A NATURECULTURAL HISTORY OF THE PALM TREE ANTENNA

FERNANDO PORTAL
Profesor asistente, Facultad de Arquitectura, Diseño y Construcción, Universidad de Las Américas, Santiago, Chile

As a form of mediation between infrastructures and living beings, architecture sometimes succeeds in developing new genetic codes. Through the study of a native Chilean species – the palm tree antenna – and its evolution during the last decades, this research describes the different assemblages required to shape the endemic character of this hybrid species, whose vegetal appearance would not only be a strategy to mitigate the visual impact but would also refer to how wireless networks take shape in the territory.

Keywords
Assemblage
Technonature
Camouflage
Essay
Vegetation

> The shape and size of an antenna is [sic] a function of its purpose.
> Royal Canadian Air Force (1963).

Quietly and in tune with the constant renewal of the telecommunications infrastructure, the last decade has seen a strange and ubiquitous technical object flourish and pale. Cut against the sky and hidden among a swarm of wires and foliage, a wide variety of plant-like antennae have colonized our landscape.

As antennas, they are an integral part of a technical system, and their location is determined both by their capacity and by the density required for the optimal technical and commercial operation of the cellular network for data and telephony. This system's intrinsic obsolescence determined its flowering as solitary totems over a decade ago. Installed at a measured distance from the plant species they sought to imitate, today, they share the landscape with other antennas that, with the nudity of their technical forms, evidence what the former meant to hide.

FIG. 1 Antena-palmera correspondiente al modelo natural palmera washingtonia, Hualpén, Chile. Fotografía estereoscópica digital, serie Réplica Original (2015-2016). / *Palm tree antenna following the natural model of Mexican washingtonia, Hualpén, Chile. Digital stereoscopic photograph, Réplica Original series (2015-2016).* © Nicolás Sáez.

Through this reading, vegetal antennae allow us to see the continuity of old disciplinary discussions about the supposed ethical qualities of technical forms and the communicational and economic value of ornament. However, if we further maintain this reading, we can also see in them the incipient materialization of a type of assemblages advanced by philosophy and contemporary science to provoke new understandings and ways of relating to nature.

The term assemblage is proposed as a tool for the analysis of space-time encounters of various scales, whose members manifest both relations of codependency and friction, and where power relations present neither balance nor permanence.

> Assemblages are *ad hoc* groupings of diverse elements, of vibrant materials of all sorts. [...] And precisely because each member-actant maintains an energetic pulse slightly 'off' from that of the assemblage, an assemblage is never a stolid block but an open-ended collective (Bennet, 2010:24).

This condition of openness allows the assemblage to integrate agents[1] of different natures, allowing us to analyze encounters between animated and inanimate agents. Thus, "for my purposes, however, I need something other than organisms as the elements that gather. I need to see lifeways – and nonliving ways of being as well – coming together" (Tsing, 2015:23).

Visualizing this assemblage requires going beyond the tools and conceptual constraints inherited from modernity and which are still approached from design, the relations between form and function, and between

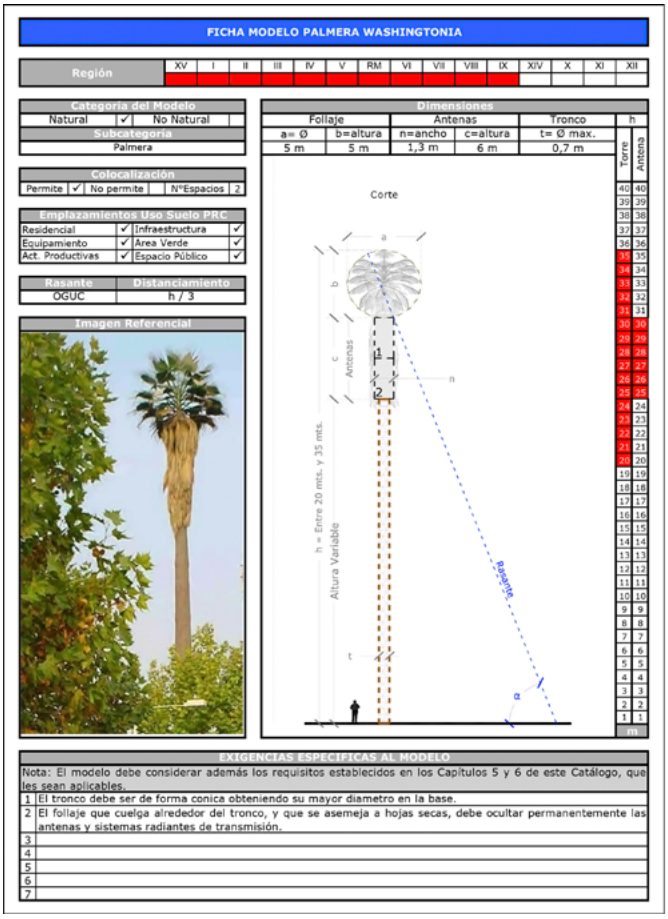
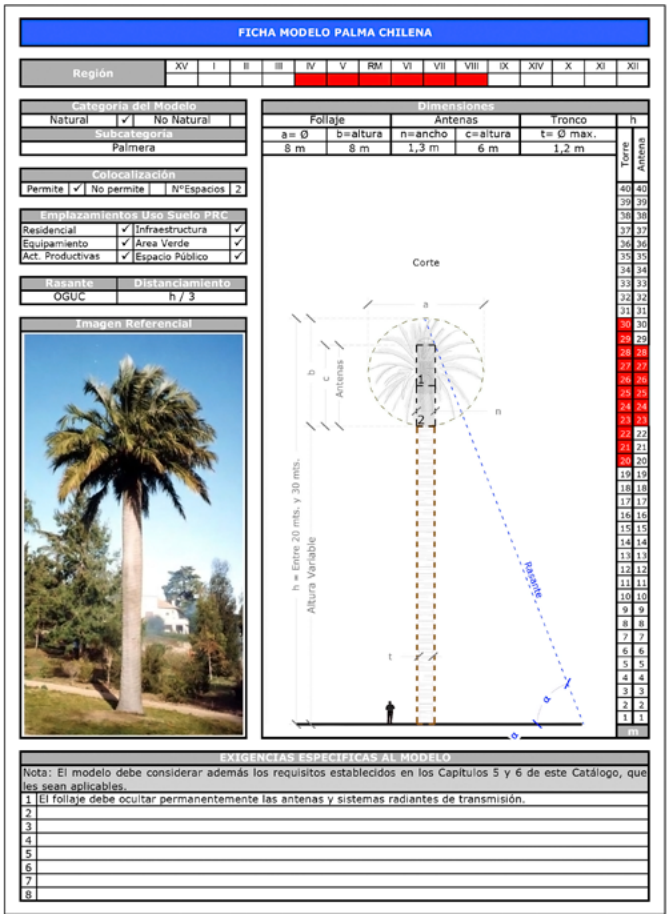


