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MESSAGES FROM THE UNDERGROUND: INTERSPECIES MEMORY IN TIMES OF CLIMATE CHANGE

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Abstract || In times of climate change, the citizens of Málaga (Spain) must consider how to respond to both the longer droughts and the torrential rain falls that pose serious threats to local agriculture. In this context, the non-profit group Ecoherencia researches and teaches how to use plants that are viewed by society as weeds, but are equipped with various nutritional, medicinal, and agroecological properties —they call them Multifunctional Plants (PlaMs)—. The ease with which these plants grow is due to what Ecoherencia calls “soil memory.” These weeds may have constituted crops long ago, and their seeds remained and multiplied over the centuries. This paper departs from Ecoherencia’s vision to propose and examine the concept of *interspecies memories*, phenomena of centuries-long interactions between species and ecosystems that generate structures of meaning, flesh, and matter. It is not just human memory of the environment or the biological memory of the species revealed by processes of adaptation, but rather a memory of co-evolution. In particular, the co-evolution of societies and their crops has shaped both cultural and technological development that are materialized in seeds and the seeded soil. Seeds, and also weeds’ seeds, are repositories of information about life and agricultural technologies from the past, when the human community faced food shortages. This information may be necessary to solve problems arising in the future of climate change.

Keywords || Interspecies | Memory | Plants | Culture | Weeds | Climate change | Activism

Resumen || En los tiempos del cambio climático, Málaga enfrenta el reto de saber cómo responder a los peligros que comportan para la agricultura local tanto las largas sequías como las lluvias torrenciales. En este contexto Ecoherencia, una empresa social sin ánimo de lucro, investiga y enseña cómo usar plantas consideradas por la sociedad como malas hierbas a pesar de sus propiedades nutritivas, medicinales y agroecológicas —llamadas Plantas Multifuncionales (PlaMs)—. La facilidad con que estas plantas crecen se debe a lo que Ecoherencia llama «la memoria del suelo». Las que hoy se consideran malas hierbas pueden haber sido cultivadas por los antiguos habitantes de estas tierras en un pasado lejano y sus semillas se quedaron en el suelo y se multiplicaron durante siglos. Este ensayo parte de la visión de Ecoherencia para examinar el concepto de *memorias interespecie*, fenómenos de largos siglos de interacciones entre especies y ecosistemas que han generado estructuras de significado, corporales y materiales. No se trata tan solo de la memoria humana del ambiente o de la memoria biológica de las especies que se revela mediante procesos de adaptación, sino más bien de una memoria interactiva de coevolución. En particular, la coevolución de las sociedades y de sus cultivos ha contribuido tanto al desarrollo de la cultura como también al de la tecnología que se han materializado en las semillas y en el suelo. Las semillas, y también las semillas de las malas hierbas, contienen información sobre la vida y las tecnologías agrícolas del pasado cuando la humanidad se enfrentaba a la escasez de alimentos. Esta información puede resultar necesaria para resolver los problemas futuros que puedan surgir como resultado del cambio climático.

Palabras clave || Interspecies | Memoria | Plantas | Cultura | Malas hierbas | Cambio climático | Activismo

Resum || En temps del canvi climàtic, els ciutadans de Màlaga (Espanya) han de considerar com respondre tant a les sequeres més llargues com a les pluges torrencials que comporten serioses amenaces a l'agricultura local. En aquest context, el grup sense ànim de lucre Ecoherencia investiga i ensenya a utilitzar plantes que la societat considera com a males herbes, però que estan equipades amb diverses propietats nutricionals, medicinals i agroecològiques —anomenades Plantes multifuncionals (PlaMs)—. Aquestes plantes creixen amb facilitat pel fet que Ecoherencia anomena «memòria del sòl». Aquestes males herbes poden haver constituït cultius fa molt de temps, i les seves llavors es van mantenir i es van multiplicar al llarg dels segles. Aquest article parteix de la visió d'Ecoherencia per a proposar i examinar el concepte de *memòries interespecíes*, fenòmens d'interaccions centenàries entre espècies i ecosistemes que generen estructures de significat, de carn i de matèria. No es tracta només de la memòria humana del medi ambient o de la memòria biològica de les espècies revelades per processos d'adaptació, sinó de memòria de coevolució. En particular, la coevolució de les societats i dels seus cultius ha donat forma al desenvolupament cultural i tecnològic que es materialitza en les llavors i el sòl sembrat. Les llavors, i també les llavors de males herbes, són dipòsits d'informació sobre la vida i les tecnologies agrícoles del passat, quan la comunitat humana va haver d'enfrontar l'escassetat d'aliments. Aquesta informació pot ser necessària per resoldre problemes derivats en el futur del canvi climàtic.

