larger sense. [...]"[66] The concept of ecosystem lets us consider lichen as a habitat, an "environment," open to its various components, as a system articulating the whole with its parts. Nevertheless, as with the concept of "superorganism," it maintains the idea of a unity of the whole, it does not allow us to describe symbiotic relationships that are located *outside* the lichenic structure itself (or outside of other living beings).

Symbiosis is an active coexistence of individualities. The morphological and genetic definition of the individual must thus be reevaluated in light of this retinue of symbionts that interact over the long term or at regular intervals with the host, in a mutualist or parasitic way. In 2002, US biologist Forest Rohwer (born in 1969) expanded upon a concept proposed by Lynn Margulis.[67] He suggested calling the ensemble composed of the host and all its micro-organisms a "holobiont" (from the Greek *holos*, "entire").[68] He began by considering coral, which is a symbiosis between an animal (the polyp) and algae (the zooxanthellae) and which brings with it as well a whole complex microbial retinue. In this sense, lichen would be the holobiont of the fungus, algae, and other tiny partners, known or not yet known, in this meta-organism. Here we are approaching what Paul Nardon called a "symbiocosm." For Marc-André Selosse, however, this model maintains the concept of organism (or unity), even if it expands it, and does not allow for taking into account the networks woven by the microbes. The same mycorrhizal fungi colonize the roots of different plants, creating an immense subterranean network of sugar exchanges in the forests. Likewise, insect pollinators do not gather pollen from a single flower, and thus design an aerial network. The holobiont concept hides the importance of the relationships between the symbionts.

Thus lichen eludes the boundary between ecosystem and organism; it constitutes a *tension*, between an ecosystem that is supposedly "crystalized," and an organism that is supposedly open. The most useful concept, it seems to me, for moving beyond this

unitary vision of the living being (organism) and for taking into account the whole ensemble of these symbiotic relationships is the one that Marc-André Selosse more radically proposes: that of "interaction."

> Modern science has transposed a Western philosophy based on the individual into a biology based on the organism. A true rupture would give interactions the central place. A spider web is not an ensemble of points, but above all the threads that hold them together.[69]

This dynamic and "tensive" vision considers all living beings to be connected to a network and actually goes back to the philosophical concept of "haecceity" as defined by Gilles Deleuze and Félix Guattari in 1980. Their concept involves thinking of individuation beginning from another biological metaphor: the rhizome.

> A haecceity has neither beginning nor end, nor origin nor destination; it is always a middle. It is not made up of points, but only of lines. It is a rhizome.[...] Any individuation is not done by way of a subject or even a thing [...]. The rhizome will not be reduced to the One or the multiple. [...] It is not made up of units but of dimensions, or rather of shifting directions. It has no beginning or end, but always a middle, by which it grows and overflows. It constitutes multiplicities.[70]

An underground, horizontal stalk of certain perennial plants, which can serve as root, stalk, or branch according to its position on the plant, the rhizome allows for conceiving of a dynamic ontology that opposes any idea of hierarchy or closure. Living beings appear as configurations of intensities, as environments of interactions.

On a political level, philosopher Dénètem Touam Bona developed the metaphor of the liana in order to show the power of "allied communities," another sign of the current success of plant

metaphors. According to him, "the plant model of the liana" allows us to "think about the emergence of an "Us" – a decompartmentalized community – encompassing the most diverse individuals and groups":

> The liana possesses formidable interlacing powers. Its ascent toward the sky is possible only because it relies on others. [...] The Breton word *lienaj*, the likely root of "liana" and of *lyannaj*, goes back to the making of cloth, to the knowledge of textiles.[...] The "living pillars" evoked by Baudelaire, should be conceived today more like an inextricable tangle of supple, adjustable lines that gather together, in one and the same texture, multitudes of living beings and elements, including those we call "humans." [...] The aerial tangle of lianas, just like the underground network of roots and mycelia, help to make the forest a shifting web [...], a *toutmonde* (as Glissant says) constantly being reinvented.[71]

This image, with its political and sociocultural implications, can serve as a model for thinking interactively about living beings, where we are "all interlaced" and where we are "never alone" (to echo the titles of recent scientific works), already present in the German word for lichen, *flechten* ("to weave, to braid, to interlace").

