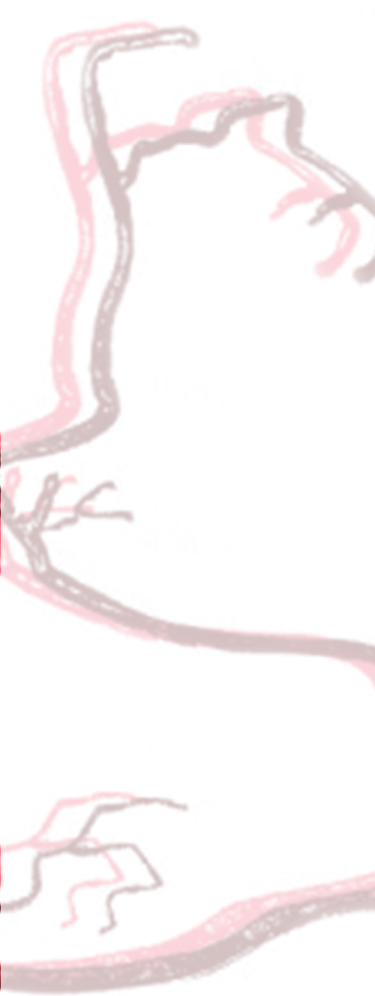


# phytognosis

## *learning from plants*

patricia vieira



**Can plants** learn? What knowledge do they have and which new insights do they strive to acquire? Imagine you are a run-of-the-mill garden pea plant worried about getting enough light to produce food and nourish yourself. Obviously, you will be on the lookout for signs that indicate where sunlight comes from. If, judging by past experience, you figure out that light and wind tend to come from the same place, you will be conditioned to grow in the direction from which the wind is blowing, even if there has been no light originating from that area for a while. Or will you? This is what biologist Monica Gagliano and her colleagues investigated in an experiment published in the journal *Nature* a couple of years ago.<sup>1</sup> They showed that, like animals, plants can associate a neutral stimulus—the blowing of air, in this case—with a biological reward—getting plenty of light to enable photosynthesis—replicating the so-called Pavlovian conditioning already widely established in animals. In the study, plants learned something they did not previously know—that wind and light come from the same area—and started to behave accordingly, growing in the direction of the air flow in the absence of light.

This experiment adds to a growing body of scientific work showing that, even though plants do not have a brain, the organ seen as responsible for intelligence in the animal kingdom, they can learn from past experience and behave intelligently. They are able to adjust their conduct to changing environmental conditions and store knowledge so as to maximize their chances to survive and reproduce.<sup>2</sup> They communicate with other plants and animals and even signal distress when under attack by predators or when facing extreme environmental conditions, such as a situation of drought.<sup>3</sup> This research

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on plant learning has been complemented by recent philosophical takes on flora that extend categories previously employed to discuss human beings and, at most, some of our closest evolutionary relatives, to the realm of plant life. Notions like “plant soul” and “plant-thinking,” developed by Michael Marder, or Matthew Hall’s theorization of plant subjectivity, push the boundaries of what we used to conceive of as plant behaviour and open the door to a cognitive approach to the vegetal kingdom.<sup>4</sup> That a pea plant can learn from where the light shines and make an informed decision to grow in that direction is taken for granted in these new philosophical inquiries.

The reconceptualization of the relation between plants and humans that is currently underway in the sciences and in some branches of the humanities should not simply result in adopting a more mindful, respectful take on flora. It entails a radical recognition of our indebtedness to vegetal life on different levels: from the physiological reality of our reliance upon plants for breathing and nourishment to the realization that many of our cultural constructs, ranging from aesthetics to ontological, ethical, and even political conceptions, can be traced back to our understanding of vegetal beings. The recent attention afforded to plants in scientific and philosophical inquiries, as well as in literary and cultural studies with the rise of ecocriticism, should prompt us to look at flora anew and draw the consequences from the fact that vegetal entities, which represent 82 per cent of all living matter, are the basis for all life on earth, including the existence and thought of us humans.<sup>5</sup>