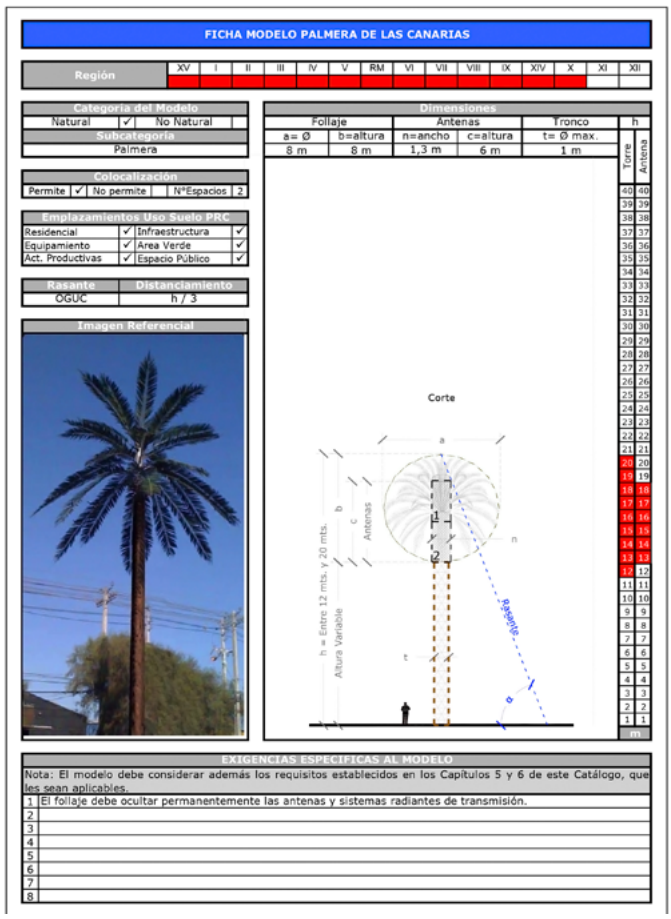
FIG. 2 Fichas de referencia de los modelos naturales de palmera washingtonia, palma chilena y palmera de las Canarias contenidos en el catálogo de diseño y utilizados para aprobar medidas de armonización urbanística (MINVU, 2012). / *Reference sheets of the natural models of Mexican washingtonia, Chilean and Canary palm trees contained in the design catalogue and used to approve measures of urban harmonization (MINVU, 2012).*

the human and the non-human. Tools and constrictions that are circumscribed by two limits. The first, defined by the reduction – from an exclusively anthropocentric view – of nature to an otherness to be exploited even at semantic levels: through the synthesis, extraction, and reproduction of the formal elements that make up its signifier. And the second, which is still debated between the mutism sublimation of technique's autonomous form or of aesthetics' autonomous form.

While the first of these limits is associated with the Enlightenment's cultural and colonial project, the second is anchored to reactionary positions that, faced with the split between art and technique caused by industrial development at the dawn of modernity, have wanted to confine art to an autonomous space. As a result of the interaction between these boundaries, the formal practices of architecture and design fluctuate between repressing and releasing an enlightened impulse. An impulse that seeks to cover the new technique forms through semantic repertoires extracted from the taxonomic synthesis of nature, either as Art Nouveau or as biomimetic architecture.

And although a "support tower of antennas and radiant elements,"[2] to which various elements are added to give it the appearance of a palm tree, is undoubtedly another manifestation of this enlightened impulse, it is also an assemblage in which different types of systems converge. Systems that are no longer just semantic and formal but also technical and sensitive. Systems such

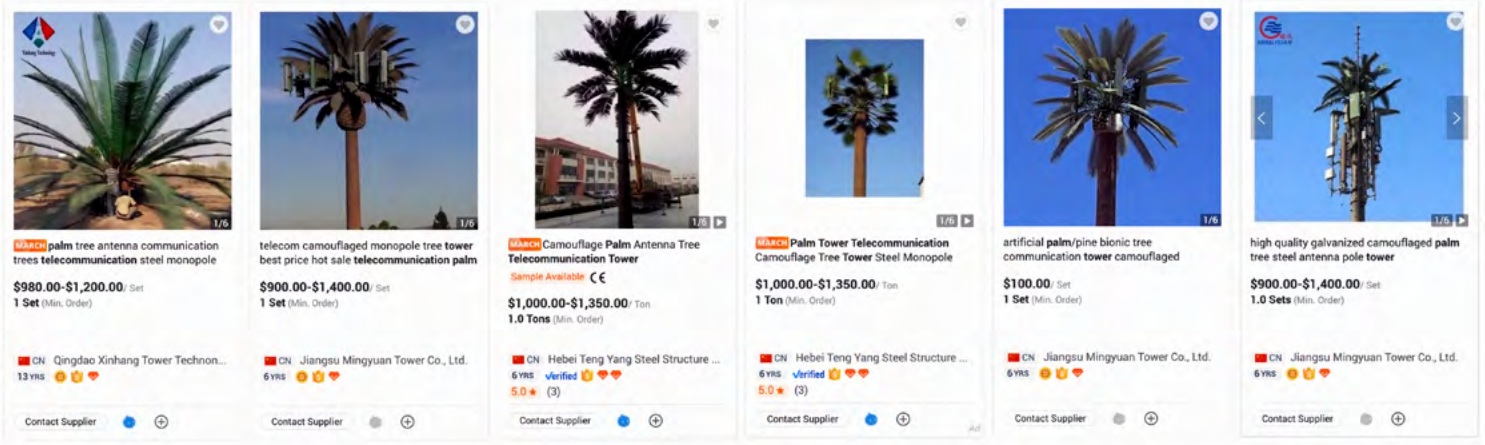




as the planetary-scale physical infrastructure that sustains the internet and, thus, the global flow of data formed not only by our searches or transactions but also by our communications, learnings, and – from a time to this part – our social and affective experiences.