Thus a new biology of interaction has been emerging in recent years, which does not replace but nuances or completes the biology of the organism: the "ecology" is replacing the "sociology" of associations and can influence the physiology of individuals.

In this sense, lichen is not just an original megastructure (composed of two or three independent symbionts and maintained in a single additive structure); rather, it is an environment interacting on many levels. The lichen-environment reproduces as a whole (through dissemination of lichenic fragments) or in part (fungi spores), and thus recreates a different environment.

This "ecology" of living beings allows us to think, for example, about one of the reproductive strategies of our famous, intrepid *Xanthoria parietina*. Like most lichens, they can reproduce by dispersing through the air either fragments of the lichenic complex (fungus–algae) that are "ready-to-use" (like cuttings) or single fungus spores, momentarily interrupting the symbiotic process, that will combine through chance encounters and then reenact the symbiosis history. Spores, released by the apothecia, germinate freely while waiting to find their algae (in what is called an "aposymbiotic" phase). In this case, one strategy, more certain but less ethical, consists of the fungus spore stealing the (algae) partner of another lichen. This form of reproductive parasitism explains why *Xanthoria parietina* very often lives in the company of another species, of the *Physcia* genre, which is gray in color and contains the same algae species. Symbiosis plays out here on many levels: within the lichen and outside of it. Likewise, one thallus combines several genotypes, those of its various symbionts, but we can find many *different* genotypes for the *same* species of fungus (or algae). This might be explained through a partial fusion of the lichen with neighboring thalli.

*

Is it possible to imagine a rhizomic taxonomy that could take into account this biology of interaction? Is lichen a plant or a fungus? Roscoff worms that ingest algae and can then feed themselves through photosynthesis – are they animals or plants? Are we seeing the extinction of "species" and the end of the realm of "realms"?[72] Could anthropology be expanded to include the symbiotic retinue of humans?[73]

The boundaries between nature and culture have become blurred. The world is a place of cohabitations (symbioses) with interactions that can be seen as "cultures" (lichenized fungus cultivates algae). As Emanuele Coccia writes, these interactions are less natural than "technical," "artificial," "of a cognitive and speculative order":

> The world then is this relation of reciprocal culture (never defined purely by the logic of utility, nor that of free usage). In this sense, no ecology is possible, because every ecosystem is the result of an agricultural practice and the involvement of other species. There is no wild space, just as there are no wild animals, because everything is cultivated. The relationship between culture and nature is always reversible: any species can embody nature for us, and vice versa.[74]

*

In recent years, the artistic practice of Pascale Gadon-González has explored precisely this lichenic symbiosis by adopting the mutualist idea of a balance of exchanges: "Notions of relationship, interaction, reciprocity, coexistence, and cooperation are at the origin of my artistic work."[75]

She describes this "second individuality" (on the level of symbiotic lichen) through this image of a "third place," a sort of utopia:

> My encounter with the world of lichens has crystallized a realization for me: what I observed and what I considered to be a single living being was in fact only the organization of two others that at the same time constituted it as a whole.[...] Existence, for lichen, is no longer located in a relationship of filiation, but in one of a conjunction that simultaneously forms an "other," a third place, a new "being" in the world.[76]

Beginning with the latest scientific observation techniques, and notably in collaboration with the Center for Applied Electronic Microscopy in Biology at the University of Toulouse III – Paul Sabatier, Gadon-González is seeking to reflect on this upheaval in the conception of the living being, as played out especially in lichen cells, in the smallest of the small. In *Paysages SP*, she conceals within her panoramic landscape photographs some images of lichens made from electronic microscopy scans (of the

surface), which she calls "augmented landscapes." In the dead leaves on the ground or the clouds in the sky, the eye gradually comes to recognize these microscopic fragments of lichens. In this way, the work creates a hesitancy in the viewer's mind, blurs for a moment identification, nominalism.

