



Figure 1: Henry Thoreau, 1856. Public domain photo.

LICHENS: THOREAU'S LEAVES OF WINTER

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*“In the coldest and bleakest places,
the warmest charities
still maintain a foot-hold.”*

-from “A Winter Walk,” 1843, Henry David Thoreau

“If there is a season particularly favorable to lichens, it is truly winter,” writes researcher Vincent Zonca in his book *Lichens* (2023). One hundred eighty-two years ago, American naturalist, writer, and philosopher Henry Thoreau (Fig. 1) felt the same way. Thoreau adored nature and sought her companionship regardless of her moods. He spent most of his short adult life “sauntering” through the forest and fields around Walden Pond near his Concord, Massachusetts home (Thoreau, 1863). Thoreau usually took notes on what he observed and later transcribed them into journals, often using reflective thinking and figurative language. His writings are steeped in similes, metaphors, paradoxes, and “deliberate inversions of accepted wisdom” instead of clear and concise scientific explanations. He wrote this way to entertain his audiences and to portray nature in imagery they could understand (Cameron, 1985; Sattelmeyer, 1980). Thoreau also used his journals as a working library for lectures, essays, and books, most of which were published posthumously (Fuller, 2017).

“There is a low mist in the woods. It is a good day to study lichens.

The view so confined, it compels your attention to near objects, and the white background reveals the disks of the lichens distinctly.”

Thoreau, “A Winter Walk,” 1843

Of all that nature offered, Thoreau loved trees the most and was intrigued and puzzled by their lichen lodgers. He made his keenest lichen observations and penned his best lichen prose on “lichen days” or winter thaws when “a little moisture, fog, or rain, or melted snow made a lichenist’s wilderness blossom like the rose” (Thoreau, 1859a). Thoreau was a transcendentalist so his choice of a rose in this simile is deliberate. A geologically old flower, the rose is an ancient and universal symbol of timelessness and the interconnectedness of all living things—the ways in which Thoreau

saw the world. On another lichen day, Thoreau personified nature as an artist and lichens, the only color among the bleached tones of winter, as her “brushstrokes” and “handbills” (Fig. 2). “Nature,” he wrote, “has a day for each of her creations, today it is an exhibition of lichens at Forest Hall” (Thoreau, 1859b).



Figure 2: Common script lichen (*Graphis scripta*), Thoreau’s handbills inscribed by nature on the bark of a birch tree. Jeff Howlett photo.



Figure 3: A prominent trio of lichens growing on a coniferous tree branch; left: *Vulpicida pinastri* (powdered sunshine lichen); middle: *Xanthoria polycarpa* (sunshine lichen); right: *Physcia aioplia* (hoary rosette lichen). Jeff Howlett photo.

Many books and articles have been written about Thoreau and his writings, but precious little has been written specifically about his lichen prose and the imagery he built around this type of fungi. Inspired by Thoreau's sincere love of nature, his transcendental leanings and my own love of lichens, this article briefly comments on what he penned about lichens and explains the science behind the figurative language he used to make them come alive in the dead of winter.

“It is remarkable how little any but a lichenist will observe on the bark of trees—The mass of men have but the vaguest & most indefinite notion ... these objects which though constantly visible are rarely looked at....”

Thoreau, *Journal*, 1858

Thoreau likely read about the widespread indifference towards lichens in *A Popular History of British Lichens* (Lindsay, 1856), a book the

Boston Society of Natural History had in its library, to which Thoreau, as corresponding member, had unlimited access. In this quote, he describes this apathy using a paradox—lichens are visible but rarely seen. Enigmatic and of no economic value except as a cheap source of dyes, lichens have never scored high on the charismatic scale. From antiquity to the present, they have been overlooked and understudied compared to other forms of life (Smith, 1921). Various classified as algae, mosses, fungi, and liverworts, medieval conventional wisdom pegged lichens as autonomous plants that generated spontaneously as warts and mucous on their substrates (Lindsay, 1856; Plitt, 1919). Linnaeus, who had little time for lichens, reportedly referred to them as *rustici pauperrii*, the “poor trash” of vegetation, and scornfully packed them all into one genus (Richardson, 1975). Despite the improvements in microscopy by the early 1800s, the discovery of the true nature of lichens was delayed until late in the century, often by erroneous interpretations,

fruitless discussions, crude theories, and pure speculations. Consequently, why and how lichens went from being unnoticed to “embellishments that eclipsed the trees on which they grew” (Thoreau, 1851a) went unexplained, even by Thoreau.