Seeing this encounter between antennas and palm trees as an assemblage rather than as the simple manifestation of an atavistic impulse implies first deactivating Enlightenment and modernity as the devices to subjectivize nature and vegetation.[3] Then, go in search of other devices that allow us to approach vegetation – and nature – as another subject. We can

FIG. 3 Sistemas de recubrimiento de antenas de telefonía disponibles para importación a través de AliExpress. / *Telephony antenna coating systems available for import through AliExpress.*



find the foundational pieces of these incipient devices in contemporary scientific and philosophical currents, which, when observed from the naturecultural network,[4] will move us fluidly between the animated and the inanimate, between the material and the immaterial, and between the individual and the collective.[5] A re-subjectivation necessary to survive the challenges of the current planetary crisis.

Natural Models

The implementation of the fourth generation of cellular telephony (4G) involved the development of new infrastructure capable of physically supporting the territorial deployment of the internet. The explosive increase in the use of cellular devices and the technical requirements associated with the public tender of 4G in Chile, between 2011 and 2013 (MTT, 2012b), were accompanied by the promulgation of a new "antenna law," Law 20,599 of 2012, which "regulates the installation of transmitting antennas and transmitters of telecommunications services" (MTT, 2012a:1). This process introduces amendments to the General Law of Urbanism and Constructions and the General Law of Telecommunications, defining the organisms, procedures, and requirements involved in the approval of a new antenna as well as in the regulation of technical and legal aspects associated with saturation zones and the obligation of co-locating, according to which, each tower must consider the use of different telecommunications companies.

Within the requirements for the construction of a new antenna and its uninterrupted operation in saturated areas, the law establishes that it should contemplate both "design and construction measures" to "harmonize the structure with the urban environment and the architecture of the place in which these are located" as well as proposals for works to improve public space. Faced with these options, it will be the community organized around the site who can decide or propose another alternative according to the possibilities granted by the law.[6] Regarding the improvement of public spaces, each municipality defines a list of works eligible for financing, to which both the telecommunications company and the neighbors must limit themselves. As for the antenna's design, there are three alternatives to meet the requirements of harmonization: proposing an original design, creating an 'object of art,' or using one of the 18 models specified in the "Antenna Catalogue" accompanying the law's enactment. In the case of presenting either an original design or an art object, these must be accompanied by a report that specifies how the design meets the harmonization requirements defined by the law. This report will be reviewed for approval, in the first case, by the Directorate of Municipal Works, and, in the second, by a Committee of Experts convened by the then National Council of Culture and the Arts. On the other hand, utilizing the reference models for the harmonization proposal reduces the requirements for

the approval of the design, which is assessed according to the objective fulfillment of the technical criteria defined for each model (MINVU, 2012). Hence, the use of listed models simplifies the stages of design and paperwork associated with the antennas' installation and continuity of operation [FIG. 2].

The catalog's models parameterize this harmonization through criteria connected with the overall design of the antenna, its geographical location, and the land use of its location site. The first distinguishes between two broad categories: "natural" and "unnatural" models, natural being those in which "the supporting tower and the antennas and radiant telecommunications transmission systems it contains, together adopt the appearance of a tree species" (MINVU, 2012:3). Within this category, standards are specified for the design of eight natural models: the Mexican fan palm or *Washingtonia robusta*; the Chilean palm; the Canary palm; the slash pine or *Pinus elliottii*; the maritime pine; the black pine; the Araucaria araucana; and the Italian cypress.

While the specific criteria that define the distinctive shape of each species are contained in their respective technical sheets, the general criterion (MINVU, 2012:7) describes that the "antennae and radiant systems" for palm trees must be installed "within an artificial foliage or as a part of it, adjusting the colors to the appearance of the foliage," while, in the case of pines, these should be "attached to the supporting structure of the foliage, which serves as a trunk." For its part, the general shape of the tower must consider that "the foliage is asymmetrical and distinguishes itself from the trunk," while the supporting structure of the tower "adopts the lines of the tree species to which it resembles and coincides with it." Finally, colors and textures "in trunk and foliage must be similar to that of the tree species." Thus, in the texts of a legal instrument, the formal conditions that give a structure its vegetal appearance are detailed. The form and its interpretation are defined by the law. The device and its subject.

Cellular Camouflage

The greater compatibility with the different geographical areas and land use given by the catalog – especially to palm trees – made the natural model the most demanded solution, driving the emergence and reorientation of construction and light manufacturing companies[7] to the development of components and procedures of "cellular camouflage."[8]

Originally operating through the import of camouflage components and the development of artisanal solutions, this market was finally transformed when a Chilean architectural company patented a system of manufacture and assemblage of fiberglass components in 2012.[9] That is, components that can be applied as a coating to the steel tubes of the tower structure before being assembled. This innovation and its development are registered in multiple applications and patents, which today are used by different