In her spectacular images, *Conjonctions* and *Cellulaires* (2018; see Ill. 14), made this time with electronic microscopy transfers

Figure 15a © Pascale Gadon-González, *Paysage SP*, 2019, gum bichromate print, palladium plate, or pigment print, 100 x 160 cm.

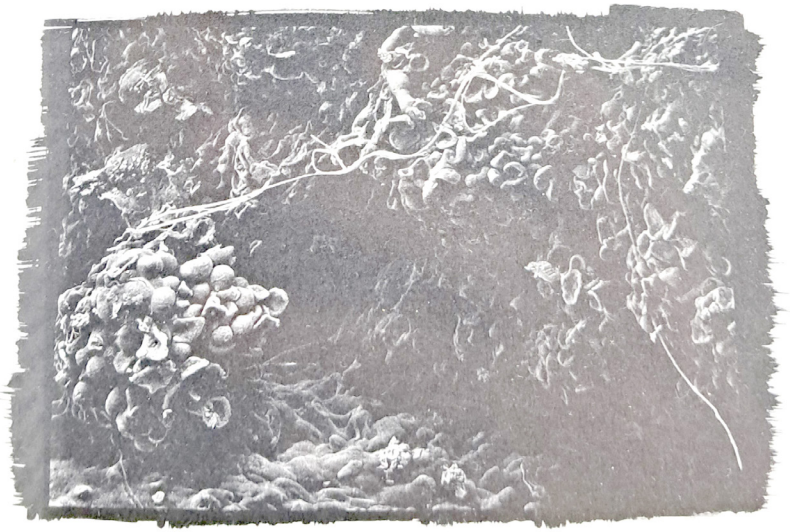


Figure 15b © Pascale Gadon-González, *Cellulaire*, 2018, with *Xanthoria* lichen, gum bichromate print, 38 x 28 cm.

(sections), Pascale Gadon-González offers a subjective dream on the symbiosis of lichens by coming as close as possible to the mechanism, by zooming in precisely on the area where nutritive exchanges occur between the fungus and algae (the "points of clarity" mentioned by Laura C. Carlson).

These can take two forms: the fungus filaments (the hyphae) become applied to the surface of the algae cells either through expansion, penetrating the walls of the algae (appressorium), or by penetrating the cell directly, through what is called a "sucker" (haustorium) – symbiosis from *licking* to the *French kiss*.

Such images are made possible solely through technical advances. This symbiosis sometimes remains very suggestive, subjective, dreamlike. The images trace the touching and joining of cells; the desire in the movement of the membrane that swells "like a balloon, is directed toward, tends toward contact."[77] Superimposed on the microscopy, in the background, is a photograph of the landscape where the lichen under examination was found. Lichen as memory of place, in an image or herbarium (as with Sbarbaro), or more precisely, memory of its original symbiotic environment. As botanist Trevor Goward has pointed out, this superimposition of levels has precisely the virtue of looking at lichen through a double focus, or rather by merging two focuses: the cellular, fragmentary perspective, and the global, macroscopic context. The inlay of the landscape provides the image with colors; the photomontage allows only for the natural shades of the Charante countryside – blues, greens, ochers – where the artist

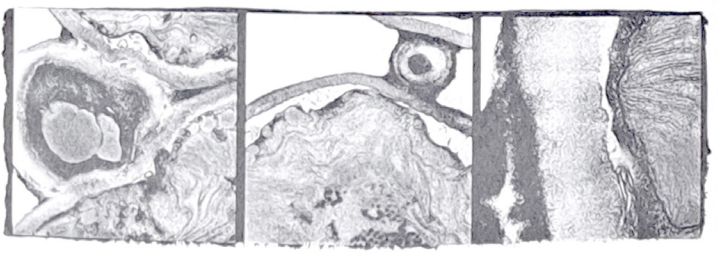


Figure 16 © Pascale Gadon-González, *Conjonctions 1*, 2018, gum bichromate print, 38 x 28 cm.

resides (La Vergne). There is no representation; the landscape is merely suggested, abstract, to make the layout and movement of the cells stand out more clearly in the foreground. This is the reverse of the process used in *Paysages SP*. Here, there is the inlay of the macroscopic into the microscopic.

