Devices

On Hospitality Hostility and Design

Martín Ávila

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The work started by exploring the theme of hospitality and hostility with the ambition to better understand the ecological complexity of the design process and its results.

This work combines different literary, philosophical and theoretical discourses and traditions with experimental design in order to develop and articulate the concept of *device*. A device organizes, arranges, frames our environment and thereby defines and limits possibilities of relation.

Through a series of design projects, the thesis examines the potential range of an artefact's relations. It does so by exploring grammatical associations that affect design conceptualizations, creating tools (*prepositiontools*) as well as studying and articulating forms of symbiosis that an artefact might develop in and with its environment (¡Pestes!).

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Devices. On Hospitality, Hostility and Design

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ABSTRACT

This thesis studies and speculates upon the interrelations of artefacts with human and nonhuman agents. These interrelations form assemblages, some of which have *emergent* properties, becoming manifestations of processes that we cannot fully control or understand.

The work started by exploring the theme of hospitality and hostility with the ambition to better understand the ecological complexity of the design process and its results.

As an assemblage, this work combines different literary, philosophical and theoretical discourses and traditions with experimental design in order to develop and articulate the concept of *device*. A device organizes, arranges, frames our environment and thereby defines and limits possibilities of relation.

Since relations can only be thought through a so-called natural language such as English, they must be taken into consideration through the process of *languaging*, understood by Humberto Maturana and Francisco Varela as "communication about communication", and as the most characteristic feature of the human species. My focusing on linguistic and biological phenomena is a response to this concern, in an attempt to understand how this process influences our perception of the world.

Through a series of design projects, the thesis examines the potential range of an artefact's relations. It does so by exploring grammatical associations that affect design conceptualizations, creating tools (*prepositiontools*) as well as studying and articulating forms of symbiosis that an artefact might develop in and with its environment (¡Pestes!).

To *mother Barei*

Without the sun,
what day? What night?

Heraclitus

CONTENTS

Setting out

I would like to proclaim one of the things of which I am ignorant, to publish a crucial indecision in my thinking, in order to see if some other doubter might help me to doubt, and the half-light we share turn into light. The subject is almost grammatical, which I announce as a warning to those readers who have condemned (in the name of friendship) my grammarianisms and requested a *human* work. I could answer that there is nothing more human (that is, less mineral, vegetal, animal, and even angelical) than grammar; but I understand and beg their indulgence this once. My joys and sufferings will be left for other pages, if anyone wishes to read them.

Jorge Luis Borges

1.1 *CCTV* - Banksy.

A grey, sharp-angled shape irrupts on an otherwise luminous and green natural scenery. A standing metal structure towers CCTV cameras beside a stream by a small country road among trees on a calm afternoon. Why are we *affected* by this image? What kind of *violence* are we confronted with? The presence of the cameras, through the contours of the metallic angles of the mast, become an uncomfortable sign of human threat and convert the scene, transforming both, 'nature' and artifice into an indistinguishable whole. The mast is not the only human sign on the picture though; the road clearly indicates human traces, the tracks of vehicles. But somehow, until then, these signs do not seem disturbing; without the mast we would perceive a 'natural' environment.

This time Banksy's intervention (Fig. 1.1) does not affect our perception of artificial environments but natural ones. And if his art has been associated with forms of 'vandalism', on this occasion, this vandalism does not affect material but imaginary 'property'. A set of relations among elements where the mast is perceived as alien brings forth a sense of hostility —a psychological ecology gets disrupted. Projecting ourselves in this scenario, we become aware of a play of forces affecting the landscape, the situation; a potential (human) threat, may be robbery —and the abuse of integrity that this implies— as well as a counter measure; the observing cameras, part of a social network, a human-nonhuman assemblage of artefacts, policies, speeds, energy, among countless others that enact it, that make it possible. Do these cameras make noise? Do they also affect the life of birds and insects somehow? As when certain electronic equipment emit electromagnetic waves that we do not perceive. If a fox or a deer are filmed, will they be reported to someone? What if a human couple making love is filmed? Who is it that is watching? Are they permanently operating? Will the mast deteriorate and contaminate the stream in the coming years? Are there other forms of pollution that we do not sense?

We may feel vaguely or strongly monitored, reassured, concerned and so on, but we cannot avoid reacting to the mast's impositions. This immediate form of coping with suggests —as in the reaction to the mast in this image— that these sort of actions do not spring from judgement and reasoning. That is, we do not reflect upon the situation and rationally understand the mast's impositions; rather, we spontaneously, at the moment it is perceived, react to its presence and behave triggered by this stimulus. These actions are brought forth in everyday life situations, and as cognitive scientist Francisco Varela suggests, they represent the most common kind of ethical behaviour. In Varela's terms, we always operate in some kind of immediacy of a given situation, "We have

a readiness-for-action proper to every specific lived situation" (1999:9), and we move from one situation to another; transitions which are virtually imperceptible.

> I call any such readiness-for-action a microidentity and its corresponding lived situation a microworld. Thus, "who we are" at any moment cannot be divorced from what other things and who other people are to us. (Varela, 1999:10)

The emergence of a microworld may be shocking, as when we experience a form of threat. Or more commonly, when we suddenly discover that we have lost our wallet: at that moment the perception of the world shifts from say, pleasantly walking home looking forward to meet our children, to the worry of having lost valuable documents, and to the intensive focusing of the tracing of the steps that might have led to that loss.

These interrelations con-form a fragile and complex ecological domain constituted by the possibilities, overlaps and interplay of a psychological ecology, a social ecology and an environmental ecology, as Félix Guattari suggested.[1] The kind of hospitality-hostility addressed in this work, is of this type; pervasive and anchored to everyday human behaviour, where our actions —mediated by artefacts and already at this micropolitical level— enact specific relations to others, becoming therefore ethical manifestations with regard to humans and nonhumans.

The scales of hospitality-hostility addressed in this work need to be assessed through multiple stances, thus the need to engage with complementary types of know-how: on the one hand, a physical and situated one by means of empathic cohabitation, by getting in contact with beings or systems that we might or might not choose to cohabit with (as in the case of coping with the view of the CCTV mast). On the other hand, a more reflexive know-how, as when we ponder or reflect upon a situation that demands our conscious attention, and that might imply, at a later stage, the enactment of some form of action. This action, in its turn and with repeated practice, might become incorporated or assimilated as a more spontaneous form of action. Both forms of know-how —in the case of human beings— are part of one single cognitive onto-epistemological process. Ontology and epistemology must be conceived as a continuum, where knowledge production reinforces ways of being and modes of engagement in and with an environment, and where biological constraints elicit particular forms of knowledge.

Returning to the sense of hostility that can be perceived in figure 1.1, I mentioned that the mast was not the only sign of hu-

man presence. There are also tracks, traces which have been naturalized throughout the years. Perhaps, even more importantly, we assume that the tracks were made by a vehicle such as cart lead by horses (to guess from the type of traces left on the ground in the painting), from a period when animals and humans lived in a somehow mutually beneficial relationship. If this is the case, how has our human relationship with horses developed, to the point that we perceive the tracks in the image as natural rather than artificial? To what extent does the cart become naturalized in this human-nonhuman relationship?

We could ask ourselves, *why do we accept the imprints left on the ground and not the CCTV mast?* Is it really about the traces? Does it have to do with the temporal scale of these artefacts? Namely, the transitional aspect of the cart moving along the territory in contrast to the permanence and static presence of the mast? Do we need the visual information to have empathy with an environment in order to perceive human or nonhuman disruptions? What if we would see an artefact that disrupts an environment by going through it making neither noise nor leaving tracks or signs of visual pollution, but having a threatening effect on birds, insects and other organisms that we perceive, scaring them away as this machine moves along?

One can speculate that cart-horse relationships may be seen as mutually beneficial, if we, by extension project that the cart mediates a human benefit, where humans profit from the strength of the horse, while the horse benefits from (ideally) the care in terms of food and shelter which is given. However, the relationship can also be understood as harmful to one of the parts, where the human benefits from the horse, while the horse becomes exploited for its strength and deprived of its freedom. What seems to be impossible to conceive, is a relationship where one of the actors, the human or the nonhuman can be indifferent to the relationship itself, that is, where one benefits while the other does not perceive the relationship as either harmful or beneficial.

In symbiotic terms, these three forms of association refer to the biological categories of mutualism, parasitism and commensalism. Succinctly, a mutualistic symbiosis is an association in which both symbionts benefit; an association in which one symbiont benefits and the other one is neither harmed nor benefited is called a commensalistic symbiosis; while a relationship in which a symbiont receives nutrients at the expense of a host organism is called a parasitic symbiosis. These notions will be explicitly developed to study host-guest relationships in the section entitled "Devising", for the moment, and following these thoughts, I would like to compare Banksy's 'natural' scene with one of the landscapes

that became the ecological niche of a device designed within the context of the project entitled ¡Pestes!

The natural scenery of figure 1.2 is barren, deprived of trees, due to the powerful winds of the region. It can also be observed that in the image there are traces of vehicles on the ground; because of the width of the tracks, we assume that cars or even trucks have left those traces. This implies a 'stronger' presence or a higher degree of the artificial than in figure 1.1, where the car, being totally artificial, stands in contrast to the cart-horse, where the elements that constitute the vehicle still come from materials made of a natural substratum (leather, wood, metal, natural fibres in terms of textiles, even glass). Do these marks affect our perception of this landscape as being more or less 'natural' somehow? Are these welcomed signs of the presence of humans, and thus a sign of comfort in an otherwise threatening nature?

The signs that we perceive in the image do not seem directly threatening though. Unless we start projecting, figuring out, a set of alternative spatial and temporal relations, where we could for example see ourselves exposed to the coming night, isolated, vulnerable and unprotected from other beings better adapted to those conditions. Knowing that the image shows a region of Córdoba, Argentina, we might sense a threat from figuring out the capacity of the local puma to see at night, to smell at a distance, to be affected by sounds imperceptible to our ear; an unlikely encounter which nonetheless may strongly affect those unacquainted with the territory.

The place itself as an ecological niche has, in spite of its barrenness, a wide range of alternatives, both in terms of shelter and nutrition. These however, may not suit human bodily needs. There are other organisms that thrive and draw upon the potential of this environment, hares, vizcachas, snakes, falcons, beetles and insects of different kind, among many others. For a human to be able to tap into these possibilities —the ecological resources of this environment— a mediation of some kind of artefact or device would be necessary. Through this mediation it would thus extend human bodily capacities to act, to survive.

The forms of hostility that a human being might perceive in such situation expose ways of engaging in and with a given environment, which form part of a complex constellation of interrelations that constitute through our body vulnerability a basic experience of hospitality-hostility. From a human perspective, Banksy's landscape depicts a more hospitable nature, one where we find water, shelter in the form of trees, less extreme temperature conditions and where we assume other forms of life; less threatening animals that might accompany us, and also potential

sources of food: birds, hares, foxes among others. The irruption of the mast displaces these projections, the natural potential of the place in terms of resources, transforming the vulnerability into a (human) social phenomenon. Partly, the hostility that can be perceived comes from the aesthetic contrast with the environment in which it is has been placed, and by our knowledge of it as being an instrument of surveillance and control. At the same time, and almost paradoxically, one could say that the hostility that we perceive in relation to the mast in this situation originates from our understanding that the artefact *does not draw upon the resources* of this ecological niche (except its being anchored to stable ground and operating during daylight conditions), it is not 'in tune' with the environment, it does not participate of its processes; it imposes a structure and a logic which is alien to the site. This becomes evident from the uneasiness experienced when, in other contexts, we occasionally discover that a certain 'tree' is in fact a camouflaged radio or telephone mast. Designed to blend in a natural environment causing the least possible visual disruption, while still having the height that affords better reception and transmission of radio waves.

How would forms that are more 'in tune' with the environment influence our perception of them? At ¡Pestes! we designed a set of radios, which were to function in given ecological niches and to draw upon the potential 'nourishment' of specific actors participating in the environments. Thus, a 'commensalistic radio' (Radiophonum Ventosa Energia), was designed for the strong winds usually found in the region of the sierras between "La Cumbre" and "Ascochinga" (Fig. 1.2). The proposal implies a radio with electric energy generated by a kite, which, by means of a piezo-electric circuit-board generates the 3V necessary to run the radio. The pressure exercised by the wind, bends the flaps of the kite, activating the piezo-electric board, generating electricity in its turn. (Figs. 1.3 to 1.5).

Through this design, and to some extent, the kite 'participates' in the landscape, drawing upon the resources of the wind. Beside the poetical associations which may elicit a sense of 'harmony' by projecting ourselves through this activity in this landscape, we could ask ourselves, more critically: if the kite/radio 'benefits' from the wind, but not the wind from the kite/radio, why is this relationship considered 'commensalistic' and not 'parasitical'? Also, if the relationship discussed is so specific as to involve only the kite and the wind, what other relations are formed by our presence and the rest of the parts of these devices, such as those in figure 1.6? And if these relationships exist, how do they influence the life or the 'performing' of other beings and systems?

1.2 'Natural' environ-
ment between "La
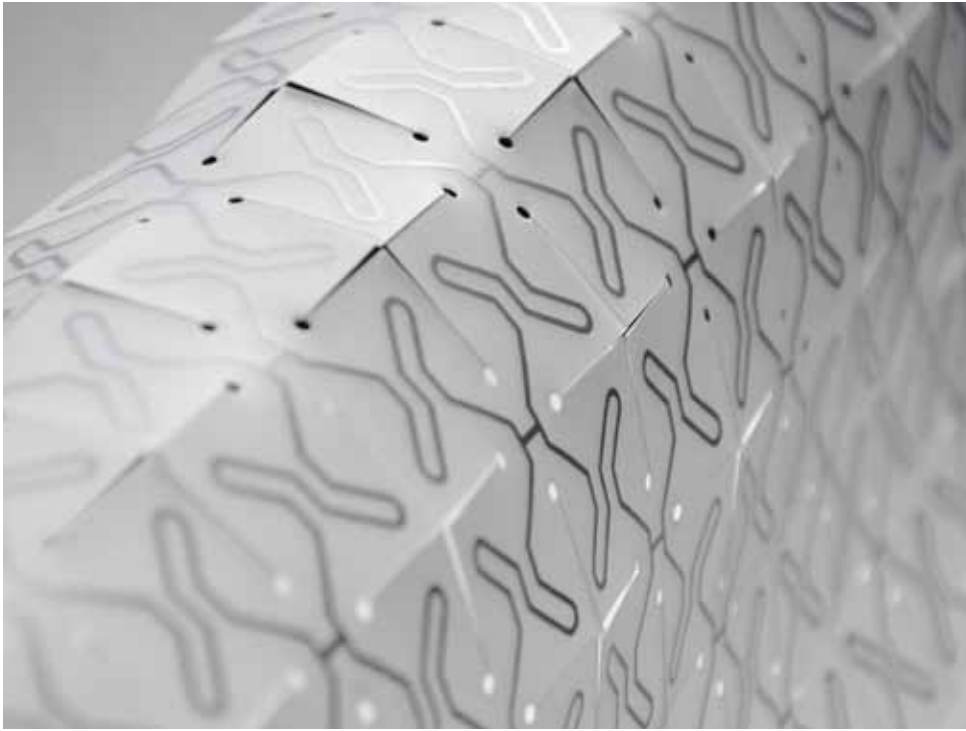Cumbre" and "Ascoch-
inga" for the commen-
salistic proposal.

1.4 *Radiophonum Ventosa Energia*. Kite detail.

1.5 Kite, detail of the
'flapping' principle
of the piezo-electric
system.

1.6 Details, commen-
salistic radio.

These issues will be addressed in the coming sections. What I would like to emphasize for the moment, is that these late reflections speculate upon different and complementary levels of interaction: on the degree of participation of an artefact with-in an environment, and also, on an ontological dimension (that of being a sentient biological organism) by exposing our physical dependency upon a natural substratum and the interrelations established with other beings and systems by cohabitation, that is by the living together which stands for *sym-biosis*.

However, no biological description of bodily needs could be disassociated from the socio-cultural development of human beings. Through a single aspect of the images examined so far, such as the media that materializes them, we understand that the painting style of figure 1.1 in contrast to the photographic medium of figure 1.2 imply forms of representations that can be more or less associated with sociopolitical and historical circumstances. This is partially what also qualifies our suppositions, when we readily accept the presence of a car or a cart, always immersed in a *semiosphere*[2], sense that is individually, collectively, and culturally produced.

Throughout this work, these dynamic formations: (monitored) human in relation to a monitoring-sound-polluting-mast, in relation to a decaying metal structure, in relation to... will be addressed through the notion of *assemblage*. An assemblage is a spatio-temporal composition of humans and/or nonhumans, in which there are "vitalities at play" that makes it unpredictable.[3]

Within the context of these thoughts ¡Pestes! will address assemblages to specific ecological niches, trying to explicitly articulate how given temporal and spatial relations such as those found in the barren landscape of figure 1.2, can be conceived as forms of symbioses. The aim however —as will become evident through the work— will not be to provide a design 'solution' that will improve the living conditions of the vulnerable human life, but to *expose the choices* and the conditions of design as human practice.

THIS APPROACH

The sections of this book do not follow the traditional order of a 'thesis', where research questions are answered by the use of specified methods from a given discourse, leading to specific conclusions. This work is *another* kind of assemblage, one that combines different literary, philosophical and theoretical discourses and traditions with experimental design in order to develop and articulate the concept of *device*.

A device (Latin *divisa*, *divisus*; division) *divides*, that is, *organizes, arranges, frames* our environment and defines thus, limits and possibilities of relation.

Between "Setting out" and "Concluding", there are three sections in this thesis: "Hosting", which articulates the concept and the approach to hospitality-hostility. "Unfolding", which through a pragmatic use of language articulates relations between humans and nonhumans. And "Devising", which explores possibilities of the design process and the relations it enables. Each of these sections ends with a short summary of the issues presented, while introducing the following one, helping the reader to keep track and to follow the logic of the arguments. For the same purpose, a glossary of the main concepts will be found after "Concluding".

More specifically, the section entitled "Hosting" will introduce views of hospitality-hostility as suggested by Jacques Derrida, and will challenge their anthropocentrism from the ethical and theoretical perspective of Judith Butler, as a way to move towards an ecological conception of hospitality-hostility. Position that will be further articulated through Francisco Varela's understanding of ethical know-how. The notion of *device* introduced here acts as the key operating concept throughout the work. In this section, I will consider machines, artefacts, and apparatuses, *as* devices. This, in order to emphasize the dividing, the sorting out rather than the 'solutions' of a given architectural proposal, 'consumer product', law, and so on. Exposing the ethical domain of the devising process and its results, in the recognition or lack of recognition of other beings and systems.

The section entitled "Unfolding" will be concerned with the specific relationships that can be conceived through the use of language *as* a device.[4] It will question the use of general categories (typological thinking) to understand the notions of hospitality and hostility. By means of the linguistic displacements that the uses of random prepositions stimulate, I will try to expand typological classifications following a logic of connectivity to approach the complexity of ecological manifestations. Developing in this way, what I call a 'heterotopian' approach to conceive design scenarios.

The section entitled "Devising" will be concerned with 'host-guest relationships', by working with the biological notion of *sym-biosis* to further understand the anthropocentrism and ecological implications of our conceptions of hospitality-hostility. By extending these biological categories to the processes of the production of the artificial, the human-nonhuman assemblages become articulated as manifestations that necessarily acknowledge (or not) the presence and interrelationship with (some) others. In this section, I will use the 'heterotopian' approach sketched in the

previous section, in order to conceive the symbiotic relationships of the devices designed. Creating in this way aleatory combinations, pushing systems and organisms to cohabit in unusual circumstances, testing combinational ideas to imagine some of the resilient capabilities of the devices and actors related and their life in symbioses.

The final section, "Concluding" summarises the work through a short revision of the projects that conform this proposal, while articulating their ethical perspective in their attempt to explicitly acknowledge an ethological, and an etho-ecological[5] position, by affirming the inseparability of the *ethos*, the way of behaving peculiar to a being, and *oikos*, the habitat of that being.

All titles of the sections of this essay end in 'ing' as in *setting* (out), *hosting, unfolding, devising* and *concluding*. In English, verbs and nouns ending in 'ing' are called gerunds, from the Latin verb *gero, gerundus*, meaning "to be carried out". I have chosen to use the gerund form to emphasize this activity, this carrying out, the processing or the process aspects of the thinking proposed in each of the sections.

Partly, this is where my fondness for etymologies comes from, not that much a quest for origins —giving authority to the word by 'finding' its 'real' or authentic meaning[6], rather, it is an approach to 'open words up', dismembering them slightly, to offer an image of the instability of language, its ongoing transformation, in its synchronicity and diachronicity, language, once again, as enaction and *process*.

All enactment is a form of attunement or composition in and to a milieu. Forms produced by humans, what we call the artificial, are predominantly operating and conceived at the human (instrumental) scale, the human cognitive model and the scale by which design comes into being. My focusing on linguistic and biological phenomena is a response to this concern, trying to understand in what way language or *languaging* as cognitive scientists Humberto Maturana and Francisco Varela suggest, is the most characteristic feature of the human species (1998:234). And in this way, how this process might influence our perception of the world.

The work has been developed through a pragmatic and experimental approach that studies the results that might originate from a design thinking that is engaged not only with the artefact (noun, the static object, the thing itself) but also with the link, or linking, in the relation established; that which pre-supposes a position, and defines or constraints the conditions for experiencing how artefacts relate to the assemblages that constitute their environment.

The study started by inquiring into what seemed to be a funda-

mental paradox, namely, that when we create —for example— a car, we create the possibility not only of transporting ourselves from one place to another, but also the car crash; a thing and its 'negative side', the accident. Design, by dealing with the artificial, re-configures our environment by introducing new artefacts and produces new knowledge; thus parallel to every single invention design constantly creates the possibilities for new unexpected events, *accidents*. Following this basic logic, and believing that the designs that humans create are a way to provide humans with better living conditions, that is, making environments more hospitable, then, one can consider that one aspect of the hospitality of a car, such as the possibility to transport ourselves, is closely related to its hostility, the possibility to injure us through a car crash. The accident, by definition, is that which happens unexpectedly, without our (someone's) knowledge or control. Thus, the notion of accident implies that such and such things have happened at that particular place and in that unexpected way. Typically, the accident of which we think about when we have a car crash in mind is that someone, for example Maria, fell asleep while driving, hitting the tree beside the road, which prevented her from injuring pedestrians nearby... thus the accidental notion refers to the events that were not meant to happen —falling asleep and crashing, but includes in this way even the presence of the tree, a 'lucky accident', since it prevented other people's injuries.

On a closer look, what becomes apparent is the human centredness of the word 'accident', or more precisely, the *category* 'accident'. If we shift scales and consider the phenomena involved in a given car crash from either a micro or a macro perspective, we would hardly consider it as an accident. If we imagine a car crashing on to a tree from a micro perspective, we would not consider the transformation that the bumper undergoes under pressure when in contact with the wood an accident; we would describe it as a transformation of some kind, since this is the behaviour expected when such materials collide. In 'nature' there are no accidents only processes of transformation, becomings.

At this level, there is a correspondence between the notion of *affordance*[7] and the category *accident*. Examining the transformations that a car bumper undergoes when crashing on to a tree, we observe a particular relation between the structural properties of both systems. Current car design has become such, that all parts of a vehicle become deformed with relatively low impacts, in order to absorb the shock of a crash, protecting thus the human bodies inside of the cockpit or passenger shell. A process known as the "weakest link", where using a weak element that 'fails', protects other elements in the system. The transformation will be

relative to the many parameters involved: speed, weight, inertia, distance/angle of impact, size and type of tree and so on. This form of interaction maybe totally destructive in some cases, but it most likely is a mere perturbation for a stronger vehicle such as a tank. In general terms, one can say that the relation tank-tree affords different possibilities than the relation car-tree. Since most of us travel by car rather than by tank, we tend to project these qualities in the *category* accident.

Here the word affordance needs to be understood as part of an *infra-language*. Bruno Latour suggests (2005:30, 174) that in an infra-language words remain meaningless, except for allowing the displacement, the connection and the consciousness of a given *specific* relation. Affordance cannot be 'general' in its 'application'; the tree affords a great variety of behaviour, depending on the relationship established with a given system or organism (cars, tanks, woodpeckers, worms...). Words that form part of this infra-language do not designate *what* is being mapped, but *how* it is possible to map it.[8]

The notion of accident is perceiver-dependent, a human construction that applies to a human social logic. This has implications when trying to understand artefacts ecologically, since what was not planned (that which comes unexpectedly) cannot be understood as accidental, only as process, processes of becoming.

This simple association of what is hostile to what is accidental has gradually led to a series of studies of the 'possibilities of relating' so to say, exploring combinational aspects from alternative perspectives. Thus, questions such as: what is the likelihood of this thing getting in contact (relating) with this other thing? Have pushed the study into researching transformation processes (when does this *become* hostile to...). In the context of this work I will return to the notion of accident and its relationship with hostility. For the moment, I would like to emphasize two aspects of my approach to the theme of hospitality and hostility. I refer to both, hospitality and hostility, by writing hospitality-hostility with the intention to capture their reciprocal con-formation. The hyphenation of these words does not aim at describing a dichotomy, but rather at describing a single phenomenon characterized by a tension that can occur between human and/or nonhuman actors. It follows that hospitality-hostility is to be understood as a dynamic process. The questions asked in this work are not necessarily concerned with 'what *is* hospitable-hostile?' but rather, with the hospitality-hostility of what, when, and for whom? Since a given process can at a given time-space be of harm or benefit to the system or organism in question at alternative scales. One can say for example, that our hospitality to another person by

means of offering food (mangoes from the Philippines) might, at a later stage —due to the unsustainable practices in the production, distribution, consumption and/or discard of these goods— become hostile not only to our guest, but also to us, the hosts of the gesture of hospitality, by causing a deterioration of the environments where 'hospitality' took place. What the project attempts to articulate, is a need to understand hospitality-hostility from a ecological perspective, where human forms of hospitality to humans, con-form part of a complex web of interrelations that can only —unavoidably— be understood from an anthropocentric ethical perspective.

A FRAMING

As a mode of preface to his book *Empire of Signs*, Roland Barthes wrote a brief note;

> The text does not 'gloss' the images, which do not 'illustrate' the text. For me, each has been no more than the onset of a kind of visual uncertainty, analogous perhaps to that loss of meaning Zen calls a satori. Text and image, interlacing, seek to ensure the circulation and exchange of these signifiers: body, face, writing; and in them to read the retreat of signs. (1982).

Analogously, not only the imagery but also, the three-dimensional materializations included in this work have uneasy relationships with the concepts and speculations of this essay. It is impossible to say at this point which has generated what, and in what way, or to what extent, the designs expand or introduce new conceptions to the arguments. To what extent the readings and the developing of the projects have reinforced or weakened positions taken.

Through the practice of design, the materialization of devices have pushed and in many cases redefined the conceptual frame, or brought a set of constraints to the project as a (thinking, enactive) process; realization involves the process of limitation, the narrowing down of possibilities, by which some are discarded and others made real, actualized. These have allowed me to provisionally position the arguments within a vast network of (sometimes problematic) associations, preventing the theme of hospitality, hostility and design to expand and displace itself endlessly.

The work has brought forth a range of approaches, the result of a personal need to articulate part of the complexity of the practice of design. Complexity, one of the words I frequently use through-

out the work, should not be confused with neither *completeness* nor *complicatedness*. In Edgar Morin's words,

> We can say on the one hand, that what is complex recovers the empirical world, the uncertainty, the incapacity to obtain certainty, to formulate a law, to conceive an absolute order. And on the other hand, recovers something related to logic, that is to say, to the incapacity to avoid contradictions. (2004:99).[9]

The series of projects interweaved with the paragraphs that conform this thesis are to be understood as propositions. Not only because, as I will develop in the coming sections, I emphasize through the 'relational', the 'positional' —thus the 'pro-positional'— but more generally because the approach to the doctoral studies has been, as in a design project, to come up with a 'proposal'. In this way the emphasis lies in the pragmatic and experimental character of the methodologies adopted, as well as the potential of the analysis and ideas generated.

I have paid particular attention to what *things*[10] do or are capable of doing. Studying how they work and what kind of behaviour do they afford, what do they make possible, available, to humans as well as nonhumans.