Paraules clau || Interspecíes | Memòria | Plantes | Cultura | Males herbes | Canvi climàtic | Activisme

“They buried us but they did not know that we were seeds.”
Zapatista’s song

No es aconsejable que crezca el árbol
Si desconoces el nombre de la semilla

(It is not good that the tree grows
If you do not know how to name the seed)

Antonio Herrada

1. Drought in Málaga

In 2017 and 2018, newspapers in Spain’s coastal city of Málaga began focusing on water scarcity with growing frequency. Jesús Sánchez Orellana wrote in *Ser Málaga*, that the province had entered 2018 alarmed by the drought, and that water usage was already being limited to 60% in various areas, which could damage crops (Sánchez Orellana, 2018). The new climate forecasts elaborated by the University of Newcastle (*Environmental Research Letters*, 2018) foresee that in thirty years the droughts will be twice as severe in Málaga (Europa Press, 2018). Agustín Peláez in *Diario del sur*, noted that the severe drought currently being experienced coincides with the larger number of tourists visiting the zone, whose usage of water aggravates the hardships. He reminded readers that droughts occur in Málaga province every 6 to 9 years, but that with intensifying climate change they will be, and already are, increasingly severe so that new strategies of environmental mitigation need to be elaborated (Peláez, 2017). In February of 2018, a drought decree was expected in the whole province of Málaga. In January 27, 2018, Virginia Gúzman wrote in *La Opinión de Málaga*: “the reserves are at their lowest since 2010” with 1/3rd of the water reserves remaining, and two of the reservoirs even below 30%” (Guzmán, 2018). But, then, in March, it poured.

Just one storm brought to the region close to half of the yearly average rainfall and it filled water reservoirs, pushing away expected agricultural catastrophes for at least two years (Lillo, 2018). While the already perceived changes of the climate aggravated incidences of drought, they also intensified storms. That brings additional problems as in the hilly areas of the region, heavy downpours wash out the fertile layers of soil. After the heavy rains, the watering restrictions were removed in Málaga and life returned to normal. Local growers say “Entre sequía y sequía hay olvido” (Between one drought and another we forget), thus pointing out that threats of environmental catastrophe have not yet transformed regional agricultural politics (Garde, 2018).



Water reservoir of Viñuela (Axarquía-Málaga) / Daniel Pérez / EFE

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1 | See <<https://www.ecoherencia.es/>>.

The agricultural area of Axarquía, north-east of Málaga, where the water scarcity is most serious since 1990s, grows avocados, chirimoyas and mangoes, which require abundant irrigation. The area planted with mangoes has been expanding particularly quickly, reaching four hundred hectares in 2014. As the area begins to experience serious water problems, the alluvial plains of Guadalhorce and Campanillas, south west of the city, where other tropical fruits, such as oranges, lemons, loquats, avocado and sugar cane grow, are also shrinking and threatening these crops. But the area of Málaga has also produced since Neolithic times almonds, olives, and algarrobo (*ceratonia siliqua*), which are now growing in the valley of Guadalmedina, the river that crosses the city of Málaga. Known also as carob (from Arabic *kharrub*) and Hebrew (*haruv*), as Saint John's bread or locust bean, algarrobo is native to the Mediterranean region and, even though it is used extensively in agriculture, it can still be found growing in the wild. Carob is used to produce nutritious flour that can be consumed by humans and animals, and it has a slightly sweet chocolate-like taste and is very filling. Being resistant to pests, droughts and even to saline waters, carob is also a slow-time, indeed a multi-generation plant. It achieves full yield only after 20 to 25 years. It is plants like carob that may be most important for human survival as intensifying cycles of drought are likely to destroy tropical fruit plantations and when the threat of water scarcity cannot be forgotten in Málaga any longer. Some intellectuals and activists in the region are thinking about how to prepare for these times. Among them are members of *Ecoherencia*.¹ The young ecologists that form *Ecoherencia* believe that the soil is seeded with the memory of the past human-plant-soil practices which should be treated as an important resource for the future. This article analyses *Ecoherencia*'s uses of this "interspecies memory" to transform community relations and promote institutional learning about human-plant relationships for a more sustainable future.

2. Ecoherencia

Ecoherencia is not a non-governmental association, but rather a business, what they call “una empresa social”² (social enterprise), formed by a group of friends who met at the graduate program in Environmental Conservation at the University of Alcalá de Henares in 2010. In 2012, they travelled together to the Brazilian Amazon with Dr. Valdely Kinnup, who taught them about an enormous variety of edible plants in the rain forest that he called PANC (Plantas Alimenticias No Convencionales or Not Conventional Edible Plants). After days of learning to recognize, name, and prepare dozens of fruits and leaves available in the forest, a moment of realization came at a local supermarket that displayed the same fruits and vegetables as in Europe. How was it possible that in a land of so many rich resources, none were marketed and as a result barely consumed by the local population? (Kinupp, V. et al, 2012, Jiménez et al., 2012). The young activists wondered if this kind of situation is particular to the Brazilian Amazon, or, perhaps everywhere, what is sold constitutes only a small part of what can be eaten, and used for medicinal purposes. According to Rappoport (1971), 95% of the world’s food proceeds from 30 different species of plants while the amount of edible species is estimated somewhere between 27 and 60 thousand.³ Members of *Ecoherencia* who live in Málaga, Alberto Jiménez Gómez and María Vela Campoy, believe that the strategic transformation of agriculture in Málaga for climate change should include rediscovering and reincorporating edible plants that have been forgotten.