In the *Bio-indicateurs* series (see Ill. 15 and 16), begun in 1998, different varieties of lichens are scanned this time, in color, on a black background and large format (often 120 x 80 cm), and identified. They appear less like a natural semiotics than symbols of life (*bios*): suspended, airborne, they stand out against the black background like lit planets emerging from the cosmos. The microcosmic and macrocosmic very often meet in Pascale Gadon-González's work: these lichens are hymns to life, to the origin of the world. The technique used, scanning with a large format camera, unlike photography, allows for multiple focal points: the view is no longer centered, hierarchical. This "symbiotic" technique lets us distinguish the lichen's details as well as its general form, the local as well as the global. The scanner is diverted from its normal use, thus allowing us to see the lichen's volume. A particular light creates a kind of chiaroscuro (moonlight? earthlight?) that comes to dramatize the apparent objectivity of the vision. The result is splendid: all the details of the complex texture and the color play of the different lichens are brought to the fore, making these photographs seem like true portraits.

In the aesthetics of symbiosis, there is also a politics at play, which Pascale Gadon-González brings to her educational and community work in Charente ("lichen as concept," as "another way of finding one's position or of being," "another relationship with the world").[78] She has created and supports several organizations and art schools in rural environments (*Le Grand Jeu*, and then *Art dans la Nature*) that seek to explore new modes of interaction.

*

The studio of Brazilian painter Luiz Zerbini (born in 1959), close to Rio's Botanical Garden, is in dialogue with the vegetation that

surrounds it. In Zerbini's monumental canvases, there is this same profusion and outpouring of life, this same entanglement of nature and culture. They represent landscapes without human beings but filled with their presence (with many objects and artifacts: hydraulic pump, shoes, electric wires). Nature and culture are painted in them with great precision and in the same language (forms, colors, movements), tracing a kind of symbiotic landscape where these two concepts are no longer differentiated. This often results in a collage of travel photos or remembered images. It involves revealing the surprising colors that nature can take on, radically "pop," even "punk" and psychedelic, revealing, in short, its surreal and spiritual side.

A sign of this aesthetic of intermingling: no surface is perfectly smooth in Zerbini's paintings. There are always textures, motifs, superimpositions, impurities at work. For this, he uses rolled acrylic paint, making the paint on certain surfaces drip and run, and even resorting to "marbled paper" techniques. In *Mamanguá Reef* (2011) (see Ill. 12), bamboo stalks and seaside stones are covered with multicolored lichens – recalling especially classical Far Eastern painting (see above, pp. 86–87). Existence is not fixed, frozen, but in perpetual motion, metamorphosis, writes Emanuele Coccia. Hence the omnipresence of cables, lianas, and other branches that bind the various elements together.

Cohabitation

> And yet, in the hopeful politics we seek to cultivate, we privilege heterarchy over hierarchy, the rhizomatic over the arborescent, and we celebrate the fact that such horizontal processes – lateral gene transfer, symbiosis, commensalism, and the like – can be found in the nonhuman living world. I believe that is the wrong way to ground politics. Morality, like the symbolic, emerges within – not beyond – the human. Projecting our morality, which rightfully privileges equality, on a relational landscape composed in part of nested and unidirectional associations of

> a logical and ontological, but not a moral, nature is a form of anthropocentric narcissism that renders us blind to some of the properties of that world beyond the human.
>
> Eduardo Kohn, *How Forests Think*, 2013

Making lichen a model (for thinking about resistance, interaction) is fruitful and allows us to upend our conception of living beings, as it offers us clues for reflecting on our world. Nevertheless, as Eduardo Kohn notes, we can make lichen into a useful crutch, projecting our ethics or ideologies, our fantasies. It then says more about us than it says about itself. By itself, lichen is certainly of both the orders of mutualism and parasitism, horizontality and verticality, fluctuating between, or perhaps even located beyond these concepts. Lichen is not only a metaphor, not only a model, not only a word: it is also a living being. Thus, it is a question, morally, of taking into account lichen as lichen, of grounding our politics by proving ourselves to be tuned into the properties of these, radically other, living beings. As ecosystem made up of interactions, it invites us to consider this continuity between human and other living beings, this "borderless common" (Dominique Lestel). To try to learn what it means *to be lichen*. To let ourselves be transformed by it: "to become plant," exclaims US anthropologist Natasha Myers – "to become lichen."