It is in the context of this turn to plants that I put forth the idea of *phytognosis*—a compound word that combines the ancient Greek terms for plant (*phyton*) and knowledge (*gnosis*). Taking as a point of departure the notion that plants can and do indeed learn and have their own forms of knowledge, phytognosis goes a step further and turns the onus of learning back onto humans. It refers to two separate but related forms of knowing. On the one hand, it signifies an effort to expand our knowledge of plants in a variety of fields. Whether to distance ourselves from plant life and assert the superiority of our species—we regard ourselves as active and agential, as opposed to the passive, “vegetative” state of plants, which has negative connotations in most human cultures—or perhaps even to repress the knowledge of *Homo sapiens*’ and most other animals’ dependence upon plants, we have long relegated them to the margins of our thoughts, as beings that are simply there, part of the background and barely distinguishable from the landscape. Phytognosis requires us to struggle against the zoocentric bias present in many disciplines that has led scientific inquiries to privilege the study of animals. As Gagliano has found in a survey of the scientific literature of the last five years, on average, only one paper is published on plants for every two published on animals.<sup>6</sup> Similar

PREVIOUS PAGE ILLUSTRATION based on  
**A fresh rhizome of *cimicifuga racemosa*.** *Drugs and medicines of North America: a publication devoted to the historical and scientific discussion of botany, pharmacy, chemistry and therapeutics of the medicinal plants of North America, their constituents, products and sophistications*, Cincinnati, J. U. Lloyd and C. G. Lloyd, 1884–87. (Reproduction Series No. 9, Pt. 2 Bulletin of the Lloyd Library of Botany, Pharmacy and Materia Medica, 1931.) Scan copyright: Henriette’s Herbal Homepage.

to science, the humanities have historically focused on the study of human beings and of our closest evolutionary relatives, foregrounding what distinguishes us from other mammals. Phytognosis would thus require us to move beyond what some have called a “plant blindness,”<sup>7</sup> beyond our privileging of ourselves and other animals in our studies. As I pointed out above, this kind of phytognosis is already well underway in some branches of science, as well as in the humanities, in philosophy, literary studies, and cinema, for instance. Plant studies has developed in the context of this re-evaluation of flora, its representation, and human-plant interactions, similar to the rise of animal studies in the 1990s in response to the animal ethics debates that took place in the last quarter of the past century.

Leaving aside the sciences, there are many questions we should aim to address in the humanities when talking about phytognosis. In philosophy, for example, we could ask:<sup>8</sup> What is the specific ontology of plants, their mode of being-in-the-world? Which epistemological questions are raised by our study of plants? What are the ethical consequences of the recent “turn” to plants? Should the socio-political status of plants change in light of new discoveries in plant science? If plants feel distress, have memory, can communicate, can learn, and are able to make their own decisions, should they not be granted some of the privileges previously reserved for humans and animals? Should plants have rights, for instance, and, if so, which form would these take? Is a tree’s right not to be cut down upon a whim the same as the right of a blade of grass growing in your backyard not to be mowed?<sup>9</sup> Is it acceptable to instrumentalize plants for economic gain and to destroy them for human pleasure? Should we be allowed to cut down a pine to use it as a Christmas tree?

In literary and film studies, another set of issues is raised when we approach plants from a phytognostic point of view. How have plants been represented in literary and cinematic works, and how do these depictions reflect cultural biases about the vegetal world? In which ways do plants inscribe themselves in human cultural productions? Are plants a mere background for human action—as in portrayals of the landscape—or can they play an active role in the development of a plot? What are the stylistic implications of having plants as main characters, as in Ursula K. Le Guin’s short story “Vaster than Empires and More Slow” (1971) or in M. Night Shyamalan’s film *The Happening* (2008)?

But phytognosis entails more than transforming our anthropocentric and zoocentric fields of research, so as to learn about the plant world. Phytognosis is both our knowledge of plants *and* the knowledge of *the plants themselves*. It recognizes that plants learn and that, in turn, we can learn from the plant world. A phytognostic approach to

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flora, then, is one that takes into consideration what vegetal beings know and that tries to learn not only *about* but also *from* them.