“It would seem then that this color is more vivid when wet—& perhaps all green plants like lichens are to some extent greener in moist weather.”

Thoreau, *Journal*, 1855

Thoreau loved winter and welcomed his lichen day respites from the cold with a boyish enthusiasm. In his journal, he turned each lichen day into a metaphorical spring, the season of abundant water and the renewal of life (Bayn, 2003). The connection between water and life Thoreau noticed goes back to Thales of Miletus, a pre-Socratic Greek philosopher Thoreau studied in his Classical Greece classes at Harvard. Thoreau saw water as transformative,

its forms as mist, fog, and melting ice and snow giving rise to “vivid greens” on the lichen thallus, a color Thoreau symbolized as the “earth’s fire,” life, and persistence (Thoreau, 1854).

Thoreau recognized the greening of lichens as evidence of photosynthesis, a transformative process first discovered by Dutch biologist Jan Ingenhousz in the mid-18th century. Had Thoreau lived a few more years, he would have learned that in lichens photosynthesis occurs in algae housed within a body composed of fungal hyphae bound together by polysaccharides, “a riddle wrapped in a mystery inside an enigma” to borrow an idiom from Winston Churchill.

This dual nature of lichens was first hypothesized by the Swiss microscopist Simon Schwendener in 1867. The theory was summarily rejected by most of his contemporaries, especially when he characterized the fungal/algal relationship as akin to “predator and prey” and worse: “master and slave” (Purvis, 2000). Fortunately, Anton de Bary, one of the most influential botanists of his time, promoted the lichen lifestyle as symbiotic, a newly coined term meaning “living together.”

De Bary promoted lichens as models of symbiosis and thanks to his efforts, the duality of lichens and their mutualistic relationship were accepted as facts by the end of the century (Oulhen et al., 2016). Since the 1990s, the use of DNA sequencing has discovered other microbes (namely yeast, lichenicolous fungi, bacteria, and viruses) as part of the lichen symbiosis, although their roles are not yet fully understood (Morillas, 2022; Lüicking and Spribille, 2024).

Today, lichens are unofficially defined as a consortium of ecologically obligated lifeforms from multiple kingdoms living together in a stable, self-sustaining, and complex miniature ecosystem (Hawksworth and Grube, 2020). And the evolving theory of symbiogenesis suggests that symbiosis, or cooperation in nature, likely helped the first cells, from which all life on Earth has evolved, to form (Margulis, 1999).

Thoreau was quite flexible in his transcendental leanings, so how he might have reacted to Schwender’s dual hypothesis and to de Bary’s lichen lifestyle characterization are speculative. He might have seen lichens simply as two realities in one or as

unity in diversity, concepts with deep religious roots that were likely familiar to him. He might have appreciated the lichens’ dual nature because of his own acknowledged “doubleness,” one-half positive and passionate and one-half negative and satirical (Canby, 1939) and because of the arguably symbiotic nature of transcendentalism—that man and nature were individuals yet united. One thing is certain though, Thoreau, the staunch abolitionist and “conductor on the Underground Railroad” (Harding, 2011), would have scorned the slavery analogy, as did most of the contemporaneous scientific communities in Europe and America.

*“The beauty of lichens with their
scalloped leaves,
the small attractive fields, the
crinkled edge! I could study
a single piece of bark for hours.
How they flourish! I sympathize
with their growth.”*

Thoreau, *Journal*, 1852c

In this quote, Thoreau portrays lichens as an embellishment, an ornament to be seen, touched, and admired. He also noted their vigor and resilience likely because while other creatures come and go, lichens endure. This induces sympathy, a response of understanding, closeness, connectedness and kinship.