> When I pay attention to how birds interact with water, or how mosses interact with water, or how lichens interact with water, I feel a kinship with them. I know what a cold drink of water feels like, but what would it be like to drink water over my entire body, as a lichen does?
>
> Robin Wall Kimmerer[79]

If aiming to "be" lichen as lichen, to think of lichen as lichen, to try to "make lichen speak," seems just as much an anthropomorphic trap, we can nevertheless, morally, show ourselves to be attentive to its existence, to its distinctive characteristics, to

be tuned into it, and to build a moral relationship with it. As Michel Serres wrote in 1990, "rights of symbiosis are defined by reciprocity."[80] Repurposing Rousseau's expression, Serres develops the idea of a "new social contract" that expresses the necessity for a "symbiotic" relationship (in the mutualist sense) and no longer a "parasitic" one between humans and other living beings, and the environment, aimed at "minimal, collective limitations of parasitic action." Readopting Rousseau's phrase with variations shows the necessity of now inscribing any political contract into a global dimension that includes ecology, establishing nature as "legal subject," and aiming toward a "bioculture." In this sense, the symbiosis of Gaia is no longer a given, but in peril, and therefore a priority.

> An armistice contract in the objective war, a contract of symbiosis, for a symbiont recognizes the host's rights, whereas a parasite – which is what we are now – condemns to death the one it pillages and inhabits, not realizing that in the long run it is condemning itself to death too.[81]

Lichen, sentient being, one of our "cohabitants," must thus become a partner in our thinking and our life. For us, it offers a thought experiment: is it possible to locate ourselves on another scale, on its scale, that of the micro-habitats and minimal interactions that occur at this level? To conceive, for example, of its relationship to space (immobility) and to time (infinitely slow growth)? It also invites us to become aware of the neglected biodiversity and the reasons for its neglect. In cities, to adopt the mode of "flaneur," though neither that of dilettante nor modern bourgeois (Baudelaire, Benjamin), but that which offers to reconnect us with other living species who are our "cohabitants." In dialogue with lichen, we will also be more aware of the atmospheric conditions in our environments, the aerial world. From a moral and pragmatic perspective, listening to lichen also means trying to protect it. Fighting against its disappearance (as against that of

another symbiotic organism, coral, in the oceans). Letting flourish the micro-habitats for which they are the pioneers, not cleaning up rocks, walls, and monuments unless the lichens are so numerous that they threaten some ancient piece of art. Not confining them to sanctuaries or museums, but letting the walls be alive, our habitat as cohabitat:

> I don't know if the lichen
> must fight with the rock?
> It doesn't shatter it
> it lives there
> it makes it habitable.
>
> Hans Magnus Enzensberger[82]

Not painting the trunks of palm trees with lime in cities. Creating a national list, in France, of species to protect. But also training the eye, creating this dialogue. In parks and botanical gardens, marking their presence and their incredible variety. Thinking like lichen allows us to know our ecosystem better, and the everyday environments of our wanderings.

ENVOI
SPORULES

"Pollen powder, lichen spores and sporules."
Saint-John Perse, *Winds*, 1945

Like many other species, the *Acarosporaceae* produce their spores inside a cylindrical structure called an *ascus*. However, each ascus produces not eight, but one hundred spores. When it rains, the pressure of the water falling on them makes the spores catapult into the air at an estimated speed of up to two hundred and fifty kilometers per hour. Many of them land close by, while others rise into the stratosphere, drifting over hundreds of kilometers.