A caveat to phytognosis precludes the facile idealization of plants as benign beings, the other side of picturing humans as sinister creatures who malevolently destroy flora's habitats and those of other animals. Plants, like all other forms of life, strive to adapt to their environment and use all physiological means at their disposal to nourish themselves, reproduce, and thrive. Regarding plants as angelical, abnegating entities whose actions are aimed solely at furthering the well-being of others, including us humans, would be as erroneous as seeing them as passive, quasi-inert life forms. Phytognosis is not about promoting a Manichean view of reality whereby plants are the good and *Homo sapiens* the bad guys in the theatre of life on earth. Still, a phytognostic take on plant-human relations acknowledges that humanity has a lot to learn from flora's forms of existence and can draw valuable lessons from the plants' specific mode of being-in-the-world.

One significant difference that separates plants from animals, including humans, is that vegetal life is able to create its own organic sources of nourishment, namely the sugars produced from carbon dioxide and water in the process of photosynthesis. Plants are self-sufficient and enable the existence of most other life forms, which use the energy harnessed by flora for sustenance. While humans cannot aspire to emulate vegetal photosynthesis, phytognosis teaches us a lesson in sustainability. Instead of preying on other beings—both the ones now living and those long dead, by using fossil fuels, which are the bodies of dead plants—we should emulate plants and, as far as possible, produce our own energy using renewable sources, in the same way that plants utilize solar energy. What would our world look like if, instead of depending on energy produced by other entities, we would direct our efforts into producing our own, synthesizing it from the elements, such as sunlight, wind, and the movement of water? Global warming would be much less of a problem, as would air pollution in major cities across the globe. Furthermore, the by-product of the vegetal production of energy is not a polluting substance but oxygen, which is central for life on earth. To be sure, oxygen was not always needed for life; ancient microbes existed in an anaerobic environment before photosynthesis changed the composition of our planet's atmosphere. Still, most creatures now alive are the result of plant colonization of the globe, and therefore plant-produced oxygen is key to their metabolism. Again, phytognosis would teach us to exist on earth, while enabling and even furthering the flourishing of all other entities that share the planet with us, a lesson sorely needed in our era of environmental devastation.

A second major difference between plants and animals is that plants have a capacity to regenerate that far surpasses that of other living beings. A plant can lose up to 90 per cent of its body without being killed: a tree can be pruned, have most of its branches cut and trimmed, and then flourish again, sprouting new branches the following spring. This capacity has often been used to denigrate flora. Because of their modular structure, basically reproducing the same elements again and again—in the *Metamorphosis of Plants* (1790), for instance, Goethe was convinced that all parts of a plant are modifications of the same basic structure, namely, the leaf—plants' organs are not as individuated as those of animals. They do not have an intestine, lungs, or a mouth, for example. The plants' ability to regenerate has served as an excuse for human destruction of the natural world. We see plants as emblems for the whole of the environment and assume that, no matter how much we devastate it, it will be able to bounce back and regrow. But were we to take a cue from plants, we would learn the boundaries of regeneration. Phytognosis makes us aware of the point up to which we are able to use a given part of nature without damaging the ecosystem as a whole. Even though plants are hugely pliable and able to regrow after large parts of them are cut, they do have bounds beyond which they will be unable to recover. Phytognosis would imply identifying these thresholds so as to work around them. It would mean, for instance, learning how to harvest timber without destroying a forest, how to fish without endangering the reproducibility of certain species, and so on. In other words, phytognosis teaches us to respect environmental limits.

Humans can also take the plants' decentred physical structure as a blueprint for progressive forms of social and political organization. As philosophers Gilles Deleuze and Félix Guattari have pointed out in *A Thousand Plateaus*, the rhizomatic structure of some plants points us in the direction of a non-hierarchical socio-political and economic structure, one where there is no "head" but, rather, a multiplicity of communicating parts.<sup>10</sup> What if, instead of thinking of the state as a leviathan, a large animal, as political philosopher Thomas Hobbes suggested in his eponymous book, we thought of it as a plant, as grass, for instance? What would be the consequences of this horizontal view of society for our institutional organization? We would certainly live in more egalitarian communities, with strong political participation and a more just distribution of resources across the body politic.