Although I put emphasis on so-called *natural languages*[11], I do not suggest a predominant role of a natural language when discussing cognition. On the contrary, as I will develop in the sections to come, I understand language as displacement of sense and a form of structural coupling, where the fundamental concepts of language derive from the experiential dynamics of corporeal movements. Language plays an important but not a constitutive role, reason why the physical enactment of design, its process —as in sketching, its gestures and the gestures that result in the interaction with a given materialization, are fundamental to understand the displacements and proposals suggested in this work.

[Relating by... 78]

I prefer to think of the devices that follow, such as the card and the stamp sets, the radios, and the book you are holding in your hand, as *machines to think* and *to sense with*. Devices conceived to favour, arrange and make available possible worlds. Without a doubt, these versions exclude other, no less interesting possibilities, as will be understood by the notion of *device*. Part of the effort of assembling the thoughts, papers, machines, words and the rest of the elements that conform this proposal, have been invested in developing and presenting projects that leave open, and even (if aware) suggest alternative versions for addressing the issues at stake.

An important aspect for the reader to navigate not only the

intricacies of this work, but also its many references, is to keep in mind several *proscriptive constraints*, that is, my conscious attempts 'not to'.

I will therefore mention at least the ones that I have been explicitly and consciously aiming at minimizing. I have tried to avoid:
a – typological thinking, by playing with categorizations;
b – essentialism, by incorporating a relativistic perspective;
c – linearity, by constantly looking for connections to other phenomena outside the original starting point, and thus,
d – mono disciplinary specialization, by studying and attempting to incorporate a plurality of forms of knowing and knowledge fields.

The work questions the very assumptions by which one inquires. In this sense it imposes a form of affirmative auto criticism which requires not only *proscriptive constraints*, but also *positive resources*. In this case, I have looked for multipliers, have attempted to remain playful, shifting alternative time and spatial scales, and bringing disparate elements that would help me to question my own assumptions.

The search for these multipliers, pursued through the practice of design, have in many occasions implied a coupling with, for example, literature or philosophy, that is, practices which in many ways are concerned with the ability to 'write down' thoughts, ideas, stories. With characteristic humour, Jorge Luis Borges used to say "arguments convince no one"[12]. His stories however, are in many ways an example of carefully refined logical arguments, crafted in an essayistic style. Borges' rejection of "arguments" however, gives us insight into what in the cognitive sciences has come to be understood as *framing*.[13] Human knowledge has an emotional basis, thus the need to have a prior form of engagement with a given line of reasoning (the framing) that can be shared, tuned into someone else's tone of voice, sensibility. The presence of a 'purely' logical argument does not suffice to communicate an idea; there is a need for a series of words to activate the frame. Creating a space where someone else can be identified with a given narrative. As such, literature or philosophy provide some of the entries into the several levels of the project. At the same time, even the (visual, material) design proposals must be understood as 'framing exercises'. Thus, this 'narrative' notion of framing should be expanded to include artefacts that do not — explicitly— 'inform' us, but which nonetheless in-form and implicitly constitute and *affect* our modes of engagement with and in a given environment.

Framing, in the philosophy of Gilles Deleuze and Félix Guattari, points out a more fundamental gesture;[14] that of ordering a world,

[Devices 56]

and an ontological manifestation of the production of *excess*[15]; design being one of these manifestations. By framing, the frame separates, arranges, and as such, it relates to the notion of *device*, as will be developed here. Elizabeth Grosz mentions, "the frame's most elementary form is the partition, whether a wall or a screen" (2008:14). A device materializes, enacts such a form, becoming something that divides, arranges, partitions. Thus, a knife, by means of its blade in combination with a handle that can be manipulated by a human hand (the handle itself being another device), cuts through softer tissues and materials. The device becomes *able*[16], affords, arranging for example, the human hospitality with the gesture of slicing fruit (to continue with another level of our hospitality by offering mangoes) for a guest and the hostility of having lacerated the fruit. Yet, this laceration becomes a manifestation of one of the possibilities of hostility which we can directly —in the use of the knife— perceive; cutting as a form of violence. There are other possible (and likely) manifestations of hostility which are not directly in relation to our use of the knife: through the production, distribution, consumption and discard of the knife, the artefact —in the process of becoming a knife or of that of decomposing or being reused, or recycled— interacts with a myriad of humans and nonhumans for a period far longer than the average human life. In this way, it affects the environments and the ones that participate, willingly or not, in the becoming of this device.

Grosz suggests that, "At its most elementary, architecture, the most primordial and animal of all the arts, does little other than design and construct frames" (2008:13).[17] When mentioning that architecture is doing "little other than design and construct", the word *design* stands for a form of enaction, *a way* of doing, whether that is architecture or something else. It is in this general sense that I speak of design in this work, referring to a (human) way of doing, a form of enaction, the production of the artificial. Following this approach, architecture, graphic design, literature, painting, the writing of a speech, or any other form of human construction are all manifestations that imply *a way* of doing, that is, a design. If specific or institutionalized forms of design are discussed, I will refer to them in terms such as graphic or industrial design, to give two common examples.[18]

Borges was sensitive, like G. K. Chesterton —a writer he worshiped— that "the essay is the only literary form which confesses, in its very name, that the rash act known as writing is really a leap in the dark" (Chesterton 2000:17) and often adopted the uncertain role of the writer whose doubt becomes a source of affirmations. What Chesterton pointed out was, that the essay

—as opposed to the epic, the sonnet, the ode— is by its very name and its very nature "an experiment", and as such, "full of the future and the praise of experiment and adventure" (Chesterton 2000:17). It is remarkable that Borges, through the practice of writing, 'trusted' the forms that were enacted —the stories that emerged from the discipline and the joy of writing— and allowed his body to become an instrument of literature. He actively practiced Coleridge's "willing suspension of disbelief", allowing other people's tones and voices to affect and to resonate in his own. He cherished the unconscious and often fantastic formations that arose in his sleep. In this sense, through his subtle and attentive sensibility, he *cultivated dispositions* that made possible a form of attunement that constantly affirmed other possibilities, other beings, other worlds, which became part of his world.

This work may also be understood as an attempt to cultivate dispositions, particularly those that seem to lead to the recognition of other worlds, other beings, and other systems.

Of the many present voices, Borges' tone is subtlety heard, sometimes in visible written form, but it also appears in the playful and experimental way in which his speculations have informed and inspired some of my designs through his stories of possible worlds and literary games. As I write these lines, I have in mind the opening passage of this section, from a young Borges in his twenties, which help me to express some of my own feelings and reservations, as I embark in this *human* work of writing an essay.

Hosting

The danger represented by the thing given or handed on is doubtless nowhere better sensed than in the very ancient Germanic law and languages. This explains the double meaning of the word Gift in all these languages – on the one hand, a gift, on the other, poison.

Marcel Mauss

HOSTIS: A GUEST, AN ENEMY

It is known that certain microorganisms thrive in 'hostile' environments, such as the acid waters of a hot spring or nuclear waste, where life was thought to be impossible. Each species adapts to, and co-creates the conditions of its existence; through the coupling of systems and organisms, forms of coevolution and symbioses have been developed where 'hosts' and 'guests' cohabit a given environmental niche. They become symbionts —which may be inside or outside of another symbiont— tapping into the resources as well as being constrained by the possibilities of the ecosystem.

Hospitality-hostility is not a property of the systems or organisms themselves, but have to do with human or nonhuman ways of relating to each other in a given environment.

From basic forms of shelter to today's 'intelligent' homes, humans have modified environments so that they could afford humans safer and less straining —more hospitable— living conditions. However, when we think of a host, or hospitality in general terms, we do not tend to think of biological relations. What we normally have in mind are human social gestures of cohabitation, many of which are mediated by artefacts: from a hand shake, through the offering of food, to shelter and urban planning, each human society has established more or less articulated *rules of conviviality*.

In general terms, the person that welcomes or invites us, the host that receives us, or the thing that offers a range of possibilities, offers them according to a code, a set of rules, a law or a language that may or may not be ours. It is therefore interesting to look into a conflict that exists at the root itself of the etymology of a keyword to this study, that of *host*:

> Host (1): one who entertains guests. L. *hospitem*, acc. of *hospes*, (1) a host, (2) a guest. The base *hospit-* is short for *hosti-pit-*, where *hosti* is the crude form of *hostis*, a guest, an enemy. Host (2): an army. (F.-L.) The orig. sense is 'enemy' or 'foreigner.' M.E. *host, ost.-* O.F. host, a host, army.- L. *hostem,* acc. of *hostis*, an enemy (orig. a stranger, a guest); hence, a hostile army...[1]

Mauss' opening passage to this section points at this, seemingly paradoxical, manifestation; *hostis* (a guest, an enemy) implies the presence, the existence of an-other, of a foreign actor and opens up for the *possibility* of hospitality-hostility. "The foreigner is first of all foreign to the legal language in which the duty of hospitality is formulated" mentions Jacques Derrida (2000:15), who sug-

gested in his seminars on hospitality, that hospitality is impossible without hostility. Hospitality and hostility constitute each other by defining each other's limit; by tracing (re)movable boundaries that open up spaces of possibilities within a set of conventions, of cultural traditions.

Foreignness however manifests itself in different ways and degrees: the human foreign that comes from another country and does or does not understand our language and our laws, to which Derrida refers; the bullet that has irrupted in the body and is foreign to the organism; the bird that is foreign to the rhinoceros and contributes to its health, among countless other examples. What these manifestations seem to have in common is that they are all forms of *relation*, in which the *knowledge* (or lack of it) of the foreign agent, of its presence, opens up to the possibility and re-cognition of hospitality-hostility.

EXPECTING HOSPITALITY

In order to act 'appropriately' one needs to *know*. The acting *appropriately* however, implies a dependency on a given context and a history of personal interaction, in this way, what should or could be known (or understood as knowledge by an observer) differs, according to the behaviour that is *expected*, depending thus on the question that is asked.

When considering whether someone *has* knowledge or not, we understand that "what we are seeking is an effective action in the realms were an answer is expected" (Maturana and Varela 1998:173). Maturana and Varela exemplify with a student who is asked at an examination to calculate the height of a university tower by using an altimeter. The student performs several calculations where he uses the altimeter, but *not* as an altimeter, thus: he attaches a string to it and drops it to the foot of the tower, calculating that the tower is 30 meters and 40 centimetres; or goes out to the garden and standing close to the tower with a goniometer, he uses the length of the altimeter to triangulate the tower, by which he calculates that it is 30 meters and 15 centimetres. In this way, the student performs several other calculations, none of which are satisfactory to the professor. What Maturana and Varela point out is that from an observer's point of view, the student had more knowledge that what he was asked for, but from the professor's point of view, all answers were inadequate. (1998:173-174). For this reason, they mention that "We admit knowledge whenever we observe an effective (or adequate) behaviour in a given context, i.e., in a realm or domain which we define by a question

(explicit or implicit)" (1998:174).

For a living organism, to act appropriately implies, at the most basic level, to react to its environment in a way that will continue to make its life possible, that is, to survive.

> every interaction of an organism, every behaviour observed, can be assessed by an observer as a cognitive act. [...] In a nutshell: to live is to know (living is effective action in existence as a living being). (Maturana and Varela 1998:174).[2]

Thus, when talking about *knowledge*, one should keep in mind this onto-epistemological continuum, where a given organism (in this example, human) enacts forms of knowledge, resulting from a history of interactions, always participating and immersed in a given culture. Cognition must be understood *as enaction*, where enaction "connotes a bringing forth by concrete handling." (Varela 1999:8). In this sense, all knowing is doing and all doing is knowing.

Thus, 'knowledge' does not only stand for 'knowing *what*': such and such things are in such and such way, as when one assumes 'facts'. Rather, it includes a 'knowing *how*', which is a form of enactment constrained by the capacities of the organism in question. At stake is not to specify how a 'perceiver-independent' world can be described, but rather, to understand how action can be perceptually guided in a perceiver-dependent world. (Varela 1999:13).

For a middle-age woman whose body is healthy, to act effectively (appropriately, adequately) when approaching an automatic sliding door —with the intention to walk through it and move to the next room— is to move towards it with a determined pace that will give the sensors time to detect her while opening the door without delaying her walk. A child or cat would act, react, and interact differently. And in case their interactions are sufficiently repeated, disrupting the system by say, constantly playing with it, a countermeasure will be taken (some form of intervention in or with the design), acknowledging the unexpected form of engagement with the doors. In the realm of useful artefacts, the explicit or implicit question relates the user (aware or not) to an absent designer or creator who (consciously or not) has defined possibilities of use.

The person that establishes contact with a given artefact acts in accordance with his or her knowledge of it, his or her experience with previous interactions, creating his or her own expectations on the possible outcomes of the interaction. What one knows is what will define whether that expectation will turn to disappoint-

ment (being therefore noticed) or whether it is going to fulfil its predictability, becoming in that case, a step to the completion of a particular task or function. The woman that successfully walked through the sliding doors 'knows', *because* of the context that validates her actions; *because* nothing unexpected happened, otherwise she would need to reassess her behaviour and adopt a new tactic that will validate her knowledge. If she runs into the sliding doors without seeing (knowing) them, an 'accident' will be produced, causing her nose to bleed or the glass to break. This accident —any accident— is that which happens unexpectedly, without a deliberate plan or cause. That which is expected is the 'pact', in Derridean terms, that has been established consciously or not, among the performing actors/actants[3] through previous interactions. The evaluation of whether or not there is knowledge is always made in a relational context, but this 'pact' —since it has been incorporated as knowledge, therefore expected— would not be perceived as 'truly' hospitable.

According to Derrida, hospitality, in order to be perceived as such, will require a transgression of the expected function. Derrida mentions,

> the absolute or unconditional hospitality I would like to offer him or her presupposes a break with hospitality in the ordinary sense, with conditional hospitality, with the right to or pact of hospitality. [...] we are taking account of an irreducible pervertibility. The law of hospitality, the express law that governs the general concept of hospitality, appears as a paradoxical law, pervertible or perverting. It seems to dictate that absolute hospitality should break with the law of hospitality as right or duty, with the 'pact' of hospitality. (2000:25).

A "making do" similar to the tactic operations described by De Certeau (1984), where the practice of everyday life becomes an artistic expression, in search for those boundaries that lead to the transgression of hospitality in order to become 'truly' hospitable.

Something 'expected' is *assumed* as knowledge in a given situation. As it is known, false expectations may have important effects on the person, the Placebo effect being perhaps the best-known example.[4] But even when expectations can influence perception and behaviour, the changes are temporary, fading away, being reincorporated into *knowledge*.

Following the logic suggested by Derrida, we understand that the roof that shelters or the door that opens are constantly being 'naturalized'. Our interacting with them results in forms of expectations that assume their performing correctly (sheltering, separating spaces), thus our —experiential— need for the transcend-

ence of their (original) hospitality, in order to experience them as 'truly' (*absolute*, in Derrida's sense) hospitable.

KNOWLEDGE AS HOSPITALITY

If absolute hospitality is only possible through the transcendence of the known, as Derrida suggests, then behavioural patterns, the capacity of a given organism to perceive and conceive a particular state of things is decisive for the identification of the elements that provide *useful* guiding (and mis-guiding) *information*[5]. However, as we have observed, the information depends on a pre-existing competence, knowledge. What are the clues that I have (perceive) for understanding a given situation? If we observe the following image by Carsten Höller, (Fig. 2.1) part of the series and exhibition entitled "killing children", we note that the work is addressed to an spectator that *knows*, but (in the imaginary) the situation is staged for children —by means of the spread candies— who *don't know*.

In the work there are perceptual clues that act as narrative elements (the candies, the power chord leading to the wall) that 'guide' or provide clues for behavior. The chord —for example— narrates by being plugged on to the wall, standing on its own, being an appealing and clearly differentiated element that points to the socket on the wall, indicating to the experienced observer the threatening of the situation: the 220 volts shock is inevitable for those who lack knowledge of electric appliances and house installations. The situation may only be defined 'accidental' in case someone or something *unaware* of the risk, gets in contact with the electric source. For the experienced observer the electric shock as such —since it is expected— is but the effect of a cause, a predictable consequence, the outcome of those 'potentialities'. Thus the tension hospitality-hostility ('inviting'– electrifying) is perceived and understood in advance. We see how the candies and the chord 'invite' (afford human beings) possibilities of behaviour: being visible, manipulable and accessible. These features and affordances are to be handled differently depending on the knowledge and intentions of the one interacting with them, thus —as spectators that *know*— we tend to perceive them as *both* hospitable *and* hostile. The 'pact' lies in the *sharing* or having shared this knowledge, a necessary act of communication since we, as humans, are unable to perceive the invisible threat of electricity. It can be said that the hostile proposition of Höller's artefact is based on our sensory limitations, perhaps, what biologist Jakob von Uexküll called our *umwelt*.
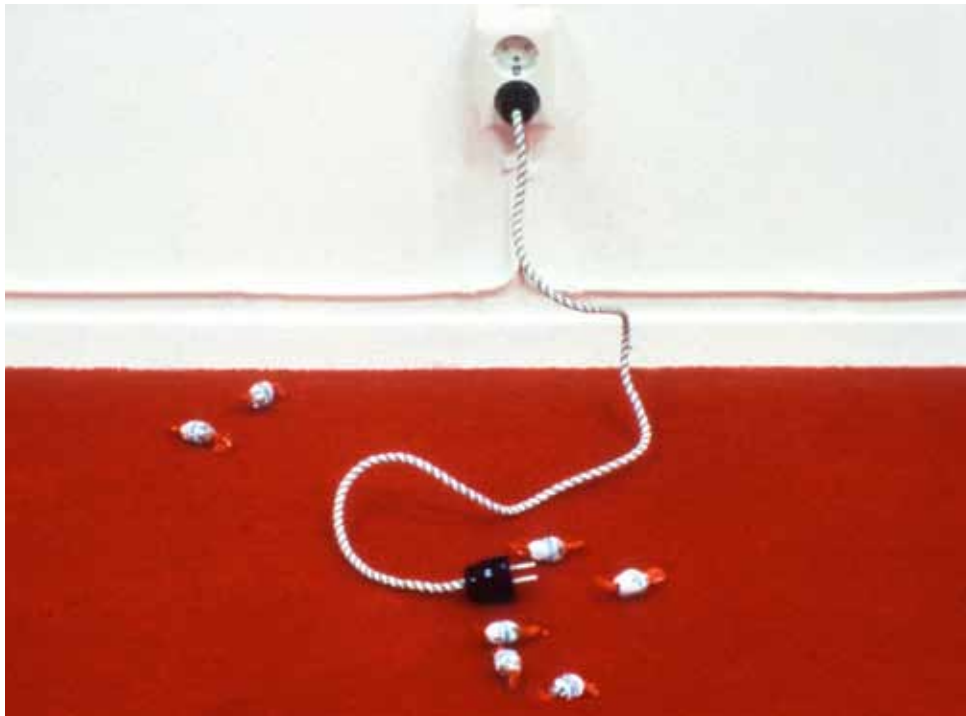
2.1 *Killing children –*
Carsten Höller.

The concept of *umwelt*, which could be translated as the 'world brought forth' by a given living being, was developed by von Uexküll, whose most famous example to describe a simple *umwelt* is that of the tick. He wrote:

> The tick is blind and deaf, she is unable to perceive odors, except one, and that is butyric acid. And that happens to be the only odor that is common to all mammals, because it is a component of sweat. In the Umwelt of the tick there are no 'sight things' or 'hear things' and only one single 'smell thing', that infallibly functions as an alarm signal, causing the tick to fall off its perch. If it lands on the warm skin of a mammal, the warmth is a second perceptual cue that releases the act of sucking. (von Uexküll 2001b:119).

These signs alone constitute the *umwelt* of the tick, nothing else exists, even if they may be significant for another organism. As philosopher Brett Buchanan explains,

> It is on this point that we can see a parallel with other organisms. In the way that a tick can sense the precise odor of mammalian sweat, the same odor may have no significance for other living beings. This sign does not figure into my *umwelt*; it has no significance for me. (Buchanan 2008:25).

An umwelt is conceived as an "island of the senses", a perceptual sensory sphere. Regarding the human umwelt von Uexküll mentions,

> For man, all distant objects are sight-objects only, when they come closer they become hearing-objects, then smell-objects and finally touch-objects as well. Finally objects can be taken into the mouth and be made taste-objects.[6]

Our perception of electricity depends on physical contact (touch), a mediated relation through other artefacts, or information mediated by language.

The hospitality–hostility that may be perceived, re-cognized and understood to be real, is not only perceptually guided but also perceiver–dependent. In spite of both being mammals, our human perception of environments at night greatly differs from that of the bat who navigates it mainly by means of sound.

As mentioned, our knowledge (all living cognitive beings' knowledge) needs to be understood as *enaction*; what counts as a relevant is inseparable from the structure of the perceiver (Varela, 1999:13). The *welt* (German for *world*), of the *um-welt* indicates

a *world*,[7] but a particular one; although the cognitive agent is 'in' both, we need to distinguish between 'world' and 'environment'. Francisco Varela, who does not refer in his work to the notion of umwelt, makes the following distinction:

> On the one hand, a body interacts with its environment in a straight-forward way. These interactions are of the nature of macrophysical encounters –sensory transduction, mechanical performance, and so on- nothing surprising about them. However, this coupling is possible only if the encounters are embraced *from* the perspective of the system itself. This embrace requires the elaboration of a surplus significa-tion based on this perspective; it is the origin of the cognitive agent's world. Whatever is encountered in the environment must be valued or not and interacted with or not. This basic assessment of surplus signification cannot be divorced from the way in which the coupling event encounters a functioning perceptuo-motor unit; indeed, such encounters give rise to intentions (I am tempted to say 'desires'), and intentions are unique to living cognition. (1999:55-56).[8]

I believe that the "world" to which Varela refers to, can be seen as a contemporary form of von Uexküll's *umwelt*, being a world brought forth by the possibilities of the cognizing organism itself.

Returning to our previous example, the woman that walks to-ward the sliding doors can also be seen as enacting a gesture of hospitality, by (re-cognizing) acting as she is expected to. Hospi-tality-hostility is a co-creation, however, the signs of the relation-ship that lead to one or/and the other are not always shared.

SHARING AS HOSPITALITY

When coming across a new situation, a person might lack the pa-rameters by which to judge the best possible way to behave.

It is in such a context when the sharing itself of the knowl-edge (rules, form, general in-form-ation) becomes the first step towards the establishment of the possibility of hospitality, that is, to the sharing *as* hospitality. What defines hospitality–hostility is a social code, a set of implicit or explicit signs to be communi-cated. As stated before, the sharing of that code (knowledge) is vital to the 'pact' of hospitality, but the *following* (respecting it or not, consciously or unconsciously) of the signs, code, of the rules, is what determines whether a circumstance becomes hostile or hospitable. Like in a game in which the rules are not being fol-lowed, the players turn hostile to the host by not respecting the agreements, making the game thus unplayable due to the lack of

a frame that validates their behaviour. If "The foreigner is first of all foreign to the legal language in which the duty of hospitality is formulated" as Derrida suggests, the first instance of hospitality lies in the acknowledgement of that difference, on the commu-nication and the articulation of that (legal) language that, until then, excludes an-other. The morality suggested by the word *duty* in this last quote refers to a (human) 'obligation'; traditionally, to offer shelter, to give food, satisfying the basic needs of the other. Gestures *mediated* by artefacts, the plate, the cutlery, the chop-sticks, the roof, the bed, the chair or cushion, each one embody-ing particular ways of performing these basic duties.

How does the designer, and later on his or her design, influence this mediation? As suggested by Bruno Latour, artefacts mediate human-nonhuman interactions based on human value systems, extending a morality by means of "delegation" which in its turn implies forms of "anthropomorphism". Thus, a door 'solves' the 'problem' of passing through a wall but creates the problem of, for example, leaving the door open after one has gotten into the room. For this purpose, 'grooms' have been designed, delegating the human (polite) behaviour of closing the door once one has passed, to the artefact that 'behaves' anthropomorphically.[9]

The artefacts in question may act as *mediators or as interme-diaries*;

> Are they well-aligned *intermediaries*, making no fuss and no history and lending themselves to a smooth passage, or full *mediators* defin-ing paths and fates on their own terms? Are they more of the same – that is intermediaries – or are they really others – that is mediators? (Latour 1997).

In this sense, the perception of a mediator implies a form of significance to the perceiving organism —an event, while an in-termediary remains unnoticed, allowing for a 'smooth passage'.

One could say that design(ers), by making something 'invis-ible', that is, by aligning all the elements in a particular situation, by converting things into *intermediaries*, tune into someone else's instrumental engagement with that environment. The design of *intermediaries* reflect, at its best, the sharing (the design act) as hospitality. That is, the designing of an artefact which is in har-mony with a range of predictable human behaviour.[10]

The act of sharing might lead to the experience of hospital-ity or hostility, by turning an insignificant passing occurrence into a significant event. Sharing implies a *relation* established by different actors/actants. In the case of artefacts, since humans produce them, they are already conceived, and constrained by,

under specific knowledge and material conditions. Although not all possibilities of interaction can be pre-figured, our interaction with artefacts have been 'planned' by someone who, aware or not, constraints (whether this is seen as constructive or destructive, positive or negative) human and nonhuman possibilities of behaviour. The hospitality that an artefact such as a garbage bin offers, can be understood, for example, in being reachable by the average human hand.

Thus, it is both, the guest (human user) and the host (designer/creator mediated by the garbage bin) that offer mutual hospitality in their reciprocal recognition, by allowing[11], by accepting each other's behaviour and actions. One could also say that in order to offer hospitality, it is not strictly necessary to start off from the existence of a dwelling, but from the dislocation of the shelterless, of the one 'without' (place, food...) that can open up to the authenticity of hospitality. This can be done directly by humans, as in human to human relations, as when giving a hug, a kiss or a handshake; or mediated by artefacts, as in the relation between the one that lacks some-thing (a bed where to sleep or a place where to throw garbage) and the thing itself.

Design itself can be understood as a gesture of hospitality–hostility; by enacting and inventing worlds, it inscribes significant differences which are of harm or benefit to some beings or systems. Hospitality–hostility is not a program that unfolds mechanically on each case. Hospitality-hostility participates in the dimension that is the gift, otherwise there would not be invention, only reproduction of the same. Mauss' pointing out Germanic languages' dual meaning of the word gift as both, gift and poison, instantiates another manifestation of the logic of artefact-accident. An obligation (imposition) to exchange is produced once we get in contact with a given thing; by participating in its use[12] we potentiate accidental forms of emergence. A device, designed and conceived to function in a 'hospitable' way will most likely become 'hostile' to some other actor or actant at a given point. Hospitality-hostility constitutes a (political) problem of thresholds and borders, between I and (the recognized) other.

[*Prepositiontools* 86]

The re-cognition of otherness, including self-as-other, has profound ethical implications. Current studies of cognitive patterns evidence that cognition results from a given perceptive coherency based on the cross correlation and working together of bodily functions. Thus, even small differences such as change of posture in the same lightning conditions affect the neuronal responses that enact vision, our capacity to see (Varela 1999:47-48). Cognition does not flow seamlessly; in contrast, it is formed by a succession of behavioural patterns. The slight change of

posture inscribes a significant difference that lead to perceptual change. This allows Francisco Varela to formulate the notion of (human) *self* as a form of narrative, where the weaving together of a personal story brings forth a sense of personal identity. Varela elaborates on the idea of *self* as "a virtual person", where the construction of a personal narrative through language sustains a mode of being in (social) relation with others.

> What we call "I" can be analysed as arising out of our recursive linguistic abilities and their unique capacity for self-description and narration. As long-standing evidence from neuropsychology shows, language is another modular capacity cohabiting with everything else we are cognitively. Our sense of a personal "I" can be construed as an ongoing interpretative *narrative* of some aspects of the parallel activities in our daily life, whence the constant shifts in forms of attention typical of our microidentities [...] If this narrative "I" is necessarily constituted through language, then it follows that this personal self is linked to life because language cannot but operate as a social phenomenon. In fact, one could go one step further: the selfless "I" is a bridge between the corporeal body which is common to all beings with nervous systems and the social dynamics in which humans live. My "I" is neither private nor public alone, but partakes of both. And so do the kinds of narratives that go with it, such as values, habits, and preferences. (Varela 1999:61-62).

Understood as such, human cognition shares the patterns that lead to behaviour with all kind of living organisms, to the extent that Varela believes that "Ethical know-how is the progressive, firsthand acquaintance with the virtuality of self." (1999:63). A way to understand otherness can result from the insights of a shared perceptive coherency. An emergent process that results in our re-cognition of a given situation and our relationship to the environment where the (re-cognized) event takes place.

