Plant and Human Work at the Botanical Garden of Rome: A Biosemiotic Ethnography

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Abstract: In this paper, we aim to answer two research questions: how do plants work with signs? Moreover, how is the human work of gardeners and conservators intertwined with the plants' semiotic actions? Starting from a field internship at the Botanical Garden of Rome and interviews with some of its conservators and gardeners, we highlight the central role of direct observation in recognising the work that plants undertake to achieve their flourishing and well-being. Further, we link the biosemiotic framework to multispecies ethnography, showing how the semiotic continuum between species is central to the recognition of vegetal work and to a broader reconceptualisation of it.

Keywords: Plant agency; Phytosemiotics; Vegetal work; Multispecies Ethnography.

Introduction

"Let us tell a little bit about their world, a lot about their world" (Oak).[1]

In this paper, we discuss several aspects of plants' lives, primarily using two frameworks: biosemiotics (Hendlin, Kusters 2026) and multispecies ethnography (Kirksey, Helmreich 2010), with a focus on the work that plants do and

[1] To ensure the anonymity of gardeners, when we discuss and quote their interviews directly, we will use the name of some plants as a pseudonym. In fact, during the interviews, the interviewer asked the gardener about their favourite plant(s) in the Botanical Garden. We will use these common names – when possible – instead of personal names and surnames. In any case, the pseudonym will not be italicised, even if in Latin, to underline that we are not referring to the actual vegetal specimens.

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the collaborations between their efforts and gardeners/conservators' interpretations and actions in the Botanical Garden of Rome. Biosemiotics plays an important role in demonstrating that plants are active and effectively perform interpretive and signalling work in their environment. This standpoint informed our idea of giving a biosemiotic definition of vegetal work to offer a non-anthropocentric view of what plants do in Rome's Botanical Garden. On the other hand, multispecies ethnography was a useful framework and analytical tool for including plants as proper research subjects and examining their relations with gardeners. We consider multispecies ethnography, both theoretical and empirical efforts to understand the experiences of other-than-human living beings and the people who are in direct daily interaction with them.
We then touch on several points to explain what the plants do and how we can recognise their activities. In *Theoretical Horizon*, we present the theses that informed our work: the definition of vegetal agency starting from the biosemiotic domain and from multispecies ethnographies; we also offer our definition of (biosemiotic) work. In the *Methodology* section, we present the fieldwork undertaken, as well as the place in which it took place – it is vital to remember, indeed, that places are never neutral, and in the case of plants, the interrelation with abiotic space is extremely important in understanding vegetal life (Casey, Marder 2024). In *Vegetal Work*, our more consistent section, we analyse the interaction between gardeners and plants, emphasising that the biosemiosis of plants differs according to their evolutionary history, and therefore the work for plants must be recognised starting from their peculiarities and the places where they evolved. Finally, in the *Final Remarks,* we conclude the paper with reflections on the research outcomes.

Theoretical Horizon

The debate on vegetal agency is rich and articulated in current critical plant studies, and several perspectives arise, sometimes at odds. In *Plant Thinking*, for instance, Marder grounds plant agency in vegetal freedom and indeterminacy (2013, p. 129), since vegetal beings do not have the same constraints of animals in the organisation of their bodies – a classical perspective on plant agency and nature taken up by several Western philosophers, as pointed out by Marder also in *A Phytocentrism to Come* (2014). Other perspectives highlight the necessity to consider biological agency in plants more straightforwardly through the study of vegetal plasticity (Gilroy, Trewavas 2022), taking into consideration also the so-called plant neurobiology (Lee, Calvo 2023), while others propose to focus on traditional Indigenous knowledge, to decolonise our gaze on plants'

actions (Lawrence 2022). There are, indeed, several Indigenous authors working on the relationship between humans and plants and on how the latter directly influence us– see, for instance, the work of Kimmerer, especially *Braiding Sweetgrass* (2013). To conclude this brief overview, we must also consider radical approaches that attribute personhood to plants (Hall, 2011). However, the decision to attribute agency to plants is not politically neutral – see, for instance, Helton's proposal in *Growing Methods* (2021), and Bourgeois-Gironde and Lumb's attempt to read the events of Paris' Commune through the lens of vegetal radicality (2025): it has consequences on our understanding of the world, and highlights the oppressive relationships between species. Hence, we adopt a biosemiotic understanding of agency, grounded in studies of phytosemiotics (Krampen 1981; Kull 2000; Comollo 2024): semiotic agency means that plants use signs to act in the environment, interpreting the external and reacting coherently to it. This perspective is not politically neutral: it deconstructs the anthropocentric and glottocentric understanding of action through meaning (Cannizzaro, Cobley 2015), acknowledging the profound interconnectedness of living beings with their environment and other organisms (Wheeler 2019). The idea of interconnection and readability of plants' signs by other living beings allows us to create a bridge between critical plant studies, biology, and anthropology; in other words, we use biosemiotics as a metalanguage capable of translating biological and semiotic understanding of agency also in philosophy and anthropology, starting from the assumption that plants are active and at the same time deeply interrelated with the external; the indeterminacy of plant signs are deeply embodied in plants' morphology, but also in the medium where they grow.