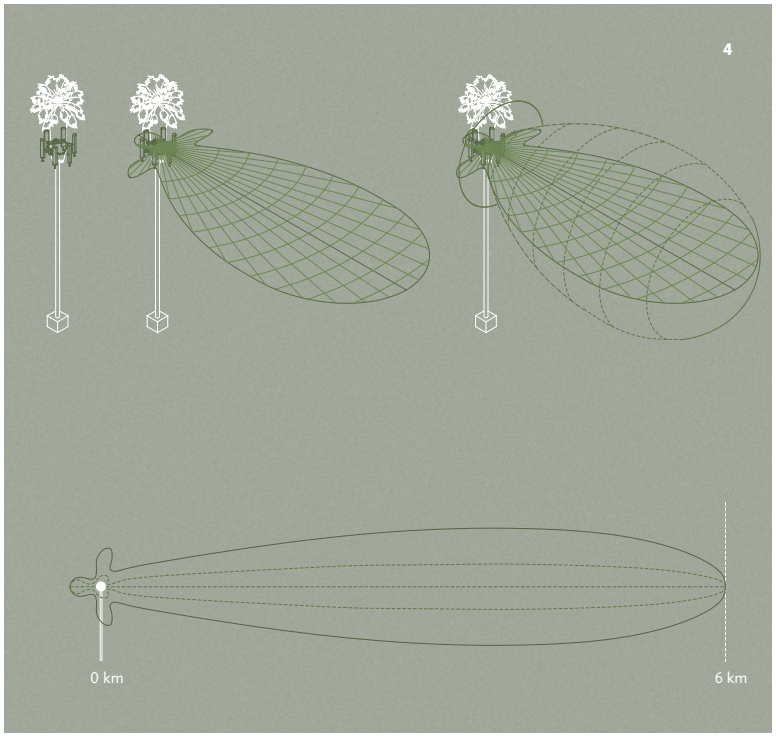


FIG. 4 Esquema de diagrama polar de antena de telefonía 4G. / *Polar pattern diagram of 4G telephony antenna.*
© Taller 25, Emilio Cid.

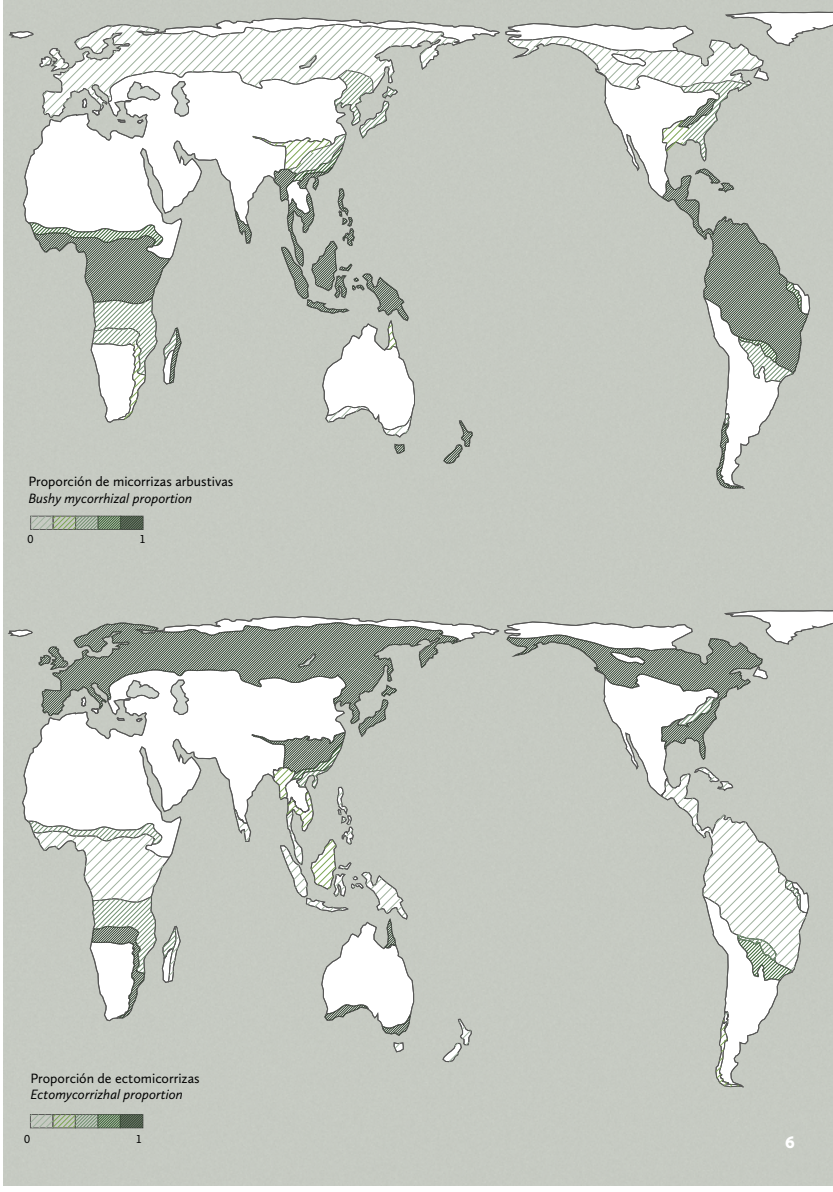
manufacturers to meet the national and international demand for these camouflage elements (Farías, s/f). Although the first camouflaged telecommunications antennas date from the early 1990s in the United States (Stromberg, 2015), in the Chilean case, it was this constructive innovation on camouflage that defined the best adaptation of this species to the national environment. An evolutionary adaptation in which it even competed against designs developed by architects, artists, and designers[10] in the quest to give antennas a non-mimetic and therefore "purely aesthetic" form[11] (Entel, 2011). This initiative was finally abandoned by the promoter company, the same that a couple of years later would publish a catalog of original designs, including 'natural' and 'unnatural' models, among them, a new model of palm tree stands out, in which "the antennae are attached to the structure and covered with dry leaves" (Entel, 2013:29). A proposal that links the camouflage strategies of the antenna-palm tree in Chile with the techniques distilled by Gyorgy Kepes and Lazlo Moholy-Nagy in the New Bauhaus for the development of modern camouflage during the Second World War (Blakinger, 2010).

Thus, the enlightened impulse has operated on the palm tree and the antenna, tearing the formal signifiers of the first through its legal reduction, its industrial synthesis, and its pruning, to then transplant them to the latter. A displacement that, after exhausting and abandoning the recurrent disciplinary discussions on the autonomy of technical form, in its material and inanimate condition, offers camouflage as an evolutionary mechanism through which to transfer the assemblage's analysis to an animated and immaterial plane.