*

Lichens are living beings located on the margins of, and in resistance to, the globalized world. They are very rarely used by large-scale industry and only sometimes on the local level. A few species are used for perfumes, a few for foods, especially by reindeer (for the moment, in any case, lichenic substances may change the situation). They are not valued (they are located outside the range of value), not wanted (a nuisance in gardens and on monuments, especially in the West), invisible, unrecognized. These shy, recalcitrant beings are equally resistant to harsh ecosystems as they are to "exploitation." It is extremely difficult to make them grow, to "cultivate" them, and in any case, their production is slow, with low yields. They lend themselves more to

contemplation, to experimentation, where they prove surprisingly fertile. Considered even less than plants, linked as they are to the lowly kingdom of fungi, they are nonetheless models and mirrors for human beings.

To think about lichen is thus to think at the margins of this world and, at the same time, to look at it hard from this distance (they are our *sentries*). It is to be located at the edge to better consider and deconstruct the logic behind the "Anthropocene." Moreover, lichens grow spontaneously in peripheral spaces, forests (etymologically, where trees "are banished," "are put out"), the poles, deserts, shores and coasts, summits and fissures, as well as in the heart of our cities, developing spontaneously in the human "ruderal" spaces or creating alternative micro-habitats, those free zones won in the urban fabric, pilfered from its mineralization and its decoration.

They are at the heart of thinking about a post-Anthropocene world. Increasingly present for artists and thinkers, they sometimes escape a kind of fantasized idealism about symbiosis, rediscovered in the early twenty-first century in the context of a growing global awareness of climate change, even while constituting an ethical and poethical model of resistance and survival in a world sometimes seen through the prism of "collapsology."

Whether they depend on a mutualist or parasitic natural bond, the most important thing today may be this bond itself, the idea that, like all living beings, they are linked and compenetrate one another, and the fact that they stimulate and nurture, in the context of global warming, an ecology beyond the separate realms, as well as a way of thinking about a multi-species community and an expanded anthropology – that they invite us to rethink our "being in the world." As Donna Haraway writes:

> Corals of the seas and lichens of the land also bring us into consciousness of the Capitalocene, in which deep-sea mining and drilling in oceans and fracking and pipeline construction across delicate lichen-covered northern landscapes are

> fundamental to accelerating nationalist, transnationalist, and corporate unworlding. But the coral and lichen symbionts also bring us richly into [...] non-arrogant collaboration with all those in this muddle. We are all lichens; so we can be scraped off rocks by the Furies, who still erupt to avenge crimes against the earth. Alternatively, we can join in the metabolic transformations between and among rocks and critters for living well and dying well.[1]

Lichens are a sign of life and an indicator in the toxic landscapes of our times: monocultures, genetically modified crops treated with pesticides, deforested areas, depleted soil, polluted water, invisible radioactivity and waves. Anthropologist Anna L. Tsing has clearly demonstrated that capitalism is the producer of ruins.

Their various biological characteristics, some of them discovered very recently, can be illuminating when it comes to thinking differently about our time. They are a model of subtle resistance, capable of living in varied and often disturbed ecosystems. Immobile, they are often very close to their support, even as they are fully directed toward the air. Finally, as French lichenologist Joël Boustie sums it up, "They are exactly the opposite of our society. They grow extremely slowly, a few microns per year for some, and live symbiotically."[2] Their identity is plural.

Lichen is also at the origin of the great models that let us understand our world. It allowed us to conceive scientifically of the ideas of mutualism and symbiosis (with the pivotal role, in this discovery, of the heterotrophic, lichenized, or myccorhizal fungus) before these concepts were expanded to include the whole of living beings. The years 1860 to 1870 were fundamental in the emergence of this scientific revolution that the realization of symbiotic mechanisms in living beings constituted. Since these mechanisms very often function on an infinitely small scale, the roll of microscopy was essential.