We can now move on to multispecies ethnography, a valuable framework that allows speculation about humans while also offering new perspectives on non-human beings and their capabilities. There are different ways to conceive of the *Anthropos* and its relationship with the more-than-human, as Kirksey and Helmreich's brilliant article suggests (2010) – and as Fuentes reinforces (2010), underpinning multiple anthropological points of view. For us, it is essential to consider human nature as an interspecies relationship, as Tsing (1995; 2015) and Haraway (2008) point out, and to take into consideration the role of "care" in these human and other-than-human ties (Bellacasa 2017). Care must be understood as a work of maintenance with ethical, political and affective implications that involve different types of living beings. This assumption is relevant because it could be seen as a fundamental first step in establishing a relationship between humans and plants, specifically in the gardeners' work; caring is an important part of their relationship with plants. Moreover, this paper focuses on plants' actions. The latter is another

multispecies' ethnography's crux: the other-than-human existence and capacities. On this topic, there are many contributions that can be cited, such as Lien and Law on salmon (2011), Van Dooren on birds (2014), and Candea on meerkats (2010). Particularly relevant is Parrenas (2012), who studies orangutans in a Malaysian recovery centre and focuses on the concept of "affect" to establish a relevant theoretical frame for understanding how relations between humans and other-than-humans share affections (of different kinds). This topic is deeply connected to the biosemiotic framework presented earlier, and in this paper, we apply it specifically to plants. Indeed, some works already focused on vegetal organisms starting from these premises. For instance, Chao, in her contribution on the oil palm tree in Indonesia and the conflict relations with the Upper Bian Marind people (2022), explains how multispecies relations and the "entanglement" concept can also generate violence and conflict among different other-than-human species and humans. Another example focuses on knowledge developed through entanglement in what Krzywoszynska (2016) defines as the concept of "skill". Multispecies relations generate, and at some time require, some kind of specific knowledge that is here described with gardeners' experience. Pruning and caring for plants are indeed works that generate "effects" on those involved and, at the same time, slowly create a new kind of connection and shared knowledge between humans and plants. For all these reasons, multispecies ethnography offers a useful lens to see beyond the definition of work as just human.

Consequently, in this paper, to define "work", we take on a definition used by Beever and Tønnessen (2015) to discuss their proposal of a biosemiotics particularism in (biosemiotically influenced) moral philosophy: according to the two scholars, normative discussions on more-than-human beings should "be based on the organism's fulfilment of their needs, which are generally related to their semiosic capacity" (Beever Tønnessen 2015, p. 34).[2] Paraphrasing this statement, we propose considering work as the semiotic activity undertaken by living forms to fulfil their needs and achieve their overall well-being, which always involves multispecies interactions. We are aware, indeed, that it is a quite broad and counter-intuitive understanding of work: several studies support different directions; for example, Besky and Blachette reflect on what it would entail to consider "industrial grains and animals as 'workers'" (2019, p. 2), in the contemporary capitalist understanding of this term: indeed, there are some specific conditions (especially in agriculture), in

[2] In other words, living beings' needs depend on living forms' abilities to interpret the surroundings and their internal states and answer to them. From a bios' miotic standpoint, all these abilities are semiotic, since there is a consistent use of signs.

which plants can be considered as producing something in the classical anthropocentric perspective: as Besky underlines in the case of monocultures, "despite dreams of alienation, monocultures 'work' – when they work – by drawing capital, labour, and technologies together and keeping them there" (Besky 2019, p. 26). However, in this context, we aim to reach a minimal understanding of this concept to move toward a plant-centred perspective. In other words, we aim to observe in the botanical garden not the "work of plants", namely just recognisable (or projected) from our human perspective, but rather the "work for plants", namely the vegetal activity which wants to reach something that is valuable for the plants themselves, and which is recognisable only in a second moment by us in the semiotic efforts done by the botanical species. With this broad definition, we can easily understand plants' semiotic actions in their environment as work, often invisible to an anthropocentric perspective. In other words, we define plant work as the activity undertaken by plants to obtain what they seek, their goals, even if they cannot be recognised by us as economically valuable. It is a phytocentric and phylogenetic definition that can be applied to all biological entities: exactly as plants, even animals (and, within this category, us), mushrooms, bacteria, and so on have their ways of working, sometimes recognisable from our gaze, others not. Since there are several ways species can indeed co-act and co-work, in this paper, we focus on the co-work humans can establish with plants in the context of a botanical garden, starting from the plants' perspective rather than the opposite.