Of all the living things Thoreau measured around Walden Pond, he certainly would have noticed that lichens changed very little from season to season. He would also have recognized that water is a limiting factor for their growth, which occurs only when the thallus is sufficiently wet as displayed by the “vivid greens” coloration of their outer surface or cortex. But Thoreau would not have known that the amount of carbon produced by the lichenized algae is relatively small and is divided between growth, reproduction, metabolite production (defensive substances and pigments), and post-rehydration repairs (Lüicking and Spribille, 2024). Consequently, lichens grow at a glacial pace, typically only a few millimeters to just a centimeter or two each year. Thoreau did, however, acknowledge this stunted growth in his



Figure 4: *Parmelia* species have sculpted surfaces and edges and are very common on fence posts and trees.

own way. “Nature,” he wrote, “is slow but sure; she works no faster than need be; she is the tortoise that wins the race by her perseverance ...” (Thoreau, 1861). What lichens lack in growth, they make up in life span. Lichenometry, dating lichens by the width of their thalli, has shown that crustose lichens like *Rhizocarpon geographicum*, which Thoreau likely found encrusting the shattered rocks on the summits of New England’s mountains, grow only a millimeter a year and can live for thousands of years.

*“A mild misty day. The red oaks
[are] ... fringed with usneas,
which in this damp air appears
in perfection. The trunk and
main stems from the trees have
... suddenly leaved out in the
winter, - a very lively green,
- and these ringlets and ends*

of usnea are so expanded and puffed out with light and life, ... They take the place of leaves in winter."

Thoreau, *Journal*, 1852a

Transcendentalists believe that "particular natural facts are symbols of particular spiritual facts" (Emerson, 1836). Thoreau believed it was "his job to be always on alert to find God in nature ..." (Thoreau, 1851b) and as a nature writer, to proclaim the perceived connections between the two (Gura, 2010). In the winter of 1852, he happened upon an aesthetic and sentimental delight: wet and bright-looking tresses of *Usnea* (hair lichen) dangling from the limbs of an oak tree. His word choices to describe the *Usnea*, perfection, light, and life, are deliberate. To Thoreau, they are attributes of God, the Perfect Being, the Source of Light and the Giver of Life. Thoreau had found God's presence in lichens!

"True, as Thales said, the world was made out of water. That is the principle of all things."

Thoreau, "Winter," 1887



Figure 5: *Usnea* hanging in tresses from a tree branch.

Thoreau noted that the *Usnea* lichens were swollen with life. In reality, they were swollen with water, the essential ingredient for life as we know it. The outer cortex layer of foliose (leafy) and fruticose (shrubby) lichens are like sponges, able to soak up to 500% of their dry weight and swell in the process (Lücking and Spribille, 2024). In dry weather, lichens slowly release this water via evaporation and in doing

so they contribute moisture to the microenvironment, the home to a variety of insects and microbes.

Thoreau's use of "lichens as leaves" is also a deliberately chosen analogy. A lichen body, called a "thallus," is Latinized Greek and means "green shoot" or leaf, something the classically trained Thoreau would have known. The analogy is artistically and philosophically significant to Thoreau. Throughout his writings, he gave leaves a very special place among nature's forms. He perceived them as symbols of life and he used them to slant natural facts—lichens, while leaf-like in architecture, are not really leaves (Lücking and Spribille, 2024). During a winter's thaw, lichens became his ripening fruit, the archetypal organic form, the expression of a creative life, the universal hieroglyph, and the symbol of creative energy (Sattelmeyer, 1950). Even on his deathbed, Thoreau found time to reaffirm that autumn leaves "teach us how to die." "One wonders," he wrote, "if the time will come when men ... will lie down as gracefully and as ripe..." (Thoreau, 1862).

In an 1852 journal entry, Thoreau listed the lichens he had identified the previous winter. Most were in the genus *Parmelia*, (Thoreau, 1852b) a group of grey-green, leafy, shield lichens that were likely widespread in the nitrogen-rich farming areas of New England (McMullin and Anderson, 2014) (Fig. 4). As *Parmelia* lichens dry, a small measure of melanin is added to the outer cortex to act as a sunscreen. This causes the lichen to darken and blend in with the tree bark, their preferred substrate. This explains why, as Thoreau noted, lichens are camouflaged against the bark and go unnoticed. When wetted and photosynthesis resumes, the melanin disappears, leaving the outer cortex translucent, hence revealing the bright green algal layer below. This also accounts for the "light" he saw in the *Usnea*.

"There is a slumbering subterranean fire in nature which never goes out, and which no cold can chill."