DEFAMILIARIZING HOSPITALITY-HOSTILITY

The experience of hospitality–hostility lies in the pleasant (or unpleasant) unfamiliarity that will lead to a specific behaviour, in the strangening of the setting, thus in the search for the transgression that Derrida calls "absolute hospitality" which final measure would be the experience, the meaningfulness of the event. Design conceived in this way has no formula that can guarantee 'communication efficiency' or 'transparency' since it would work against the very principle of design; by definition, the creation of the new,

[*Expecting...* 44]

Hosting

the re configuration of the known. Designer Kenya Hara speaks of *exformation,* which in his view, is a tactic for the defamiliarization or the strangening of something that we believe we 'know'. For Hara, exformation is an operation performed as a counterpart to information,

> 'In' is to 'ex' as 'inform' is to 'exform'. In other words, I want to specu-late on the form as well as the function of information, not for making things known, but for making things unknown." (2008:376).

Hara worked with students at Musashino Art University in To-kyo to communicate the idea of exformation. One of the results of this collaboration was the 'exformation' of the Shimanto river in Japan. The images elaborated at the project show a composite of a full scale asphalt road and the surface of a river, which leads to the experience that the terrain as well as the movement of the river are perceived "with a reality beyond our expectations" (Hara 2008:371). By means of our memory of asphalt roads, and our relation to them through cars, our perception of the size an flow of the river changes, through the unusual associations with car sizes and speed.

When talking about exformation, Kenya Hara never refers to science writer Tor Nørretranders, who had coined the term exfor-mation previously. In his book *The User Illusion*, Nørretranders' notion addresses "discarded information", that is, information that is not explicitly dealt with but meaningful in providing context to information. Biosemiotician Jesper Hoffmeyer and theoretical bi-ologist Claus Emmeche write:

> every time we create knowledge, we also – and by necessity – create non-knowledge. To make things visible, we make other things – or in a certain sense the same things – invisible. This creation of non-knowledge, which by necessity accompanies any process of investiga-tion, is in itself a legitimate reason for the very widespread uneasiness towards the scientifc project. (1991).

In this work, however, the notion of exformation includes both, Hara's and Nørretranders' conceptions since they relate to the logic of the *device*, by explicitly dealing with what in-forms and what ex-forms; in this work, that which divides, arranges. And in this way, with the general conception of information as in-form-ation as will be developed in "Devices".

One could say, that Front's *bin* for Materia (Fig. 2.2) "makes an entrance for curiosity" as Hara would put it. It is in its defa-miliarizing the average garbage bin that we experience a sense

of wonder for its behaviour: the communicating of a 'with' and 'without' garbage. Although performed by all containers, the relationship nonetheless does not become explicitly communicated through the behaviour of these type of artefacts. The exforming act of its design exposes the weight and the pressure (that which is ex-formed, hidden) exercised in the relation content–container.

DEVICES

As mentioned, etymologically, a device *divides*, that is, arranges, frames, organizes. It might arrange for example an environment, an activity, or a gesture; devices become the agents that mediate a given relationship. The notion of device has been elaborated and developed in several contexts; I especially draw upon philosopher Giorgio Agamben's understanding of it, which is a particular elaboration of Michel Foucault's notion of the term *dispositif*.[13] As Agamben notes, Foucault never stated a clear definition of what a *dispositif* (apparatus) is[14]. In an interview from 1977, Foucault states:

> What I am trying to single out with this term is, first and foremost, a thoroughly heterogeneous set consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral, and philanthropic propositions – in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the network that can be established between these elements […] by the term 'apparatus' I mean a kind of formation, so to speak, that at a given historical moment has as its major function the response to an urgency. The apparatus therefore has a dominant strategic function […] I said that the nature of an apparatus is essentially strategic, which means that we are speaking about a certain manipulation of relations of forces, of a rational and concrete intervention in the relation of forces, either so as to develop them in a particular direction, or to block them, to stabilize them, and to utilize them. The apparatus is thus always inscribed into a play of power, but it is also always linked to certain limits of knowledge that arise from it and, to an equal degree, condition it. The apparatus is precisely this: a set of strategies of the relations of forces supporting, and supported by, certain types of knowledge. (Foucault).[15]

Here, Foucault refers to *dispositifs* as 'strategies', thus emphasizing the conscious *plan* behind these assemblages. In the course of this work however, I refer to them to emphasize the unknown, 'unconnected', unplanned and the dividing. In other words, the

conscious *and* the unconscious acts of the plan, project or devising process; the division of the device that leaves aside an actor likely or unlikely to come in contact with, thus pointing out at the potentiality, the 'accidental'. At the same time, Foucault's paragraph emphasizes the "forces supporting, and supported by, certain types of knowledge". This is crucial, I believe, for understanding the hospitality-hostility that a given device might trigger, as we have seen through Höller's installation (Fig. 2.1).

Foucault's *apparatus*, points at a (pre)conceived order, but when a device participates in the con-formation of a given environment, it establishes relations that are both expected *and* unexpected. A device has agency and forms assemblages with a given world, a given environment; some of these relations may have emergent properties, this is the reason why Agamben's definition of an *apparatus* is closer to my understanding of the term. Agamben notes:

> Further expanding the already large class of Foucauldian apparatuses, I shall call an apparatus literally anything that has in some way the capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviours, opinions, or discourses of living beings. Not only, therefore, prisons, madhouses, the panopticon, schools, confession, factories, disciplines, juridical measures, and so forth (whose connection with power is in certain sense evident), but also the pen, writing, literature, philosophy, agriculture, cigarettes, navigation, computers, cellular telephones and –why not- language itself, which is perhaps the most ancient of apparatuses... (2009:14).

In the following section, we will look into language and some of its linguistic components *as* devices. For the moment, I would like to further expand the already expanded large class of apparatuses, by noting that *all things* can be understood as apparatuses or devices. We can say, things *afford* (Gibson 1979) possibilities of behaviour, thus, a stone offers shelter to the worm, separating it from the warming sun, the song of a bird distracts a human reader, rain mobilizes insects... having capacities to capture, orient, determine, intercept, model, control, and so on. In other words, we are *structurally coupled* with a given environment that we con-form, the affection of perceivable objects trigger possibilities of enaction, including the bringing forth of *worlds.*

At this level, the distinction between 'natural' *things* and 'artificial' *artefacts/devices* becomes irrelevant, since the possibilities not only of the 'artificial' but also the 'natural' can be understood as devices. However, being concerned with the production of the artificial, I refer to devices agreeing with Agamben's conception,

where apparatuses "capture, orient, determine, intercept, model, control, or secure the gestures, behaviours, opinions, or discourses of living beings".

The notion of *device* acknowledges the power —hence *morals*— manifested through any artefact[16]. This agency however, needs to be understood, as political scientist Jane Bennett points out, as "distributive agency", distinguishing between (willed) agency and a (subject-less) *distributive agency*.

> In the tradition that defines agency as moral capacity, such new effects are understood as having arisen in the wake of an advanced plan or an intention, for agency 'involves not mere motion, but willed or intended motion, where motion can only be willed or intended by a subject. A theory of distributive agency, in contrast, does not posit a subject as the root cause of an effect. There are instead always a swarm of vitalities at play. (Bennett 2010:31-32).

This distinction has important implications in this work, partly due to ecological concerns, and also, as we have seen, since accident, as that which happens without control, is inscribed in the potentialities of an assemblage[17]. From a biological perspective, distributive agency also helps us understand a (human) subject *as* assemblage in relation to human and nonhuman assemblages, as when conceiving the emergent property of the human self (Varela 1999). Regarding the assemblages that we conform with devices design theorist Cameron Tonkinwise mentions,

> A device allows me to focus on some aspect of the world only by hiding other aspects of the world. There is therefore always some kind of sacrifice to any technology, something that is given up to attain new powers. Critical theorists of technology worry about how little attention we pay to the world-obscuring aspects of technology devices; we do not seem to miss what we are missing when we uncritically accept what this or that piece of technology enables us to do. But this very point indicates that innovative designs almost never present themselves in terms of this sacrificial economy. Designs simply declare what they make possible; they manifest their value, never all the supposed sacrifices that one is going to have to make to access that value (learning new interactions, buying new peripherals, becoming a different kind of person, etc). Designs, presented in these non-comparative ways, offer themselves for voluntaristic affirmation. (2011).

Sharing this view, one should be careful to note that unless talking of advertising campaigns, designs do not "simply declare" what they make possible. Devices *trigger*, allow possibilities of

behaviour, although, through their in-form-ation, they attempt to arrange or inscribe *some* possibilities rather than others. Also, when talking in terms of a "sacrificial economy", the risk becomes that the word 'sacrificial' might be interpreted as a form of renouncement or abstinence, as it is often found in discourses on ecology[18]. From my perspective, although the concept of *device* seems to introduce a negativity that derives from its association with something that *divides*, thus something that subtracts, slices; what this 'dividing' does, is to introduce a *difference* that influences given systems or organisms in positive *and* negative terms. Thus, if the idea of sacrifice is to be accepted, it needs to be understood in more neutral grounds, where sacrifice stands for the *effort* that a human being makes in sustaining (consciously or not) a world-view. In this sense the device is understood in terms of what it makes available to humans as well as nonhumans throughout the whole of its life-cycle, as opposed to the specific human 'sacrifices' during the useful-cycle of the artefact. In this work, the notion of *device* co-relates to Latour's often-quoted line by Gabriel De Tarde "To exist is to differ" (Latour 2005), and by extension, to make differences to those who interact with it.

Information as in-form-mation becomes a (perceivable) difference, which makes a difference. Jesper Hoffmeyer and Claus Emmeche quote anthropologist and cyberneticist Gregory Bateson,

> 'There are in the mind no objects or events - no pigs, no coconut palms, and no mothers. The mind contains only transforms, percepts, images, etc....It is nonsense to say that a man was frightened by a lion, because a lion is not an idea. The man makes an idea of the lion' (Bateson 1972: 271). // According to Gregory Bateson information is based on *difference*. A sensory end organ is a comparator, a device which responds to difference. While reading this, for instance, your eyes do not respond to the ink, but to the multiple differences between the ink and the paper. // The number of potential differences in our surroundings, however, is infinite. Therefore, for differences to become information they must first be selected by some kind of 'mind', the recipient system. Information, then, is *difference which makes a difference* (to that mind). (1991).[19]

Returning to the notion of hospitality-hostility, it can be said that the design act itself can always be understood as an act of hospitality, as a gesture that consists of the enactment or materialization of an idea to be used by a human being. A designer decides a specific height of the door-knob (itself an item that offers possibilities of behaviour, like any other component), which would allow some (people), let us imagine that most, to be able to open

it, provided that they come into contact with the door. Excluded from that possibility would be short children, and perhaps, even people with some form of disability. It is here where the notion of device —that which divides, organises, arranges— becomes explicitly relevant to the understanding of hospitality–hostility. As I have been suggesting, this gesture, in order to apply to the more pervasive forms of hospitality–hostility addressed in this work, must be developed following an ecological sensibility. This will account for the inclusion not only of humans, but also nonhumans.

Generally speaking, artificial environments afford human beings with lifestyles that involve less effort than natural ones.[20] Ecologically, a sacrificial logic, understood in terms of effort rather than renouncement or abstinence, can be of help to conceive that in design terms, as philosopher John Rajchman suggests,

> The problem of *autri,* of being with others, then becomes one of constructing spaces owned by no one, allowing disparate points of view to coexist in the absence of any 'architectonic' system or harmony. (1998:96).

Thus, we could ask ourselves: what constructions allow for sacrificing the least while including the most? Once again, 'the most' is not 'all'. The devising slices, arranges.

In the context of this work, machines, artefacts, and apparatuses are *devices*, in their quality of arranging, disposing a given partition. As we have seen, although the Foucaultian term *dispositif* has been rendered into English as *apparatus*, the French word can designate any sort of device; a *dispositif* is precisely that, something that *disposes*, arranges.

By considering these things *devices*, what I highlight is the dividing, the sorting out rather than the 'solutions' of a given architectural proposal, 'consumer product', law, and so on. Addressing the inclusions and exclusions of the results and the devising process itself.

WHOSE WORST-CASE-SCENARIO?

Psychoanalyst and philosopher Julia Kristeva quotes the cosmopolitans of the French Revolution, "Hospitality means the right of a stranger not to be treated as an enemy when he arrives in the land of another" and then asks "Whence would such generosity follow? Quite simply... because the earth is round: naturally therefore, inevitably" (1991:172).

Inevitably, we cohabit the earth with other humans and non-

humans and although we can sometimes, and to some extent, choose who to share our life with, as in the case of choosing a human partner or living close to friends or family, we cannot choose who to cohabit the earth with. This cohabitation implies complex ecological inter-dependencies of systems and organisms at local and planetary level. Interdependencies which humans have exponentially de-stabilized.[21] Human bodies, like any other systems and organisms, have degrees of resilience, they are vulnerable, precarious. Along this line of reasoning, philosopher Judith Butler elaborates an ethical perspective based on the principle of *precarity*, understood as body vulnerability.

> Precarity only makes sense if we are able to identify as clearly political issues bodily dependency and need, hunger and the need for shelter, the vulnerability to injury and destruction, forms of social trust that let us live and thrive, and the passions linked to our very persistence. (Butler 2011:19).

Butler extends the anthropocentrism of an ethics of cohabitation to an ecological ethics, arguing that

> every inhabitant who belongs to a community belongs also to the earth, and this implies a commitment not only to every other inhabitant of that earth, but we can surely add, to sustaining the earth itself. (2011:13).

In this way, Butler echoes some of the claims of Bruno Latour's *Politics of Nature*, in trying to articulate and to bring together a "collective" of humans and nonhumans invoking and pointing out the political difficulties of what philosopher of science Isabelle Stengers calls "The Cosmopolitical Proposal". Through this proposal, Stengers affirms,

> the inseparability of the *ethos*, the way of behaving peculiar to a being, and *oikos*, the habitat of that being and the way in which that habitat satisfies or opposes the demands associated with the ethos or affords opportunities for an original ethos to risk itself.[22]

By placing human manifestations within this cosmo-political and etho-ecological domain, Stengers retains the word "political", as something "signed" by humans, in opposition to a pseudo "neutral" anthropological category. The idea of the *cosmos*, is not that of the existence of a "good common world", but of *a slowing down of the construction of this common world*. No 'good' definition of a 'good' common world can be achieved. At stake

are the problems originated by human knowledge, its practices, technical equipment, and judgements which have repercussions that are global.[23]

In order to understand the multiple levels where hospitality-hostility manifests itself, one should be aware of the ecological interrelations among *panarchies*,[24] or ecosystem hierarchies where a given eco-system provides (hosts)[25] the conditions and the possibilities of existence of an-other. Design, as the manifestation of the artificial, plays a significant role by enacting a subject's 'willed' agency through a human social group that influences not only those humans, in the triggering of behaviour, but also the environments throughout the processes of the life-cycles of these devices. Once again, assemblages which are per-formed and transformed through the interrelations of a triple ecological register —psychological, social, and environmental.

Traditionally, the threat of nature in its otherness, reminded us of our body vulnerability, affecting us in such a way that,

> To achieve their universal design solutions, manufacturers design for a *worst-case scenario*; they design a product for the worst possible circumstance, so that it will always operate with the same efficacy. This aim guarantees the largest possible market for a product. It also reveals human industry's peculiar relationship to the natural world, since designing for the worst case at all times reflects the assumption that nature is the enemy. (McDonough and Braungart 2002:30)

Nature, which historically has been considered as otherness par excellence, has relatively recently become vulnerable, "fragility has just changed sides" (Serres, 1995:20).

HOSTING IN SHORT

The word *hostis*, meaning both, a guest, and an enemy, implies the presence, the existence of an-other, of a foreign actor and indicates the *possibility* of hospitality-hostility. Knowing whether someone or something might potentially become one or the other depends on the conditions of the relationship established; its many parameters such as place, time, and history of interactions. Implicit in this relation is a *capacity to value* (or not) the other as *different*.

Information, being a "difference that makes a difference" to someone or something, implies an *umwelt*, an etho-ecological way of being of a particular organism in a given habitat. By discriminating, valuing some things and not others, exformation (as

'information excluded') becomes the other side of the coin of inform-ation. The differences that can be valued differ from being to being, depending on the ecological niche of the organism in question. In spite of both being mammals, our human perception of environments at night greatly differs from that of the bat which navigates it mainly by means of sound.

Design (the devising process) implies acts of inscriptions, inclusions and exclusions, where the device becomes a particular manifestation of human assumptions and concerns.

Devices cannot be de-scribed in general terms, only in ecological relationships, hence the need to acknowledge the partitioning, the devising process and the choices and decisions made, which inevitably take part for a group of actors/actants while discriminating others. The notion of *device* does not designate *what* something is or can be (what is 'out there'), but *how* the entity recognized arranges a partition, a division.

Understanding cognition as enaction becomes a crucial factor in the perception of hospitality-hostility. This matters to the discussion of design and design thinking since devices prescribe domains of interaction of ecological proportions, which are always fragmentary and fragmenting. Thus, when a given device has been conceived keeping in mind 'user-friendliness' (human hospitality to humans) it embodies a form of knowledge that ignores countless actors at alternative situations and scales. 'User-friendliness' also enacts and inscribes forms of hostility, to humans and non-humans.

By considering machines, artefacts, and apparatuses as *devices*, what I emphasize is the dividing, the sorting out rather than the 'solutions' of a given architectural proposal, 'consumer product', law, and so on. Addressing the pre-scriptions and in-scriptions, inclusions and exclusions of the results and the devising process itself, and in this way the ethical domain in which design operates in its recognition (or not) of other beings and systems.

From the devising follows the device which arranges, partitions. The next section entitled "Unfolding" explores how we think relations through language, and how the *languaging* process affects the process of devising and our perception of the ecological relations of the artefacts produced. It develops thus the notion of cognition as enactment, by looking into how these languaging procedures bring forth worlds by concrete action.

Unfolding

The totality of the causes of evil is the totality of relations... to know what these are one has only to describe the network of prepositions.

Michel Serres

RELATION AS ACCIDENT

Architect and technology theorist Paul Virilio has mentioned,

> Since I have a Judeo-Christian religious background, it is obvious to me that one must link any definition of the accident to the idea of original sin. The content of this idea is merely that any person has the potential to become a monster. Now, this idea of original sin, which materialist philosophy rejects so forcefully, comes back to us through technology: the accident is the original sin of the technical object. Every technical object contains its own negativity. It is impossible to invent a pure, innocent object, just as there is no innocent human being. It is only through acknowledged guilt that progress is possible. Just as it is through the recognized risk of the accident that it is possible to improve the technical object.[1]

Here again, this time through Virilio's point of view, we sense a constitutive aspect of the logic of the sacrificial (negativity, guilt). The sacrificial however, should be understood as effort rather than renouncement. Which implies that what is produced has a cost in terms of energy (usually required for the 'performing' of a combination of machines, humans and nonhumans), with its correspondent impact on the environment. But also, that whatever choice we make demands an effort: a social and psychological investment to achieve desired forms of knowledge and behaviour. The demands of the interfaces of new electronic devices are the most evident examples; the phenomenon however, is pervasive. One can think of the way a simple t-shirt might affect someone's behaviour. How, for example, a teenager might identify with a certain group, fashion, or subculture, and how the t-shirt might embody some of the values that relate to this group through a material feel, fit, set of colours and so on, creating a renewed sense of self perception, attachment and cultural heritage. We can imagine that this type of process of individuation might create an assemblage such as: *perfume-convertible car-electronic music band-clean black t-shirts-suburban garage scenes-at night*. Among the countless instances where efforts are made to maintain and regenerate such lifestyle, there are the occasions where keeping the t-shirt clean might require washing it at say 60 degrees. Washing at that temperature[2] —to take one single aspect of it— causes a chemical called nonylfenol to be released from the t-shirt to the sewage. This chemical, already known as "extremely poisonous to water organisms" (Prevodnik 2008), is used in the production phase of the t-shirt as a dilutant in most t-shirts in the market in Sweden, and can still be found on sewage in the

waters of Stockholm 20 years after it has been released. Around 46 tons (from 310000 tons of textiles) were imported to Sweden in 2006. Among other effects of nonylfenol, recent studies found a hormone related feminisation of male frogs. This change of sexual behaviour —which affects all water species and not only the frogs— affects in its turn, the water conditions of the Baltic sea.[3]

The emergence (the accident) of the relation t-shirt-frog through the assemblage formed by teenage desire becomes, in its psychological, social, and environmental complexity, overwhelming; especially if in the short or long term, some of the components is hazardous to some form of life.

At the same time, one should not forget the accident's revealing of our perceptive constraints. In spite of its negativity, Virilio ascribes positive value to the accident. As such, the accident reveals something that we would not be able to perceive, becoming a "miracle in reverse", being a "gift brought before the eyes" (Virilio and Lotringer 2005:63). Not all accidents are destructive; or more precisely, what is destroyed yields way to new forms, new lives; being at the same time, constructive, creative[4]. A broken wine-glass (made of the material glass) would no longer afford containing the same (or any) amount of liquid, but it will afford tearing apart, cutting softer objects such as paper napkins. Thus the affordances of the useful tool (glass to contain liquid) may be thwarted, but its materiality continues to afford possibilities of behaviour. A transition from order to disorder and vice-versa that points out a phenomenon that Yuri Lotman has called *explosion*. Lotman's explosion is not a physical phenomenon (dynamite, the atomic nucleus, etc.) but a philosophical concept associated with the idea of transformation and generation. The moment of the explosion is also the place of a sudden increase of informativity; information about the latent state of things, their tendencies, their possibilities (Lotman 1999:28). The explosion is unpredictable, but if considered once it has happened, in retrospective, it changes the object observed: seen from the past into the future, we see the present as a set of all sort of possibilities equally probable. When looking to the past, it acquires the status of 'fact' and we are inclined to see in it a single possibility (Lotman 1999:172); the explosion seems to us logical since the information has been assimilated into knowledge. "Once technical objects are stabilized they become instruments of knowledge" writes Madeleine Akrich (in Bijter and Law 1992:221) referring to the breakdown situation, where "there is a failure that reveals the inner working of the setup". Illustrating how the instability of a system becomes 'informative'.

Virilio has written that "the beginning of wisdom would be to acknowledge the symmetry of substance and accident instead of constantly dissimulating it"[5]. Following this logic with the intention to move on beyond what was said in the introduction, namely that when we create a car, we are simultaneously creating the possibility of the car crash. What is interesting at this point is to ask ourselves: what are the implications of thinking in terms of this particular set of words: substance-accident? Since the word "symmetry" implies a form of 'alignment' that 'bring things together', a particular form of *relationship*, we could start by asking: what does it mean to *relate*, to 'put' these things 'together'? Relate suggests that which has reference to something, from *referre* (*re + ferre*: to bring) to carry back, bringing into, establishing an association, a connection. By means of a so-called natural language such as English, we conceive these associations through prepositions.

We say that such and such things are related in a specific way, that for example, the bin is *on* the floor, or that it is *beside* the door, or *across* the corridor and so on. In grammatical terms, prepositions link nouns, pronouns and phrases to other words in a sentence, while indicating a temporal, spatial or logical relationship.

Philosopher Michel Serres' opening quote to this section draws our attention to this particular function of language mediated by prepositions[6]: the defining, enacting or determining of relationship.

But relating, having reference to something seems not to be *essential* to the thing it refers to, that is, it is not one of the properties that constitute *what* something is, but *how* this thing relates to other things. Distinguishing between what is essential and accidental leads us back to Aristotle whose philosophy divided *Being* into *substance* ('what') and *accident* ('how': modalities, properties, accidents of the substances). In his *accident categories* we find:

Quality: sensible characteristics of a substance (e.g., colours and sounds), shape, active and passive powers, dispositions, habits.

Quantity: dimensions of a substance (*continuous quantity*, e.g., lines, surfaces: the subject-matter of geometry); number (*discrete quantity*: the subject-matter of arithmetic).

Relation: how a substance stands with respect to other substances (mother of, teacher of, to the left of, bigger than, etc.).

Where: place.

When: temporal characteristics.

Action (acting): what a substance is doing.

Passion (being acted upon): what is being done to a substance.

Having: what the substance has on (e.g., clothes, makeup.

Position (*or posture*): how a substance's parts are ordered with respect to one another.[7]

Interestingly, the Latin *substantia* substance, essence (lit., that which stands under, i.e., underlies) grounds and sustains accidental properties. If Maria is pale and small —and we cannot avoid seeing her as pale and small— the existence/being/substance of Maria underlies and sustains (and is partly revealed by) the accidental properties. This *substantia*, that which 'sub stat', that lies under, grounds and sustains accidental properties, becoming thus *the pre-position* of *prepositions*.

It is relevant thus that not only *relation*, but also *position* falls within the Aristotelian accident categories, since prepositions pre-establish, pre-figure or pre-define a position (temporal, spatial, logical) in relation to.

Manuel DeLanda points out that Gilles Deleuze has tackled the issue by proposing

> that we get rid of the dichotomy between the essential and the accidental, affirming that everything is accidental, but distinguishing in the latter between the ordinary and the singular (or the special, the remarkable, the important). As he [Deleuze] writes: 'It will be said that the essence is by nature the most 'important' thing. This, however, is precisely what is at issue: whether notions of importance and non-importance are not precisely notions which concern events or accidents, and are much more 'important' within accidents than the crude opposition between essence and accident itself. The problem of thought is tied not to essences but to the evaluation of what is important and what is not, to the distribution of the singular and regular, distinctive and ordinary points, which takes place entirely within the unessential or within the description of a multiplicity, in relation to the ideal events that constitute the conditions of a problem'.[8]

Deleuze, by shifting from the distinction between essence and accident to "the problem of thought" (that of evaluation), proposes a philosophy that emphasizes the particular *relations* with an 'object of study'; indicating its ecological implications, as well as the positions taken when a thought performance occurs. Since we cannot but think with a language, through language, the understanding of the performative operations of prepositions, reveal this connecting, this 'tying' of things to one another; without this activity we would not be able to neither classify nor order our worlds.

RELATION AS ORDER

Language is never neutral; any so-called natural language implies ways of understanding and perceiving the world. Languages are modelling systems; they are means not only for communication but also modellization.[9] Partly, as cognitive linguist George Lakoff points out, what is important is to understand that most symbols, such as words and mental representations do not designate particular things or individuals in the world such as the Eiffel tower or Louis Armstrong,

> Most of our words and concepts designate categories. Some of these are categories of things or beings in the physical world –chairs and zebras, for example. Others are categories of activities and abstract things –singing and songs, voting and governments, etc. (1987:xiii)

Understanding the *constructed*, artificial and cultural nature of categories through words is vital to gain insight into the logical and performative implications of a given natural language.[10] Lakoff argues that

> human categorization is essentially a matter of both human experience and imagination – of perception, motor activity, and culture on the one hand, and of metaphor, metonymy, and mental imagery on the other. (1987:8)

Thus, "to change the concept of a category is to change not only our concept of the mind, but also our understanding of the world." (1987:9).

Looking into the word *accident* in its everyday use, being *accident*, a notion (and a category) that allows chance and causality to coexist, it is possible to perceive a particular viewpoint, an *order* of things. If language —through prepositions (in combination with verbs, nouns, etc.)— plays a con-forming role; by which procedure can we use it to influence our understanding of the world? Is it an accident that the milk has fallen *in* the glass? We tend to answer: no. An accident would be if the milk has fallen *outside* the glass. In these two sentences the accident is defined as such by a particular instrumental view where we assume specific actors, cultural contexts and times. The milk falling *in* the glass becomes no accident, because we assume someone, a human agent, pouring it from a package (that has possibly been stored in a fridge), who wants to drink it. Following the same implicit assumptions, the milk falling *outside* the glass *becomes* an accident, since our human agent has missed the target (glass for example) and has

spilled the milk, wasting a valuable good. What if we were to challenge these assumptions by replacing the prepositions used in the sentences?

If we think in terms of positions, of pre-positions and prepositions, it is possible to better understand the *framing*, the syntagmatic assemblages implicit in our (world)views.

Let us consider the following sentences:

The milk is *on* the glass.
The milk is *under* the glass.
The milk is *against* the glass.
The milk is *before* the glass.

Each of these variations suggests a particular *view*, a particular perception of the relation between the elements in question and its imagined context. If we speak of 'milk' as the white liquid that infants normally drink, and not —by metonymy— of the generalization 'milk' that stands for both the liquid and its package, then: "The milk is *on* the glass" may suggest a fallen glass with the milk spilled on to it, while "The milk is *against* the glass" may suggest a sense of physical gravity, a poetical sensibility at work.