As they began to research the forgotten edible plants of the region, they realized that most of them had a number of characteristics that were beneficial for humans and for the environment, so they called them PlaM: Plantas Multifuncionales (Multifunctional Plants). PlaMs have nutritional and medicinal properties, but many are also insect repellents and can substitute for insecticides, and others fertilize and clean the soil. Chicory, for example, is able to clean soils from the insecticide DDT (Jiménez, 2017), and it can also kill human parasites. Ragweed is a “hyperaccumulator” that can build up in its cells a higher concentration of heavy metals than those existing in the soil and can thus be used to detoxify land where nothing else can grow (Bernstein, 1992). Different amaranth species have also been used to clean contaminated soil (Ziarati et al., 2014). These plants are also easy to grow and hardy, or in fact, hard not to grow, since most of them grow in the urban areas, planted or not, as weeds.

While the list is long, among the shortlisted PlaMs in Málaga are: Aloe, Amaranth, Starflower, Calendula (or Marigold), Chicory, Plantain, Purslane, Mustard, Comfrey, Tansy, Dandelion, Nasturtium, Social

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2 | *Ecoherencia* is a non-profit organization whose employees are shareholders. *Ecoherencia* leads research, publishes educational materials, offers paid workshops for institutions and corporations that are required to provide environmental education for their employees. It also competes for grants, and seeks support from private foundations.

3 | See also, Kunkel 1984 and Cardoso, 1997.

Garlic, and Nettle, just to mention a few. According to Jiménez's research (2017), these plants return now unwanted, and are often removed as weeds, after they used to be grown and consumed as crops in the past. Jiménez claims that about 90% of plants growing as weeds in the city are edible while this percentage is much lower outside of the densely populated areas. This is because the plants that grow in the cities coevolved with humans for hundreds and sometimes even thousands of years. Their seeds remaining in the soil and spreading through time have been perceived in modern times as an annoyance but it is in fact a persistence of the past.

Many plants are viewed as annoyances in spite of their nutritious and medicinal properties because the definition of food has been changed by the market. It has become a product rather than a giver of nutrition and a partner, and limited to the profitable lines of highly processed articles, which are often made addictive, to be consumed more often, with a high sugar content. These cheaply produced and cheaply sold, yet profitable, neoliberal foods have particularly undermined the health of the poor. This has been manifested most dramatically in the United States where obesity and diabetes affect various ethnic minorities (Otero, 2012; Pechlaner and Otero, 2010; O'Brien, 2007), but similar problems are beginning to be noted in Europe (Portalatín, 2016; Zamorano, 2018). Similarly, industrial agricultural production does not have as its goal feeding people, but rather turning a profit (Clapp, 2017). What is being grown depends on market price fluctuations and on governmental subsidies rather than on people's nutritional needs (Jiménez, 2017). In that way, food sovereignty has been progressively lost in most places.

Ecoherencia believes that getting to know native edible plants of the region, and learning how to prepare them and eat them, transforms cultural attitudes towards consumption. It not only improves the soil and human health, but also helps to build local food sovereignty and communal resilience. What if supermarkets are empty one day due to some unforeseen circumstance? What if drought destroys plants that need a lot of water? PlaM will still be growing there in spite of all these problems, and the knowledge of how to use them may prove to be crucial for survival. Gaining that knowledge is nothing more than regaining memory of what past generations knew, and that now seems to be only known by the weeds and by the soil that retains their seeds. Is vegetal memory just a metaphor?

3. Vegetal Memory and Biocultural Memory

According to plant philosopher Michael Marder (2013), vegetal beings devoid of consciousness nonetheless possess memories (126). This imageless memory is an inscription of the diverse

stimuli of the environment on the cells of the plant. Marder writes that “Whereas humans remember whatever has phenomenally appeared in the light, plants keep the memory of light itself” (127). Marder defines plants’ rumination as “thinking before thinking” —that is a thinking independent from the instinctual need to adapt and the formal intelligence to abstract. In Marder’s words, plant thinking has “nonconscious intentionality” (125) that “fuses with milieu” and is not self-reflective. Marder’s philosophy is based on scientific research.