Plant Magnetism

> In Spiritism, this enmeshment of life is seen as a form of animal magnetism, the invisible natural force that flows through all animated beings.
> Candice Lin (2018:61)

Seeking to defuse modernity, Anselm Franke resorts to animism by presenting it not as a belief system but as a "boundary-making practice." Questioning what modernity has put on both sides of the line that separates the animated from the inanimate implies challenging "whether we are able to step outside the matrix of modern dichotomies, not abandoning them, but by regaining our capacity to act on them, and to transform what presents itself to us as 'given' reality" (Franke, 2012:4). Yet, questioning this limiting system does not necessarily suggest believing that the inanimate is animated – that what is dead is alive – but rather just conceiving as something natural "that objects and inanimate things act, that they have designs on us, and that we are interpellated by them" (Franke, 2012:1). From here it is also possible to recover and revise practices of boundary-making that belong to cultures denied and subjugated by modernity, this, understood as a Western colonial project.



Law 20.599 defines an antenna as "that device which is designed to emit radio waves that may be constituted of one or more radiator elements and annexed elements." In this sense, the function of each antenna attached to a support tower is to transmit information by irradiating an electromagnetic field. The scientific knowledge and technical advances that resulted in the antenna are related to the experimentation developed during the eighteenth and nineteenth centuries on the properties of electrical energy. Initiated by the flight of Benjamin Franklin's kite in 1750, these were systematized in Heinrich Hertz's experiments of 1888 to prove the interdependence between electricity and magnetism proposed by James Clerk Maxwell in 1873. Hertz demonstrated the existence of electromagnetic waves, which in turn could be modulated for the transmission of information, as determined by Marconi's interoceanic transmissions in 1901. Hence, each antenna generates an electromagnetic field through the emission of waves.

The mathematical modeling of this magnetic field, to analyze the irradiation capacity of an antenna, is carried

FIG. 5 Cuadro del documental *Intelligent Trees* representando la emisión de señales por parte de cada árbol integrante de la *wood wide web*. / *Frame of the documentary* Intelligent Trees *representing the signal emission by each tree member of the wood wide web.* © Dorcon Film.

FIG. 6 Mapeo de la *wood wide web*. Redes arbustiva y ectomicorrizal. / *Wood wide web mapping. Bushy and ectomycorrhizal networks*. Fuente / *source*: Taller 25 y Emilio Cid en base a información presentada en Steidinger (2019). / *by Taller 25 and Emilio Cid based on information presented in Steidinger (2019).*

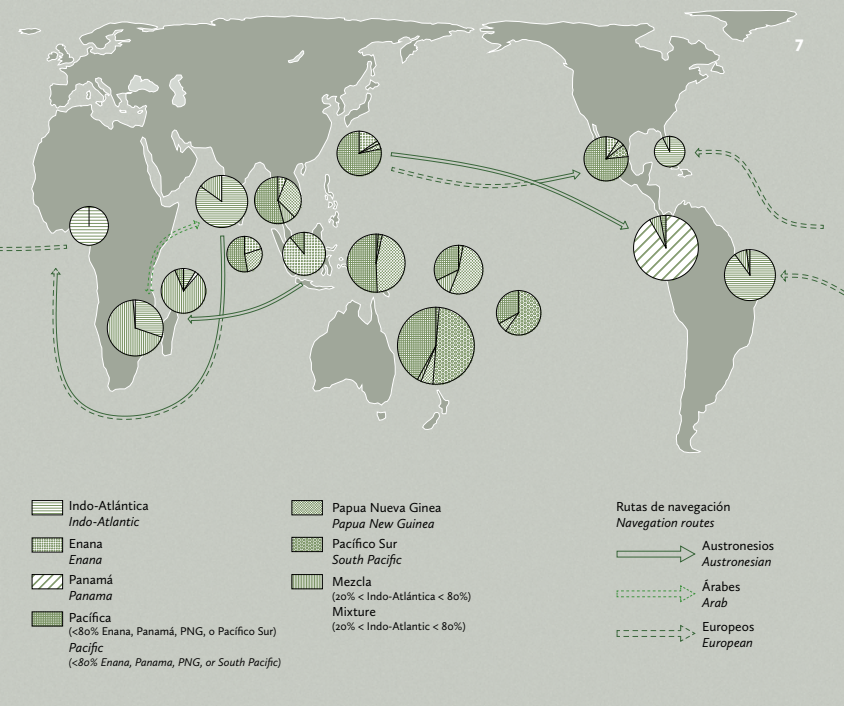


FIG. 7 Rutas de migración de la *Cocos nucifera*. / *Migration routes of the* Cocos nucifera. Fuente / *source*: Taller 25 y Emilio Cid en base a información presentada en Gunn et al. (2011). / *by Taller 25 and Emilio Cid based on information presented in Gunn et al. (2011).*

out through its polar pattern, which consists of vectorizing the measurements of the antenna's signal strength, taken in the field at a fixed distance from the emission source. Depending on their geometric construction, the shape of these diagrams resembles those of a webbed leaf [FIG. 4]. That the topographic procedure, which allows the spatial representation of an antenna's magnetic field, delivers similar shapes to those of a palm leaf, not only opens a new layer of semantic and formal coincidences between antennas and palm trees but also allows to imaginarily stack on each antenna (camouflaged or not of palm tree) a volume of revolution, whose section responds to the perimeter of a webbed leaf. A volume that, in the case of a 4G antenna, can have an extension of up to 6 kilometers in rural areas.

Spatially visualizing this electromagnetic field through the interweaving of palm leaves provides an image in which plant forms and human communication networks are integrated. An image that allows us to approach the possibility of understanding vegetation as a communication network itself.