In the West, lichen has contributed to the model for a new biology no longer based (solely) on insularity, but rather on

networks of interactions, "globalizing" the living, beginning in particular with the small, the microcosmic (the microbial world). It was at the origin of bio-indication. Due to its creative forms, it also contributed to earlier models, a theory of painting as well as the doctrine of signatures.

But lichen is not only a model, not only a support for projections or values. It is also a new partner in reflection; it is important to link it more closely to our own ecology. In this sense, this inquiry is also the opportunity to offer a hospitable stone (or strip of bark) to the effort to popularize lichen. An attempt to make it more well-liked, to make its familiarity more familiar. It participates in our symbiotic ecosystem, and develops unsuspected strategies of adaptation, sometimes indications of, or antidotes for, our modernity. It thus asks us to conceive of a *micro-ecology*, one of ruderal spaces, urban and rural micro-habitats, which must be protected.

Surprisingly, in France, not a single species of lichen appears on the national list of protected species; no watch list for endangered lichens exists. Lichens represent a neglected but very rich biodiversity, fundamental in the stabilization of soils, in pioneer ecosystems (they prepare these areas for subsequent plants by trapping moisture and organic debris, and then by decomposing themselves), and in the establishment of micro-habitats. They serve as ecological niche for many minuscule invertebrates at the bottom of the food chain. Thanks to their photosynthetic algae, it is estimated that when life began, about four hundred and forty-five million years ago, they produced, along with moss, nearly thirty percent of terrestrial oxygen.[3]

Thus lichen constitutes a complete world apart, an alternative and mysterious world for which the descriptions by scientists and writers, like Thoreau, Sbarbaro, Gascar, Zola, Butor, and Japanese haiku poets, remain engraved in my memory, ecopoetic approaches on lichen's level. In poetry, it mirrors existential quests and opens the way for reflection, in the form of fragmentary thoughts, "poor" aphorisms, or "salvaged" lines, like Butor's lichen of "breaths" that stubbornly survives on our sidewalks.

"Exercise of metaphysical freshness" for Bachelard, "diet" for Thoreau, lichen is a physical and spiritual practice, a cleanse or vital cure, a "life force" shining now as from the depths of time its small bathyscaphe light, its firefly beacon. It reveals, at the same time as it demonstrates, the relationships we must weave with the world that we share.

61 Gilbert Simondon, *Individuation in light of notions of form and information*, trans. Taylor Adkings (Minneapolis: University of Minnesota Press, 2020), p. 201.

62 Ibid., pp. 199–200.

63 F. Dal Grande, G. Rolshausen, P.K. Divakar, A. Crespo, J. Otte, M. Schleuning and I. Schmitt, 'Environment and host identity structure communities of green algal symbionts in lichens', *New Phytologist* 217:1 (2017), pp. 277–289.

64 Goward, 'Twelve Readings on the Lichen Thallus', article cited above, book 1, note 37.

65 The Salish, Samí, Sherpa, and Okanagan vernacular names bear precise traces of a specific relationship and knowledge regarding lichen taken as a whole (see on this subject, Catherine Kendig "Ontology and values anchor indigenous and grey nomenclatures: a case study in lichen naming practices among the Samí, Sherpa, Scots, and Okanagan," *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 84 (December 2020).

66 Arthur George Tansley, 'The use and abuse of vegetational concepts and termes', *Ecology*, 16:3 (1935), pp. 284–307.

67 Margulis and Fester, *Symbiosis as a source of evolutionary innovation.*

68 Forest Rohwer et al., 'Diversity and distribution of coral-associated bacteria', *Marine Ecology Progress Series* 243 (2002), pp. 1–10.

69 Marc-André Selosse, 'Au-delà de l'organisme, l'holobionte', *Pour la science* 469 (November 2016), pp. 81–84.

70 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), p. 321.

71 Dénètem Touam Bona, 'Lignes de fuite du marronnage: Le "lyannaj" ou l'esprit de la forêt', *Multitudes* 70:1 (2018), pp. 177–185.

72 See on this subject, Marc-André Selosse, 'Les végétaux existent-ils encore?', *Pour la science: Dossier* 77 (October 5, 2012); on line: www.pourlascience.fr/sd/botanique/les-vegetaux-existent-ils-encore-6987.php.