Thoreau, "A Winter Walk," 1843

Thoreau believed that a wild and metaphysical force "emerged from

within the self-maintaining processes of organic life" (Furtak, 2023). He referred to it as a "slumbering subterranean fire," an inner warmth, a sign of a living and self-sufficient earth (Tindel, 2011; Otterberg, 2007). It is easy to envision this force in lichens as Thoreau witnessed them repeatedly surviving the winter chills alternating with his short false springs. Today we can attribute this metaphorically "slumbering fire" to the processes of anhydrobiosis, a paradoxical Greek term that means living without water.

Anhydrobiosis explains how lichens, a few plants, and even fewer animals can survive extended periods of time without water. Also known as desiccation tolerance, dormancy, or suspended animation, anhydrobiosis includes physiological responses commonly found in all poikilohydric organisms, i.e. ones that cannot control their water content and hydrate via osmosis in wet weather and dehydrate via evaporation as the air dries (Grimm et al., 2021). Anhydrobiosis is possible because of a sophisticated dance by a suite of built-in and induced stress-tolerant mechanisms (Thoreau's self-maintaining process) that are activated whenever thalline water content approaches five percent of its dry weight or ambient air humidity reaches 50%. The dance begins with the shutdown of photosynthesis. The solar radiation that continues to bombard the lichen thallus but is no longer required for photosynthesis, is absorbed by pigments stored in the outer cortex and released as heat. This process creates free radicals or oxidants that are quenched by secondary metabolites to reduce potential harm to the lichen symbionts (Sadowsky and Ott 2016).

Another desiccation-tolerant mechanism is vitrification. This process occurs when sugar alcohols stored by the fungi (the mycobiont) transform cellular cytoplasmic liquids into a "glass state," essentially a solid with some liquid properties. Vitrification reduces molecular interactions, effectively ending most metabolic activities and maintains cell vitality by keeping cellular membranes and walls from collapsing (Gasulla et al., 2021; Lücking and Spribille, 2024). Another anhydrobiotic cellular-level mechanism is cavitation, a process in which a gas bubble acts like an "airbag" to maintain cell membrane



Figure 6: *Cladonia* species (pixie cup and British soldier lichen) poking through ice and snow. The mechanisms lichens use in surviving dehydration (vitrification and cavitation) also help them survive freezing temperatures.

and cell wall integrity and vitality (Honegger, 2009). When rehydrated, the lichen cells return to form and the partners resume their metabolic activities, often unscathed. Any damage caused by this dance is repaired. These wet/dry cycles are repeated hundreds of times throughout the year and seem to be necessary for the health and growth of lichens in general.

“The bright on the walls of the Walden Road, yellow sulphur lichens look novel as if I had not seen them for a long time— Do they not require cold as much as moisture to enliven them?”

Thoreau, *Journal*, 1859

During this 1859 thaw, Thoreau was attracted to a patch of snow-covered lichens affixed to a fence post. He studied them excitedly, as if seeing them for the first time. The lichens might have been some type of *Xanthoria*, a bright yellow-orange lichen that are also common around nitrogen-rich farmlands and bird perches. Thoreau used a paradox, namely cold as an enlivening force, to describe his observations. In penning his thoughts as a question, Thoreau created a mystery

that he passed on to his readers for consideration. Not surprising, like most paradoxes, this one has a grain of truth. The microclimates on the north faces of trees and posts often remain wetter and cooler for longer periods of time than the south faces exposed to the

sun for most of the day. This extends photosynthesis, giving the north face lichen more time to grow. Studies show that under the protection of a thin layer of snow, lichens can photosynthesize even when air temperatures are slightly below freezing, an ability that explains why lichens are the dominant form of “vegetation” in the Arctic, Antarctica, and on alpine slopes above the tree line. The moisture provided by sublimating snow combined with the heat released into the thallus by melting intercellular ice, make it possible for lichens to momentarily escape dormancy, a revival with an uncanny connection to Thoreau’s subterranean fire. Here again, Thoreau recognized the importance of water to all living things. But he knew from his own experience with crop failures on New England farms that when water freezes via an untimely frost, it kills vegetation. Frostbite to our skin and frost damage to our bedding plants and vegetable gardens are well-known examples. To protect lichens from frostbite as temperatures approach freezing, cellular water is pushed into intercellular spaces where it remains in a supersaturated state even at temperatures as low as -20°C . If the water does nucleate and ice crystals form, the cells remain undamaged.