Sharing this objective, forest ecology – based on the work of Suzanne Simard – presents the inverse of this image. In the documentary *Intelligent Trees* (Dordel, 2016), we see a forest in which each trunk transmits to the ground concentric rings of light, simulating the electromagnetic waves emitted by the antennas [FIG. 5]. Representing the polar diagram of each tree in this way seeks to illustrate its behavior as part of the 'wood wide web,' a planetary network of communication and exchange made up by the roots of terrestrial plants in a relationship of symbiotic mutualism with mycorrhizal fungi and bacteria (Simard, 1997). This network allows plants to exchange nutrients – especially carbon, but also water, nitrogen, and phosphorus – according to a source-sink dynamic, in which individuals located in habitats with a high degree of access to resources transfer this excess to other individuals located in habitats with less access (Allaby, 2010). Additionally, this network enables exchanges defined as communication (Gorzelak, 2015), both between individuals of the same species and between different species, through chemicals capable of determining the growth of other individuals and of activating defense systems against common environmental threats.

Currently, the planetary scale of this plant communication network is being mapped (Steidinger, 2019) through extrapolations that relate to the presence of certain plant species, with the probability that species of fungi and bacteria in these habitats will develop to form this mycorrhizal network [FIG. 6]. These maps show the size of this network as well as the ability of terrestrial plant species to cross the oceans in conjunction with different types of vectors throughout their evolutionary development.

Planetary Networks

> The plants are [...] in short [...] divisible beings, endowed with numerous "command centers" and with a grid structure not very different from that of the internet [...].

> But this is not all: plants also evidence what is known as 'swarm intelligence,' which allows them to behave not as an individual, but as a crowd and manifest group behaviors similar to those of a colony of ants, a school of fish, or a flock of birds.
> Stefano Mancuso (2015:5)

There are more than 2,600 known species of palms grouped in the *Arecaceae* family. Within this category, the only living species of the *genus Cocos* is the *Cocos nucifera*, popularly known as '*cocotera*.' Widely distributed throughout the tropical coasts of the Pacific, Atlantic and Indian Oceans, their place of origin and the direction of their movement have been a subject of scientific inquiry for more than 500 years (Tribillon, 2017) – this due to its ubiquitous presence in the logs of Spanish, Portuguese and English navigators who traveled incessantly along the continental and island coasts of these seas. The records of their sightings were accompanied by observations regarding the uses given to the palm by the inhabitants of these coasts, including the extraction of fibers and foliage for the construction of structures and boats, its burning to obtain coal, and its consumption as food, either directly, or through the preparation of milk, oil, liquor, bread, and flour.

FIG. 8 Antena-palmera correspondiente al modelo natural palma chilena. Lo Valledor, Santiago, 2021. / *Antenna-palm tree following the natural model of Chilean palm. Lo Valledor, Santiago, 2021.* © Sebastián Mejía.

FIG. 9 Mapa de cables interoceánicos de internet. / *Interoceanic internet cables map.* Fuente / *source*: Taller 25 y Emilio Cid en base a información presentada en TeleGeography, 2021. / *by Taller 25 and Emilio Cid based on information presented at TeleGeography, 2021.*

By having an airtight endocarp, the coconut cannot only float but also keep its ability to germinate and be ingested as food intact, even after months of navigation. Either aboard a boat or on saltwater. This condition resulted in the theories of autonomous migration, which since the fifteenth century, have held that its spread might have developed from coast to coast, with no vector other than the waves of the sea. Subsequently, through empirical investigations of the ability of the coconut to move and germinate (Edmondson, 1941), the extent that human navigation had on its propagation was explored, identifying independent exchange routes for the Indian Ocean, between Southeast Asia and the east coast of Africa, and for the Atlantic, between Africa and America, through Portuguese and Spanish settlers (Mancuso, 2019). However, the genetic study of *Cocos nucifera* has not only allowed identifying the original habitats of its different variants with precision but also the routes that unite their points of origin with their subsequent germination habitats (Gunn, 2011). In this way, the genetic memory of the coconut has allowed us to verify the existence of human migration routes from Southeast Asia and the islands of the South Pacific to the Pacific coast of Central and South America [FIG. 7]. Thus, the coconut palm has been a vector of our own spread as a species around the planet.

This means the coconut palm has had the ability to cross the oceans, establishing on arrival mycorrhizal networks of communication and exchange of nutrients with other species (Carrillo, 2002). But it also did this by spreading and adapting to new environmental conditions, as in the case of the *Jubaea chilensis*, or Chilean Palm, a coconut species related to the *Cocos nucifera* (von Fürstenberg, s/f), and the only endemic palm included in the catalog of natural models of Law 20.599 [FIG. 8].

Yet, the mycorrhizal network that underlies each coconut palm is not the only communication network that has managed to cross the oceans. The roots of the physical infrastructure that supports the Internet are composed of a set of interoceanic fiber optic cables and their respective repeating stations, which rest on the seabed [FIG.9]. Upon reaching the coast, these cables are integrated into a network that connects servers to data centers and irradiation points, whether these are wi-fi modems or telephone antennas. And, as we already know, many of these antennas are camouflaged as palm trees.

Techno-Vegetable Assemblies

> Patterns of unintentional coordination develop in assemblages. To notice such patterns means watching the interplay of temporal rhythms and scales in the divergent lifeways that gather.
> Anna Tsing (2015:23)

Seen in this way, the palm trees, the antennae, and the antennae-palm trees seem to share more than a simple semantic or formal transplant, setting up the complex

FIG. 10 Ejemplares de palmas chilenas y washingtonias dan la bienvenida a los cables interoceánicos de fibra óptica Prat, South America-1 (SAm-1), Pacifico, South American Crossing (SAC) y Curie a su llegada a la playa Las Torpederas en Valparaíso. / *Specimens of Chilean and washingtonia palms welcome the interoceanic fiber optic cables Prat, South America-1 (SAm-1), Pacifico, South American Crossing (SAC), and Curie upon arrival at Las Torpederas beach in Valparaiso.* © Fernando Portal.

entanglement of an assemblage in which the animated and the inanimate, the material and the immaterial, the individual and the collective, merge and confuse between foliages and electromagnetic fields.

Here, vegetation and technology overlap, resulting in the potential for these to be re-subjectivized as porous (Lin, 2018) – and potentially interchangeable – categories, but also as the emitters of a deep crisis. Because, among the same conditions of progress that have enabled the formation and knowledge of both global communication networks, there is also the potential to mortgage the future, compromising the survival of vegetation – and us with it – in exchange for more 'progress.'