If we look instead at the Aristotelian notion and category of *accident*, we perceive that the same phrases: milk *on, under, against, before* the glass, do not affect the notion of (or the real) 'milk', or rather that the milk does not *affect* the other bodies until we start imagining for example, that the milk *under* the glass implies an absorbing material such as wood, where eventually a process of evaporation will take place, separating the water molecules from the 'milk', or rather, the components that *in combination with* water, one distinguishes as 'milk'. As such, an operation which requires a contextualization of the 'substance' in question, and thus, an inevitable combination with the accidental categories. The key criteria being a perspective —human scale— and a given perception of 'substances' as given, as 'out there'. Such logic presents difficulties when contextualizing specific elements ('milk') in an ecological framework that considers relation to acting and affecting bodies and processes. As von Uexküll suggests, in relation to other beings, things are *carriers of meaning*: if someone grabs a stone that lies on a path to scare away a barking dog, and manages with a throw to get rid of the dog, no one would doubt that the stone is, afterwards, still the same stone.

> Neither the shape, nor the weight, nor other physical and chemical properties of the stone have changed. Its color, its hardness, its crystal formations have all stayed the same -and yet it has undergone a

fundamental transformation: it has changed its *meaning*. (von Uexküll 2010:140).

Transformation which implies our perceiving it from a "path stone" to a "throwing stone". Becoming thus a *carrier of meaning*, once it enters into a relationship with an organism, in this case, a human. Following von Uexküll and considering our milk-glass example, we could imagine that we have a glass that is transparent and cylindrical. We could insert the glass into a wall of a house, transforming it into a window, letting sunlight to come in and making difficult for passers-by to seeing inside. The glass could also be put on the table, filled with water and used as a flower vase. None of these uses change the properties of the artefact,

> But as soon as it has transformed itself into a carrier of meaning such as "window" or "vase", a distinction of properties according to their rank becomes apparent. For the window, transparency is the "leading" property, whereas curvature represents a supporting property. For the vase, on the contrary, curvature is the leading property and transparency the supporting property. // Through this example, we can gain some understanding of why the Scholastics divided the properties of objects into *essentia* and *accidentia*. They only ever had carriers of meaning in mind, whereas the properties of relationless objects have no gradations. Only the tighter or looser binding of the carrier of meaning to the subject allows for the separation of properties into leading (essential = *essentia*) and supporting (nonessential = *accidentia*). (von Uexküll 2010:141).[11]

As sentient human beings participating in and with an environment, and keeping in mind Deleuze's suggestion that everything is 'accidental', we need to better understand the singularity of the perceptions that we are capable of conceiving through the use of language. Sentences such as 'the milk is *under* the glass' might point at a syntagmatic shift, that pushes us to reevaluate experience, and at a reconfiguration of preconceived boundaries that might lead to a less anthropocentric perspective.

BOUNDARIES

Studying 'mechanisms' by which cultures establish differences among each other, semiotician Yuri Lotman points out that

> One of the primary mechanisms of semiotic individuation is the boundary, and the boundary can be defined as the outer limit of a

first-person form. This space is 'ours', 'my own', it is 'cultured', 'safe', 'harmoniously organized' and so on. By contrast 'their space' is 'other', 'hostile', 'dangerous', 'chaotic'. (1990:131)[12]

Although interdependent with culture, the physical and biological relations in which we find ourselves immersed in and are part of, play a significant role in defining, constraining our possibilities to think and reason.[13]

A distinctive characteristic of the human cognitive model is its capacity to *languaging* as Maturana and Varela suggest. As we have seen, whenever a question is stated, there are distinctions being made, as well as criteria for those distinctions being implicitly or explicitly formulated. For this reason, it is important to try to understand the implications of the distinctions that our (human) organisms are capable of doing, of organizing. To begin with, the distinction between living and nonliving beings implies an idea of a given *organization*.

'Organization' signifies those relations that must be present in order for something to exist. For me to judge that this object is a chair, I have to recognize a certain relationship between the parts I call legs, back, and seat, in such a way that sitting down is made possible. That it is made of wood and nails, or plastic and screws, has nothing to do with my classifying it as a chair. This situation, in which we recognize implicitly or explicitly the organization of an object when we indicate it or distinguish it, is universal in the sense that it is something we do constantly as a basic cognitive act, which consists no more and no less than in generating classes of any type. Thus the class of 'chairs' is defined by the relations required for me to classify something as a chair. [...] When we speak of living beings, we presuppose something in common between them [...] our position is that living beings are characterized in that, literally, they are continually self-producing. We indicate this process when we call the organization that defines them an *autopoietic organization*. (Maturana and Varela 1998:42-43).

Maturana and Varela identify that a feature distinctive of cellular dynamics in living organisms compared to other molecular transformations in natural processes is that

the cell metabolism produces components which make up the network of transformations that produce them. Some of these components form a boundary, a limit to these networks of transformations. In morphologic terms, the structure that makes this cleavage possible is called a membrane. Now, this membranous boundary is not a product of cell metabolism in the way that fabric is the product of
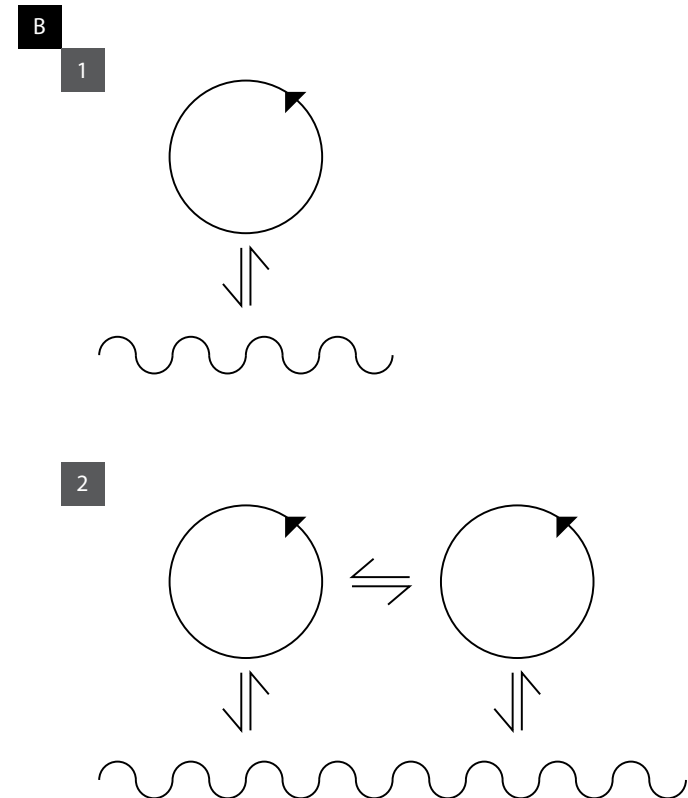
a fabric-making machine. The reason is that this membrane not only limits the extension of the transformation network that produced its own components but it participates in the network. If it did not have this spatial arrangement, cell metabolism would disintegrate in a molecular mess that would spread out all over and would not constitute a discrete unit such as a cell. What we have, then, is a unique situation as regards relations of chemical transformations: on the one hand, we see a network of dynamic transformations that produces its own components and that is essential for a boundary; on the other hand, we see a boundary that is essential for the operation of the network of transformations which produced it as unity [Fig. 3.1-A]. Note that these are not sequential processes, but two different aspects of a unitary phenomenon. (1998:42-46).

Thus, an autopoietic organization is an organization which is capable of self production (from the Greek *auto*: "self", and *poiesis*: "a making"). The *ontogeny* (the history of the structural changes) of autopoietical unities results from the continuous interaction with an environment. Autopoietical units become *structurally coupled* through a history of recurrent interactions, leading to the structural congruence between two or more systems. (Maturana and Varela 1998:75).

Maturana and Varela have diagrammed the coupling of a unity as in figure 3.1-B1. When considering the ontogeny of more than one unity, the corresponding diagram is that of figure 3.1-B2.

The notion of structural coupling is valid for all kind of system, living and non-living. One can speak of the structural coupling of a car with a city and the mutual perturbations/changes that each system triggers on the other. Think of the small cars populating the centre of Rome in contrast to the wide four-wheel-drive vehicles of northern Scandinavia. As living beings do, if what is typical of a region is the presence of snow, cars will manifest features conceived to better function (behave) in these conditions. One important aspect of Maturana and Varela's notion is that the environments or systems that a system interacts with never *specifies* a particular behaviour; environments and systems *trigger* behaviour, which is conditioned by the capabilities of the autopoietic structure, and vice versa (1998:75). Thus, the car's structural coupling will —at that particular moment in history— materialize a range of possibilities within the materials and processes of the system itself, responses to the 'problem' of snow. These may result, in the case of tyres for example, in components developed with softer versions of rubber, with the consequent environmental pollution.

The human body —as any autopoietical organization— is a re-

sult of a legacy of structural coupling in and with an environment. Human cognition pertains to the biological domain while it is lived in a cultural tradition, and in spite of a multiplicity of cultural traditions, regularities can be observed. Lotman writes,

> Human consciousness forms its model of the world from such constants as the rotation of the earth (the movements of the sun across the horizon), the movements of the stars, and the natural cycle of the seasons. No less important are the constants of the human body, which posit certain relationships with the outside world. The measurements of the human body determine the fact that the world of mechanics and its laws seem 'natural', while the world of particles and cosmic space can be conceived of only speculatively and with extraordinary mental effort. The correlation between average human weight, the force of gravity and the vertical position of the body have resulted in what is universal for all human cultures: the opposition of *up* and *down*. (1990:132).

This paragraph resonates with cognitive linguists George Lakoff and Mark Johnson's studies where the authors propose that our conceptual system is largely metaphorical; that is where — for example— expressions of spatial orientation such as up-down, front-back, on-off, centre-periphery, and near-far provide the basis for understanding.

Thus, Lakoff and Johnson explain how *up* is 'good' and *down* is 'bad', as in: hitting a *peak* last year, being *downhill* ever since... or how *up* is 'happy' while *down* is 'sad': being in *high* spirits, *falling* into a depression... This metaphorical register depends on experiential bases,

> ...no metaphor can ever be comprehended or even adequately represented independently of its experiential basis. [...] Though the concept *up* is the same in all these metaphors, the experiences on which these *up* metaphors are based are very different. It is not that there are many different *ups*; rather, verticality enters our experience in many different ways and so gives rise to many different metaphors. (Lakoff and Johnson 1999:19).

In this context, the importance of the notion of boundary partly lies in the human-centred nature of these perceptions,

> When things are not clearly discrete or bounded, we still categorize them as such [...] Human purposes typically require us to impose artificial boundaries that make physical phenomena discrete just as we are: entities bounded by a surface. (Lakoff and Johnson 1999:25).

Categories bring forth a world. The understanding of the role of boundaries of 'human consciousness' is of relevance, since prepositions act as 'bridges', 'linking' entities (bounded and identified as such). Maturana and Varela mention "By existing, we generate cognitive 'blind spots' that can be cleared only through generating new blind spots in another domain" (1998:242). What we can do, according to them, is generate explanations through language that reveal a mechanism of bringing forth a world.

RELATING BY LANGUAGING

It is important to keep in mind that we are specifying a linguistic (human) experience through so-called natural languages in order to address the displacements that prepositions might mediate. This emphasis on language however, should not be understood as giving predominance to language as a mode of cognition; one should conceive human bodies as "post-kinetic", where "the fundamental concepts of language are anticipated in the experiential dynamics of corporeal movements" as argued by Maxine Sheets-Johnstone[14]. As we have seen, human consciousness forms models from the constants of the body and the environment. It is through this structural coupling with the environment that human language came into being. Maturana and Varela mention,

> We humans, as humans, exist in the network of structural couplings that we continually weave [...] Language was never invented by anyone only to take in an outside world. Therefore, it cannot be used as a tool to reveal that world. Rather, it is by languaging that the act of knowing, in the behavioural coordination which is language, brings forth a world."[15]

Natural languages imply displacements of sense, what Deleuze and Guattari have called *deterritorializations*[16], which become re-territorialized in language, the body, society, the biosphere as a whole. Language, Deleuze would claim, "exists only as a reaction to a non-linguistic material, which it transforms."[17] In this dialogue (deterritorialization-reterritorialization) language does not become "embodied", it is important to understand these manifestations as *enaction*, where a process is realized, brought forth. The risk of talking in terms of "embodiment" in relation to living beings, is to perpetuate a Cartesian divide between self/subject and body.

When calling something embodied one has already presupposed some essential belonging to a de-corporealized hypothetic domain of reality that could, in principle, be somehow separated from the body. But how can anything be embodied if it *is* itself a body? (Hoffmeyer 2008:301).

The capacity to communicate through language is not exclusive to the human species, this is where the notion of *languaging* as a form of human enaction differentiates from other animals. Even well known linguistic examples such as bees' 'language'[18] does not constitute language in Maturana and Varela's terms, since in their understanding, there is language when there is "communication about communication". According to Fritjof Capra, Humberto Maturana illustrated this meaning of language with a hypothetical communication between a cat and her owner,

> Suppose that every morning my cat meows and runs to the refrigerator. I follow her, take out some milk, pour it into a bowl, and the cat begins to lap it up. That is communication -a coordination of behaviour through recurrent mutual interactions, or mutual structural couplings. Now suppose that one morning I don't follow the meowing cat because I know that I've run out of milk. If the cat were somehow able to communicate to me something like 'Hey, I've now meowed three times; where's my milk?', that would be language. Her reference to her previous meowing would constitute a communication about a communication. (Capra 1996:280-281).

In this sense, the 'language' would qualify as *languaging*. At the same time, we cannot be too certain of the degrees of communicative interaction among other organisms. Examples can be found in a life-long series of recordings as well as recent studies by musician and bio-acoustician Bernie Krause that reveal phenomena that the human ear is unable to register. Among Krause's recordings there are cotton trees's 'talking', that is, their signalling their process of exuding fluids which attracts certain insects, and in their turn, birds to the tree resulting in mutually beneficial forms of symbioses.[19] It is well known that blue whales have bigger brains than humans, and that their capacity to communicate under the water reaches thousands of kilometres, science writer Dorion Sagan comments,

> The threshold of pain to the human ear is 120 to 130 decibels. A jet engine is about 140 decibels. Concert music, at its loudest, is 150 decibels. Blue whales, comparatively, belt out their vocals at 188 decibels. Their communications are time-delayed because of water. They may, in their giant Umwelten, have fabulous multisensory pictures of major

portions of the ocean, images that, even if we had direct access to them, we couldn't process, because our brains are too small.[20]

Cats may not be able to perform such languaging operations, but other primates such as chimpanzees, by creating new expressions by combining signs, seem to blur and thus point at a need not to distinguish these two modes (language-languaging) too sharply.

one of the chimps, named Lucy, invented several signs combinations: 'fruit-drink' for watermelon, 'food-cry-strong' for radish, and 'open-drink-eat' for refrigerator. One day when Lucy got very upset upon seeing that her human 'parents' were getting ready to leave, she turned to them and signed 'Lucy cry'. By making this statement about her crying she evidently communicated something about communication. (Capra, 1996:281).

With regard to these studies Maturana and Varela write "It seems to us, that at that point, Lucy is languaging" (1998:215).

Through the process of languaging, as a displacement of sense that brings forth a world, human beings use prepositions to define: what is *outside*, *inside*, *above*, *below*, *before*... Acts which influence our perception of relations. As such, as Agamben suggests, any so-called natural language can be understood *as* a device. Although it can be said —metaphorically at least— that even though language is less discrete or bounded than other devices such as chairs, bins, books, or toys could be; it still (per) forms arrangements, specific forms of displacements. It is important to note that although I am considering language *as* a device, what I mainly point out is the capacity of natural languages to model, to organize worlds. Once again, natural languages should be understood in their dynamism, as forms of enaction, as process, as *languaging*.

What if we look instead at the way material artefacts define relation *as* language? Can a given three-dimensional artefact, a device, be understood as a 'material preposition'?

MATERIAL PREPOSITIONS

Things *afford* possibilities of behaviour. From an instrumental point of view, and at the human social scale, some everyday material artefacts are better at communicating how they should/could be used than others.

As mentioned, being interested in the results that might origi-
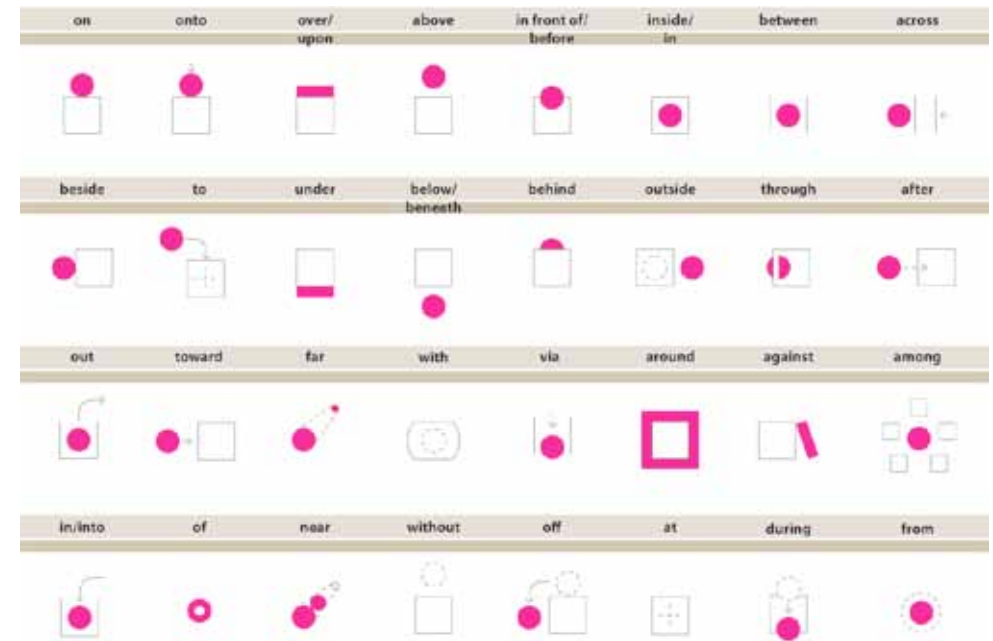
3.2 Selected prepositions and their pictorial representations. This is a selection of 32 prepositions, commonly used in the English language.

on
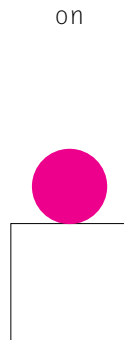
nate from a design thinking that is engaged not only with the artefact (noun, the static object, the thing itself) but also with the *link*, or linking, in the relation established, I designed a first approach to a methodology that attempts at visualizing relation by combining a series of prepositions with specific icons that complement them. (Fig. 3.2).

The specificity of the icon in comparison with the word indicates that there is a degree of metaphor/metonymy that acts/models the associations. Thus, the *on* seen in figure 3.3 suggests a spatial rather than a temporal relation; having this icon in mind, it would be difficult to think of —for example— someone being 'on time'.

If we look into the ways in which three-dimensional artefacts establish 'relations with', we could return to Front's *bin* for Materia (Fig. 2.2), where the logic (the prepositions used) to create the artefact could be thought to be *with/without*, by which the user/viewer understands the 'state' of the artefact.

Note that this *with/without* highlights the relation container-contained; alternative prepositions could be introduced in order to explore how the artefact relates to other actors in space, in time and across scales. Thus, this particular *with/without* of the *bin* implies specific views of relation, namely, the *with* of the garbage bin suggests 'container', 'pregnancy', thus differing from the *image* '*with*' that can be established by thinking for example 'with a friend', that is, a relation of adjacency and not of containment.

If one considers a work such as the silicon crutches by Mona Hatoum, one understands that the *with/without* of this artefact can be thought differently. The physical support provided by the standard crutches that it refers to is no longer a structural component of the material, thus the *without* is read neither as containment nor as adjacency but as 'lack', although it could also be thought as a more diffuse form of 'containment'.[21]

Perhaps, in experiential terms and paraphrasing Lakoff and Johnson, one could say that 'withoutness' enters our experience in many different ways, and so gives rise to many different metaphors. While keeping the shape of the wooden or metal crutches, the *strength*, *support*, *potency*, which are the physical properties characteristic of the general human-scale relation to metal-human or wood-human, are replaced with the *softness*, *instability* and *faintness*, which are characteristics of the general human-scale relation to silicon. This material replacement generates thus, associations of 'lack of': of absence, of isolation, of despair, that can be projected (in an art installation for example) onto social and psychological domains by a human observer.

As we can notice, the icons suggest already particular relation-ships to the words. This narrowing can be seen as somehow prob-lematic since it becomes clear that the concept of a preposition cannot be distinguished too sharply. A preposition has 'overlaps' of *sense*, our experience tells us that there is more to perceiving relations than this static symbol can hint at; language's ambigu-ity demands contextual information. With these pictorial schemes that accompany the words, I do not aim, however, at linguistic descriptions that *match* a specific situation. Following Lakoff, I have attempted to depict the prepositions at the *centre,* so that the senses of each preposition can form *chains* with specific de-scriptions or situations.[22] If we consider the preposition *over*, we can get a better understanding of what is at issue here. A closer inspection of the word *over*, reveals that the central sense of *over* combines elements of both, *above* and *across* (Fig. 3.4). I here summarize in a simplified version Lakoff's survey of previous stud-ies.[23] We say for example,

The plane is flying *over* the hill.
Sam is walking *over* the hill.
Sam lives *over* the hill.
The wall fell *over*.
Sam turned the page *over*.
Sam turned *over*.
She spread the tablecloth *over* the table.
The play is *over*.
You made *over* a hundred errors, among others.

In figure 3.4, the plane is understood as a trajectory (TR) ori-ented relative to a landmark (LM). TR and LM are generalizations of the concepts figure and ground. In 3.4.A the landmark is un-specified. The arrow in the figure represents the PATH that TR is moving along. The LM is what the plane is flying over. The PATH is *above* the LM. The dotted lines indicate the extreme boundaries of the landmark. The PATH goes all the way *across* the landmark from the boundary on one side to the boundary on the other. Al-though the drawing in 3.4.A indicates noncontact between the TR and LM, this sense is actually neutral on the issue of contact. There are instances with contact and instances without contact. The instances of the schema 3.4.B to D are arrived at by adding information, in particular by further specifying the nature of the landmark and by specifying whether or not there is contact. These are all linked to schema 3.4.A since they are all instances of that schema. In a sentence like *Sam walked over the hill* in 3.4.C, we can think of the hill, vertical and extended, while walking requires contact with the ground. The verb *walk* would match the contact specification, and the direct object *hill* would match the verti-
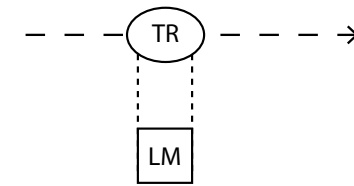
A - The plane flew over.
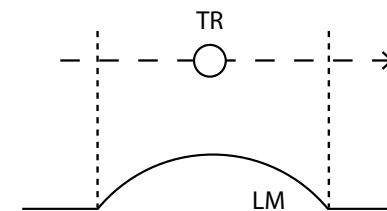
B - The plane flew over the hill.

C - Sam walked over the hill.

D - Sam lives over the hill.

cal extended specification. The differences is whether the verb and direct object *add* the extended and contact specificat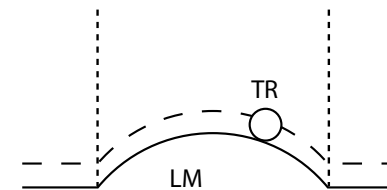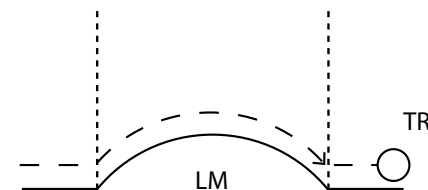ions or whether they *match* it (in relation to the centred schema 3.4.A). In the examples of figure 3.4, the different senses of *over* form a chain, having figure 3.4.A at its centre, as a schema that covers a wider range of situations.

The iconography developed for the *prepositiontools* attempt to perform this type of conceptual operation. To centre the sense of each preposition, while acknowledging their overlaps. My materializing them *as* —while using them through the playful approach of— *prepositiontools* aim at enabling us to conceive alternative logical spaces, while implying ways to enact versions of the future,[24] and thus, to sensitize ourselves to the potential becomings of the things we relate to.

PREPOSITIONTOOLS

To illustrate the specificity, as well as the power for analysis and ideation that prepositions posses, we might take as an example a well-known package design by Naoto Fukasawa called "Juice Skin".

Taking two prepositions, *through* and *during*, I have highlighted existing and potential aspects of the package. On the one hand, by using *through*, one can point at —for example— the existing package material which 'breathes', letting oxygen come in contact with the juice through the 'skin' but does not let water come out of it. On the other hand, by using *during*, one could suggest —for example— the expiry date by considering the time aspects and ageing of the juice container (Fig. 3.5).

In order to come up with a more dynamic way of stimulating thinking using the disruptions[25] provoked by prepositions, I developed a set of cards and a set of rubber-stamps that I call *prepositionstools*.

These two sets aim at stimulating thinking by creating disruptions and unfolding categories. *Prepositiontools* are meant to raise the question *what if?* Asking 'what if?' implies, at the same time, an assumption that things 'are', already, in 'some way', and that we strive for an alternative, for something else. We imagine things *doing* something, performing something in some way or another. When using *prepositiontools*, what is at stake is the understanding of what things do, using them as tools for analysis, and also, what they could potentially do, that is, using them as tools for ideation.

through/during   Naoto Fukasawa: juice skin

below, my version of its ageing process (expiry date)
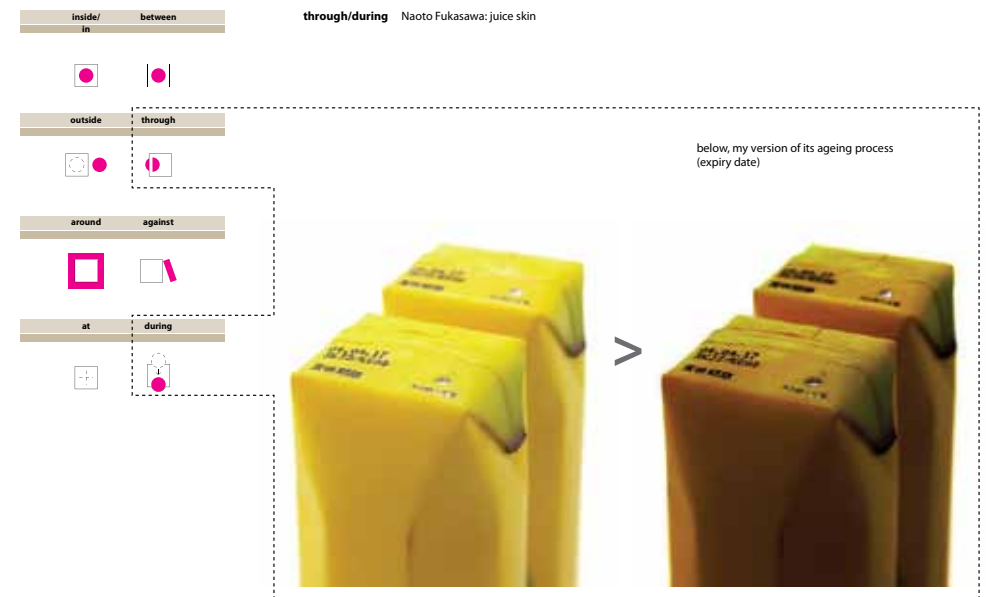
3.5 Examples of design studies for analysis and ideation using prepositions. In the picture: Naoto Fukasawa's "Juice skin" and my own redesign based on the preposition "during", suggesting a possible visualization of the expiry date.

3.6 Preposition cards
– The backside of
the cards symbolize
'directionality', in this
case illustrated with
icons formed by ar-
rows or small triangles
spreading from a
centre.

The designs of these tools reflect a concern not only with prep-ositions (under any natural language, in this case, English), but also with the material and embodiment of prepositions. The impli-cations of the materializations that I here propose as well as their potential uses range from the written word, to the written word accompanied by an icon, these in their turn, integrated onto a se-ries of sets: cards or stamps. As it can be noticed, the interacting with these tools in the form of a card set (Fig. 3.6) differs, even if slightly, from interacting with them as a stamp set (Fig. 3.7).