Methodology

Considering the theoretical approach and framework, along with our biosemiotics-oriented, vegetally inflected definition of work, we can gain a deeper understanding of the methodology employed during fieldwork. One of the authors spent ten months, from May 1, 2024, to February 28, 2025, conducting a research internship at the Museum Botanical Garden of Rome, part of the University of La Sapienza's museum system. During this period, eight semi-structured interviews were conducted with workers at the Botanical Garden Museum, and various participant observations were performed with collaborators. The Botanical Garden of Rome is situated in the centre of the city, in the Trastevere neighbourhood. It is situated on the Janiculum, one of the seven hills of Rome, and within it, several paths allow visitors to explore the various collections, which can be quite dense, as seen in the bamboo collection.

Figure 1: Section of the Bamboo collection at the Botanical Garden of Rome. (*Picture by the authors*).

Inside, we can find several plant collections: palm trees, ferns, a rose garden, Italian vines, bamboo, a rock garden, a Japanese garden, a Roman forest, conifers, a garden of aromatic and medicinal plants, a zone for aquatic vegetation, a tropical greenhouse, the Corsini greenhouse, the monumental greenhouse, the French greenhouse, the propagation greenhouse, and the mediterranean garden; there are also several monumental trees, and not always the plants of a collection are limited to a single place. The place is an ideal laboratory for botanists and biologists. Inside the park's outer perimeter, hundreds of perfectly preserved local and alien species coexist. The various plant-related activities are planned according to the specific needs of each species. People who work in the garden are friendly with strangers and visitors, and are happy to share and discuss their experiences freely. At the same time, after making some observations, it became clear that everyone in the garden was very busy. The place is enormous, and it requires a lot of work and organisation. The species currently preserved in botanical gardens, including those autochthonous to Rome, have no predominant productive purpose in a capitalist sense and do not share the dynamics of extractivism, plantation logic, and deforestation typical of productive varieties, even if visitors must pay an admission fee to help maintain the place.

Thanks to the long internship period, it was possible to observe the immense extent of the Botanical Garden, with all its various zones and greenhouses. These observations were conducted alone during extensive walks around the garden and by following the workers' daily lives within the same structure. Each "gardener" is responsible for a specific plant collection. The human workforce comprises the director, curators, botanists, researchers, and workers who are not directly involved in plant care but rather interact with visitors or provide educational/artistic programs and services offered by the Botanical Garden. The people interviewed are mainly men aged 30-50, most of them with a high level of education (master's degree or higher). During the ten-month research period in the Garden, seventeen gardeners worked daily to care for the plants; due to the volume of work at the Botanical Garden, it was not possible to interview all of them.

During the first months of the internship, an essential questionnaire with guided questions was developed to explore three thematic fields: first, what does it mean to be a curator, and what plants need most in terms of care? This part of the interview helped explain how a curator's job is articulated, and how they can interact with vegetal organisms. Secondly, participants were asked to observe and explain the intra and interspecific relationships among plants, indicating which plants better "collaborate" with others. Thanks to these questions, it was possible to understand some relationships that form and inhabit the Bo-

tanical Garden. The final field explored the possibilities of interaction between humans and plants, with questions aimed at examining the informants' sensitive perception and how they learn to "read" plants' needs. This last field also focused on the experiences of gardeners who, quoting Clément, need to work with, rather than on, nature (1994, p. 12). These questions allowed us to enter the world of the Botanical Garden and its complex relationships through the eyes and observations of the workers who daily interact with plants.

Vegetal Work

To begin the discussion on vegetal work, we would like to start with one observation made by the gardener Aloe[3] during the interview on succulent plants.[4] Discussing the various species present in the Botanical Garden's greenhouses, the conservator explained how plants of the *Lithops* genus can perform the photosynthesis process underground. The sunlight passes through the fleshy leaves and reaches the part of the plant most protected from heat and potential dangers, which is located below the soil surface. This simple botanical notion about one of the thinnest species in the Botanical Garden offers a helpful metaphor for plant work: it is, most of the time, invisible to the anthropocentric gaze. This condition is not only determined by the so-called plant-blindness, but also by a general difficulty in considering plants without a zoo-centric approach (Sandford 2023, p. 2). Following a phylogenetic interpretation of biosemiotic branches, we know that the semiotic competence of distinct species (and, clearly, kingdoms) is differentiated through the phylogenetic tree (Lineweaver 2025);[5] in other words, the semiotic actions (and, consequently, the work) of botanical species are shaped by the various constraints[6]

[3] From this point to the end of the paper, this is the pseudonym for this gardener.

[4] With "succulent plant", we refer generally to plants that have "large cells for water storage" (Griffiths, Males 2017, p. 890).

[5] A phylogenetic tree is the graphical representation of the differentiation of species and kingdoms of life during the years; it is helpful in recognising the exact momentum in which organism evolutionary path diverged, and different abilities evolved.