Faced in this way with a self-imposed – and increasingly irreversible – extinction, and situated at a moment when science tells us that vegetation is an entanglement of solidarity while philosophy compels us to think from and with other species, perhaps it is time to respond with more than just an aesthetic choice. After all, how to build systems capable of distributing resources equitably among species and individuals with varying degrees of access to them remains one of the questions that the devices of modernity have failed to answer and that the current climate and health crises make increasingly urgent.

Let us hope then this call is captured and transmitted through the antennae and palm trees. **ARQ**

Notas / *Notes*

1 Both Tsing and Bennet formulate their own uses of the assemblage concept, starting from Deleuze's notion of *agencement*, which is presented by Bonta and Protevi as "an intensive network or rhizome displaying 'consistency' or emergent effect by tapping into the ability of the self-ordering forces of heterogeneous materials to mesh together" (Bonta & Protevi, 2004:54, cited in Bennet, 2010). For a discussion of the use given to "assembly" by Deleuze and Tsing, concerning the concept of "device" developed by Agamben, see Nikolić (2018).

2 A definition that is given to these constructions by the Law of Antennae. It distinguishes between the support structure ('tower') and the electromagnetic devices located on it ('antennas' and 'radiant elements'). In this essay, the word 'antenna' will be used in its colloquial sense to refer to the whole composed of both elements.

3 According to Agamben (2014): "The term 'apparatus' designates that in which, and through which, one realizes a pure activity of governance devoid of any foundation in being. This is the reason why apparatuses must always imply a process of subjectification, that is to say, they must produce their subject."

4 The concept of "natureculture" is proposed by Donna Haraway (2003:8) to identify the network of reciprocal relationships that bring together and determine the ways of being of different participants within an interspecies relationship. As such, it is a category that seeks to overcome the modern construction of boundaries between nature and culture, questioning a "human exceptionalism" that has placed us – along with our humanism and our humanities – not only outside nature but also as the only producers of culture.

5 For this, the present essay will go to the conceptual repertoire proposed by the posthumanities, specifically the neo-materialism from Jane Bennett's vitalist approach and the interspecies ethnography by Donna Haraway, Eduardo Kohn, and Anna Tsing. From the sciences, the essay will resort to the proposals on botanical neurobiology by Stefano Mancuso and the advances that, from the forest ecology, have been proposed by Suzanne Simard.

6 It is interesting how, in the law, the antenna is an infrastructure capable of constituting and activating communities in territorial terms. Thus, the community affected by its installation is defined as: "the respective board of neighbors and [...] the owners of all the properties that are included totally or partially in the area located inside the circumference that has as its center the vertical axis of the tower and a radius equivalent to twice its height, including its antennae and radiant systems," which has the ability to make decisions that affect the "public space located inside of the circumference that has as its center the vertical axis of the tower up to a radius of two hundred and fifty meters around the place where it will be located."

7 Among those that stand out: AJ Ingenieros, Ectel, Estanglass, Fibratec, and Infrawireless.

8 Trade name of the service in Ectel's webpage.

9 This corresponds to Patent no. 7415: "Antenna that simulates a palm tree, with an elongated body that presents a simile at a radial arrangement of leaves in the upper area; base formed by a series of five cylindrical bodies, modulated upwards in four sections of the same height, the fifth cylindrical upper section of different shape, on whose upper end rests a vertical tubular projection." Other applications also submitted by Cavieres Arquitectos Ltda. to develop natural models include: "Cover for telecommunications antenna, consisting of a vertical body formed by circular cylindrical sections of decreasing diameter in height, superimposed on the same longitudinal axis; in the mantle of the upper cylinder, minor concave cylindrical transverses extend with multiple small contiguous superficial identical elements, which give shape to a simile of Araucaria," and "Antenna cover in the form of a Chilean palm, of lower conical trunk section, another inverted, and a conical trunk of great height; the upper area is partly covered by convex vertical elements of wavy surface and sharp vertices, and the top has eight elements similar to the previous ones, alternated with smaller ones."

10 Here, we refer to the project ARTenas, developed by Allard-Partners for Entel in late 2011. The project featured Pablo Allard and Patricia Ready as curators, inviting architects and artists to design and modify cellphone antennae, aiming to define and propose their own models. The following participated in this initiative: Ximena Mandiola and Ismael Frigerio (painters), Cristián Salineros (sculptor), Claudio Correa (visual artist), Pezo Von Ellrichshausen, Lyon & Bosch (architects), Grifo Group (along with Felipe Zegers as well as publicists and designers), and Sebastián Errázuriz with Daw (design).

11 When asked about his office's participation in this initiative, the Chilean architect Mauricio Pezo commented: "At the moment antennae are only a technical solution. Super efficient. Super prefabricated, like some sort of machine. What we are doing is a wrapper for that machine that only serves an aesthetic function. So, in any case, it's always going to be better than that technical machine that is behind."

Bibliografía / *Bibliography*

AGAMBEN, Giorgio. «¿Qué es un dispositivo?». *Qué es un dispositivo. Seguido de El amigo y La Iglesia y El Reino.* Buenos Aires: Adriana Hidalgo Editora, 2014.

ALLABY, Michael. *A Dictionary of Ecology*. Oxford: Oxford University Press, 2010.

ARAIZA, Verónica. «El pensamiento crítico de Donna Haraway: complejidad, ecofeminismo y cosmopolítica». *Península*, vol. XV, no. 2 (2020).

BENNETT, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.

BLAKINGER, John R. *Un Camouflage New Bauhaus*. Paris: Editions B2, 2014.

CARRILLO, Lilia; ORELLANA, Roger; VARELA, Lucia. «Mycorrhizal Associations in Three Species of Palms of the Yucatan Peninsula, Mexico». *Palms*, vol. 46, no. 1 (2002): 39-46.

BONTA, Mark; PROTEVI, John (eds.). *Deleuze and Geophilosophy: A Guide and Glossary*. Edimburgo: Edinburgh University Press, 2004.