Based on my own experience as well as on exercises performed with students, an important implication of the different materiali-ties of these two sets, is that in the case of the cards, the playing with them becomes somehow more dynamic and 'conceptual' or 'abstract', while the action of stamping the prepositions and leav-ing the marks on a page or an object tend to 'fix' a few of them.

It is also interesting how the 'bearing' of a stamp acts as a reminder, which modifies our perception of the things through time. Thus, an image such as figure 3.9, where *through* has been stamped on to a hand, might remind that person to perform a specific action 'persuading' him or her —for example— to 'go through the corridor smiling at everyone he/she sees...' or (adopt-ing another perspective and scale) reminding that person of his or her relation to the surrounding environment by pointing at the breathing of the skin.

As a linguistic experiment, a 'prepositional approach' would im-ply, an opening to a more plural or diversified understanding of artefacts' affordances. Not only in relation to us humans (under-standing their form of enabling impositions, constraints, and the useful-cycles they provide, that is, the psychological and social aspects), but also the environmental dimension, in suggesting re-lations to alternative environments, systems, organisms.

We should be thankful to the designers of the *bin* (Fig. 2.2) for the gift of communicating, of depicting a *with* or *without* garbage. What follows however, is a sense, perhaps, of perplexity from not perceiving many other relations. Where are the rest of the prepo-sitions? *Above, below, beside, far, close, around, behind, via, near, on, in, between, across, out, against, among, at, during,* etc. Can they also be visualized? Do they need to be visualized in order for us to understand what the bin can *do*? What it affords? Can we think a temporal relation that points out the potentialities of its different components and better understand the hostility that comes from considering this garbage bin beyond its useful life? What if we would appoint ourselves the task of looking into some of the possibilities of relating through each of the prepositions of the *prepositiontools*? (Fig. 3.13).

3.7 Detail of a rubber-
stamp with the box as
background.
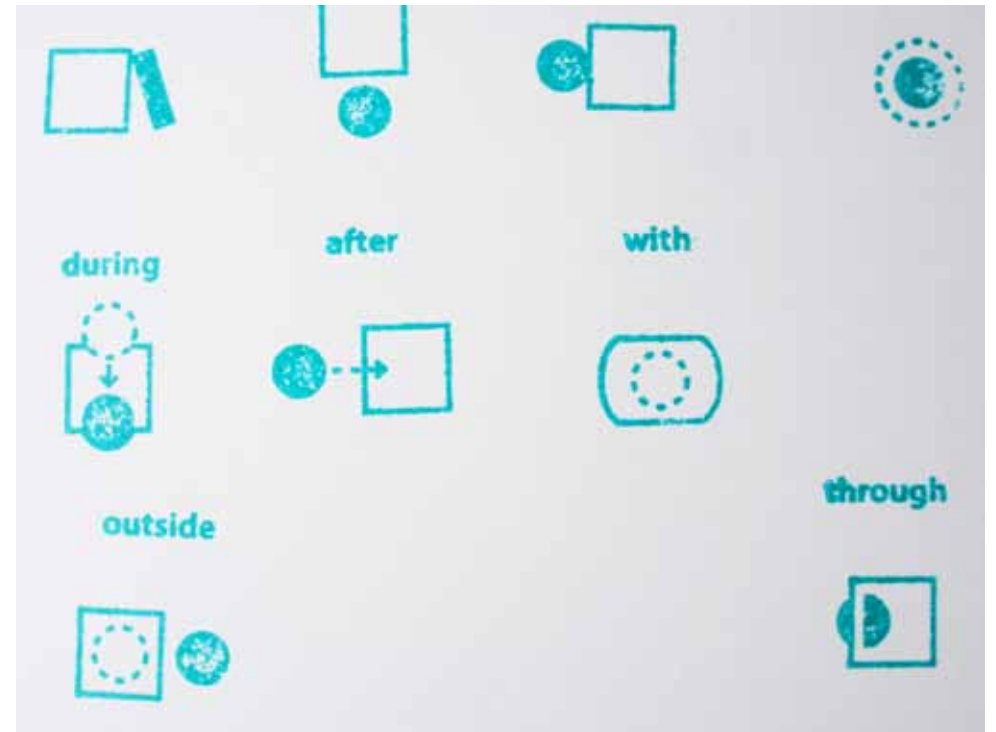
3.8 Paper with marks
left by some of the
rubber-stamps.

3.9 The rubber-stamp seems to modify the way a user perceives the relation by being literally 'stamped', carried on the thing itself.

From the series of figures 3.10-13, another image emerges; that of the bin formed by layers. In this image the artefact becomes blurry, which in a sense, suggests a more 'realistic' *perception* of the artefact, in all its invisible futures, in all its unrealized potential, likely or unlikely to happen. A kind of "real virtuality", as DeLanda understands it.[26] Not that the 'clear-cut' bin lacks relational possibilities, rather, that the bin no longer communicates (as in the with–without) its potential associations.

I suggest that a form of engagement with the logic that these methodologies imply might result —if the tools are used playfully, without becoming too systematic— in an approach that *lightens*, "as though one were to insert oneself into it like a surfer in a wave" as Rajchman proposes through his principle of operative abstraction "...when a spatial construction is loosened up... to behave in other less predictable ways or affect us along other, less direct lines" (1998:47). Operation which he relates to the more "...'schizophrenic', Borgesian situation where characters become so flexible or indeterminate that at any point they might bifurcate and go off into other possible narratives." (1998:104-105).

As a way to unfold typological thinking at alternative scales[27], grammatical prepositions act as 'hinges' in the establishing of relations that can be thought, sensed, conceived. Bridging, in Varela's terms, the *microworlds* that we enact and constituting the *microidentities* of which we are unaware of, since the transitions from one state to the other are "virtually imperceptible". Varela mentions,

> it is the breakdowns, the hinges that articulate microworlds, that are the source of the autonomous and creative side of living cognition. Such common sense, then, needs to be examined on a microscale, for it is during breakdowns that the concrete is born. (1999:11).

Breakdowns in human perception illustrate our particular relation to the *emergence* of knowledge. We might find ourselves pleasantly walking home, looking forward to meeting our children, when, all of a sudden, we realize that our wallet is gone! Our perception shifts and we no longer see the world in the way we did just an instance ago, instead, we find ourselves immersed in the intensive process of focusing on the actions that might have led to our loosing the wallet and the valuable documents in it.

The time span that a human being calls 'present' has been calculated to 200 to 500 msec (Varela 1999:49). This is, the time when the cross correlating of the networks lead to the emergence of what Varela calls a *microworld*; the shift from walking pleasantly to the intensive focusing on the actions that might have led

3.10 Layering relations
with tracing paper.
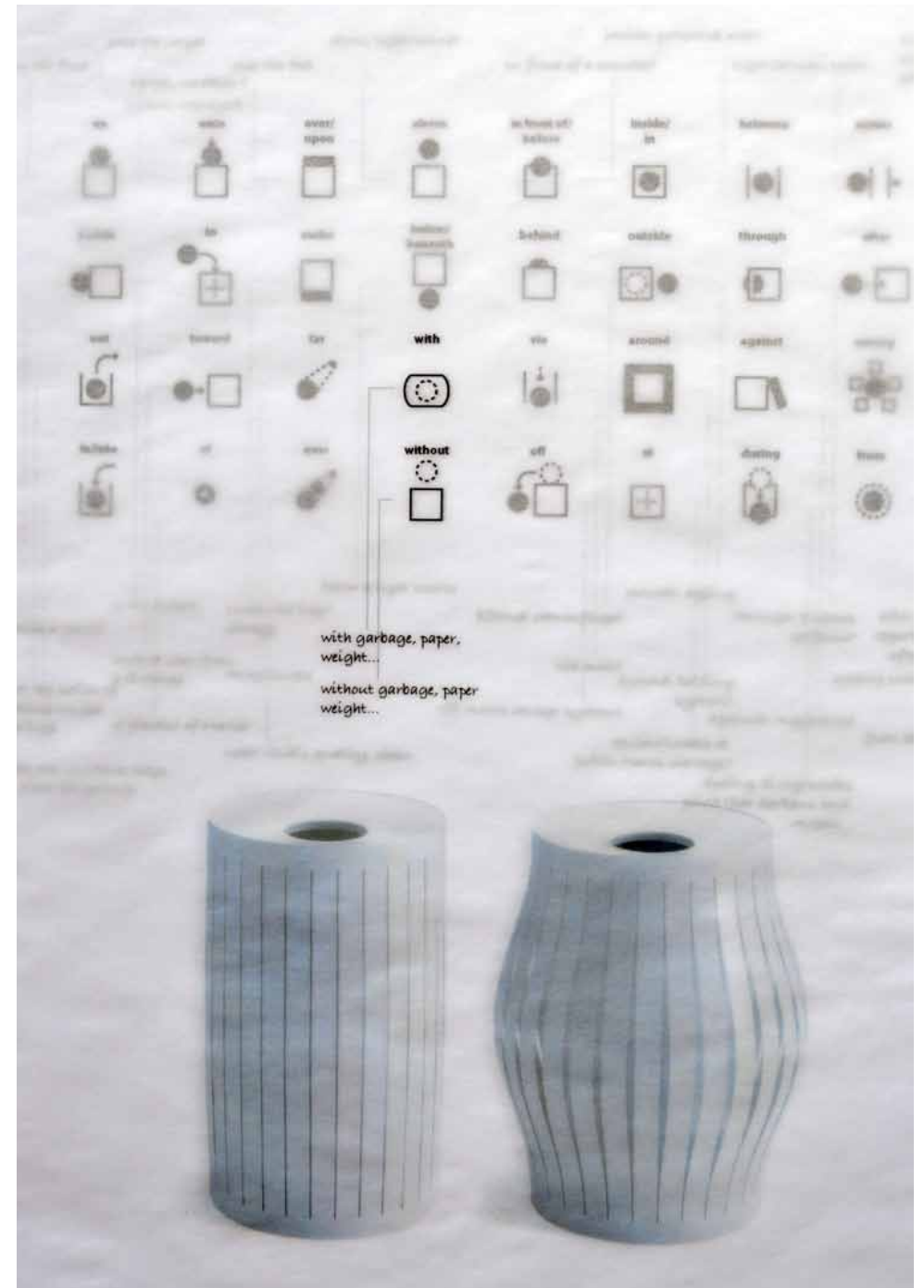
3.11 Layering relations
with tracing paper.
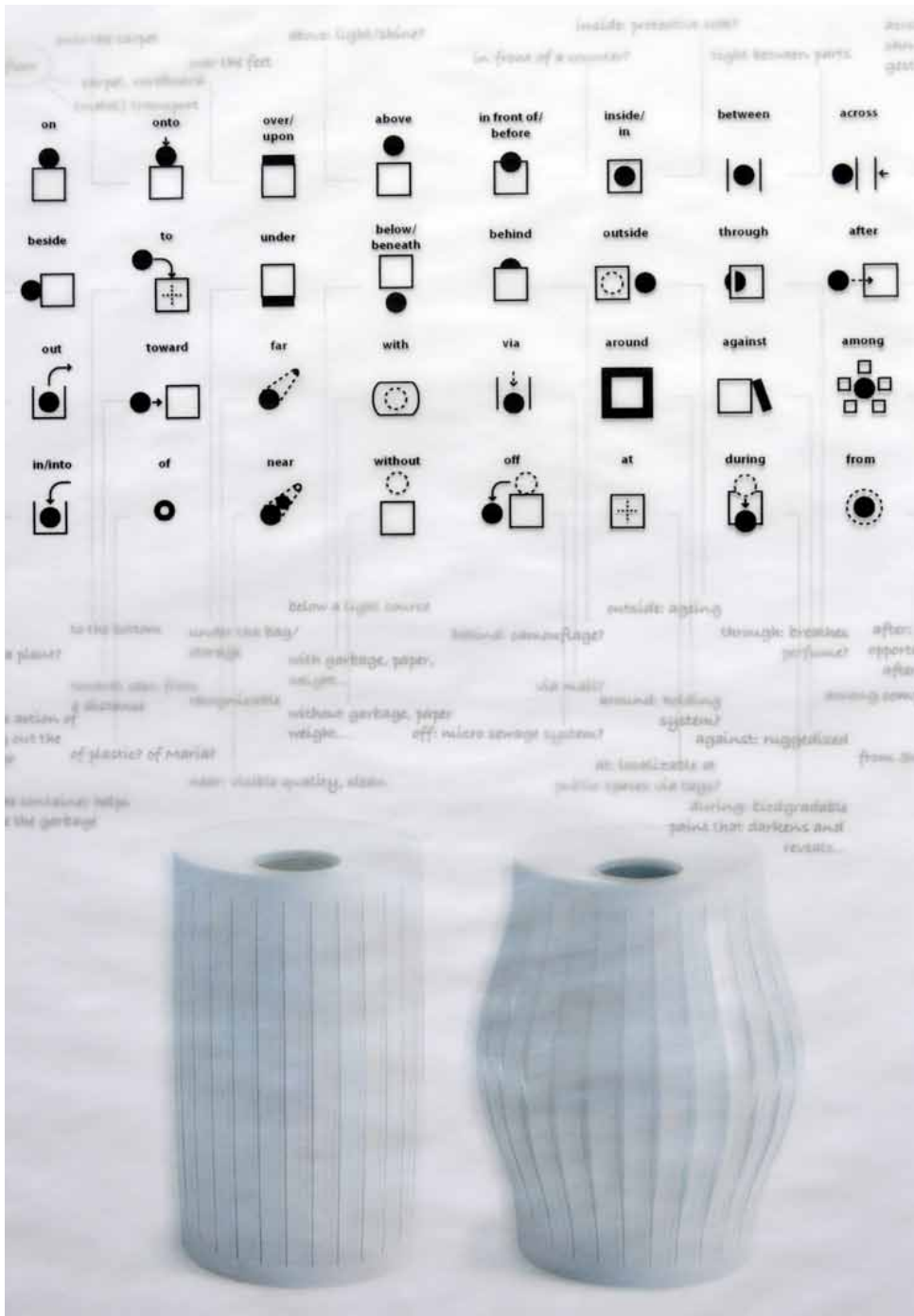
3.12 Layering relations
with tracing paper.
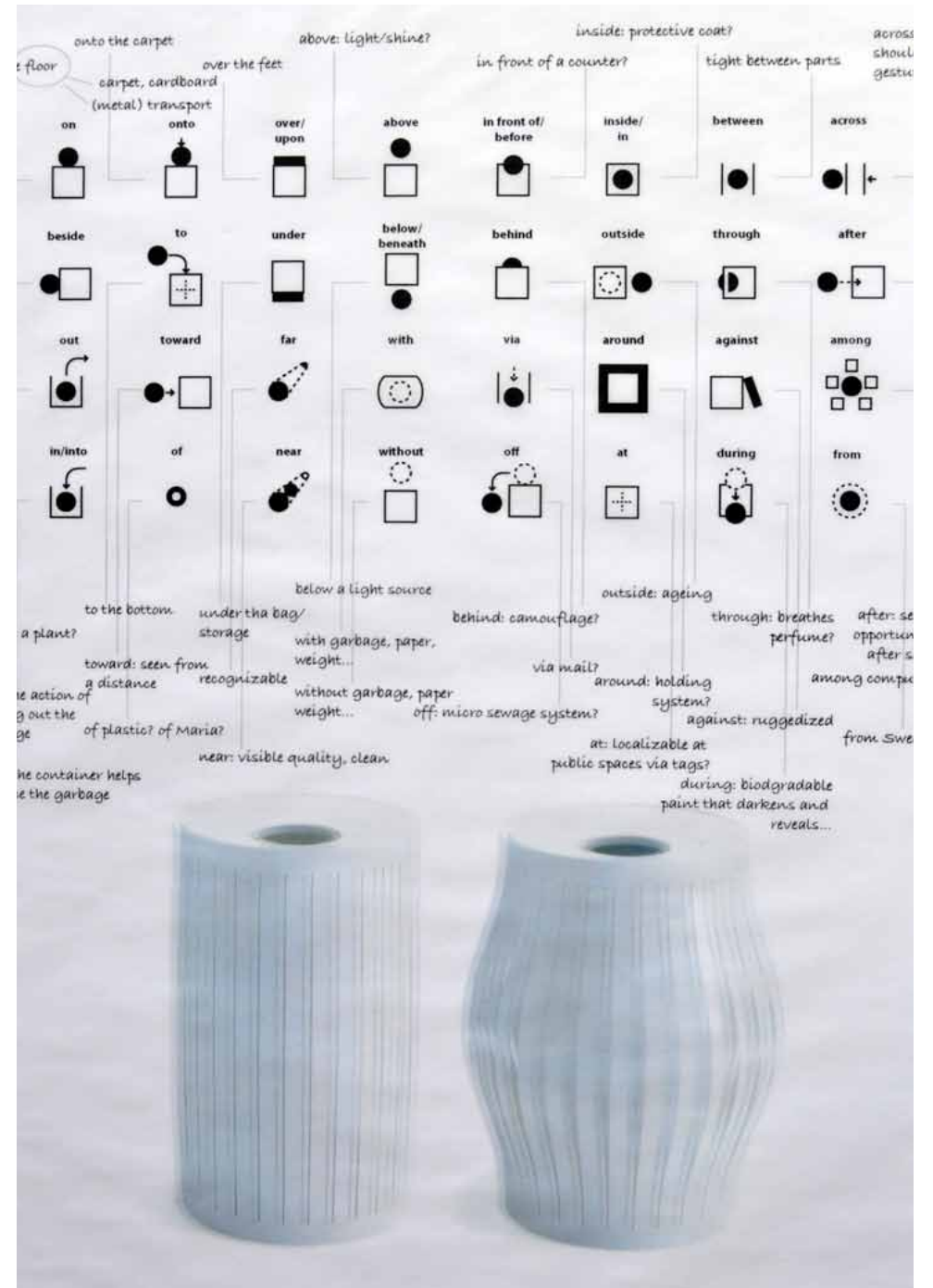
3.13 Layering relations
with tracing paper.

to our loss. At such breakdown, affected by the re-cognition of this event, we act based on a personal history of interactions.[28]

By considering these three-dimensional artefacts as 'material prepositions' I am simultaneously conceiving them as 'devices', that is, things that divide, organize, arrange. The parallelism arte-fact-device implies a perception of things as actors organizing our environments, inscribing differences. Each contact at each given instance with a thing implies a re-discovery and a continuation or discontinuation of the narrative that we construct when behaving in everyday life. The wallet no longer being there shocks, because it is a discovery (during a breakdown), that lead to the discontinu-ity of our current self: 'parent on her way to meet children' to that of 'person *without* wallet', robbed or otherwise.

Similarly, when facing the CCTV mast of figure 1.1 for the first time, we are confronted for an instance with such a disruption of our microidentity (person pleasantly walking through a natural en-vironment) and with our acting and re-acting based on our knowl-edge of situations with such devices. We immediately understand that we have already been seen, at least potentially. Whatever be-haviour follows the discovery of the mast, is based on an already limited set of possibilities to choose from, since they have been, to some extent, predefined, constrained: not being seen is not an option; not affecting other systems and organisms (human and nonhuman) is not an option either.

A genesis of mutual interactions with situations and environ-ments results in the structural coupling that lead to ontogenesis, that is, "the history of structural change in a unity without loss of organization in that unity" (Maturana and Varela 1998:74). Even though this form of everyday disruption does not cause the in-terruption of the human processes of living, it becomes signifi-cant enough for someone to behave differently. As such, these forms of structural coupling could be understood as a looser form of symbiogenesis, that is, as a history of the lineages of systems and organisms as they change through time and in symbiosis to one another; forms of collective becomings. Thus, Varela's em-phasis on these forms of interaction as being the most common kind of ethical behaviour, "'who we are' at any moment cannot be divorced from what other things and who other people are to us" (Varela 1999:10).

From a psychoanalytical perspective, Julia Kristeva points out that the insight of being "strangers to ourselves" lead to an ethi-cal shift which in human social terms implies the recognition of a weakness (our radical strangeness), and the possibility to engage us in action; people "ready-to-help-themselves in their weakness" (1991:195). The same sensibility can be extended understanding

that shared biological processes should or could lead to forms of empathy with nonhumans.[29]

If we, by means of tools such as the *prepositiontools*, would ac-quire expertise in this —playful— languaging procedure, it would be easier to understand the interrelations of the triple register of the psychological, social, and environmental ecologies. Where the prepositiontools would become tools for *transversality*, as tools that facilitate to open up and examine 'closed logics' or hierar-chies.[30]

One could say with architect Keller Easterling that "Expertise in this [error] language might involve the practice of knowing nothing rather than the practice of protecting an accepted set of skills." (2005:134). In a way, Easterling's epistemological concern also expresses, on a linguistic plane, the concern of being with others, that which Rajchman identified with the problem of "con-structed spaces owned by no one". A space constituted by the possibilities of movement, from a thing to another, until the ethi-cal stance —relating this and not that— of the device becomes enacted, materialized by a design.

Through the specificity of the relations brought forth by the *prepositiontools*, we can ask: *the hospitality-hostility of what, and for whom?*[31] And in this way glimpse at the *places*, the logical and spatial constructions of design.

[Heterotopian... 109]

AND...

William James mentions,

> Things are 'with' one another in many ways, but nothing includes everything. The word 'and' trails along after every sentence. Some-thing always escapes. 'Ever not quite' has to be said of the best at-tempts made anywhere in the universe at attaining all-inclusiveness. (1996:321-322).

It is the word *and*, as James points out, that trails along here (and everywhere), after every sentence; in its inclusiveness, it suggests the network, the connection, the forgotten, the un-known, the unforeseen.

And points not only at what (we know) 'exists' but also suggests what is to come or might come in the future. The potentiality of the nuclear plant *and* the tsunami, of the shoes *and* the bacteria, of the t-shirt *and* the frog, indefinitely bringing together likely or unlikely encounters. One could ask as well, more specifically, how is 'and' expressed through a so-called natural language? When

we say, this *and* that, or this goes with that, we are suggesting an association, a conjunction that becomes further specified once we ask, *how* is this going together with that? We mainly express those associations through prepositions, determining the way the 'and' is to bring forth a relationship. Thus as we have seen, the milk is *on*, *under*, or *against* the glass, are all particular instances of milk *and* glass. Beside these systematic and somehow mechanical examples, we can consider other cases to understand how a full-fledged language enacts meaning. Think of W. B. Yeats' poem, *When You Are Old*,

> When you are old and grey and full of sleep,
> And nodding by the fire, take down this book,
> And slowly read, and dream of the soft look
> Your eyes had once, and of their shadows deep;
>
> How many loved your moments of glad grace,
> And loved your beauty with love false or true,
> But one man loved the pilgrim soul in you,
> And loved the sorrows of your changing face;
> And bending down beside the glowing bars,
> Murmur, a little sadly, how Love fled
> And paced upon the mountains overhead
> And hid his face amid a crowd of stars.

The poem accumulates through the coordination of the *and*, a description of a personal history that can be shared by the reader. Its nostalgic beauty treads forth through the associations of the *and*, weaving a universe of emotional experience finally suggested by a face *amid* stars.

Consider the implicit 'and' in Heraclitus' fragment:

> Without the sun,
> what day? What night?

How the relation day *and* night, mediated by the presence-absence of the noun *sun* through the preposition *without*, is rendered nonsensical as opposition and duality.

We observe how *and,* as a conjunction, performs a particular operation: it is additive, differing from other conjunctions such as *nor, but, yet, so*, in presenting non-contrasting items or ideas. Thus one says: Maria is pale *and* small —being affirmative. Other conjunctions introduce instead contrasts, alternatives or exceptions: Maria is (neither) pale *nor* small —a contrasting negative idea. Or Maria is pale *but* small —a contrast or exception. Or Ma-

ria is pale *yet* small —a contrast or exception. Or Maria is indoors *so* she is pale and small —a consequence. *And* thus, simply — neutrally or even positively— 'brings' things together.

In strict linguistic terms however, conjunctions are not 'specified' —as I suggest— by prepositions; conjunctions and prepositions work as complementary constituents of grammar. Keeping this in mind, the logic formulated here, belongs to a form of philosophical grammar rather than a linguistic one. In this sense, the progression of the 'anding', through our capacity to conceive alternative logical, spatial, and/or temporal relations, lead or glimpses, at a way to grasp what one might call, using Deleuzian terminology, a *multiplicity*. In search for other actors that relate or can possibly relate to a thing in question, expanding the *frame*, in the case of day and night, most likely, a horizon, a sky, darkness, and so on, to extended them introducing illogical connections and associations, provoking a disruption, a schism in the logical and experiential 'image' of a given thing.

The non-contrasting inclusiveness of the conjunction 'and', the ever present need to account for yet another element, feature or aspect not 'included', that is, *not related to*, works, according to John Rajchman, as the basic logical operator of Deleuze's philosophy.[32] According to Rajchman, with this 'and' "Deleuze's logic frees itself from the question of 'ontological determination' [...] It supposes a different kind of grammar or logical coherence than the ones modelled on sentences like 'the sky is blue' or 'God exists'."[33] In dialogue with Claire Parnet, Deleuze mentions,

> What defines [a multiplicity] is the AND, as something which has its place between the elements or between the sets. AND, AND, AND-stammering. And even if there are only two terms, there is an AND between the two which is neither the one nor the other, nor the one which becomes the other, but which constitutes the multiplicity. (2006:26).

The abstract machines of Deleuze and Guattari presuppose such a logic, of the *abs-tractus*, the act of withdrawal or turning away through the 'affirmative' exit of the *and*.[34]

Prepositiontools as tools for analysis and ideation, can explicitly help defining the way the 'anding' results in the bringing forth of worlds. This bringing forth implies propositions, which can be constructed with prepositions, as in something relating to something else in this or that way. At the same time, prepositions imply propositions, that is, proposals (assertions) of how humans and nonhumans relate to each other.

As suggested by their name, *prepositiontools* are precisely

that, *tools*. These tools have the capacity to stimulate a particular performativity, one that emphasizes chance, and highlights (on the linguistic plane) the tools' capacity to originate 'concepts'. But equating preposition with proposition is not merely a linguistic word play. The use of prepositions randomly —by breaking with experiential (and syntactic) logic— opens up for (images of) thoughts[35], proposals which are unlikely to be made otherwise, and launch us on to unexpected considerations.

UNFOLDING IN SHORT

Classifying certain processes of transformation *as* accidents, imply a particular framing, an instrumental human perspective, where specific forms of association are considered of harm or of benefit to human beings. Categories perform in/ex-clusions, connecting this and not that. As such categories should be understood *as* devices. We cannot avoid categorization, what we can do is to be aware of our tendency to crystallize particular views of things or state of things that are otherwise dynamic.

The "symmetry" substance-accident implies understanding accident as it manifests itself through *unexpected relations*, in everyday life and at all spatio-temporal scales. These relations, since we cannot but think of them through language, must be taken into consideration through the process of *languaging*, understood by Maturana and Varela as "communication about communication". The central role of prepositions, by being the grammatical constituents that 'link' things to each other, allows for the development of 'tools' such as *prepositiontools*. These facilitate to playfully ask 'what if', and help us to model and imagine the future as open-ended, to become tools for *transversality*.

Prepositiontools become devices that help us to unfold categories in order to emphasize in-betweeness and to compose and associate things that we otherwise would be unlikely to conceive. One could say that prepositions help de-scribing thus *tracing* a network, defining an account where each actor is or becomes a *mediator*, that is, where all the actors *do something* (Latour 2005:128).

Awareness of the performative role of prepositions eases the development of a mind set capable of conceiving the future as open-ended. Emphasis on the modelling of natural languages however, does not imply a predominance of language as a mode of cognition. Rather natural languages should be understood as a result of complex processes of individuation, playing an important role in the bringing forth of worlds.

Devising is an act of inscription of particular views, in relation to a given situation and a set of constraints. The disruptive capacity of *prepositiontools* allow us to create logical shifts, some of which will be explored in the following section entitled "Devising" through a logic that will be called 'heterotopian'. The studies that follow are attempts to explicitly address some of the symbiotic relations established by the devising process.

Devising

Invention is a question followed by an answer. But for each question set a thousand answers are possible, of all possible degrees of completeness and exactness.

Gabriel De Tarde

The products, the results of the speculations of this section are the physical manifestations of thinking 'prepositionally', or more precisely, of using grammar (prepositions, conjunctions, nouns, pronouns, verbs, adverbs, punctuation marks, and so on) while paying particular attention to the logical operations that we realize when 'linking', when relating things to one another. However, as mentioned previously, the whole of grammar in any so-called natural language is not capable of expressing all experiential nuances. I will take a concrete example from the sketching process during my work on the icons for the *prepositiontools*.