[6] The concept of "constraint" is critical from a biosemiotics perspective. Indeed, living forms can evolve and adapt through their semiotic freedom in the presence of external «enabling constraints» (Kauffman 2014, p. 3) that must be overcome. Different constraints lead to distinct evolutionary adaptations, and, as Zhou notes, more constraints mean greater semiotic freedom (2023, p. 412). The essential point of our discussion is that evolutionary adaptations and habits define how living beings work, following the biosemiotic definition of work we adopted. Therefore, the distinction between species, determined by the different constraints and interpretations of the latter, is a central aspect of the differentiation between more-than-human works. We could say that there exist as many more-

they face(d) during their evolutionary paths. If the general definition of work we gave at the beginning of this paper is helpful to show a general informative assumption of our paper, we want to underline the differences in plants' work in the botanical garden. We explain them through analysis of various collections and observations made by gardeners, starting with the succulent plants curated by Aloe and distributed across four expository and one reproductive greenhouse. In these places, we can find several plants from different ecological niches, all characterised by a subdesert climate. Aloe began explaining the organisation and division of the greenhouses, where each plant has a specific place. This is a central topic in Aloe's interview. The plants are not only divided into different greenhouses depending on their needs, but the work of Aloe is also aimed at describing and rebuilding their origins:

> So this is a small quantity of the objective of the Botanical Garden, that is, *ex situ* conservation and then reintroducing the plants *in situ* into their environment; therefore, no 'more or less there' but in a geographical area that corresponds precisely to the natural population, and therefore gives this data an additional value to the collection (Aloe, translated by the authors).

Plants have their place both inside and outside the garden; determining where they fit best is Aloe's responsibility. This topic highlights a critical element of reflection: even plants can migrate, and gardeners and conservators are well aware of the mobility of vegetal beings. For this reason, the taxonomical work at the Botanical Garden is not just a discipline that aims to "know names"; instead, it focuses on describing the story of every single plant. Where they came from, how they arrived in the Botanical Garden, where they belong, etc.
Considering all these differences among plants, Aloe observed that geographically distant organisms sometimes evolved similar traits to overcome similar constraints, a phenomenon that can be termed "evolutive convergence" in scientific terms. Consequently, some plants evolved similarly, while others completely differently: when we refer to "succulents", we are dealing with a an extremely vast number of living forms (and the same discourse applies to other plant groups, due to the incredible variety in the plant kingdom). Taking these premises into account, we can now discuss some characteristics of the succulent plants' work. As Aloe underlined during the interview, succulent plants usually do not face particular competition from other plant species. However, rather than their direct "opponent", the environment itself can be considered

than-human works as there are interpretative organisms, or, to use a Uexküllian term, *Umwelten* (von Uexküll 2010 [1934]).

a serious risk. Due to the extreme climate, the plants evolved specific habits to not disperse water and energy. If, on the one hand, the classic action attributed to almost all vegetal life forms is photosynthesis, on the other hand, one of the vital works of succulent plants is to conserve water. It is indeed a characteristic that defines important aspects of these plants' life and morphology, as some of them have evolved a peculiar photosynthesis system.[7]

Considering this aspect, we can discuss some interesting points: the recognition of the surroundings, the search for water, the storage of the latter, and the evolution and growth of defence mechanisms to prevent its loss (for instance, thorns). All these (semiotic) actions entail interpretation of stimuli, internal communication and signalling, the making of decisions on how to cope with constraints, and the use of energy to effectively "act"; in other words, they are forms of work. The various ways species respond to their environment demonstrate a diversity that cannot be reduced to mechanicism: there is a creativity of living forms (Hoffmeyer 1996, p. 38), the creation of paths that did not previously exist.

This aspect is common to all vegetal work: plants overcome similar or different constraints, creating new paths or reproducing past habits to them. An important part of the role of gardeners and conservators at the Botanical Garden is, therefore, to recreate the conditions that allow plants to grow (and, consequently, work) effectively. Without the right climate, exposure, and symbiotic species, some plants cannot undertake the actions they evolved to flourish and thrive, and sudden evolution and the creation of new habits are not always immediate. Gardeners, in other words, are the direct observers and facilitators of vegetal work.

This perspective takes us outside the Botanical Garden's succulent greenhouses to the tropical greenhouse, curated by Jubaea,[8] where the vegetal work differs. In the greenhouse, there are tropical plants from four continents, which thrive in a hot, humid climate: their ecological niches extend across the equator, encompassing the Tropic of Cancer in the North and the Tropic of Capricorn in the South. The temperature can fluctuate between 35 and 40 degrees Celsius (the closer to the tropics, the lower it is), with a humidity range of 70% to 90%. Another important characteristic of these environments is the hours of light: approximately 12 hours of daylight and 12 hours of night throughout the year. Indeed, Jubaea explains that tropical plants grow and photosynthesise year-round.

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[7] We are referring to the so-called CAM (Crassulacean Acid Metabolism), namely the mechanism through which some (but not only) succulent species can exchange gases necessary for the photosynthesis process at night. In this way, the evapotranspiration is prevented. For a detailed review of this mechanism, see *Crassulacean Acid Metabolism* (Ranson, Thomas 1960) and *Crassulacean Acid Metabolism: Plastic, Fantastic* (Dodd *et al.* 2002).

[8] From this point to the end of the paper, this is the pseudonym chosen for this gardener.