Various scientific articles focus on genetic flexibility in plant adaptation as memory. In an article titled “Do plants remember drought? Hints towards drought memory in grasses” in the journal *Environmental and Experimental Botany*, Walter, Nagy et al. find an increase in drought-adaptation by grasses after multiple exposures to damage by lack of water. Kinoshita and Seki (2014) write “it has recently been shown that plants can remember past environmental events and can use these memories to aid responses when these events occur.” Karpinski and Szechynska-Hebda (2010) even argue that “plants are capable of processing information encrypted in light intensity and in its energy” in order to optimize their fitness. They continue by saying: “Animals have their network of neuron synapses, electrophysiological circuits and memory, but plants have their network of chloroplasts connected by stromules, PEPS (photoelectrophysiological signalling) circuits transduced by bundle sheath cells and cellular light memory.” Karpinski and Szechynska-Hebda suggest that plants could be intelligent organisms with much higher organismal levels of organization than it was thought before.” Netea et al. (2011) talk also about vegetal immune system memory: “There is an increasing body of evidence to suggest that exposure to a pathogen leads not only to specific immunological memory (represented by memory T and B cells) but also an enhanced innate immune response.” In that way plants’ development of resistance to pesticides can be viewed as vegetal epigenetic memory of a stressor.

Owing to their nature, plants are constantly exposed to a multitude of environmental stresses to which they react with a battery of responses. The result is that plants grow tolerant to difficult conditions such as excessive or inadequate light, water, salt and temperature, and resistant to pathogens. Not only is plant physiology known to change under stress, but changes in the genome have also been identified (Molinier et al., 2006). Although, it was not determined whether plants from successive generations of the stressed plants inherited the capacity for genomic change, it can be concluded that environmental factors lead to increased genomic flexibility in successive generations, which likely increases their potential for adaptation. Plant memory could then be defined as coded chains of reactions to stressors that allow these plants to survive.

How does the vegetal memory expressed as adaptation differ from the social memory of agricultural and food gathering and production practices that Toledo and Barrera-Bassols (2009) call “biocultural memory?” According to these researchers, *biocultural memory* is a knowledge of the environment with its multiple forms of life relevant to human survival that allows us to continue inhabiting the planet. The concept involves human subjective perception of environment as a space of life where we establish relationships with different creatures that help us satisfy our needs. Biocultural memory is a human memory of thousands of years of their passage on the planet in order to know how to coexist with nature. This includes knowledge of plant species that are edible and poisonous, their preparation and cultivation, knowledge of soil and the capacity to discriminate between threatening and friendly behaviour. One could reflect, however, that all animals and plants possess this kind of memory as well, and that these memories are in fact entangled and often working out together through encounters and in the mediation of common spaces. Understanding this in the context of the climate change affected future, e.g. longer droughts and more torrential rains in the area of Málaga, can help think of better strategies. Animals, plants, and soil can be viewed not just as objects of experimentation, but rather as partners in possession of helpful information, that should not simply be used but rather dialogued with.

4. Interspecies Memory: *Les Lieux de Memoir*

Perhaps, rather than talking about plant memory and human memory separately, we should in fact talk about “interspecies memory.” We reflect on the possibility that plants are not only *actants* in Bruno Latour’s (2005) meaning of significant catalyzers of socio-economic processes, but as some indigenous peoples and some environmental humanities scholars believe,⁴ that they indeed have their own species thinking and agendas. These agendas are realized, however, by their alliances with other plants, animals and human groups with whom they grow over very long spans of time on the same land. In the processes of co-evolution of different species and their mutual entanglements, agency is distributed among partners in struggles for survival and betterment. The stories of transformations of life forms have their own meaning, and this meaning is coded in all participating entities, but it becomes activated when they interact. As these interactions mostly occur in particular areas, these areas are the places of common interspecies memories where identities, narratives and economies arise through relations with others. This is not to naturalize cultures or economies, but to rather see them as irreducibly entangled with the nonhuman forms of life and matter that surround them.

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4 | See, for example, Kohn (2013), Wohlleben (2015), Ryan (2012), Pollan, (2013), Tsing (2016), and Myers, (2015).

The semiotic and material entanglements of plants and economies appears in myth, fairy tales and other forms of cultural narratives, showing how these cultures differ. While in the English fairy tale, *Jack and the Beanstalk*, a plant was a base to build a civilization that would later colonize the wild forces of otherness, in indigenous mythologies of the Americas, plants are partners and relatives. Maize is the mother of Mexican people, while potato is a gift from the gods in Bolivia. The Zapoteca community of Guelatao has a concept of interspecies identity formed *in between* people and their crops of *milpa*, where plants are active participants in the process of remembering. According to Zapoteca activist Aldo González (2017), maize has coded in its cells thousands of years of co-evolution with indigenous peoples of the region. Indigenous activists believe that with the demise of this interspecies memory, their very identity will be wiped out as well because they treat maize memory as an indispensable part of their own. Ecoherencia and other groups of intellectuals and activists around the world listen to and learn from these different ways of conceiving the interspecies and trans-material realms while rethinking how to creatively respond to the challenges posed by the climate change. These alternative epistemologies, enrich conceptualizing of the relationships between the social and the life and matter that surrounds it in ways that incorporate history, and ethics by focusing on *interspecies memory*.