I started a series of drawings while I was choosing among the prepositions most commonly used in the English language. Since I was interested in the example of the *bin* —'with' and 'without'— I followed the logic of this particular artefact and I sketched among others, the icon of figure 4.1, but could not assign to it a single preposition that would allow me to include it in the series. The icon demanded not a single word but a whole sentence. Somehow, this icon suggests (if we keep the logic of containment of the *bin* by Front) a previous state of things, one which demands a *without* before the bin without the garbage. It suggests, I believe, a gesture of a previous instance by which we perceive the coming movement (and our particular relationship to the physical constitution of the artefact). An instance that can be understood, not (only) in the linking or connecting with a given thing (with-without garbage), but with the process itself of expanding and contracting, with the tension and pressure exercised not only by the garbage, but by multiple variables that can be conceived in relation to its material and structural possibilities. Prepositions imply a way, but the process resulting in a particular behaviour can only be de-scribed (and to a limited extent) through all components of a given natural language.

To describe an icon such as the one with the question mark in figure 4.1, one would need to write a sentence, not unlike this one: "the container has the capacity to contract and expand by means of its structural and material properties, affording a human observer the possibility to understand the degrees of emptiness-fullness of the artefact." Here we observe how the specificity of the icon can hardly be expressed through the use of words. If the structure of the *bin* would behave in such a way, one could imagine for example that the icon with the question mark of figure 4.1 can be explained with the same logic, through a —normative, instrumental— design that indicates that the 'starting point' for the functioning of this device includes the containing (weight) of
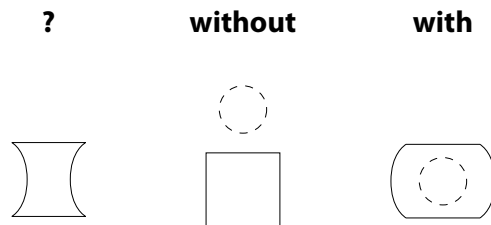
a garbage bag, item which brings the contracted bin to a 'straight' line, indicating its correct modus operandi.

Devices are normally understood as nouns: 'this *is* a bin'. If we also think of these 'nouns' as verbs and as prepositions, we increase our capacity to perceive their ecological complexity.[1]

The 'bin' *as* verb implies a more dynamic conception of the artefact, where we start looking into it in terms of processes and in terms of actions by thinking 'will be', 'has been' and so on. In relation to the bin, one might think of: expanding, contracting, ageing, corroding... to name but a few. This helps us to understand what an artefact becomes through time. By looking into it in terms of prepositions, we refine our perception of the becoming process by paying attention to the relations that the artefact is able or is likely to establish in and with the environment where it is located. Corrosion as the particular relation water-oxigen-metal and the likelihood of this process to affect other things that it relates to; a carpet, a human hand, a piece of land when thrown away and so on. These three basic grammatical perspectives contribute to expand our understanding of devices, by allowing us to think their effects as well as by helping us to imagine their potential affects.

HETEROTOPIAN PROPOSITIONS

In 1966 Michel Foucault published *Les Mots et les choses*, later translated on to English as *The Order of Things*. In the preface to that book, Foucault starts by quoting a passage from Borges' "The analytical language of John Wilkins"[2] and tells us,

> This book first arose out of a passage in Borges, out of the laughter that shattered, as I read the passage, all the familiar landmarks of my thought –*our* thought, the thought that bears the stamp of our age and our geography- breaking up all the ordered surfaces and all the planes with which we are accustomed to tame the wild profusion of existing things, and continuing long afterwards to disturb and threaten will collapse our age-old distinction between the Same and the Other. This passage quotes a 'certain Chinese encyclopaedia' in which it is written that 'animals are divided into: (a) belonging to the emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies'. In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that by means of the fable, is

? **without** **with**

demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking *that*.

Foucault then asks the question, "But what is it impossible to think, and what kind of impossibility are we faced here?" (1994:XV). He suggests that

Borges adds no figure to the atlas of the impossible… he simply dispenses with the least obvious, but most compelling, of necessities; he does away with the *site*, the mute ground upon which it is possible for entities to be juxtaposed. (1994:Xvii)

What Foucault points out, is not only the *site* (geographical place-space) but also a method for constructing an argument, as in classical rhetoric, the Greek *tópos koinós*, common place,[3] and develops accordingly a nomenclature to distinguish the *tópos,* differentiating between u-*topia* and hetero-*topia*.

Utopias afford consolation: although they have no real locality there is nevertheless a fantastic, untroubled region in which they are able to unfold; they open up cities with vast avenues, superbly planned gardens, countries where life is easy, even though the road to them is chimerical. *Heterotopias* are disturbing, probably because they secretly undermine language, because they make it impossible to name this and that, because they shatter or tangle common names, because they destroy the 'syntax' in advance, and not only the syntax with which we construct sentences but also that less apparent syntax which causes words and things (next to and opposite to one another) to 'hold together'. This is why utopias permit fables and discourse: they run with the very grain of language and are part of the fundamental dimension of the *fabula*; heterotopias (such as those to be found so often in Borges) desiccate speech, stop words in their tracks, contest the very possibility of grammar at its source; they dissolve our myths and sterilize the lyricism of our sentences." (1994:Xviii).[4]

It is in this, de-stabilizing way that the design projects that follow can be said to be heterotopian. They propose a dislocation of experience by means of illogical vicinity (as in figure 4.2), by displacing the ground on which our human experience operates through the use of language.[5] More specifically, the use of prepositions allow us to systematically create thoughts closely related to those of Borges' 'Chinese encyclopaedia' as in "(n) that from a long way off look like flies", where the trigger of this could be the preposition 'far', a particular relation that establishes a link between the range of human sight, particular lightning conditions,

4.2 *Prepositiontools* to create *heterotopias*.
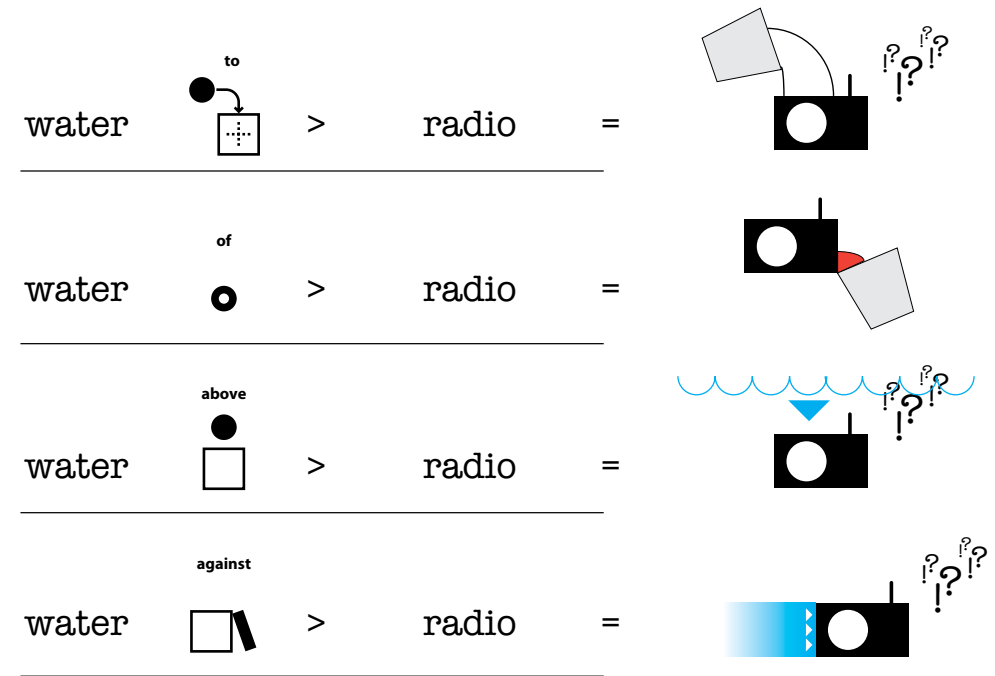
an object of study and so on, with the objective to establish a taxonomy, a particular order.

They are also heterotopian in the sense that they challenge "epistemes".[6] As in a Borgesian garden of forking paths, the design exercises that follow present possible worlds[7], where a chosen alternative explicitly enacts, unfolds, a series of possibilities while eliminating others. Or in Deleuzian terminology, where a combination actualizes a virtuality, which then open further paths that may or may not be actualized. Thus, the idea of a 'possible world' is here related, following Deleuze, to the notions of *compossibility* and of *virtuality*. Deleuze not only distinguishes, as we have seen, between the essential and the accidental, but also between the virtual and the possible or the actualization of the virtual and the realization of the possible. The actual is what manifests and effectuates the virtual, but the actual never completely activates all the potential, all that the virtual implies.

The virtual lies in those forces or potentials whose origin and outcomes cannot be specified independently of the open and necessarily incomplete series of their actualizations […] the virtual is thus not an abstraction, a generality, or an a priori condition. It doesn't take us from the specific to the generic. It increases possibility in another way: it mobilizes as yet unspecifiable singularities, bringing them together in an indeterminate plan.[8]

A thinking that acknowledges the virtual affirms possibilities by saying 'and'. Conceptions such as the ones that can be proposed through the use of *prepositiontools*, allow a greater number of singular connections. It is the opposite of reducing specificity by finding something more general. It is in this sense that the 'composing' of these possible worlds can be understood as multiple, an arrangement or disposition that allows for the greatest number of specific connections.[9]

One might consider the word *site*, not only as the 'discursive' *site* that Foucault exemplifies with Borges' stories, but also the spatial *site* in a geographical sense, as being closely related since the worlds that can be brought forth by an organism are dependent on the organism's capacity to perceive and conceive *signs*[10] from an environment. Thus, with regard to human organisms, the dynamic continuum of ontology-epistemology implies the (ontological) relation to an *environment* which, among its processes and through the organism's capacities, enacts, brings forth, (epistemological) *worlds*. In this sense, all *topoi* (places), by being partially enacted by some organism, could be potentially conceived as biotopes.

KITE AS PARASITE?

To further explore the relationship host-guest, by proposing designs conceived through the biological notion of *symbiosis,* I developed a project entitled ¡Pestes! Before looking into the implications of this proposal, it is necessary to revise and develop our understanding of the three categories which conform the notion of symbiosis.

In biology various types of symbioses, whether beneficial or harmful, are described by the terms *mutualism*, *commensalism* and *parasitism*. As mentioned, an association in which both symbionts benefit is called a mutualistic symbiosis; an association in which one symbiont benefits and the other one is neither harmed nor benefited is called a commensalistic symbiosis; while a relationship in which a symbiont receives nutrients at the expense of a host organism is called a parasitic symbiosis. Of these forms of interaction and association the most common is parasitism. In terms of evolution, biologists suggest that mutualism and commensalism arose from parasitism.[11] One should keep in mind that living associations form and dissolve, thus, these categories fluctuate, they are transitional, establishing relationships that may be stable or ephemeral, blurring their own boundary lines. What might start as a form of parasitism might co-evolve as a form of mutualism or commensalism.

Michel Serres notes that etymologically, to parasite means 'to eat next to' or feeding beside (2007:7). To para-site (the Greek *parásītos*, stands for one who eats at another's table), drawing our attention to the distinction that the host is not a *prey*. The parasite does not 'eat up' its host, the way a lion might hunt, kill and eat up a zebra. The parasite finds nutrition on or in the host, but this host is also —at least temporarily— its residence, its habitat.

The way a given organism might develop a form of co-evolution with another system or organism will depend on the organisms' resilience and capacity to adapt to the contingencies of their life in symbiosis. Forms of symbioses may be nutritional or protective; still, most people's perception of parasitism relates strongly to nutrition[12]; we tend to picture a 'life sucking' organism, image which in most cases has a negative connotation, part of the anthropocentrism of the category parasite. Moreover, we tend to equate parasitism with pathogens (infectious agents), missing thus their contexts in terms of symbiosis and evolution, where parasites may participate in vital functions of an organism, and becoming in this way indistinguishable from the body itself.

If we consider the work of artist Michael Rakowitz entitled

paraSITE, it is possible to understand that even the distinction nutritional/protective is problematic. Rakowitz places inflatable tubular shelters for homeless that 'feeds off' a building's exhaust system. Literally in these series of works, the para-site, is that which eats/shelters next-to. But, is it possible to talk of parasitism here? Are we confronted with a case of biological parasitism or a metaphor of parasitism that applies to human social life? Who or what becomes the parasite? The human? The nonhuman device that provides shelter? Both, considering the artefact as *assemblage,* or as *extension* as in McLuhan (2001)? By naming it a para-site, are we not projecting a 'life' on to structures (architectural building and shelter) that are otherwise perceived as lifeless?

Before developing this point, it is interesting to briefly reconsider some of the arguments on hospitality-hostility in relation to devices. Rakowitz's *paraSITE*, an inflatable structure that 'feeds off' (inflates itself while using the warm temperature of the air of) the building's exhaust system, organizes, arranges a situation by which a human can take advantage of the sheltering structure to find refuge. Its hospitality exposes the homeless' vulnerability, precarity.

> The shelters communicated a refusal to surrender, and they functioned as a protest against authorities seeking to make their cities 'homeless proof'. They made visible and legitimized through artistic gesture, the unacceptable circumstances of homeless life within the city.[13]

From my perspective, although the nomad homeless stages, as suggested in the previous quote, the unacceptable circumstances of such life, neither the human nor the nonhuman become parasites in this particular relation. The works propose a looser form of social (human-human) parasitism, rather than establishing a concrete parasitic relationship. The structure (shelter) does not harm the system (ventilation of the buildings), and in this way, the parasite cannot be considered a pathogen. Perhaps, the relationship should rather be understood in terms of commensalism. In this way however, the artefact's critique gets diluted by the lack of poignancy of the word commensalism, in contrast to the stark set of associations that can be triggered through the word parasite. Rather, it is the word paraSITE in its etymological sense (eating next-to) that metaphorically constitutes, and brings forth the category parasite as socially problematic. Regarding the parasitism of artefacts and their assemblages, I believe that the issues can be more clearly approached by looking into the more 'basic' relations established by a kite and the wind, which is one of the symbiotic associations proposed at ¡Pestes! (Figs. 1.3-5).

One could simply start by asking: can a kite be a parasite? The nutritional metaphor of the kite 'feeding off' the wind is appealing but insufficient to describe the relation, since we immediately understand that the 'life' that the wind affords the kite with has no energetic components in terms of food. The kite affects the wind, but it does not harm it, does not 'weaken' it or 'infect' it[14], there is no influence of the kite on its 'host' except in dynamic terms, creating turbulence and disrupting its flow.

A distinction needs to be specified here; the (biological) category of parasitism applies to 'living' organisms, not to systems thinking in general. Thus, the wind does not 'live', cannot be said to be *autopoietical*, and thus does not belong to the (logical) class that we can use to establish such a relation: wind-kite parasitism. In fact, neither the kite nor the wind is an autopoietical organism. In contrast to *autopoietic* organizations which, as we have seen, produce themselves, Varela describes (artificial) machines as *allopoietic*, that is, as machines that produce something other than themselves (1979). This is indicated by their prefixes, *allo* being the Greek for "other", while *auto*, being the Greek for "self". The kite, being an artefact, a device producing (in this case) electricity should be considered in the frame of allopoiesis rather than autopoiesis.

Part of what defines an autopoietic network, is that it is *not* a set of relations among static *components*, as in the wind, but a set of relations among *processes of production* of components, and "If these processes stop, so does the entire organization" (Capra 1996:163).

To explain the structure of living systems, Fritjof Capra complements the organizational closure of Maturana and Varela's autopoietic networks with the notion of *dissipative structure* by physical chemist Ilya Prigogine, where the emphasis on the process of living resides in flow of energy and matter, rather than on the closure of the networks.

> Thus a living system is both open and closed – it is structurally open, but organizationally closed. Matter continually flows through it, but the system maintains a stable form, and it does so autonomously through self-organization. // To highlight that seemingly paradoxical coexistence of change and stability Prigogine coined the term 'dissipative structures'. (1996:164)

Not all dissipative structures are living systems. In order to visualize the coexistence of continual flow and structure stability, Capra exemplifies with a whirlpool in a bathtub (a vortex in flowing water), that is, with a nonliving dissipative structure.

Like the whirlpool, the wind in our example, must be seen as a nonliving dissipative structure. The balancing forces of the whirlpool and wind are mechanical, while those of a living organism are chemical (Capra 1996:163). The wind, being neither allopoietic nor autopoietic, being a manifestation of moving air caused by difference in air pressure within our atmosphere, should be considered according to the physical laws of thermodynamics.[15]

We speak of *structural coupling* between humans by means of the assemblages that we form with a given environment, where a history of interactions lead to some form of congruence. We, as humans (autopoietic organisms), create artefacts (allopoietic systems), extensions that form assemblages, products of our interaction with an environment. As we have seen, the environment only *triggers* structural changes in the autopoietic unities (it does not specify or direct them), and vice versa for the environment. Thus, our recognizing of affordances in the wind is triggered by our perception of, for example, its carrying capacity in relation to our and other bodies.

In terms of parasitism, Donna Haraway has mentioned that "Disease is a relationship", explaining that there is no relationship until a host and a parasite recognize each other; arguing that if there is no infection there is no relation (2000). However, could one say that if there is no recognition of the carrying capacity of the wind, there will not be relationships established, neither 'parasitic', nor 'commensalistic' or 'mutualistic'? Even if we would not recognize the wind's carrying capacity, the wind would still be affected; our presence creating turbulence.

Once again, one must distinguish between metaphorical, biological and systemic uses of the word parasitism. I believe that although Haraway refers to a biological form of parasitism, she is equating parasitism with pathogens, missing thus the broader context of symbiosis and evolution, where parasites may participate in vital functions of an organism, thus becoming indistinguishable from the body itself. Disease might be called a 'relationship' in the same way that health might be called a 'relationship'. The focus should not be put on them as being *relations*, rather, on health or disease as becoming particular forms of relationships that harm/benefit a given system or organism at a specific spatiotemporal scale.

If the devising, the design process, of any given artefact has not considered the phenomenon of a potential coupling by/with an unexpected actor (i.e. a hacking technology), the relation will still affect the system, while 'parasitism' will remain unnoticed by, for example, human monitoring.

In their allopoiesis, machines are sometimes not 'machinic

[Boundaries 73]

enough', to use a Deleuzian expression. Their performing implies the use (the recognition), of the most basic parameters that allow their performance to occur. Thus, a television set would have perforations on the back cover of the screen, allowing the artefact to dissipate the heat coming from its electronic components. This does not imply, for example, that as a boundary, this cover would also react —like human skin does— to the internal/external temperature conditions, or to the protection of the TV set from a foreign agent such as water. The degrees to which any of these are taken into account, exemplifies the level of elaboration of the devices and their devising processes.

By thinking in symbiotic terms, even about artefacts, one becomes aware that organisms function only in relation to other organisms, and that each organism is the result of symbiogenesis and of co-evolution in and with a given environment. The becoming of these living and nonliving systems, witness a legacy of structural coupling and continuous refinement of adaptation. At the same time, we should be careful to note the analogies and the metaphorical degrees when comparing allopoietic with autopoietic systems. These systems are *different* dynamic systems from one another, operating, not in harmony, but in their own tensions in and with their environments.[16]

Since humans' exploitation of ecological niches has no precedent in the biosphere, it seems that at this point in history, the capacity of human beings to adapt can be challenged. The depletion of resources has made difficult or impossible in some cases, the development of other life forms, affecting vast ecosystems' capacity for resilience, systems which we influence and of which we are part of. In spite of the exponential growth of technology, in most cases, the results of our labour are far from implementing (even understanding) products that would lead to a human sustainable life-style in its ecological complexity.

Our partial knowledge however, is not unique in the realm of living species, on the contrary. The plasticity of human cognitive capacities has been the key to our adapting to multiple environments. In all living species forms of knowledge become enacted, ranging from the individual (i.e. ant) to the species specific (i.e. ant colony) and even to inter-species forms of cohabitation and coevolution. The plant does not transform CO_2 into oxygen in order to elaborate a product that will continue to make possible the life of hyenas or anything else but itself. Rather, as we know, it has co-evolved during millions of years through the coupling in and with a multiplicity of environments, developing specific biological features co-creating a niche that exploits, simplifying for the sake of this argument, sunlight.

FRAMING

What is common to a range of multicellular organisms is an 'excess of life' manifested in a myriad of selective processes that are not only 'natural' but also 'sexual'.[17] Sexual selection as aesthetic process, by which organisms have developed responses and 'solutions', but also created, through *framing*, their own risks by becoming attractive, desirable, to their potential partners, since they also become recognizable for their predators.

While being life sustaining, sexual selection indicates a surplus of life which has a 'cost': the more beautiful the peacock's plumage, the more visible it is for all. By becoming more attractive, individuals not only attract partners but also become vulnerable to predation. Interestingly, birds that do not visually impress their partners have tended to develop musical, singing capabilities instead. Their way of becoming attractive has been enacted differently: their songs have framed nonvisual possibilities of contact.

There is only environment rather than world until qualities perceived and generated by someone or something are brought forth to the world. We understand that some signs have no significance for me, they do not figure into my umwelt or world. The notion of *framing*, in this respect, involves a mode of organization and of sensibility that is characteristic of each form of life. In this sense the notion complements *framing* as the 'narrative technique', introduced earlier, while still retaining that conception (framing as narrative) as a particular manifestation of this more general (ontological) territoriality suggested by Deleuze and Guattari.[18] In Deleuze and Guattari, *framing* becomes a spatio-temporal territorialization enacted by vibratory forces. Partly, they follow von Uexküll, who believed that nature works "by counterpoint", a contrapuntal agreement where spider and fly perform in tune to one another. Thus, the spider weaves threads that have to withstand the collision of the fly, the threads, on the other hand, need to be thin enough to become invisible to the fly, while its mesh matches the size of the fly's body (von Uexküll 2001b). These performances (actions with a purpose) of animals "are not products of a harmonic build of the body, it is the harmony of the performance that determines that of the body" (von Uexküll 2001b). Thus, Deleuze and Guattari say that the territoriality framed by a bird through its song responds to a "nomos" (in ancient Greek philosophy, a law, a convention), or a

> musical 'nome' [...] melodic formula that seeks recognition [...] The *nomos* as customary, unwritten law is inseparable from a distribution of space, a distribution in space. By that token, it is the *ethos*, but the ethos is also the Abode. (2004:344)

The *ethos*, the way of being, coincides with its home, its abode. In *A Thousand Plateaus*, Deleuze and Guattari created the concept of *refrain* (*ritournelle*), which explains this psychological shift were an individual creates space by means of sound. Thus, a child in the dark comforts herself by singing, or a housewife sings to herself or listens to radio, where radio and television sets "are like sound walls around every household and mark territories" (2004:343-344).

The marking and diverse expressions of territorialization become the signature of a species, a way to compose social assemblages with spatial and temporal ranges. In need of protection, mating, food, or rest, species develop partitions, frames that allow them to organize an otherwise chaotic world.

Attentive to the risks created by the tension between natural selection and sexual selection, Grosz develops this Darwinian distinction, pointing at their roles in developing language and art. Grosz explains that Darwin introduced an excessiveness into the development and transformation of species,

> Species are no longer natural collections or kinds developed to survive and compete, they are also the a posteriori and ultimately incalculable consequences of sexual taste, appeal, or attraction. Perhaps sexuality itself is not so much to be explained in terms of its ends or goals (which in sociobiological terms are assumed to be the [competitive] reproduction of maximum numbers of [surviving] offspring, where sexual selection is ultimately reduced to natural selection) as in terms of its forces, its effects (which can less contentiously be understood as pleasure in indeterminable forms), which are forms of bodily intensifications. Vibrations, waves, oscillations, resonances affect living bodies, not for any higher purpose but for pleasure alone. (Grosz 2008:33).

In this sense, art becomes the sexualization of survival, "sexuality is the rendering artistic, the exploration of the excessiveness of nature" (Grosz 2008:11).

One could say that what is produced, enacted, through the framing established (whoever or whatever organism enacts a framing) is a selection, by picking up signals, and differentiating some aspects of a given situation. What the frame includes in its organization is the enactment of a sensibility, thus, the enactment of a 'desiring' organism, always partial; developing knowledge of some things and not others. As enactment, the tension knowl-

edge-non-knowledge becomes articulated through bodies and materialities that actualize some possibilities of behaviour and not others.

The frame *affects* us by organizing, enframing powers and forces which might be impossible to experience otherwise. In Deleuze and Guattari's notion of *affect* (1994), affects, like intensities and sensations, are connected to forces in general, and with bodily forces in particular.[19] Grosz comments,

> What differentiates them [sensations, affects, and intensities] from experience, or from any phenomenological framework, is the fact that they link the lived or phenomenological body with cosmological forces, forces of the outside, that the body itself can never experience directly. Affects and intensities attest to the body's immersion and participation in nature, chaos, materiality. (Grosz 2008:3).

With regard to an organism's participation of and with forces, Varela has mentioned that the origin of the cognitive agent's world is based on the coupling of an excess, an elaboration of a surplus signification,

> this coupling is possible only if the encounters are embraced *from* the perspective of the system itself. This embrace requires the elaboration of a surplus signification based on this perspective; it is the origin of the cognitive agent's world. Whatever is encountered in the environment must be valued or not and interacted with or not. (1999:56).

Once again, von Uexküll's *umwelt* resonates through Varela. If this surplus, this excess, can be considered (as aesthetic becoming and as a form of attunement to worlds and environments) as the driving force behind the production and enaction of 'a way' (design); one could speculate that sexual selective forces engage us (humans) in an exchange —through the production and consumption of artefacts— with forms of threat and unexpected events (accidents), that we might, consciously or not, feel are 'worth paying for'. Following this reasoning, it becomes interesting to look into design manifestations as conceptions that bring forth and enact forms of attunement that prefigure or somehow discover negative or ontological aspects of the artificial.

OTHER DEVISERS

In design, art and architecture more or less comprehensive notions of symbiosis have been developed. At a personal level, the following cases have been of relevance: architect Kisho Kurokawa has proposed a "philosophy of symbiosis" (1996, 2005) that emphasizes processes of transformation, *metabolism*. In Kurokawa's view, the roots of symbiosis are to be found in Buddhist philosophy. Although many of Kurokawa's approaches to architecture and design are valuable to an understanding of the processes and the becoming of design, his view of symbiosis is not compatible with the perspective of this work, since he understands the general notion of symbiosis as a form of mutualism. This conception is particularly expressed in sentences where the term symbiosis stands for forms of 'harmony': "[symbiosis] rather than coexistence, harmony, or peace".[20]

Designer Li Jönsson developed a project entitled "Made by Products" in which she studied forms of energy (heat, noise/vibration, water particles —steam, among others) that dissipate from the use of home appliances such as kettles, televisions, or lamps, proposing design responses for tapping onto the potential of these phenomena.[21] The possibilities of devising artefacts that function in relation to the 'by-products' (steam coming from a kettle, when what we desire to obtain is hot water for a tea) of these devices indicates possibilities for other machines, and other organisms for parasitism, commensalism, or mutualism. Through the "parasite lamp", designers Anthony Dunne and Fiona Raby had previously suggested one such scenario, where the lamp 'parasites' electric appliances benefiting from their electromagnetic fields.[22] By explicitly addressing the 'waste' produced by devices which is not assimilated as 'food' by other systems or organisms, the ecology of devices of a given environment becomes exposed: the possibilities to study alternative scales of a phenomenon, ranging from —to continue with the example of a (plastic) kettle— the microscopical scale of the heat that transforms the molecular structure or its plastic shell, to the scale of the steam (visible by the human eye), or the human manual labour invested in interacting with it.