Figure 7: A species of *Xanthoria* covered by a layer of ice, the result of a freezing rainstorm.

“The true farmer is to those who came after him and take the benefits of his improvements, like the lichen which plants itself on the bare rock and grows and thrives and cracks it and make a vegetable mould, to the garden vegetable which grows in it.”

Thoreau, *Journal*, 1852d

Thoreau is often called the first ecologist. In this quote he sees lichens as farmers who prepare the soil for the plants that come later, a recognition of lichens as pioneering species. This role is evident in lichen distribution worldwide. About fifteen thousand species of lichens cover six to eight percent of the Earth’s terrestrial surface. Lichens are usually the first “organism” to occupy disturbed soil and the barren postglacial landscapes that once covered much of North America above the forty second parallel. If left undisturbed, lichens will even colonize the structures (stonework, headstones)

we erect.

“In winter nature is a cabinet of curiosities, full of dried specimens, in their natural order and position.”

Thoreau, “A Winter Walk,” 1843

In 1843, Thoreau moved to Staten Island to tutor the nephew of his friend Waldo Emerson. He would often venture into New York City to meet with publishers in an effort to jumpstart his struggling writing career. On these trips, Thoreau also visited the university museums he characterized as the “catacombs of nature” (Thoreau, 1834). In the quote above, Thoreau sees life in the wild as “curiosities” and deliberately uses the word “cabinet” to contrast nature (outdoors) where “order and placement” are natural, to museum cabinets (indoors) where “order and placement” are artificial. “The leaves and grasses stand perfectly pressed by the air without screw and gum,” he writes, “and the bird’s nests are not hung

on an artificial twig, but where they builded [sic] them” (Thoreau, 1843). Thoreau used metaphors as more than entertaining literary devices. Here he is using “nature as a cabinet of curiosities” to influence his readers’ thoughts (Suchostawska, 2017), he challenges them to embrace nature in its own cabinet, the outdoors. This is, after all, where natural relationships are true, visible, and valued.

“How many a man has dated a new era in his life from the reading of a book!”

Thoreau, “Walden,” 1854

In the summer of 1860, Thoreau read Charles Darwin’s book *On the Origin of Species*. Thoreau saw himself in the slightly elder British naturalist and was struck by Darwin’s ideas on variation, distribution, and natural selection. He saw these things in the forest around Concord. Thoreau did not live long enough for us to see the full impact of the book on his understanding of lichens and on his own evolving ideas on nature and transcendentalism. Initially, lichens proved to be a problem for Darwinians who believed symbiosis had no place in evolution as Darwin had described it: divergent rather than convergent as symbiosis suggested. Where on the Tree of Life does one place a communal “organism” whose members arose from multiple kingdoms, they asked? Maybe Thoreau’s own words provide clues on how he would have reacted to Darwin’s theory. For example, on facts he wrote “Let us not underrate the value of a fact; it will one day flower in a truth” (Thoreau, 1842). On Darwin’s “compendium of facts” (Fuller, 2018), Thoreau wrote “The development theory implies a greater vital force in nature because it is more flexible and accommodating, and equivalent to a sort of constant *new* creation” (Thoreau, 1860). On lichens he wrote that “all the world seems a great lichen and grow as such ...” (Thoreau, 1853) i.e., that the Earth is “one ecologically integrated process of processes” (Wilde, 2021). To his early biographers, *Origins* had no impact on him. To more recent observers, Thoreau lived a transcendentalist but died a Darwinian (Fuler, 2017).