Interspecies memory would be, then, not just a human memory of interspecies interactions, or a vegetal memory in its biological sense of adaptation strategies, but rather a hybrid interspecies phenomenon of centuries-long interactions that generate structures of meaning, flesh and matter. This memory may be opening through mutual encounters between plants and humans, such as planting, harvesting, tasting or smelling. It may be encoded in humans as liking or dreading certain images, tastes and smells, which allow people to recognize edible plants that they do not know, but which their ancestors have known and eaten. It may be encoded, in turn, in plants as knowing how to grow in certain places with certain soils fertilizers, and certain human technologies, and how to attract certain insects. It is encoded in the soil filled with seeds from the past human cultures that still grow unexpected in places where something else is planned. In this way, soil, seeds and plants *remind us* that they used to have significant relationships with us and could still help us out if needed, as they did in the past. Jiménez (2016) compares the presence of weeds emerging in the cities to graffiti. These are messages coming from underground, both literally and symbolically, reminding us of what the mainstream culture rejects and represses; that they were and, perhaps should be, a source of our food so that we live sustainably, or so that we survive.

In humans and nonhumans, memory is a capacity of the body to code, store and retrieve information. In most cases, this occurs in a material context. In other words, most kinds of memory are environmental and space based. In particular, so called “episodic memory” refers to information that is encoded along a spatial and temporal plane (Schacter & Addis, 2007; Szpunar, 2010), where material referents are integral parts of the processes of coding and retrieving. In various contexts, similar to Latour’s Actor-Network Theory, these referents are active—they do not only remind us of things, but also provoke actions. In this way, memory and what the anthropologist Birgit Müller (2014), calls “agentivity” of seeds, soils, and ecosystems are closely related. For Müller, “lived contact” with plants and soils, and a “sensorial perception of the nonhuman” is a key motivational source for alternative social movements that treat seeds as “fellow participants in the same world [...] rather than a genetic resource at the disposal of humans” (63). Material-semiotic relationships connect humans and plants in always changing networks, where pasts are coded through stories and in vegetal and human bodies that over centuries consume each other.

According to Gomez-Pompa (1967), in the soil of urban areas, even in the places covered by perennial vegetation, a wide range of dormant seeds in the soil can be detected. According to Jiménez (2017), most of them will develop into edible plants, and if only we stop destroying them by herbicides and if we remove the crops that historically do not belong to the area, these plants can be readopted as food crops. Pierre Nora’s (1984) concept of “*lieu de memoire*” describes places, things or impulses bringing back memories of the past. In this sense, soil, being a bank of dormant seeds, is a place of memory. A wetland where eucalypti were planted dried out and it was sufficient to remove the eucalyptus, and the soil restored the previous ecosystem that it remembered. The wetland and its vegetation returned by themselves (Jiménez, 2017). Our soils are deeply seeded and every piece of land can potentially become a forest if only we remove factors of degradation. If only the soil is not destroyed in other ways by erosion or over-exploitation, we can perhaps together (humans, soil and seeds) remember all that has not been completely forgotten by extinction.

In Nora’s words, «*a lieu de mémoire* is any significant entity, whether material or non-material in nature, which by dint of human will or the work of time has become a symbolic element of the memorial heritage of any community» (xvii). These are nods to relations between things and discourses, memories and practices. Before they become symbolic, however, *les lieux de memoire* are indexes. The symbolic qualities of plants need no explanation. While the Roble of Guernika, symbolizing the Basque history and separation from Spain attracted one of the most terrible aerial bombings of the civil

population, an olive tree branch always asks for peace, and maize is the symbolic mother of Mexican people. Indexes, unlike symbols, cannot be abstracted from the reality in which they appear. They only have meaning in a particular local context, and like the pronouns “you” and “I” they are different in each conversation. Without necessarily symbolizing it, they point to something they are related to in a more metonymic than metaphoric way. When purslane emerges from the cracked pavement stone in Wisconsin, it points to its relationships with the indigenous people who used to eat it before the colonizers arrived. In Málaga, purslane is called “verdolaga” and points to the Italian cuisine introduced there in the sixteenth and seventeenth centuries (Jiménez, 2017).

5. Seeds’ Interspecies Memory Wars

As the scale of environmental destruction intensifies, seeds become not only a source of hope, but also weapons in a struggle that is as much about the material aspects of life as it is about the meanings of agri-culture. Seeds are carriers of memories in both domains. The Zapatista’s song that was recycled after the kidnapping and murder of 43 Ayotzinapa students expresses hope in the midst of mourning that gives meaning to resistance: “they buried us but they did not know that we were seeds.” In this way memory that can rise and spread like weeds becomes a weapon. Activists in many places of socio-environmental struggles use seeds as allies, planting them in the contested territories to fortify their own human-ideological positions. Native seeds planted at the gate of Monsanto’s seed factory, or by the wall separating the US and Mexico, turn into both partners and resources in the struggle by providing food for the time that passes while they germinate and grow, and by pointing to the future where some aspects of the past could be revived. In these ways, sprouting seeds function as indexes of past human-plant relationships, coding them and reminding the activists of what they fight for. One could say that new social movements are learning from the seeds and are themselves becoming seed-like. They occupy plots of land where they grow, then disappear, to reappear again bringing new hope, sometimes somewhere else where the wind takes them or after many years like pine seeds that can survive a fire and resurge after 30 years of dormancy (Tsing, 2016). Marder, in his article meaningfully titled “Resist Like a Plant” (2012), compared the Spanish *Indignados* occupying plazas of various towns in the Iberian Peninsula in 2011 to weeds occupying plots of land. María Vela Campoy (2017) calls these new social movements’ strategies learned from plants, and consisting in planting oneself and growing in the interstices of the system like weeds in the midst of toxic crops “a soft guerrilla.”