DORDEL, Julia; TÖLKE, Guido (dir.). *Intelligent Trees*. Holanda: Dorcon Films, 2016. Consultado el 13 de marzo 2020, en: https://vimeo.com/ondemand/intelligenttrees/181082721

EDMONDSON, C. H. «Viability of Coconut Seeds after Floating in the Sea». En *Occasional Papers of Bernice Bishop B. Museum*, vol. 16, no. 12 (1941): 293-304.

ENTEL. *ARTEnas para Chile*. 2011. Consultado el 13 de marzo 2020 en: https://www.youtube.com/watch?v=Hv6X3KAmUaI

ENTEL. «Las antenas que Chile necesita». 2013. Consultado el 13 de marzo 2020 en: https://www.entel.cl/landing_antenas/mas_info/entel_catalogoantenas.pdf

FARÍAS, Roberto. «A la sombra de las antenas palmeras». *La Tercera* (s/f).

FRANKE, Anselm. «Animism: Notes on an Exhibition». *e-flux journal*, no. 36 (2012). Consultado el 13 de marzo del 2021 en: https://www.e-flux.com/journal/36/61258/animism-notes-on-an-exhibition/

GORZELAK, Monika; ASAY, Amanda; PICKLES, Brian; SIMARD, Suzanne. «Inter-Plant Communication through Mycorrhizal Networks Mediates Complex Adaptive Behaviour in Plant Communities». *AoB PLANTS*, vol. 7 (2015): plv050.

GUNN, Bee; BAUDOUIN, Luc; OLSEN, Kenneth. «Independent Origins of Cultivated Coconut (*Cocos Nucifera L.*) in the Old World Tropics». *PLOS ONE*, vol. 6, no. 6 (2011): e21143.

HARAWAY, Donna. *The Companion Species Manifesto. Dogs, People, and Significant Otherness*. Chicago: University of Chicago Press, 2003.

KOHN, Eduardo. *How Forests Think. Toward an Anthropology Beyond the Human*. Berkeley: University of California Press, 2013.

LIN, Candice. «Licking the Wound: Three Works from Pacific Standard Time: LA/LA». En MORTON, Timothy, et al. (eds.). *Hyperobjects for Artists*. Marfa: Ballrom Marfa, 2018.

MANCUSO, Stefano. *El increíble viaje de las plantas*. Barcelona: Galaxia Gutemberg, 2019.

MANCUSO, Stefano; VIOLA, Alessandra. *Sensibilidad e inteligencia en el mundo vegetal*. Barcelona: Galaxia Gutemberg, 2015.

MAXWELL, James Clerk. *A Treatise on Electricity and Magnetism*, vol. II. Oxford: Oxford University Press, 1873.

MINVU (Ministerio de Vivienda y Urbanismo). Resolución 9741 Exenta. Aprueba catálogo o nómina de diseños de torres soporte de antenas y sistemas radiantes de transmisión de telecomunicaciones, 2012. Consultado 13 de marzo de 2020 en: https://www.bcn.cl/leychile/navegar?idNorma=1046546.

MTT (Ministerio de Transportes y Telecomunicaciones). Ley 20.599. Regula la instalación de antenas emisoras y transmisoras de servicios de telecomunicaciones, 2012. Consultado el 13 de marzo de 2020 en: https://www.bcn.cl/leychile/navegar?idNorma=1040859&idParte=9264668&idVersion=2012-06-11.

MTT (Ministerio de Transportes y Telecomunicaciones). «Licitación 4G: Se definen frecuencias para Entel, Movistar y Claro», 2012.
Consultado el 13 de marzo de 2020 en: https://www.subtel.gob.cl/licitacion-4g-se-definen-frecuencias-para-entel-movistar-y-claro

NIKOLIĆ, Mirko. «Apparatus x Assemblage». 2018. Consultado el 24 de mayo de 2021 en: https://newmaterialism.eu/almanac/a/apparatus-x-assemblage.html

ROYAL CANADIAN AIRFORCE. *Antenna Fundamentals. Propagation*, 1963. Consultado el 13 de marzo de 2020 en: https://www.nfb.ca/film/propagation

SCOTT, John; MOHOLY NAGY, László; KEPES, György. *Materials for the Camoufleur*. Chicago: Dartnell Corporation, 1942.

SIMARD, Suzanne; PERRY, David; JONES, Melanie; MYROLD, David; DURALL, Daniel; MOLINA, Randy. «Net Transfer of Carbon between Ectomycorrhizal Tree Species in the Field». *Nature,* vol. 388, no. 6642 (1997): 579-82.

STEIDINGER, B.; CROWTHER, T.; LIANG, et al. «Climatic Controls of Decomposition Drive the Global Biogeography of Forest-Tree Symbioses». *Nature* vol. 569, no. 7756 (2019): 404-8.

STROMBERG, Joseph. «The Bizarre History of Cellphone Towers Disguised as Trees». *Vox*, 2015.

TRIBILLON, Justinien. «Wonders and Enigmas of the Migrating Coconut». *Migrant Journal*, no. 3 (2017).

TSING, Anna. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton: Princeton University Press, 2015.

VON FÜRSTENBERG, Paulina; EYZAGUIRRE, María Teresa. «*Jubaea Chilensis* (Molina) Baillon». Consultado el 13 de marzo de 2020 en: https://fundacionphilippi.cl/artculo/jubaea-chilensis-molina-baillon/

Fernando Portal
<fportal@udla.cl>

Architect, Master in Architecture, Pontificia Universidad Católica de Chile, 2004. MSc Critical, Curatorial and Conceptual Practices, Columbia University, 2012. His work focuses on the relationship between design, performance, and politics, through editorial and curatorial projects. He has edited the books *Portales del Laberinto* (2009), *Bienes Públicos* (2017), *Lo nuevo, again. Architecture and biennial in Chile* (2021), among others. His artistic work is part of the collections of the Museo de la Memoria y los Derechos Humanos, the Centro de Documentación de las Artes Visuales, the Museo de la Solidaridad Salvador Allende, and the FAVA Foundation. He is part of the interdisciplinary collective Mil M2 and is an Assistant Professor at the University of the Americas, where he directs the Núcleo Lenguaje y Creación.