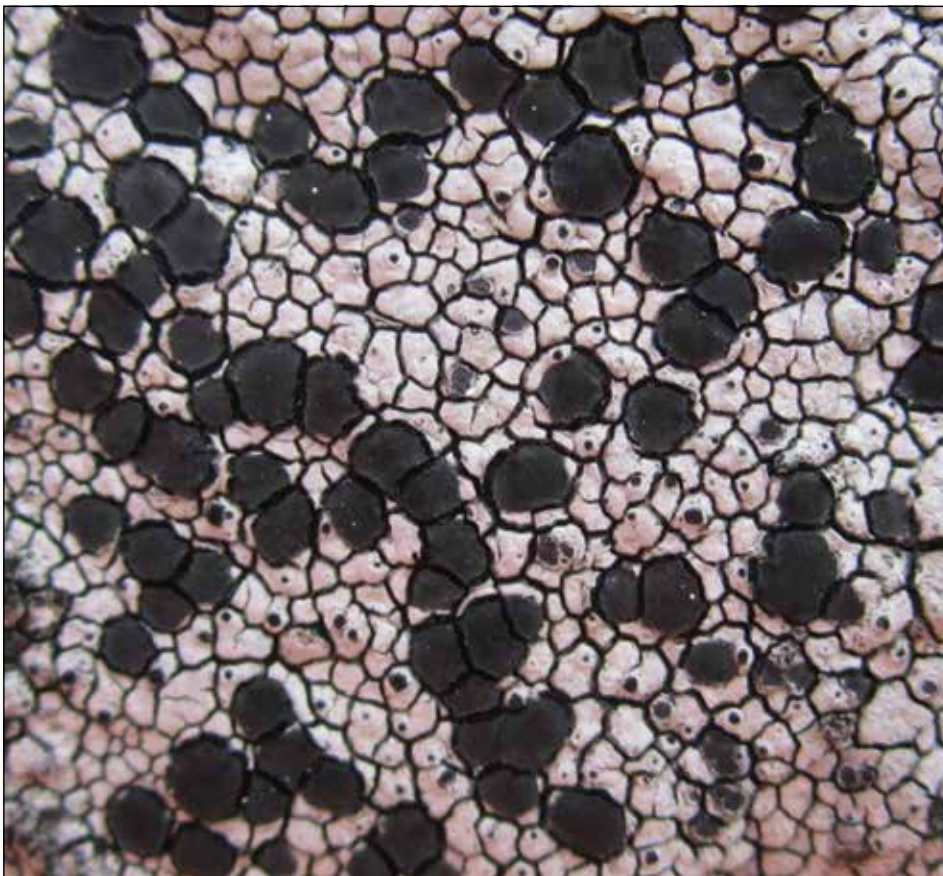


Figure 8: *Crustose lichens* release acids that etch their rocky substrates, breaking them down to form rudimentary soils that enable other vegetation to gain a foothold and flourish over time.

*“To study lichens is to get a taste
of earth and health,
to go gnawing the rails
and rocks.”*

Thoreau, *Journal*, 1859a

As I read Thoreau's journals and essays, I felt like I was there with him ... Walking ... Stopping ... Observing ... Recording ... Reflecting and most of all, “relishing” the experience. Metaphorically, Thoreau's directive to “taste and gnaw” lichens is to observe them with a temporary obsession, like a dog eating a bone. He invokes the study of nature as being healthy. Of lichens, he wrote, “They are a collyrium or salve for sore eyes” and “a relisher [sic] and tonic, to make life go down and digest well.” And, he urged his readers to “go bathe and screen your eyes with them in the softened light of the woods” (Thoreau, 1859a), i.e., to experience lichens as a healing and purifying force.

As the original environmentalist, Thoreau realized what industrialization would do to the Earth long before it was a recognized problem. His life's work is a call for us to protect the environment, and an alarm if we fail to do so. In this, the “lichen,” paradoxically hardy enough to survive in extreme environmental yet sensitive to slight changes in those environments, is a modern “handbill,” and a clarion call for us to change our ways. If we are to save this planet from ourselves, we all must become like Thoreau!