One of the most memorable guerrilla plants, in the context of the struggles for land, is Amaranth. A number of its varieties became resistant to glyphosate, the main ingredient of the herbicide Roundup, used with genetically engineered soy and some varieties of maize. This mutation occurred as the enzymatic pathways of the plant remembered the toxins and evolved in response to it. In many ways, these nonhuman mutants that were previously non-prevalent or non-existent have become allies of humans resisting the GE-soy. Super weeds have learned⁵ and remembered how to use technologies for their own purposes as they spread through plantations by attaching their seeds to agricultural equipment and machinery. When Syngenta produced an advertisement for RR-soy in a poster where areas of Argentina, Uruguay, Paraguay, Bolivia and Brazil were marked as a “United Republic of Soy,” openly displaying its neo-colonial discourse, activists reacted by choosing Amaranth as a symbolic hero and an ally in their decolonizing campaign, voicing a “revenge of the Amaranth” (Serruya, 2013), but also urging people to throw mud balls filled with amaranth seeds into RR-soy plantations (Beilin & Suryanarayanan, 2017). These are forms of rhetoric and of social action, carried through the interspecies memories shared by fumigated people and Amaranth seeds.

Besides being an aggressive weed, amaranth has a number of edible varieties, such as *Amaranthus caudatus* in the Andes, *Amaranthus hypochondriacus* in Mexico, *Amaranthus viridis* that grows in India, Jamaica, but also in Spain, and *Amaranthus hybridus*, that fluctuates between domesticated edible and weed variety, and that is also present in Mexico and in Spain. Amaranth is harvested by hand and it catalyses community-formation. It does not offer a high margin of profit but it constitutes an excellent source of nutrition. *Caudatus* and *hypochondriacus* were important crops of the pre-Columbian populations, abundant in proteins and modulating immune systems. They were destroyed by Spaniards in part due to their sacred status for the Aztecs, and in part as a form of biological warfare (Cole, 1979; Sauer, 1977). *Amaranthus hybridus* is the wild variety from which edible varieties of amaranth such as *quitensis*, *caudatus* and *hypochondriacus* have been developed and to which they possibly regressed to survive in surrounding forests and sustained people in times of hunger and war (Kietlinski et al., 2014; Sauer, 1977). When, in the 20th century, activists, inspired by Robert Rodale’s vision that Amaranth could save the world from hunger, brought different varieties of this plant to Mexico’s Tehuacán valley, where it had been grown abundantly five hundred years ago, Totonoca people, reluctant to accept any new crops, immediately accepted amaranth (Hernández Garcíadiego, 2016). In fact, they consumed the first trial crop before it even matured. It is perhaps that Amaranth reminded them in some ways of their long-lasting relationship that was sustained by the hybrid variety growing in the forests. For the

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5 | We are using “learning” in the sense of findings in epigenetics that acquired behaviour can be passed to new generations (Jablonka & Lamb, *Evolution in Four Dimensions*) as well as in the sense of previously quoted research on plants memory.

activists, Raúl Hernández Garcíadiego and Gisela Herrerías, this meant a triumph of a certain vision of the future, among a number of options that they considered in their mission to alleviate the poverty in the region (ibid). After waiting for hundreds of years, Amaranth took over Tehuacán valley again, promoting a society where cooperation and family agriculture is essential. This was due to the return of the semi-forgotten interspecies memory shared between indigenous people and Amaranth. If the memory of Amaranth seeds had not been available (Hernández Garcíadiego received seeds from a grain collector for they were nowhere to be found), this Amaranth-related community that is now composed of about 10 thousand people, would have never been possible.

Zapoteca people of Guelatao, Oaxaca understand how important it is for them to safeguard from forgetting their interspecies memory shared with maize. During the seed exchange seminar that I attended in 2017, peasants promised to keep planting the seeds of their indigenous maize where it has always grown, even if it is not profitable and even if it has become illegal.⁶ Aldo González (2008), Zapotecan activist, writes: “These lands are not only ours, they are also of maize.” The place of memory that they share is not only preserved by the actual germination and harvest, but also through the preservation of the family and social structures, meals, rituals, space layouts and time rhythms connected to these forms of planting. According to González (2017), seeds that are preserved in Seeds Banks lose these capacities for regulating life.