"Symbiots", a project within an initiative called Switch! at the Interactive Institute in Sweden has explicitly dealt with human-nonhuman interrelations and interdependencies through the notion of symbiosis (Bergström et. al. 2009). Although the categories of symbiosis (parasitism, commensalism, mutualism) are not explicitly articulated in relation to the urban interventions proposed, the project addresses cultural and energetic forms of

4.3 *Street Cinema*
- Switch! Symbiots
team, Interactive
Institute.

harm or benefit to those identified as part of the network through alternative everyday life (human social) behaviour. In this sense, "Symbiots" suggestively visualizes (urban, human) 'trade offs' of cohabitation. This can be seen for example, in one of the scenarios proposed (Fig. 4.3), where a group of neighbours have been rewarded with the screening of a film in the middle of a street, becoming a seat and a traffic-stopping event by means of raising the level of the stripes of a crosswalk. This event results from a collective effort were everyone in the area works together to lower energy consumption. In this way, the intervention becomes "a parasite" that feeds off the surplus of energy resulting from lowered consumption of traditional house appliances. "The survival of the parasite depends upon its ability to minimize the energy consumption of local residents sharing the resources of the host grid." (Bergström et. al. 2009:4).

Designer and theorist Otto von Busch, has worked with students at the London College of Fashion, exploring the theme of the von Uexküllian *umwelt* under a course entitled "Neighbourhoodies" (2010). von Busch focuses on the framing of territory produced by rhythm. He follows Deleuze and Guattari, who, through von Uexküll, had suggested that

There is a territory when the rhythm has expressiveness. What defines the territory is the emergence of matters of expression (qualities). Take the example of color in birds or fish: color is a membrane state associated with interior hormonal states, but it remains functional and transitory as longs as it is tied to a type of action (sexuality, aggressiveness, flight). It becomes expressive, on the other hand, when it acquires a temporal constancy and a spatial range that make it a territorial, or rather territorializing, mark: a signature. (Deleuze and Guattari 2004:347).

Along this reasoning, von Busch writes "The borders or fronts of neighbourhoods also take cultural and traditional expressions along which the [refrain] ritournelle can be experienced" (2010:10). Thus,

an ethnic group might use communal cooking along the street as a refrain recreating home by means of culinary expressions, the gustatory sense of specific spices and olfactory markings. Muslim communities have loudspeakers on minarets to announce the calls to prayer, thus framing the neighbourhood sonically, not too different from the refrain of birds. (von Busch 2010:10).

The concrete outcome of the speculations were materialized as

Devising

4.4 *Neighbourhoodie*, Brixton covered market - Kate Wakeling.

street style garments, "hoodies". Identified with the stigmatized and criminally minded and as an "intimidating uniform" by certain politicians in England, the hoodies became the canvas were each neighbourhood's umwelt would resonate. Figure 4.4 shows a project by Kate Wakeling, were she expresses Brixton's covered market's diversity, "which although chaotic, helps to maintain a friendly and cohesive community". In her version of the hoodie, the honeycomb pattern represents the constant "hive of activity" that can be experienced any day of the week at Brixton.

The designs of Tuur Van Balen as well as those of Revital Cohen investigate possible scenarios through biotechnologies. In "Pigeon D'Or" (Fig. 4.5) Van Balen explores cities as complex metabolisms and proposes the modification of feral pigeons' digestive systems through synthetic biology. With the help of specific interfaces, Van Balen introduces a bacteria designed and created in such a way that, when fed to pigeons, turns their faeces into detergent and becomes "as harmless to pigeons as yoghurt is to humans", in other words, the pigeons become designed to defecate soap.[23] In Revital Cohen's "Dialysis Sheep" (Fig. 4.6) a transgenic lamb 'cleans' blood for a human patient with kidney failure. The sheep's kidneys are connected via blood lines to the patient. During the night, pumps remove waste products from the patient's blood by pumping it out of the body, through the sheep's kidney while returning it cleaned.[24]

A variety of degrees of 'naturality' and 'artificiality' are enacted through this small selection of design manifestations. Each of these projects raises important ethico-aesthetical issues, modes of engagement that question our capacity to control, and perform, through technologies, relations to systems and organisms. The devices frame and crystallize given partitions, inscribing differences and sensitizing us from their own logic, by prescribing more or less unexpected forms of cohabitation. In my view, each of them articulates —by making visible— a form of *ethology*. Ethology, the scientific study of animal behaviour, puts emphasis on the behavioural patterns occurring in specific environments. It stresses the study of relations between an organism and its environment, and in this way, among systems, living and nonliving.

A design that stresses the interactions with humans and nonhumans, generates awareness of ways of being in the world, and the possibilities of short and long term cohabitation. In this sense, ethology —etho-ecological studies— provides insights into the possibility of hospitality-hostility to beings (and systems) that affect and conform the biosphere.

In this respect, Otto von Busch's "Neighbourhoodies", by explicitly addressing the human umwelt as a form of attunement to

4.5 *Pigeon D'Or* - Tuur
Van Balen.

4.6 *Life support.*
Dialysis sheep -
Revital Cohen.

local (in this case urban) environments, articulates an ontological dimension of design that we tend to be unaware of.

I believe that the human parasitism to the lamb or the seemingly commensal relation to the pigeons, expose degrees of hospitality-hostility to other beings, human and nonhuman. In their biotechnological instrumentality, Van Balen's and Cohen's works capture and channel a life force, an existing power of which we are part of, and explicitly address forms of interrelations with a natural substratum (biological, systemic) which tends to be abstracted in the urban and artificial settings of most design projects.[25] Exposed to their framing, the appeal of these works suggest accidents of biotechnology, their designs stage the shock of a first time encounter, as in a breakdown: the hospitality of the lamb, and its accident through the hostility of the (ab)use of the lamb. But only temporarily, until it is naturalized, incorporated into knowledge. What follows —in order to become truly hospitable— is the need to form a new territoriality, another movement in search for a framing that will displace the expectations of the hospitality of these bodies.

My particular attempts to deal with forms of symbioses reflect a personal need to articulate, to make explicit, the categories —parasitism, commensalism, mutualism— as a form of territorialization, as enframing. And question, through a systematic engagement, their difference in register; whether they are for example, metaphorical, anthropocentric, ecological, a combination of them, or whether they suggest a given temporal or spatial perspective. My intention, is to elaborate distinctions to further understand the emergence and the ethical implications of possible assemblages.

Understanding cognition as enaction, by which what we can do, sense and think influences what we can be and become, the designs that follow are an attempt to materialize proposals that stress ontological politics, where realities are enacted rather than pre-given (Hinchliffe and Whatmore 2006). Pushing epistemological claims of things being something 'known', to engage instead in an open and speculative relation with affordances of specific environments, systems and species.

The more we acknowledge other entities and their needs, all places (*topoi*) should be conceived, at least potentially, as biotopes. However, the division, the partition will remain; from the devising follows the device. That is to say, from the planning, imagining, conceiving, an action or a materiality is enacted as a response to the preconceived arrangement. The less fragmentary the thought, the less damaging the resulting conceptions.

¡PESTES!

From a biological perspective, forms of symbiosis may be nutritional or protective. Even though, as we have seen, the categories are problematic, I decided, in order to keep the concept relatively simple, to design artefacts considering the symbiotic relations from a 'nutritional' perspective. My use of single quotation marks emphasize the metaphorical register of the word 'nutritional'. The symbiotic concepts of ¡Pestes! must be understood in the light of the complex interrelations of assemblages, as extensions, thus as processes of (human) singularization, where a psychological, a social, and an environmental ecology overlap and are at play.

I have dealt with a relatively simple and well-known artefact, the radio. Partly because of its iconic status, being easily recognizable. It is also, at least in most of the so-called developed world, economically affordable and accessible in terms of interface, most of these devices having the quality of being portable. I have chosen the radio as a generic 'artefact' that stands for, or represents so-called consumer products in general. I could have chosen other devices which are also easily recognized; clocks, lamps, or telephones, to name a few of the most common everyday ones. The choice of the radio had to do with the possibility of modelling and prototyping these machines in real scale, as well as with the possibility of raising issues that concern intangible and unperceivable dimensions such as the reception and transmission of electromagnetic waves, aspects suggested, but not explicitly addressed here.

Implicit in the symbiotic interrelations studied, ¡Pestes! (meaning "pests" in Spanish) plays with the idea, and suggests the role of humans as forms of pest.

Although I initiated the project in Stockholm months earlier, ¡Pestes! was developed in Córdoba, Argentina (Fig. B.1) during a 3-month period, between March and June 2011.

I designed the radios in collaboration with industrial designer Leonardo López. Each radio was designed considering a specific 'ecological niche' that ranged from a 'natural' context to an 'artificial' one. We decided to situate each form of symbiosis in a setting that we would name 'artificial', 'natural-artificial' or 'natural', to emphasize more explicitly that the concepts do not deal with a dichotomist opposition between what is 'natural' or what is 'artificial', but with *degrees of* 'naturality' or 'artificiality', and where all kind of symbiotic relationships exist. 'Artificiality' simply implies a more pervasive presence of human constructions.
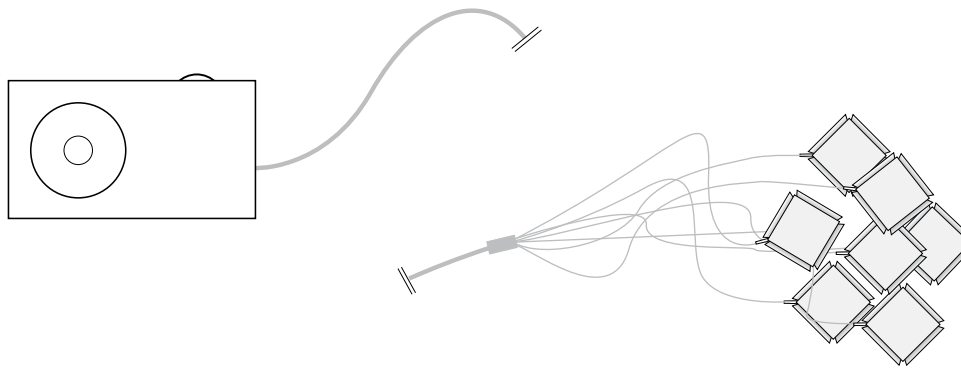
As the project developed, Leonardo and I 'aligned' the artificial setting with the parasitic proposal, the natural-artificial one with

artificial environment/
parasitic radio
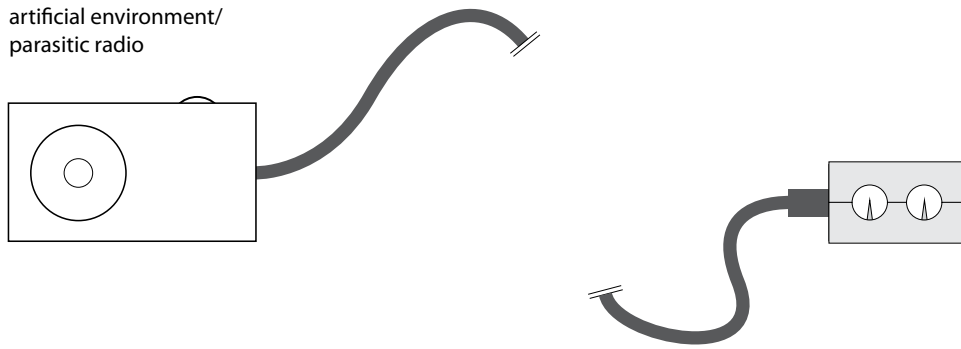
natural-artificial environment/
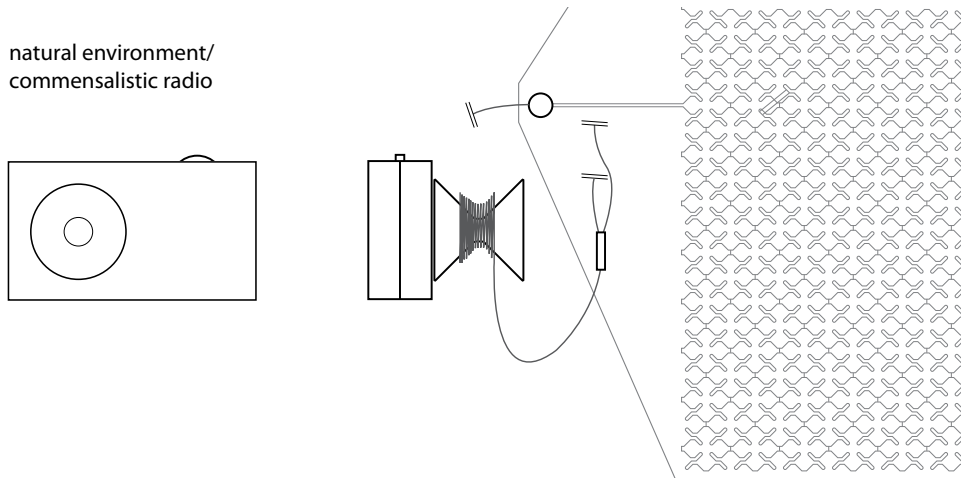mutualistic radio

natural environment/
commensalistic radio

4.7 Iconic radios and
matching of forms
of symbioses to local
environments.

[Latin names 149]

the mutualistic proposal, while the natural setting was matched with the commensalistic proposal (Fig. 4.7).

Gradually, three designs for radios where suggested in relation to the niches studied. In all cases, the general design process was a combination of work with *prepositiontools* (associating elements such as water, or air —as in figure 4.2— to organisms or system components, depending on the environment in question), as well as traditional desk and field research. Some instances of this process are documented in "Appendix B".

Partly, as I understand it, the relevance of the 'heterotopian' approach to symbiotic relationships lies in its unpredictability. In this sense, it is interesting to note with Lynn Margulis, that "symbiogenesis is far more splendid than sex as a generator of evolutionary novelty." (1998: 89). Explicitly —instead of gradual evolutionary processes— unexpected events have led to aleatory combinations, pushing systems and organisms to cohabit in whatever circumstances, and to the testing of resilient capabilities and their life in symbioses.

The search for energy sources in the artificial setting resulted in the decision to contextualise the parasitic radio *(Radiophonum Electridis Prehensio),* in a neighbourhood called "Juniors" —where our studio was situated— being the houses of this area located particularly close to the electrical network, to the extent that some of the cables at more than three meters height can be easily reached with a hand through windows in the upper floors (Figs. 4.8-9).

The prototype of the parasitic radio was built according to standard electronic radio devices. It consists of a wooden case divided into pieces that form the outer shell of the radio, these parts are joined by magnets that keep the case in one piece (the three radios of this set are built with the same magnetic principle). The radio receiver is electronic, as well as the transformer that converts the 220V coming from the terminal into the 3V required to run the radio. Its terminal —by which one can puncture the existing electrical network— consists of two piercing metal instruments (see figures 4.10-11), each of them puncture a single of the four cables of the network. Of these four cables, three of them conduct 220V, while the fourth one is grounded, for the radio to function the piercing metals must be connected to a single 220V cable as well as a grounded one.

The commensalistic radio *(Radiophonum Ventosa Energia),* was designed for the natural setting and the strong winds of the sierras between "La Cumbre" and "Ascochinga"(Fig. 1.2). As mentioned, the proposal suggests a radio functioning on electric ener-

4.10 Radiophonum Electridis Prehensio - Parasitism in an artificial environment.
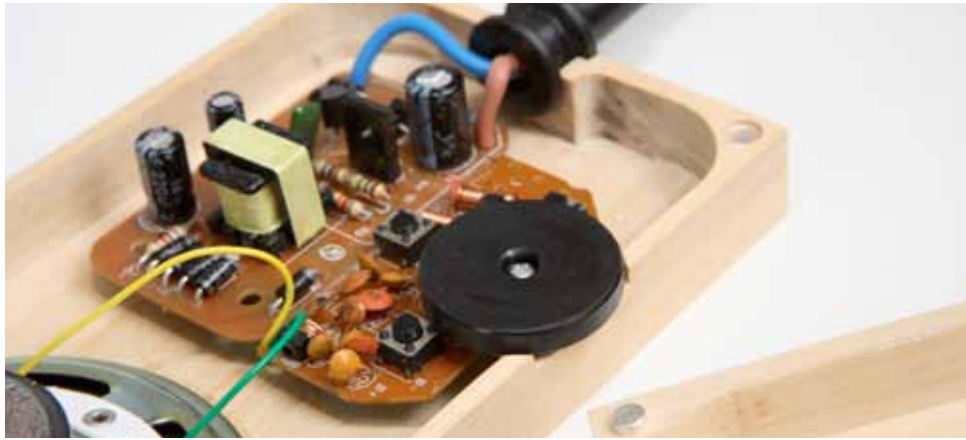
4.11 Details, parasitic radio.

gy that originates from a kite, which, by means of a piezo-electric circuit-board generates the 3V necessary to run the radio. The pressure exercised by the wind, bends the flaps of the kite, activating the piezo-electric board, generating electricity in its turn (Figs. 1.4-5).

The mutualistic radio *(Radiophonum Piscea Energia),* was conceived for the natural-artificial setting located in the area belonging to an electric power plant from 1911 in "La Calera" still producing energy to the region until the staging of our project in May 2011. A traditional hydroelectric plant, producing electricity from the flow of water of the river beside its building (Fig. 4.12).

The proposal implies a radio with electric energy generated by the pressure from the movements of water flow in conjunction with the energy provided by the biting (on the terminal made of balanced food) of *Serrasalmus spilopleura,* a local fish called "palometa". The piezo-electric devices designed to oscillate with the water flow as well as the biting obtain and transmit the 3V necessary to run the device (Figs. 4.14 and 4.16). The mutualism proposed here, reflects the relationship with the fish, where the providing of food in exchange for energy is seen as mutually beneficial.

Figure 4.15 shows images of two specimens of *Serrasalmus spilopleura,* one of them being infected with a parasitical fungus, quite common in this species. Partly, what interested us —forming through the radio a relation of mutualism— was the possibility to design the food on the piezo-electric terminals (Fig. 4.16). In this way, the notion of mutualism with this species could have higher/lower degrees of benefit. To begin with, food, in this case, cannot be 'bait', which is the standard association of the human-fish relation through fishing. Food in this context equals 'balanced food', as in pet's food. In this way, if local communities of fish are identified (categorized) as 'ill' or affected by such fungi, the food might be, for example, treated with doses of medicine, increasing the degree of mutualism with the fish.

The degrees of "exactness" of which De Tarde speaks of in the opening quote to this section, imply a degree of inclusion-exclusion, we could say, of hospitality-hostility. The suggestion of curative balanced food, does not only point at a possible 'application' for the 'improvement' of a product, it also exposes *the choice*: without fully understanding their ecological roles[26], intuitively, we tend to prefer the fish rather than the fungi. It would also be possible to devise an alternative that stimulates the advance of fungi. Provided that we sympathise, if not directly with the fungi, with the idea of a mutually beneficial relationship. The practice of design has always been ethico-aesthetic.[27]

4.12 'natural-artificial' environment at the power-plant at "La Calera" for the mutualistic proposal.
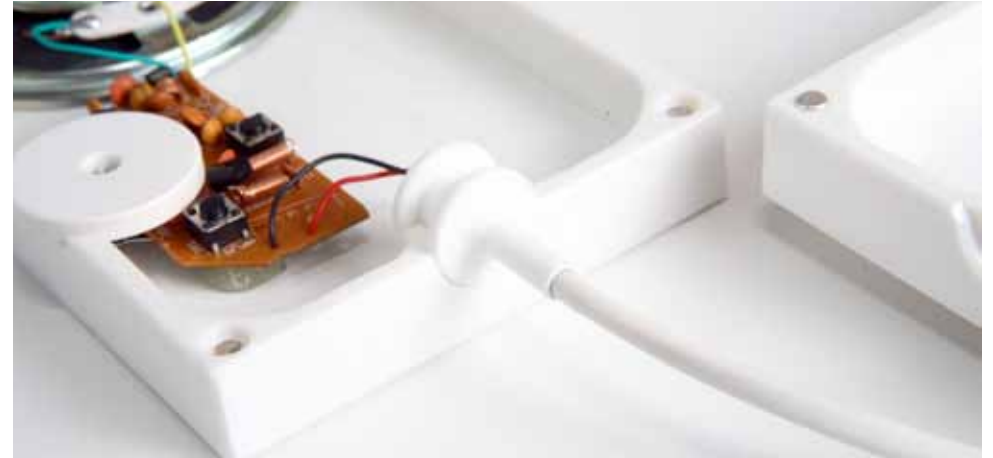
4.13 Radiophonum
Piscea Energia - Mu-
tualism in a 'natural-
artificial' environment.

4.14 Radiophonum
Piscea Energia.

4.15 *Serrasalmus spilopleura* - locally called "palometa". (Below: individual affected by fungi).

4.16 Details, mutualistic radio. In the middle: Balanced food for *Serrasalmus Spilopleura*, study model.

By conceiving the radios in relation to specific actors of ecological niches (the wind, a fish, a particular electric network), the focus of the designs becomes displaced from their traditional human-centredness to the given energetical relations that allow the devices to function. Each niche becoming a source of discovery and potential, by being performed, enacted in relation to the devices. Each actor investigated, examined for its capacities, abilities to perform in-relation-to.

My presenting images of the places, the niches, where the radios were to later function, is a response to this concern: to render the environments 'visible' by looking for potential forms of interaction which are non-standard in current energetic terms, since most devices rely on a global, standard, electrical network as energy source.

The three radios where conceived as a 'family' of radios, thus their visual resemblance. More specifically, what an observer recognizes as 'the' radio is an iconic design that proposes the artefact as a prototypical member of a category (radio), making it familiar in order to maximize the radios' capacity to suggest and communicate the complexity of the concepts in question, rather than challenging the observer with the recognisability of the device as a radio (Fig. 4.7). The designs were conceived to communicate the (symbiotic) concepts, thus the size, particularly the thickness of the cables used in the models/prototypes, which follow the 'concept' rather than the optimal cable diameter that a specific electric voltage would require. This is particularly noticeable in the 'parasitic' device, the cables being thicker than for the standard electric appliances running on 220V, in order to communicate the threat of 'hooking' the device by puncturing the electric network.

Although as I mentioned, all concepts are predominantly conceived from a 'nutritional' perspective, the 'parasitic' radio can be said to operate at a more diffuse level of social parasitism. Being a device that 'feeds' on electricity that originates from an existing —human, social— network, the 'nutritional' aspect is perceived as an act of piracy, since the user of the radio cannot but be aware of its illegal mode of operation.
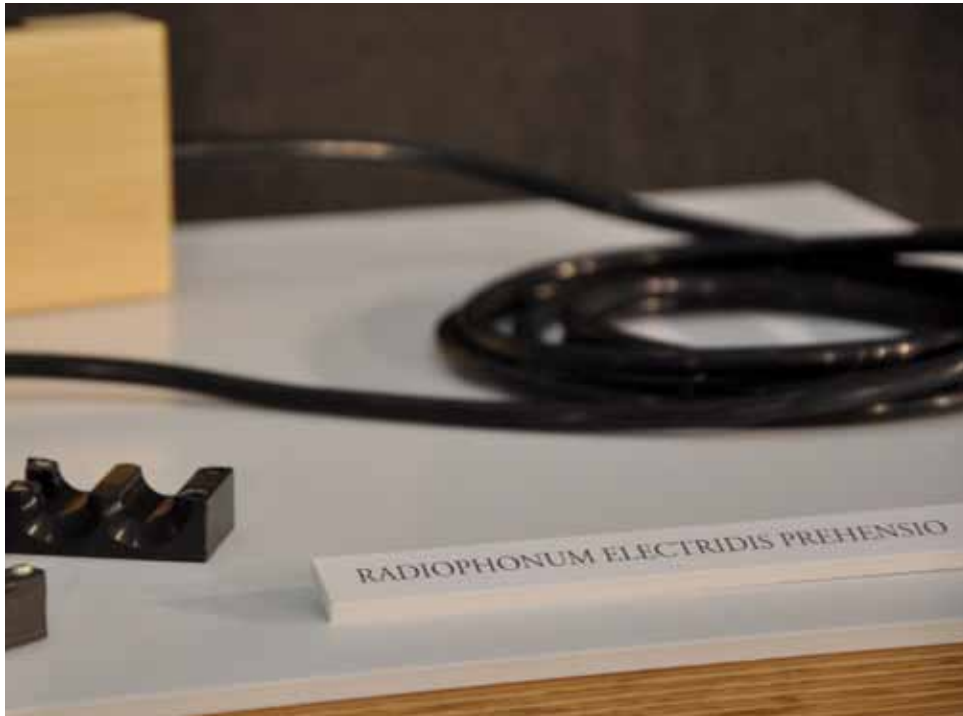
LATIN NAMES

Based on the 'nutritional' conception of the devices, the radios were given Latin names that refer to the source of energy that makes them function. Thus *Radiophonum Electridis Prehensio* (Fig. 4.17) means "radio (artefact) that 'takes', 'seizes', or 'prehends' electricity". *Radiophonum Piscea Energia* stands for "radio (artefact) that runs on energy coming from a fish", while *Radiophonum Ventosa Energia* stands for "radio (artefact) that runs on energy coming from wind".

The Latin names were given to create associations with the world of living or natural species, using the traditional biological nomenclature to designate a 'domain' where the artefacts might 'belong' to, in relation to living (and artificial) systems.

I believe that through this procedure, one does not only address the taxonomic relativity of their classification, a much debated topic and not only in biology, but also and more importantly in this work, the naming itself as an act that con-forms our perception of a given artefact-system-organism's 'position' or '*phylum*'.

The naming 'freezes' so to say a perspective, a given set of relations. As a name, *Radiophonum Piscea Energia* for example, 'captures' the relational aspect between the energy coming from the fish, and in this sense works already at a basic descriptive level. In its specificity, this description does not suggest any other of the relations that the device establishes with its environment, neither at the time when the artefact is being used by someone as a radio, neither before, nor during, its production or distribution as a product, or after, once the radio is discarded. Our naming reflects this tendency to 'fix', or rather, to perceive artefacts as fixed, static and bounded. However, nothing is static, natural and artificial things evolve, age, transform themselves in relation to their environments. It is in relation to our own bodies, as sentient organisms, that the duration of these entities is perceived as static, or with a certain degree of permanence.

The naming resembles, in a sense, the logical operations performed by some of the works of Joseph Kosuth, as in "One and Three chairs" (Fig. 4.18), where the *word* "chair" for example, participates in a de-limitation and con-formation of a category. A performative and generic notion that includes not only this particular artefact but also all the ones that resemble it. Kosuth includes in the installation, the dictionary definition of "chair", as well as a photographic image of the three-dimensional chair itself, located where it is, confronting us with what one might understand as degrees of 'chairness'. Note that Kosuth entitled the work "One *and* Three chairs", where the 'anding' brings together, coordinates

4.17 Latin name for the parasitic radio. (Detail of the radio at the exhibition "Devices" in connection with the final doctoral seminar at HDK, Gothenburg).

4.18 *'One and Three Chairs'* - Joseph Kosuth. Wooden folding chair, photographic copy of a chair, and photographic enlargement of a dictionary definition of a chair.

in this case, these three particular arrangements, all of them bringing forth a *type* of chair.

Once again, Roland Barthes' *satori* moments come to mind, the "retreat of sings", in-between our perceptions. Similarly, the photographic images and the names of the devices proposed at ¡Pestes! are meant to complement or even supplement (if one can think of them as 'increasing' reality) performing a movement, a tension between familiarization and defamiliarization. We familiarize us, when we perceive the three-dimensional artefact, the radio, and relate to it first by sight, and later by touch, smell and hearing. The images that accompany the radios situate or contextualize them in specific 'niches', where they were conceived to ideally function, increasing our understanding of their particular (symbiotic) performativity. Being descriptive —although in a vaguely familiar foreign language— the names 'close' the categorization. Thus, the device called *Radiophonum Piscea Energia*, *becomes* the 'radio (artefact) that runs on energy coming from a fish'. Rather than indicating that the radio *is* (i.e. "Philips FM radio"), this naming suggests that it becomes *that* radio in its very relation to the 'nutrient' and the process that provides it with energy, and its specific 'degree' of (in this case) mutualism.