73 In this regard, I'm thinking of the work of Philippe Descola

and the book by Eduardo Kohn, *How Forests Think: Toward an Anthropology beyond the Human* (Berkeley: University of California Press, 2013).

74 Coccia, *Metamorphoses*, trans. Robin Mackay, p. 158–159.

75 Sylviane Carin, 'Expo à Dignac: Pascale Gadon à la croisée de l'art et de la biologie', *Charente libre* (November 28, 2013).

76 On line: www.lichen.fr/perso_adresse.htm.

77 Interview with the author, April 6, 2018.

78 Ibid.

79 'Two Ways of Knowing: Robin Wall Kimmerer on Scientific and Native American Views of the Natural World', interview with Robin Wall Kimmerer by Leath Tonino, *The Sun Magazine* 484 (April 2016), pp. 4–14; on line: https://www.thesunmagazine.org/issues/484/two-ways-of-knowing.

80 Michel Serres, *Le Contrat naturel* (1990) (Paris: Le Pommier, 2018), p. 67. *The Natural Contract*, trans. Elizabeth MacArthur and William Paulson (Ann Arbor: University of Michigan Press, 1995), p. 38.

81 Ibid.

82 Enzensberger, *Blindenschrift*, extract from the poem, "Lichenology."

Envoi: Sporules

1 Haraway, *Staying With the Trouble*, p. 56.

2 Marina Julienne, 'Joël Boustie, rare explorateur du monde des lichens', *Le Monde* (January 4, 2020).

3 Timothy M. Lenton, Tais W. Dahl, Stuart J. Daines, Benjamin J.W. Mills, Kazumi Ozaki, Matthew R. Saltzman, and Philipp Porada, 'Earliest land plants created modern levels of atmospheric oxygen', *Proceedings of the National Academy of Sciences* 113: 35 (August 30, 2016), pp. 9704–9709.

Originally published in French as *Lichens. Pour une résistance minimale.*

Polity Press
65 Bridge Street
Cambridge CB2 1UR, UK

Polity Press
111 River Street
Hoboken, NJ 07030, USA

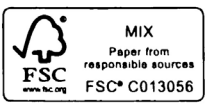
ISBN-13: 978-1-5095-5344-0
ISBN-13: 978-1-5095-5345-7 (paperback)

A catalogue record for this book is available from the British Library.

Library of Congress Control Number: 2022936786

Typeset in 10 on 14 Fournier
by Fakenham Prepress Solutions, Fakenham, Norfolk NR21 8NL
Printed and bound in the UK by TJ Books Limited

For further information on Polity, visit our website:
politybooks.com



notes:

ily cere- cahiers is a collection of texts(fragments). it is a branch of the collective *it is part of an ensemble*. these texts function as starting points for dialogues within our practice. we also love to share them with guests and visitors of our projects.

the first copy of *ily cere- cahier 18b* was printed in december 2023

1	the artist as producer in times of crisis	okwui enwezor
2	the carrier bag theory of fiction	ursula k. le guin
3	arts of noticing	anna lowenhaupt tsing
4	whatever & bartleby	giorgio agamben
5	notes toward a politics of location	adrienne rich
6	the intimacy of strangers	merlin sheldrake
7	the zero world	achille mbembe
8	why do we say that cows don't do anything?	vinciane despret
9	nautonomat operating manual	raqs media collective
10	on plants, or the origin of our world	emanuele coccia
11	hydrofeminism: or, on becoming a body of water	astrida neimanis
12	the gift and the given	eduardo viveiros de castro
13	the three figures of geontology	elizabeth a. povinelli
14	what lies beneath	george monbiot
15	sculpture not to be seen	elena filipovic
16	the onion	kurt schwitters
17	tentacular thinking	donna j. haraway
18	toward a symbiotic way of thought	vincent zonca

www.ilycere-cahiers.com
www.itispartofanensemble.com
www.naipattaofficial.com