6. Institutional Learning with Interspecies Memory

Ecoherencia teaches how to make “seed bombs,” but not as a part of what María Vela Campoy (2017) calls “a soft guerrilla,” but rather as a subversive infiltration of the corporate mentality. They encourage corporate employees to throw mud balls filled with seeds from helicopters provided by the Civil Guard. Ecoherencia claims that they attempt to transform the system from within, offering programs on Corporate Social Responsibility and Environmental Corporate Volunteering to large businesses, such as Telefónica, and state institutions, hoping to change them in the process through lecturing and entertaining environmental restoration. In December 2017, in one such program they managed to make and throw 27 thousand seed bombs carrying indigenous seeds to restore a piece of land destroyed by fire. Herbs: romero, plantain, thyme; trees: carob, pine, and what Vela Campoy calls “trilogy of the green fertilizers” (trilogía de los abonos verdes), such as gourd and mustard that restore destroyed soil, were among the seeds. The program started with twenty workshops in five high schools in the area, and five local

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6 | According to a new law all seeds need to be certified to be planted, but only improved seeds receive certification. Indigenous seeds are thus planted illegally.

municipalities, during which seed bombs were produced over two months. The helicopter allowed them to throw the seeds in areas that could not be accessed otherwise. In this way, humans and seeds helped the soil to remember what it used to grow before the catastrophic fire. Did the bodies of the city dwellers recruited for these operations remember their planting pleasures from the deep past as well?

On the website of Ecoherencia, the recipe to make seed bombs, and their original name “nendo dango” can be found. This name was coined by Mansanobu Fukuoka, a Japanese farmer who believed in minimum intervention in agriculture and was the first to propose no-till planting. In an interesting turn of events, nendo dango, as a strategy of seeding, is spreading through both new social movements for resistance as a subversion strategy and through institutionalized practices, in a process that could be called the seeding of seeding. Can seeds and seeding act as a bridge between the worlds of capitalist-technology-mediated expansion and resistance? Ecoherencia is placing its activities in between the two worlds as an enterprise that Erik Olin Wright (2010)⁷ terms as *interstitial*, which seeks to build “new forms of social empowerment in the niches” of the existing system (211). It is debatable if their *symbiotic* relationship with the existing order increases social empowerment while at the same time strengthening the system by building the resilience of communities.⁸

Travelling to small towns and villages for place-based workshops allows city people to think anew about ethical and political commitments with the environment that in rural areas is oftentimes further linked with people. Learning through travelling to rural areas, and participant observation with rural activities, is an old Regenerationist idea, promoted at the end of the nineteenth century by Julián Sanz del Río, and, in the environmental context, especially Joaquín Costa and Eugenio Noel, who believed that the regeneration of rural culture would heal the political corruption in the nation. In their analyses of Spanish rural life, Costa and Noel applied a strong socio-environmental consciousness, supporting rural practices and traditions that were healthy for the community and mindful of the forests, and criticizing those that were cruel and destructive, such as the traditions focused on the torture of animals in festivities of little towns (Noel, 1968). The idea that the health of the national culture is based on sustainable and ethical *cultures of nature* (Ares-López, 2016) returns even more strongly now in the context of climate change.

Ecoherencia’s educational practices follow a Regenerationist path in attempting to promote institutional learning by developing their relations with “nature,” obviously not a pristine wilderness but rather as spaces where plants and animals constitute a more

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7 | In *Envisioning Real Utopias* (2010), Erik Olin Wright distinguishes symbiotic, interstitial and ruptural social movements.

8 | Resilience is a complex and widely contested term. Used both in psychology and ecology, it signifies the capacity of an organism or ecosystem to bounce back to an optimal state of functionality after undergoing stress. Susie O’Brien (2012) argues that the concept of resilience has “aligned itself with the ideals of neoliberalism” as “there is a non-coincidental relationship [...] between the rise in the value of ‘resilience’ and the dismantling of environmental and social welfare program”.

perceptible part of human life. This learning occurs not only through human interventions and interactions, but also around, with and through seeds, plants and planting. As a special moment during the workshops organized by Ecoherencia, after planting, harvesting or food preparation, people share their dreams for the future.⁹ Organizers notice that these dreams are different after interacting with plants as if they were in part conveyed to them by and through the vegetal realm. As if the seeds and plants were reminding people what their real dreams have always been (Plant them!). Participants often say that they hope to be able to grow their own food and stop eating the junk food that is destroying their health or reduce their usage of the car, or live closer to green areas.

This does not mean, however, that human-plant interspecies memories provide a simple recipe for a sustainable future. Some human-plant interactions are toxic, and some are associated with hardship and suffering. For example, some older people that remember the Spanish Civil War, are reluctant to remember carob and purslane, PlaMs, that are very healthy and increasingly appreciated in the ecological market, because they associate them with suffering of all sorts, including hunger, to which they were subjected in those times.