After many years of collecting and reproducing tropical plants, gardeners faced one significant issue: overpopulation. Some of the initial 300 species planted over approximately 630 square metres had to be moved outside because growth could not be maintained indoors. Growth is indeed one of the more intuitive ways to notice and account for the plants' work. Through morphology and plasticity, we can recognise not only the vegetal movement but also the interpretation they give to the territory (Gilroy, Trewavas 2022).
In this regard, Jubaea provides a critical example. To address the overpopulation problem, some plants have been relocated outside the tropical greenhouse and planted under two *Quercus suber* trees, whose evergreen foliage helps maintain temperatures above 4 or 5 degrees Celsius. After a few challenging years (for example, Jubaea reports cases of leaves growing smaller than usual), the situation stabilised, and some tropical plants have even flourished. Among these plants, we find specimens of *Ceiba speciosa* also known as *Palo Borracho* in Spanish, an endemic plant in Argentina and other South American regions, including Brazil. This species is characterised by numerous thorns on the trunk and branches, which help defend the water inside the plant. Jubaea noted, however, that one of the plants exhibited morphological change and did not possess these spines. He brought the interviewer to the plant and pointed out the bark: it was completely thornless. The gardener discovered that the plant had been planted where a heavily irrigated flowerbed once stood, and the abundance of water made the plant's thorn defence within it unnecessary. By adjusting the irrigation, the plant has begun to revert to its classic morphology.
We have so far pointed out how plants work through signs and give meaning to the external world, and we can observe this through the analyses of their morphological changes, underscoring that the work of each species highlights its specificities. However, analysing species solely from a morphological perspective poses many practical problems, for instance, in determining plant origins. Related to this topic, hybridisation is one of the most common factors in misidentification, as Platanus,[9] a systematic botanist, says, and it is also directly associated with human activity, often for commercial purposes or to move plants from one climate to another. The question of plant names is relevant to Platanus' job, and he created a database of all species names from the Botanical Garden to upload and register with Botanic Garden Conservation International, a platform and organisation that involves various botanic gardens around the world. The classical Linnean method of systematisation of plants is not always sufficient to identify plants and understand their origins, as Platanus explained:

[9] From this point to the end of the paper, this is the pseudonym chosen for this botanist.

Figure 2: A specimen of Ceiba pentandra inside the tropical greenhouse. (*Picture by the authors*).

> However, we obviously need to give it a name. Moreover, sometimes we do not succeed because there is no historical reference. The plant may not even present the diagnostic characteristics required for recognition; for example, if it has only leaves and does not produce flowers and fruits, we are unable to determine the plant (Platanus, translated by the authors).

Another line of reflection that directly connects to plant morphology is the symbolic value we assign to the shapes of flowers; in this context, roses are a clear example, suggesting that some plants have special meanings and economic value due to their appearance. To underscore the importance of flowers in our market system and chain of value, it suffices to recall that in the 17th century, the first speculative economic crisis of the modern capitalist era was triggered by the importation of tulips into the Netherlands (Neal, Weidenmier 2003). Aesthetics and plants have a close relation that passes through the human anthropocentric gaze and system of meaning, and sometimes this relation manifests in the plant's appearance. Modern roses are remarkably different from old varieties, explains Rose,[10] a young researcher interested in various issues, including the impact of climate change on *Rosaceae* species. Older species are more sensitive and fragile to climate change; the number of petals varies (so-called ancient roses have fewer petals), and every year, thanks to human-induced hybridisation processes, new varieties are created. We find it interesting to highlight this step, as the biological capabilities of these plants, i.e., their work, are utilised for human economic and aesthetic interests. At the basis of this procedure, there is the recognition of this vegetal capacity, even if little explored. The aesthetic conception is clearly anthropogenic and has little to do with plant health.

This point is clear in relation to plant work seen in the Botanical Garden's rose garden. Rose presents the various reasons why roses are grown by humans – from aesthetic reasons to controlling certain pests in vineyards – and explains, during a walk through the rose garden, how rose plants are fertilised in an artificial or controlled way to give life to new varieties for collectors. However, during the interview, he points out that roses are also bioindicators due to their sensitivity to climate variation.

> They are considered the sentinels of nature; these spies of nature are used and known by winemakers. Why do they plant them at the beginning and end of the rows of vines? Because roses get sick first, winemakers immediately know how to intervene before vines become infected (Rose, translated by the authors).

[10] From here until the end of the paper, a pseudonym for this conservator and gardener.