A third substantial difference between plants and animals is that, apart from some exceptions, plants are sessile beings, that is to say, they are rooted to a specific location, while animals are mobile, going from place to place in search of food and shelter. True, plants release their seeds to the elements in such a way that they often traverse large distances, but a place where a seed falls owes as much to chance as to the ingenuity of the plant

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and, once it takes root, it can rarely move to a different spot. The sessile nature of flora has historically been regarded as a sign of deficiency, with vegetal beings deemed inferior to animals because they are unable to choose where they grow. However, humans could gather valuable insights from the rootedness of plants. Being tied to a place, plants need to cherish and nurture that particular area, lest it become unsuitable to support life. Instead of depleting and rendering barren a given region, and then moving on to exploit the next one, as some animals, including humans, often do, plants nourish their environment, the bodies of dead vegetal matter providing the soil with the nutrients needed for the growth of other plants. A phytognostic approach to plant life would learn from its attachment to a given place. At a time when humans are already looking for other planets as a possible replacement for the earth once we have used up all of its resources, completely destroyed the planet's ecosystems, or made it unlivable because of a nuclear catastrophe—as in Christopher Nolan's film *Interstellar* (2014) or in more concrete plans to colonize Mars by entrepreneurs such as Elon Musk—plants teach us to care for and preserve the environment that allows for our existence. They are a constant reminder of how reckless it is to dirty, devastate, and deplete one's own home.

A final example of phytognosis, in terms of what we can learn from plants, takes as a point of departure the recent scientific studies that highlight the plants' various forms of communication, decision making, language, "vision"—through their photosensitivity to sunrays—and so on. The recognition that much of what we thought were exclusively human or, at the very least, animal features are shared by all living beings shows that, far from being the pinnacle of creation, *Homo sapiens* is not all that exceptional. Our lives are neither more complex nor superior to those of animals or plants, many of which have existed on earth long before we came along and will surely live on long after our disappearance. Plants teach us that the human mode of existence should not be seen as the measure of all life, and that the idea of all other beings existing exclusively for our use is nothing but a phantasy created by our anthropocentric arrogance. Perhaps more important than anything else, plants teach us humility.

Phytognosis is a pressing task in light of the current environmental destruction. Turning to plants, learning about and from them, paves the way for a less instrumental approach not only to the environment, to the way we behave toward other vegetal and animal beings, but also to social relations, to our interactions with our fellow humans. Phytognosis teaches us to cherish the place we inhabit, as well as to be mindful of the lives and needs of other humans and non-humans—in other words, to be good guests in the home we share with all other beings on this planet.



## notes

1. Gagliano et al., "Learning by Association in Plants."
2. See, for instance, Trewavas, "Aspects of Plant Intelligence"; Brenner et al., "Plant Neurobiology"; or Gagliano et al., "Experience Teaches Plants."
3. See, for instance, Karban, "Language of Plant Communication."
4. Marder, *Plant-Thinking*; Hall, *Plants as Persons*.
5. Carrigton, "Humans just 0.01% of all life."
6. Gagliano, Ryan, and Vieira, "Introduction," viii.
7. Ibid.
8. For a review of how flora's mode of being leads us to question established philosophical ways of thinking, see Marder, "Vegetal Anti-Metaphysics."
9. For instance, the government-appointed Swiss Federal Ethics Committee on Non-Human Biotechnology (ECNH) considered in a 2008 report that interfering with plants without a valid reason is morally inadmissible.
10. Deleuze and Guattari, *A Thousand Plateaus*. To be sure, Deleuze and Guattari contrast the rhizomatic structures to arborescent ones, i.e., those that are tree-like and hierarchically structured. Still, one could argue that all plants are, to a certain extent, rhizomatic, especially when compared to animals.

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