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References Cited

- Armstrong, M. 2017. “Late in Life, Thoreau become a serious Darwinian.” <https://longreads.com/2017/07/13/late-in-life-thoreau-became-a-serious-darwinist/>.
- Bayan, N. 1966. “From Metaphysics to Metaphor: The image of water in Emerson and Thoreau.” In: *Studies in Romanticism* (5)4: 231–243; <https://www.jstor.org/stable/25599670>.
- Canby, H. 1939. *Thoreau*. Houghton Mifflin Company, Boston.
- Cameron, S. 1985. *Writing Nature: Henry Thoreau's Journal*. University of Chicago Press, Chicago.
- Damijian, G. 2000. Evolving together; the biology of symbiosis. *Baylor University Medical Proceedings* 13(3): 217–226.
- Emerson, R.W. 1836. “Nature. American Transcendental Website.” <https://archive.vcu.edu/english/engweb/transcendentalism/authors/emerson/nature.html>.
- Fuller, R. 2017. *The Book that Changed America: How Darwin's Theory of Evolution Ignited a Nation*. Penguin Books, New York.
- Furtak, R.A. 2023. “Henry David Thoreau. Stanford Encyclopedia of Philosophy.” <https://plato.stanford.edu/entries/thoreau/>.
- Gasulla, F., E.M. Del Campo, L.M. Casano, and A. Guéra. 2021. Advances in the understanding of desiccation tolerance of lichens and lichen-forming algae. *Plants* 10: 4; <https://doi.org/10.3390/plants10040807>.
- Gura, P. 2001. “Chapter 29: Nature Writing.” In: *The Oxford Book of Transcendentalism*. Oxford University Press.
- Harding, W. 2011. *The Days of Henry Thoreau*. Dover Publications.
- Hawksworth, D.L., and M. Grube. 2020. Lichens redefined as complex ecosystems. *New Phytologist* 227: 5; <https://doi.org/10.1111/nph.16630>.
- Honegger, R. 2009. “Water Relations in Lichens.” In: G. Gadd, S.C. Watkinson, and P.S. Dyer (Eds.), *Fungi in the Environment* (pp. 185–200). Cambridge University Press; <https://doi.org/doi:10.1017/CBO9780511541797.010>.
- Grimm, M., M. Grube, U. Schiefelbein, D. Zühlke, J. Bernhardt, and K. Riedel. 2021. The lichens' microbiota, still a mystery? *Frontiers in Microbiology* 12: 623839; <https://doi.org/10.3389/fmicb.2021.623839>.
- Hash, T.H. 2010. *Lichen Biology*. Cambridge University Press, Cambridge.
- Lindsay, W. 1858. *A Popular History of British Lichens*. Lovell Reeve, London; <https://books.google.ca/books?id=U1EDAAAQAAJ>.
- Lücking, R., and T. Spribille. 2024. *The Lives of Lichens*. Princeton University Press, Oxford.
- Margulis, L. 1999. *Symbiotic Planet: A New Look at Evolution*. Basic Books, New York.
- McMullin, T., and F. Anderson. 2014. *Common Lichens of Northeastern North America*. New York Botanical Garden Press.
- Otterberg, H. 2007. “Immanence and transcendence in Thoreau's *A Winter Walk*.” SPELL: Swiss papers in English language and literature; <https://doi.org/10.5169/seals-100059>.
- Oulhen, N., B. Schultz, and T. Carrier. 2016. “English translation of Heinrich Anton de Bary's 1878 speech, ‘Die Erscheinung der Symbiose’ (‘De la symbiose’);” DOI:10.1007/s13199-016-0409-8.
- Plitt, C.C. 1919. A short history of lichenology. *The Bryologist* 22(6): 77–86; <https://www.jstor.org/stable/pdf/3238526.pdf>.
- Purvis, W. 2000. *Lichens*. Natural History Museum.
- Richardson, D. 1975. *The Vanishing Lichens: Their History, Biology and Importance*. David & Charles, Vancouver.
- Sattelmeyer, R. 1980. *Introduction in Henry David Thoreau, The Natural History Essays*. Peregrine Smith, Salt Lake City.
- Smith, A.L. 1921. “The Project Gutenberg eBook of Lichens.” <https://www.gutenberg.org/files/61616/61616-h/61616-h.htm>.
- Suchostawska, L. 2017. Metaphorical construals of nature in Thoreau's writings. *Anglica Wratislaviensia* 55: 113–121; DOI:10.19195/0301-7966.55.8.
- Thoreau, H.D. 1837. “The Natural History of Massachusetts.” <https://www.walden.org/wp-content/uploads/2016/03/NaturalHistoryMassachusetts-2.pdf>.
- Thoreau, H.D. 1842. “The Writings of Henry David Thoreau: *Journal: 1834–1837*.” <https://www.walden.org/wp-content/uploads/2016/02/Chapter9.pdf>.
- Thoreau, H.D. 1843. “A Winter Walk.” In: J.S. Cramer (Ed.), *The Portable Thoreau* (2012). Penguin Classics.
- Thoreau, H.D. 1851a. “The Writings of Henry David Thoreau: *Journal: December 1851*.” <https://www.walden.org/wp-content/uploads/2016/02/Journal-3-Chapter-3.pdf>.
- Thoreau, H.D. 1851b. “The Writings of Henry David Thoreau: *Journal: September 1851*.” <https://www.gutenberg.org/files/59031/59031-h/59031-h.htm>.
- Thoreau, H.D. 1852a. “The Writings of