Again, in the Rose's interview, hybridisation and aesthetic cross in a multi-species relationship. Discussing the history of roses and even their future, the plants' freedom and agency emerge in distinct ways. Indeed, if we abandon an anthropocentric gaze, we notice that the semiotic activity of these plants is present in every interaction they have with their surroundings, as they process information, attract pollinators, and even react to stimuli humans send them. Moreover, plants, and even roses, affect us, making the process of domestication less unilateral. If the semiotic continuum demonstrates that all living beings act through signs, vegetal signs can act on us. Therefore, plants are not only working with us to flourish (like in the case of roses' hybridisation, where the human and the other-than-human work converge), but are also working on us, inducing us to care for them, as proposed by Hodder (2012, p. 74).
Clearly, in the case of roses, aesthetics plays a central role in our understanding of plant value and even of their responses to our stimuli. However, this is not always true for all plant species. We can explore this point further, returning to the words of Jubaea:

> Plants are not, as we think, objects of aesthetic beauty only. I consider all plants beautiful, regardless of whether they produce more or fewer showy flowers. Why? Ultimately, they all serve the same purpose: absorbing carbon dioxide. They are the first medicine and pharmacy in the world that come from plants. Furthermore, the fact that a plant can have a beautiful flower next to it, a less significant one, in fact, does not change the functionality for us (Jubaea, translated by the authors).

Plants are, therefore, purposeful and co-acting living beings, and we can act with them in several fields and for different purposes: aesthetic, medical, environmental, etc. This point of plant co-action with us is evident even in the interview with Hypericum,[11] curator and gardener of the *Orto dei semplici*, where medical plants and spices are cultivated together. Hypericum notices the difference between some species that are more "exuberant" and can migrate through flowerbeds, and those that require human assistance to propagate and change position. The gardener's action is therefore required to recognise the signs of plants that need to change soil, migrate, and adapt in a new space and, at the same time, contain the exuberance of those plants that would harm other vegetal species. We could wonder where Hypericum's work begins and ends, and where the plants' actions predominate in this subtle relationship. However, we know that the boundary between human and plant action is ambiguous, mak-

[11] From here until the end of the paper, a pseudonym for this conservaphylogenetic differentiation, and provided plant species-specific analysestor and gardener.

ing plant work particularly difficult to isolate. Differences between species suggest that we should treat plant work as distinct from human work. However, as mentioned earlier, sometimes entanglements can occur.
So far, in this section, we have explored vegetal work, including examples of phylogenetic differentiation, and provided plant species-specific analyses and discussions. Moreover, we mentioned the issue of co-action, showing that each botanical species has distinct exigencies, and that its work is not isolated in the environment but, on the contrary, requires contact with other agencies.
Moreover, another point emerges: the direct observation of plants' work. Only through the latter, multispecies ethnography, is it possible to describe and untangle the complex relational schemes among species. As one of the curators (here referred to as Maple) pointed out, observation is crucial to understanding the plant world. While theoretical studies are important and can save time and effort, only through direct observation of plants, analysing their condition, and interpreting their signals can we grasp part of the complexity of the vegetal world. As previously mentioned, the gardener's work involves understanding the plants' needs, fulfilling them, and standing alongside them when necessary. Therefore, the Japanese garden curated by Maple can be viewed as a collaborative effort among different agents, both human and vegetal. As Maple observes, the plants in the Japanese Garden grow by interpreting their environment and adapting to human aesthetic goals. Consequently, Maple had to study their behaviours carefully and accompany them as they followed a specific, unfamiliar order. In a context of syncretism involving plant species from very different ecological niches, it became necessary to make some adjustments during the garden's construction, providing more space for plants that risked being suffocated by unfamiliar neighbours or invasive species, both underground and aboveground.
At the same time, the gardener needs to know when to leave space for the plant to work. During an interview, another collaborator, Oak, points out that plants often need to be left to grow without our intervention, since they have existed far before our species and have adapted to extreme conditions and climates. Leaving space plants, indeed, is not just a gardener's practice, but a possible path for ecological niche restoration (Gagnon 2023). In most cases, as humans, we are led to think that plants depend on us, when in fact the opposite is true. Plants can migrate but cannot rapidly leave a place; many of their adaptations have been designed to increase their chances of survival without requiring quick movement. "What do we have to do with a plant that has been alive for 140 years? Nothing, as little as possible", said Oak to explain his point of view better. The interaction between our species has not always been beneficial for them, as Oak mentioned in the case of rose cultivation in Rome's suburbs. Due