The “working the dream” visualization strategy has an advantage of being fully participatory, and community forming. After people share their dreams, they look for common ideas and images and treat these as “seeds” for future projects. They then try to figure out what would be a way of realizing them. Facilitators ask people what they will do the following week to get closer to the dream. In the discourses of Ecoherencia, the symbolic and material use of seeds alternates constantly. They compare helping people realize what dreams they have for the future to the germination of a seed. In this comparison, they again envision plant growth as a realization of a previous plan, whose meaning, even if only partially, always comes from their long-lasting interspecies relationships. Dreams are for them like dormant seeds in the soil that need to sprout when the conditions are appropriate. Then, like in a book of drawings that you wet to see the images emerge, people realize what their dreams are after they plant their semi-forgotten seeds (Vela-Campoy, 2017).

It is precisely the non-human participants (such as seeds, plants and then food) that allow diverse groups to come to an agreement that was previously hard to reach (Suryanarayanan et al., forthcoming). In the participatory methodologies developed by new social movements this is, once more, made possible by the focus on the more-than-human partnerships that bring out interspecies memories.

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9 | While working, the dream follows the “Dragon dreaming” methodology, inspired by Australian Aborigine understandings.

In this sense, focusing on the nonhumans as not only resources but also partners, functions as what Garud et al. (2011) call “unusual experiences” that allow transformation of hegemonic narratives, facilitating the speedup of institutional learning while extending the time considered as “not-productive” (4). The purpose of achieving environmental resilience is conditioned not only by transforming regional agriculture in terms of what is planted and water infrastructures, but also interpersonal relations (including gender relations), processes of decision-making and governance as well as cooking and eating. These are interconnected and so the transformation of one affects all the others.

7. Conclusion

This paper begins with the story of a drought in Málaga that was interrupted by a torrential rain, which swept away fears of an ecological catastrophe, filling up the water reservoirs for the next two years. The returning memory of the wilting that was threatening most crops due to a lack of water, was once again interrupted. Business as usual, unsustainable as it is, returned to the area. Tropical fruit plantations consuming excessive amounts of water resumed their profitable operations, unrestricted by drought decree, while the slow shrinking of water basins continues. Ecoherencia fosters cooperation by bringing back what they call “an interspecies memory” of human-plant relationships from the past. If, historically, Málaga finds itself today in one of the highest moments of social consumption, where conditions of human life, in spite of the periodic droughts, are relatively easy, the future may be more like the harder periods from the past.

While fear does not help activism, and catastrophic visions may not foment social action, it makes sense to know both the best and the worst scenarios. Since, according to the climate forecasts, the future may be more like the past than like the present, Ecoherencia activists believe in the need to look into agricultural and consumption patterns from the times where society struggled harder to feed its members. They find information about these in written sources, but they also learn from the weeds that emerge in rural areas, reminding people of their past uses.

In the last part of the paper, I considered how Ecoherencia’s social facilitation strategies are incorporating interspecies memories of the seeds and plants that they are promoting and how the presence of plants helps to transform social interactions and structures in a systemic way. The hopes are that, as the system changes, the forgetting that follows droughts in Málaga and other places, where after it rains few initiatives are taken to prepare for the new drought,

can be thus slowly overcome. I conclude that incorporating seeds, planting and plants in social actions changes interactions between participants. It may facilitate communication between groups and individuals with diverse agendas, ranging from resistance that adopts soft guerrilla strategies from the realm of weeds, to movements preferring slow adaptive change by establishing more affective relationships with seeds and plants in the institutional realms through mediation.

I argued that plants themselves are able to mediate social action not only through the use-forces inscribed in them, but also as memory-carriers that supply future possibilities by evoking recyclable past practices. In this second aspect, seeds can be viewed as containers of human-plant interspecies memories, alternatively coded in the vegetal tissues. Amnesiac patients experience deficit both in the area of the past and in the capacity to imagine and foresee the future, and that the past memories are constantly sampled while future scenarios are considered (Szpunar & McDermott, 2008). This and other research show that the future is constructed, to a great degree, on the basis of past memories.¹⁰ In this sense, memories, apart from constituting identities, can be viewed as important resources to constructing future scenarios. Even if all these considerations are specifically about human memory, in terms of their use of the past for the construction of the future they can be applied to the interspecies memories coded in seeds. This allows one to problematize the conceptualization of seeds as resources through the reconsideration of the very concept of resources that can be seen as tensed between material and immaterial data and subjective meaning. The need to protect and cherish seeds would appear then not only as driven by the desire to continue growing the existing varieties of plants, but also by the desire to have choices and knowledge to grow futures. Constructing futures, by imagination, problem-solving and creative thinking, will certainly require interspecies memory-episodes coded not only in human brains and books, but also in seeds. According to Schacter and Madore (2016), specific events or scenes from the past may need to be inducted from memories to solve problems arising in the future. What if those most important ones, the absolutely crucial memories, are in fact interspecies memories coded in seeds and in soils?

NOTES

10 | See also, Schacter and Madore (2016); Adis, Wong & Schacter (2007), and others.

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