- Henry David Thoreau: *Journal: January 1852*." The Walden Woods Project. <https://www.walden.org/wp-content/uploads/2016/02/Journal-3-Chapter-5.pdf>.
- Thoreau, H.D. 1852b. "The Writings of Henry David Thoreau: *Journal: February 1852*." The Walden Woods Project. <https://www.walden.org/wp-content/uploads/2016/02/Journal-4-Chapter-2.pdf>.
- Thoreau, H.D. 1852c. *Winter: From the Journal of Henry D. Thoreau* (H.G.O. Blake, Ed.). Riverside Press, Cambridge, Mass; [https://en.wikisource.org/wiki/Winter_\(1888\)_Thoreau/Winter](https://en.wikisource.org/wiki/Winter_(1888)_Thoreau/Winter).
- Thoreau, H.D. 1852d. "The Writings of Henry David Thoreau: *Journal: March 1852*." The Walden Woods Project. <https://www.walden.org/wp-content/uploads/2016/02/Journal-3-Chapter-6.pdf>.
- Thoreau, H.D. 1853. "The Writings of Henry David Thoreau: *Journal: February 5, 1853*." The Walden Woods Project. <https://www.walden.org/wp-content/uploads/2016/02/Journal-4-Chapter-10.pdf>.
- Thoreau, H.D. 1854. "Walden." In: J.S. Cramer (Ed.), *The Portable Thoreau*, (2012). Penguin Classics.
- Thoreau, H.D. 1855. "The Writings of Henry David Thoreau: Sept 3–May 12, 1855." https://thoreau.library.ucsb.edu/writings_journals_pdfs/TMS18newTR.pdf.
- Thoreau, H.D. 1858. "The Writings of Henry David Thoreau: July 9–November 9, 1858." https://thoreau.library.ucsb.edu/writings_journals27.html.
- Thoreau, H.D. 1859a. "The Writings of Henry David Thoreau: *Journal: February, 1859*." The Walden Woods Project. <https://www.walden.org/wp-content/uploads/2016/02/Journal-11-Chapter-8.pdf>.
- Thoreau, H.D. 1859b. "The Writings of Henry David Thoreau: Sept. 22, 1859–Dec. 6, 1860." https://thoreau.library.ucsb.edu/writings_journals_pdfs/J15f4-f6.pdf.
- Thoreau, H.D. 1860. "The Writings of Henry David Thoreau: *Journal: October 1860*." <https://www.walden.org/wp-content/uploads/2016/02/Journal-14-Chapter-3.pdf>.
- Thoreau, H.D. 1861. "The Writings of Henry David Thoreau. *Journal: January 1861*." <https://www.walden.org/wp-content/uploads/2016/02/Journal-14-Chapter-6.pdf>.
- Thoreau, H.D. 1862. "Autumn Tints." *The Atlantic Monthly* 5: 60.
- Thoreau, H.D. 1863. "Walking." In: J.S. Cramer (Ed.), *The Portable Thoreau*, (2012). Penguin Classics.
- Tindel, R. 2011. The function of scientific metaphor in Thoreau's Walden. *Rupkatha Journal on Interdisciplinary Studies in Humanities*.
- Walls, L. 2018. *Thoreau, A Life*. University of Chicago Press, Chicago.
- Wilde, D. 2010. "Thoreau and the Lichens." <https://www.centralmaine.com/2021/03/10/dana-wilde-thoreau-and-the-lichens/>.
- Zonca, V. 2023. *Lichens*. Polity Press. 📖

It is getting stranger out there
The streets are paved in fool's gold

There is good reason to believe
The wounded are panning for laughs

In the dank basement of my muse
The mushroom poems grow

Paul Fericano – California

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