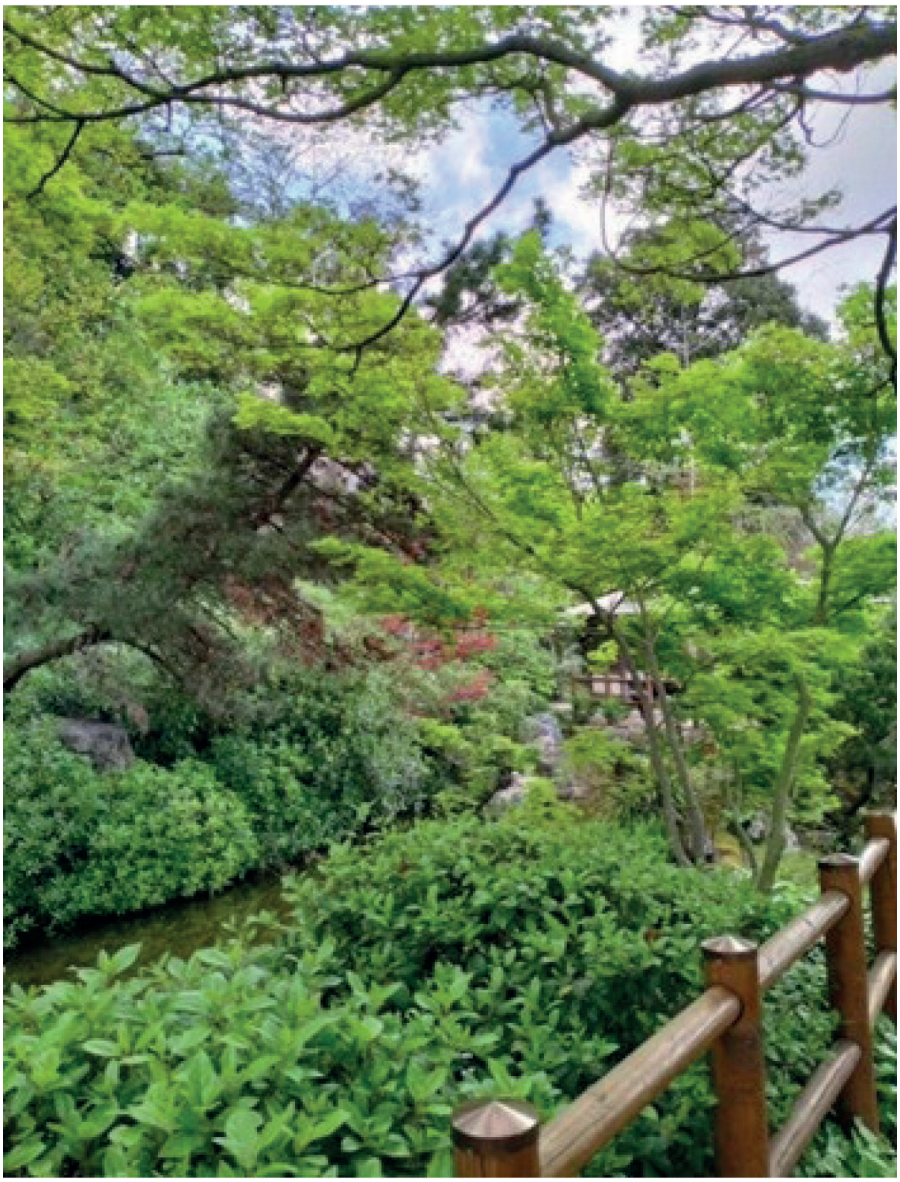

Figure 3: Glimpse of the Japanese garden. (*Picture by the authors*).

to the excessive use of chemical products, the soil remained totally sterile for decades. Not everything in interspecies relations is easy, and most of the time, we (humans) make mistakes. Therefore, the gardeners and conservators need to know precisely when and where to interact with the plants, leaving space for vegetal work. A great sensibility toward vegetal beings, demonstrated also during the interviews, is then central and non-negotiable: just through observation, the gardener is the one who lives with and "senses" the more-than-human work of plants daily.

The question of reading plant appearance is a recurring topic among the people interviewed. Shape is the first characteristic our eyes can see and try to understand. All observation gardeners make on plants is based on plant morphology and external appearance, even when they try to assess a plant's health. The recognition of work is, again, related to our recognition of their spatial position and change, returning to the centrality of plant morphology.

> Thus, plants have their own appearance as well as their own architecture, like us animals. Each of us has our own form, and each animal has its own strength. In short, each plant has its own unique shape, and beyond that, they exhibit a very distinct appearance. I cannot tell you precisely by what signs the florid plant is doing well […]. Experience, unfortunately, cannot be written. It cannot be written; it can be told in everyday life. You observe plants, you observe them in a community because they live in large communities and in any case, they somehow manage to feel better, because they are not only living but also sentient beings, […]. And then they together form a 'we' that we call an ecosystem (Oak, translated by the authors).

Oak is responsible for several projects, including aquatic plants, and is very precise; the relationship and knowledge of plants derive from empirical observation that cannot be translated into words. Moreover, in Oak's opinion, plants are perfectly sentient, living in an entangled community and ecosystem. He explained several of his perspectives to the interviewer, including what he meant by the terms "ecosystem" and "sentient". Sometimes, the only real option for understanding otherness is to try to read others' emotions; in some ways, gardeners do the same with their plants. He discussed newborn *Ginkgo biloba* specimens generated from a group of other *Ginkgos*. For many years, they never needed water. For him, plants that grow in "families" are stronger and less sensitive to climate alterations. Humans are not essential, and in any case, only if we can clearly understand the plants' conditions and needs can we develop a way to co-act with them.

On this topic, Oak is an expert. During his time at the Botanical Garden, he, along with other collaborators, developed a specific hydroponic system that

utilises ordinary water, is chemically free, and relies solely on daylight for crop growth. Observing plants' work and clearly recognising the latter helps imagine and develop new forms of collaboration between species, taking into account the needs and perspectives of both humans and plants.
Another interesting aspect of the recognition of plants' activity and collaboration has been presented by Cinnamomum,[12] who discussed one of his projects, which we can call "gardens of well-being". At the time of the interview, Cinnamomum was the curator of conifers at the Botanical Garden. After graduating in psychology, he spent "his second life" at the Botanical Garden, studying and exploring how plants can be used in therapy. The project is ongoing, and Cinnamomum is thinking of introducing a garden for well-being in the Botanical Garden, to explore the so-called "forest therapy":

> [...] I was saying forest therapy and therapeutic wellness gardens. A wellness garden will be built here within the botanical garden and will be designed for the autism spectrum, Alzheimer's, and addiction. Partly taking into account the most widespread pathologies, and considering the particularity of the location, specifically the botanical garden, as well as the nearby neighbourhood (Cinnamomum, translated by the authors).

These conversations underscore a profound understanding rooted in gardeners' empirical experiences and their intimate relationships with plants. Across various conversations, the relevance of observational practice emerges as an independent source of knowledge and understanding, enabling relationships with other beings, including, in this case, the acknowledgement of the more-than-human work they undertake.

Final Remarks

As we have seen in the various interviews, the Museum of the Botanical Garden of Rome demonstrates that theory and practice converge, showing that the vegetal world is far more complex than we usually imagine. Indeed, our understanding of vegetal work, grounded in a biosemiotic understanding of agency, is recognised by the humans who necessarily work with these living forms every day. In other words, we can say that at the Botanical Garden of Rome, plants work alongside humans, creating a unique relationship between species that cannot be described within the anthropocentric notion of work.

[12] From this point to the end of the paper, this will be the pseudonym for this gardener.

From our perspective, however, this case study is not merely an observation of how work can unite several species, but also an example of how biotic communities can be effectively established among different living forms. Leopold, in *A Sand County Almanac* (1966 [1949]), broadly discussed his proposal for a "land ethic," underscoring that humans could create multispecies communities only by abandoning their conqueror attitude (and, we add, gaze) towards other living forms – and even towards abiotic parts of the landscape. What we find in the Museum of the Botanical Garden of Rome is exactly what meets these necessities: a multispecies community in which several living beings with completely different evolutionary backgrounds collaborate and cooperate for a common objective: the well-being of plants.

People interviewed at the Botanical Garden have been crucial to understanding and exploring the concepts of "work" and "work with" as they relate to plants. The fundamental knowledge and relationships they have with various kinds of plants are an outstanding example of multispecies relations observable in an urban context. Their "art of noticing", their deep sensitivity to understand plants' needs, and their dedication to another form of life are inspiring and deserve careful reflection. First, it is essential to emphasise that, for various authors (Tsing 2015; Kohn 2013), multispecies ethnography is a discipline that focuses on studying the relationships between humans and other forms of life inhabiting the wilderness, often in non-Western countries. The fundamental elements that make multispecies ethnography so valuable – and at the same time so necessary – are its ubiquity and its interiorisation. Places like the Botanical Garden of Rome demonstrate that it is not necessary to be in a natural environment to observe other species. Since species are everywhere in our world, even in urban contexts, we can imagine ethnography as a common practice for "tell" elements of other worlds; it is just necessary to develop the art of observation, as Tsing (2015) suggests. This possibility of conducting ethnography almost anywhere has direct consequences, promoting self-questioning about what we are observing, who we are as humans, and what our role is in the environment. Most of the people interviewed share these questions and doubts, but they also know very well what plants do: they move, interpret, migrate, produce oxygen and absorb carbon dioxide; at the same time, they know what their role as gardeners and conservators is: to live with plants and "read" their necessities when they occur, facilitating plants' well-being, or, in de la Bellacasa words, "caring" (2017). Therefore, related to this topic, we can assume from the interviews that the strict relationship built between gardeners and plants contributes to the process of recognition and discussion of what we can call a "vegetal agency", an interesting new point of view in considering other forms of life as "working subjects", without attributing all the characteristics of human subjectivity to plants, clearly.

Applying our understanding of work and a solid theory of agency grounded in biosemiotics, we notice that all these interactions and the creation of this sort of "community" are made possible also by the active nature of plants; vegetal beings seek connections and relationships to overcome constraints and survive. We, therefore, believe that a convergence between species, in this case with botanical species, is achievable in the exact moment in which more-than-human work stops being invisible to us. Gardeners and conservators at the Botanical Garden of Rome trained their gaze to recognise how plants communicate, act, change, and intertwine with external stimuli and other plants. They can coordinate their actions with those of plants, working with them rather than on them, only after noticing this form of activity. The Botanical Garden is therefore a multispecies social laboratory of significant importance: in addition to being an important place for botanical research, dissemination of knowledge outside the academy, and aesthetic pleasure for our eyes, it also becomes a place where human beings can experience different forms of relationships with plants without necessarily having to go through purely instrumental and extractivist needs, as happens in contexts such as agriculture. Hopefully, in the future, Botanical Gardens will become increasingly spaces for ethical and social research on plants, studying new forms of living and working together.

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