PROPOSING A CRITIQUE

Knowledge and learning processes (cognition) cannot be disassociated from their bodily, material manifestations. Being both expressions of structural coupling, "development and learning are two sides of the same coin" as Fritjof Capra has emphasized (1996:261). In evolutionary terms, the structural coupling of humans with-in environments evidences a capacity to adapt to alternative conditions without precedence for mammals. Human's semiotic capacity and strength provides a possibility to overcome challenges. These challenges need to be anchored on an acknowledgement of ecological interdependence, and an understanding of the processes of human and nonhuman systems. In other words,

4.19 Life-cycle.
Useful-cycle high-
lighted in red.

4.19 Life-cycle. Useful-cycle highlighted in red.
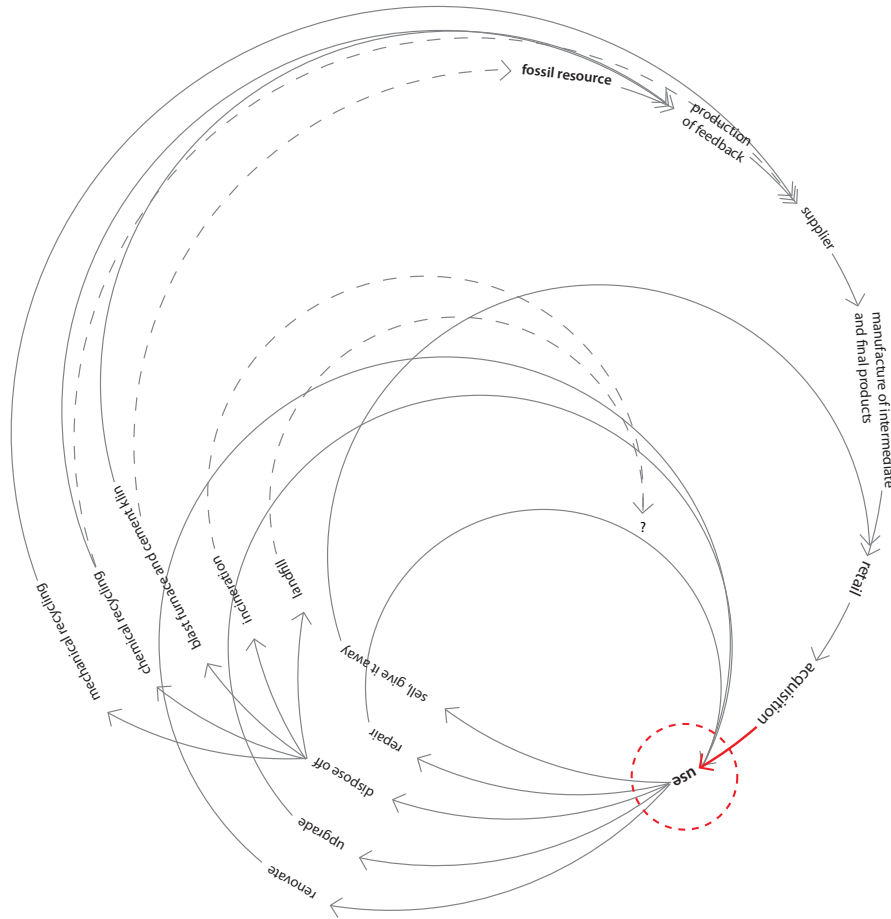
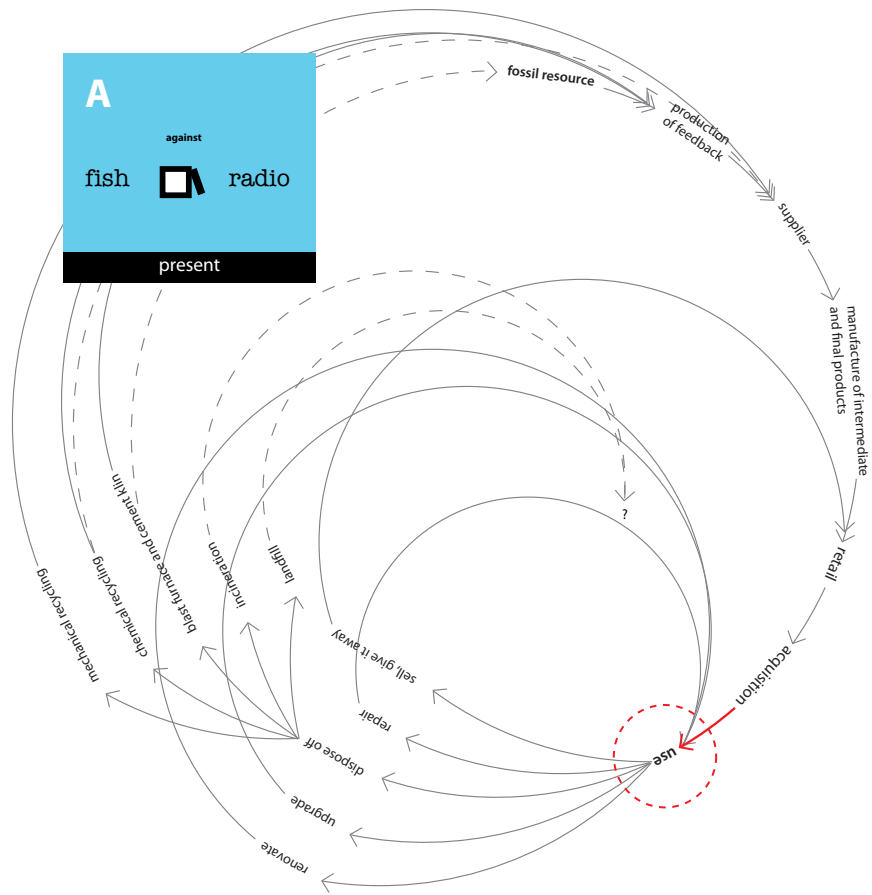anchored on an attempt to understand symbiotic associations and symbiogenesis.

Devising is an act of in-scription, of folding. Through the logic of this work, both processes, folding and unfolding, have made use of *prepositiontools*. Some of the associations which these tools have made possible have been exposed through the materialization of the radios. More specifically, through their terminals (with the electrical network, with the wind, with a fish and a flow of water). Like any other artefact, the radios give us a glimpse of how we live and have lived; artefacts can be thought as *traces*, transitional states of development, the materialization of a given knowledge in relation to multiple variables and compromises.

An archeology of these devices would disclose that the forms of symbioses projected in ¡Pestes! emphasize an energetic and material engagement to a place, a particular interrelationship to a 'niche', pointing at both, cooperation and competition as sources of evolution. It would also disclose that they reflect an instrumental concern with the 'useful' cycles of the artefacts rather than with their whole life-cycles: the commensalism, mutualism and parasitism of the proposals can only be conceived during the *useful-cycle* of the radio, that is, during the period when a human is using it to listen to radio.

Based on diagramming developed at 3Ecologies, figure 4.19 depicts a basic scheme of a life-cycle and some of its potential becomings. In this case, of a plastic component of the radio, one that is made from fossil resources. The diagram highlights instances of the life-cycle of the product such as: the extraction of resources from the earth, the production of materials and intermediate parts, the assembly of the parts to become a product, as well as key logistical stances until the moment of acquisition of the product by a user. This two-dimensional diagram emphasizes the time aspects of the cycle, and takes into account potential ways of disposing off or reusing of the product. Highlighted in red, is the *useful-cycle,* which is, as mentioned, the period when a user acquires the product and uses it.

What this type of diagramming may facilitate is to understand in visual terms, that generally, life-cycle does not end with useful-cycle, and —if able to 'zoom' in and out of it, enabling one to look at specific activities— that simple everyday behaviour such as the way washing a cotton t-shirt at 60° in the city of Stockholm, affects the sexuality of the frogs in its archipelago, and by extension the water conditions of the Baltic sea.[28]

The relationship that the radios —their processes and components— form throughout the whole of their *life-cycles*, from production to waste can only be suggested, hinted at, in these

Diagram labels (upper left lifecycle diagram):

A / against / fish radio / present

fossil resource
production of feedback
supplier
manufacture of intermediate and final products
retail
acquisition
use
sell, give it away
repair
dispose off
upgrade
renovate
landfill
incineration
blast furnace and cement kiln
chemical recycling
mechanical recycling
?

lifecycle

useful cycle >

Lower row of panels:

A / against / fish radio / present

>

A1 / against / fish radio / present/micro

A2 / against / fish radio / present/human

A3 / against / fish radio / present/macro

+

B / against / fish radio / past / past/micro / past/human / past/macro

C / against / fish radio / future / future/micro / future/human / future/macro

4.20 On the mutualism of *Radiophonum Piscea Energia*, in relation to its symbiotic complexity at alternative scales.

scenarios. Following a triple ecological register, one should account for psychological, social and environmental aspects during the manufacturing, using, and discarding of the devices. These, on their turn could be further explored through alternative spatio-temporal scales, going through a multiple-layered set of relationships, during the whole of the life-cycle of the device. From source to source, energy to waste and waste to energy.

For example, the radios are made of several components, electronic or otherwise. Some of them can be singled out such as 'wood', or 'zinc'. Many of them are composed of several materials, which in their turn, may or may not be composite. Sometimes the components are made of combinations of materials that are difficult or impossible to dismantle, to disassociate, as in the circuit boards. The production, distribution, consumption and discard of each of these materials relate to processes and environments where humans behave affecting not only human social and individual bodies, but also the environments that humans are capable of perceiving, conceiving.

A schematic example to depict this reasoning can be seen in figure 4.20, taking in consideration the design of the mutualistic radio, conceived through the (i)logic relationship fish-against-radio. The mutualism proposed here, can then be understood in its narrowness and specificity.

In figure 4.20, we can observe the *present* situation "A" (in blue) of the mutualistic relation fish-radio. In this present situation, the mutualism is understood as the providing of food for the fish in exchange of energy. This mutualism is time and place specific, it ceases to exist as soon as acknowledgement of the processes of manufacturing, distribution, and even consumption outside of the specific fish-radio domain, are taken into account. Moreover, the radio and its components will become other things when no longer in use as a radio (in this particular assembly that provides the functionality of receiving radio waves and converting them into sound waves perceptible by the human ear), once trashed, reused or recycled. Once again, highlighted in red is the useful-cycle, the moment of use to which I refer to.

Within "A" one could think alternative scales, A1: a micro scale, A2: a human scale, and A3: a macro scale.[29] All of them happening at present time. These scales could also be considered at alternative temporal scales, a past "B" (in orange) and a future "C" (in yellow), each of them subdivided into their micro-human-macro spatial scales. The result of the speculations of such co-ordination becomes overwhelming through the amount of potential relations that can be considered. No design response can acknowledge the total complexity of such potential and virtual interactions; in their

multiplicity and distributive agency, they become not only unpredictable, but even unconceivable.

As such ¡Pestes! (including its processes using *preposition-tools*) is a critique of design as a basic, human, way of devising; the practice of production and conception of the artificial. The project addresses the need to engage in ontological politics, by making explicit some of the symbiotic associations of the devices proposed.

The assemblages that machines constitute with human beings, can be said to become, by extension, *autopoietic*.[30] In the sense that our own capacity for self generation (autopoiesis), becomes extended by means of the structural coupling to the environment mediated by (allopoietic) machines. Rethinking the coupling of human products (the technosphere) to the biosphere through a reassessment of the notion of autopoiesis, might allow to conceive more integrative devising processes.[31]

Design's ethico-aesthetical domain imply propositions, inscriptions, of possibilities of relation, practices enacted by a human logic of sense. If the human assemblages can be understood to be or become autopoietic, they should also be seen, in their incapacity to acknowledge other life forms, as mutilating and excluding.

Maturana and Varela define ethics by stating that

Every human act takes place in language. Every act in language brings forth a world created with others in the act of coexistence which gives rise to what is human. Thus every human act has an ethical meaning because it is an act of constitution of the human world. This linkage of human to human is, in the final analysis, the groundwork of all ethics as a reflection on the legitimacy of the presence of others. (1998:247).

Extending this claim through the expanded notion of autopoiesis, otherness should include nonhuman manifestations, as in human-nonhuman and also nonhuman-nonhuman relations through assemblages. Thus, the hospitality-hostility that acknowledges or disregards others is enacted through the human capacity to recognize the entanglement, the interrelations and the continuum nature-culture, from the very gestures of everyday practices mediated by language and design.

DEVISING IN SHORT

The devising process inscribes differences that benefit or harm some systems or organisms and not others. As such, it implies the

enactment of forms of hospitality-hostility.

Through the biological notion of symbiosis the partitions of devices become explicit once each given artefact or component becomes associated with the systems and organisms that con-form the habitat or ecological niche where it per-forms.

The 'heterotopian' shifts triggered by the playful use of prepositions (through *prepositiontools*) allow us to associate entities in a way that seems counter-intuitive and against experience, but which nonetheless offer the insights of speculating upon an environment as if all forms of association could lead to the constitution of a world.

The project entitled ¡Pestes! by means of 'heterotopian' propositions raises awareness of the potentialities of a given environment. It also suggests a range of possible symbioses of each device to these environments, depending on the situation and scale adopted to consider the relation.

As such, it allows considering and speculating upon the symbiotic associations and the symbiogenesis of a given device —that is, on its genealogy, its history of structural coupling and ways of affecting and being affected throughout the whole of its lifecycle.

Awareness of the symbiotic associations that we, consciously or not, willingly or unwillingly, engage in through the enactment of the artificial, brings us closer to the possibility of developing designs that acknowledge emergence as well as other forms of life. Such awareness frames design as the ethical practice that it has always been.

Concluding

We know nothing about a body until we know what it can do, in other words, what its affects are, how they can or cannot enter into composition with other affects, with the affects of another body, either to destroy that body or to be destroyed by it, either to exchange actions and passions with it or to join with it in composing a more powerful body.

Gilles Deleuze and Félix Guattari

I started this work inquiring into the relationship artefact-accident. These enquiries gradually led to a broader understanding of the ecological implications of our cultural activities, which I associated with issues of hospitality-hostility affecting humans and nonhumans.

It has been of personal importance throughout these years, to acknowledge and to try to understand, the ethological, and the etho-ecological aspects of design, that is, modes of human production that affirm the inseparability of the *ethos*, the way of behaving peculiar to a being, and *oikos*, the habitat of that being. Through this perspective, the proposals suggested here emphasize the instrumental roles of devices in performing tasks that prescribe models or ways of engagement, not only with a particular activity but more generally with a way of being and a model of cognition.

One could say that all forms of *how* are design questions. Whenever we can ask a question, there is the likelihood (some would even say the precondition) of an answer. 'How' questions (as opposed to 'what' or 'why' questions), pre-figure *a way*, a mode of engagement. The answers to these questions enact ways of being and of doing that favour particular stances, positions, views. However, when we design a 'response', we enact and/or materialize how something relates to, not only the thing or situation we had in mind, but how that relates to a myriad of bodies and systems conforming the biosphere in ways that we cannot fully predict or control. 'How' questions become design questions to the extent that they are understood as willed agency. Inevitably however, distributive agency forms part of the assemblages enacted through the becoming of the processes of doing and making things.

We do not construct something that will have a univocal outcome, or for that matter a series of (planned) outcomes; we enact and materialize *triggers* with ranges of possibilities.

Once in contact with the potentialities of other beings and systems (human and nonhuman), these triggers form assemblages of different life-spans and characteristics, ranging from the explosive behaviour of accidental encounters as in the assemblage nuclear plant-tsunami (in all its vast network), to the less dramatic but still overwhelmingly complex: cotton t-shirt-washed-at-60°-in-Stockholm, affecting the sexuality of frogs and by extension the water conditions of the Baltic sea.

This is partly why, as I understand it, the relevance of the playful and 'heterotopian' approach to symbiotic relationships lies in its unpredictability. The heterotopian compositions, lead to aleatory combinations that push systems and organisms to cohabit in

unprecedented spatio-temporal circumstances. Such novel forms of cohabitation in their turn lead to the testing of their resilient capabilities and of their life in symbiosis. And through this procedure, to our awareness of the relationships themselves.

'Hows' far too often assume 'real outcomes' and *given* relations, but since we cannot quite completely know what nor why, it is of importance to adhere to a language that assumes less real relations, and thus sensitizes us to the unexpected. My design proposals are an attempt to cultivate such disposition.

Bruno Latour's notion of an infra-language becomes, in the search for ecological realities, fundamental by demanding a practice of languaging which engages in ontological politics. This demand occurs since the words used to express or manifest our thoughts cannot quite pre-define what 'is out there', but rather, need to point at potential associations, engaging us explicitly in the *enactment* of these realities and on our taking sides: taking positions that expose the devising and the likely partitions of the device.

If the notion of *device,* in spite of becoming a category, forms part of an infra-language, it is because, precisely like *affordances*, one can only talk of or investigate a given partition in relation to a given entity, at a given time, at a given place. The tree affords a wide range of possibilities, depending on what and how it relates to. Equally, the device arranges a wide spectrum of possibilities, and might trigger planned and unplanned reactions, performing both, inclusions and exclusions.

When "we know nothing of a body until we know what it can do" we tend to become careful, mindful, receptive. In this way, the device exposes the choices of conviviality, and its preferences at addressing precarity: the vulnerability of what, and for whom?

It also embraces virtuality in its acknowledging of emergence without completely assuming the totality of its forms. If we are to take, accept and learn to measure risks, and do this in the cosmopolitical way that Isabelle Stengers suggests, we are to, not only acknowledge the symmetry artefact-accident as Paul Virilio wants, but understand its ecological implications: there are only processes of transformation, some of which happen unexpectedly, and are the result of complex interactions. Accident must be understood as a human category with its limitations in spatio-temporal scales. And through this awareness, attempt to compose *that* etho-ecological cosmos, which is not ideal but real unknown.

Current studies of cognitive patterns evidence that cognition results from a given perceptive coherency based on the cross correlation and working together of bodily functions. Through its actualization/reorganization, a body enacts forms of knowledge,

processes which in the case of human beings result in bringing forth worlds and the enaction of languaging.

Understanding cognition as a networked and emergent process, has allowed Francisco Varela to formulate the notion of (human) *self* as a form of narrative, where the weaving together of a personal story brings forth a sense of personal identity. We do not notice the transitions, the breakdowns that occur in the lapse between the 200 to 500 msec that we call present; the lapses of time get knitted together under our current intention (going home), until something 'dramatic' happens: our wallet is gone!

In spite of the difference between the results of the processes of (animal) language and (human animal) languaging, cognitively, human and nonhuman autopoietic organisms, share this basis, the enaction of a response based on this same emergent process. The empathy that might be brought forth through this insight can be a source for a refinement of an ethical sensibility of ecological dimensions; biologically, we act and coordinate our behaviour in similar patterns than any other sentient being. Any evolutionary survey of skeletons acknowledges morphological correspondences between humans and animals, but the study of life processes clearly indicate that human similarities to other life forms is more common than their differences. This in itself should inspire empathy, wonder and esteem.

In these pages, I have considered relations and the processes of linking and re-linking through the articulation of two projects: *prepositiontools* and ¡Pestes!

In my view, *prepositiontools* help us ask 'what if', and to model and imagine the future as open-ended. The 'heterotopian' shifts triggered by the playful use of *prepositiontools* allow us to associate entities in a ways that are counter-intuitive, but which offer insights for speculating upon an environment as if all forms of association could lead to the constitution of a world. They are devices that contribute to unfold categories in order to emphasize relations and to compose and associate things that we otherwise would be unlikely to conceive. In this way, they contribute to think and sense the ethical implications of the inclusions and exclusions, of connecting this and not that.

¡Pestes! explored 'host-guest relationships', by working with the biological notion of symbiosis. The relations exposed through the design proposals articulate degrees of anthropocentrism and suggest some of the ecological implications of these conceptions.

As I understand them, both projects enact not only proposals, but also critiques of design. They critique a narrow instrumentality of the conception of the artificial, where the emphasis tends to be placed on a given epistemology, rather than in the process

aspects, the becoming of our lives in symbioses with other beings and systems, that is, with emphasis on a ontological project of collective becoming.

By thinking in symbiotic terms, even about artefacts, one becomes aware that organisms function only in relation to other organisms. Although I have not explicitly addressed historical cases, it becomes evident that, historically, design has been mostly establishing parasitic and commensalistic relations with the environments and beings (other than human) that conform them. With the exception of 'house pets' such as dogs and cats, if forms of mutualism have been developed with species other than human, these have normally been unintended, thus not designed or consciously conceived as part of the project itself, resulting from the emergence of the distributive agency of a given assemblage.

This is interesting for several reasons. In terms of design, for the need to identify and evolve life-cycles of products together with their 'hosts' (it is in the interest of the parasite to survive), articulating a basic but fundamental challenge, that of creating sustainable and resilient relationships that lead to a desirable (hence human) co-evolution of species. It is also interesting as a general biological manifestation since, as noted, most biological associations are or have been parasitical. This points at the challenge, and, perhaps, a future research opportunity in the field, investigating current manifestations of allopoietic 'parasitism': how they form assemblages that are likely (or not) to sustain ecosystemic resilience through their parasitism by limiting the emergence of other physical and biological systems, and also, their potential for becoming commensalistic/mutualistic at specific scales.

I believe that biosemiotic as well as 'vital materialistic' studies (as in Bennett 2010), could expand material and social studies of forms of artificial symbioses, and would be of value to develop our ethical (onto-epistemo-logical) perception of the environments and worlds that we con-form *as* ethologies.

In philosophy, for instance, Gilles Deleuze and Félix Guattari's notion of art as *framing*, as developed by Elizabeth Grosz introduces —in my view— an opportunity to conceive and develop design forms that explicitly deal with the co-evolution of species. Not only from a gender perspective, but more generally as manifestations of (social and cultural) structural couplings, where the production, consumption and acquisition of devices —as social forms of interaction— can be understood as processes of sexual selection in tension with natural selective processes.

By conceiving the production of the artificial (framing, devising) through the logic of natural selection in tension with sexual selection, one will tend to explicitly address the risks of design.

Thus, not only that the more beautiful a plumage the more visible it is for all, which would stand for the 'cost' of being, or becoming attractive; but also that things that we do not perceive, or are not even aware of producing, *affect* other beings in tune with other aspects of the same environment at the same or alternative spatio-temporal scales. In this sense, human's capacity to produce waste that is toxic or becomes of detriment to other beings and systems has no parallel. The waste=food paradigm of *Cradle to Cradle* fits all species except for one: humans.

The knife's hostility does not primarily lie in its cutting tissues —even in the extreme case of human violence to humans— but in the more pervasive and 'invisible' damage occasioned to communities of humans and nonhumans affected by the extraction of minerals in areas detached from the locations where most consumption takes place. Similarly, the discarding of the devices that no longer 'arrange', 'partition', the specific task for which they have been designed in relation to a human use.

Acknowledging accidents, design must expect the unexpected and incorporate into project activity an opening for chance and emergence. This does not imply having total control over the becoming of any given device (which is an impossibility). Rather it concerns the creation of devices conceived to address multiple actors at alternative spatial and temporal scales, creating the 'spaces' for them to participate in a becoming of the device that would lead to the sustenance or increase of biodiversity.

There is a need for an explicit simbiotization of cultural diversity, one that also leads to biodiversity. As exposed through the proposal of the 'mutualistic' radio, the suggestion of curative balanced food, does not only point at a possible 'application' for the 'improvement' of a product. It also exposes *the choice*: without fully understanding their ecological roles, we are inclined to have preference for the fish rather than the fungi. It is also possible to devise an alternative that stimulates the advance of fungi.

Design developed within such a frame, cannot but explicitly acknowledge the complex interrelations which it becomes part of. If, as proposed here, ethology registers the (ethical, in the acknowledging of otherness) manifestations of beings, human and nonhuman, then, the understanding of human capacities to and for structural coupling should lead to a less anthropocentric conception of the artificial.

Humans' cognitive plasticity should be acknowledged as a precondition for hospitality-hostility: the thinking act, our reflective capacity, as an inquisitive mode of questioning real or imaginary worlds. Maintaining awareness of the devising, and its resulting devices; on the one hand keen on understanding otherness, on

communicating with an-other (some-others), and on the other hand, discriminating in its purposeful anthropocentric activity.

Through the process of languaging, we socially and explicitly acknowledge our singularity in relation to countless other singularities. As such, our (human) perception of body vulnerability becomes enacted through the ongoing process that assesses a particular situation, such as one's exposure to a form of threat, in relation to a series of more or less articulated and assimilated cultural norms.

In relation to hospitality-hostility, it can be said that among humans, epistemological aspects inscribe a 'contractual' human social (human-to-human) dimension on the ontological dimension of human life in its ecological complexity. It thus incorporates a reflexive dimension that complements the more pervasive and spontaneous ethical forms of action, the emergent know-how, which is anchored on bodily functions in relation to a history of interactions with given cultural and physical environments. In other words, and back to our first example, as sentient beings and by perceiving the CCTV mast visually, we spontaneously react to its presence, which is our first and most basic mode of ethical relation to it. Then reflexively, we understand its human social implications, and attempt to elaborate laws, rules of conviviality, that impose the least constraints on those who these laws select, the chosen groups of beings recognized as interacting with them.

As devices, each text and artefact that I have proposed, participates in the possibilities of this assemblage. Through its design manifestations the project has attempted to enact an ethical domain, in order to acknowledge, starting from the most basic gestures of the practice of design, the thinking process, and its relation to other beings and other systems.

Thinking, sensing, will always be partial, fragmentary. We should attempt, individually, collectively and through technology to refine and complete our sense of ecological interrelations. Attentive that the divisions inscribed through the design process will remain; from the devising follows the device. The less fragmentary the thought and its forms enaction, the less damaging the resulting conceptions.

GLOSSARY

Allopoiesis: An *allopoietic* organization (from the Greek *allo*: "other", and *poiesis*: "a making") has as the product of its functioning something different from itself. (See Varela 1979). Any artefact, such as a car, is in this sense an allopoietic machine. In contrast to *autopoietic* organizations such as living organisms, that produce themselves and are autonomous because they maintain their own organization, artificial machines are *allopoietic machines* because they are not autonomous since they subordinate their organization to the production of something different from themselves. Considering allopoietic machines in relation to human assemblages, I argue, following Félix Guattari 1995, that allopoiesis should be seen in the broader context of evolution and symbiogenesis, and in this way, not in opposition but as an extension of autopoiesis.

Assemblage: An assemblage is a spatio-temporal composition of humans and/or nonhumans, in which there are "vitalities at play" that makes it unpredictable. Thus, the notion of assemblage relates to the notion of *emergence;* the way complex systems and patterns arise out of a multiplicity of relatively simple interactions, and where the emergent is unlike the sum of its components. In the words of Manuel DeLanda, *assemblages* are wholes characterized by *relations of exteriority,* "These relations imply, first of all, that a component part of an assemblage may be detached from it and plugged into a different assemblage in which its interactions are different. In other words, the exteriority of relations implies a certain autonomy for the terms they relate, or as [Gilles] Deleuze puts it, it implies that 'a relation might change without the terms changing'." (2006:10-11).

Autopoiesis: An autopoietic organization is an organization which is capable of self production (from the Greek *auto*: "self", and *poiesis*: "a making"). An autopoietic system is organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produce the components, that through their interrelation regenerate and realize such network. (See Varela 1979, Maturana and Varela 1998). Part of what defines an autopoietic network (in contrast to allopoietic or thermodynamic systems), is that the autopoietic network is *not* a set of relations among static *components* —as in a radio or a whirlpool— but a set of relations among *processes of production* of components. Living systems are autopoietic organizations.

Device: A device (Latin *divisa*, *divisus*; division) *divides*, that is, *organizes, arranges, frames* our environment and defines thus, limits and possibilities of relation. In the context of this work, machines, artefacts, and apparatuses off all kind —in their quality of arranging, disposing a given partition— are considered *devices*. The notion relates to the Foucaultian term *dispositif* (as developed by Agamben 2009), which has been rendered into English as *apparatus*, the French word however, can designate any sort of device; a *dispositif* is precisely that, something that *disposes*, arranges. By considering these things *devices*, what I highlight is the dividing, the sorting out rather than the 'solutions' of a given architectural proposal, 'consumer product', law, and so on. In this way, the notion addresses the inclusions and exclusions of the devising process and its results: *devices*.

Enaction: According to Francisco Varela, *enaction* is a bringing forth by concrete handling. This is based on two interrelated issues: that perception consists of perceptually guided action; and that cognitive structures emerge from the recurrent sensorimotor patterns that enable action to be perceptually guided (Varela 1999:8,12). Enactive knowledge comes through action and it is based on motor skills; it is developed by doing, such as manipulating objects, driving a motorbike, playing a sport or drawing with a pen. When talking about human *knowledge*, one should keep in mind this onto-epistemological continuum, where our organisms enact forms of knowledge, resulting from a history of interactions (ontogeny), always participating and immersed in a given culture. In this sense, 'knowledge' does not only stand for 'knowing *what*': such and such things are in such and such way, as when one assumes 'facts'. It also includes a 'knowing *how*', which is a form of enactment constrained by the capacities of the perceiving organism in question. At stake is not to specify how a 'perceiver-independent' world can be described, but rather, to understand how action can be perceptually guided in a perceiver-dependent world. (Varela 1999:13).

Ethology: Science that studies animal behaviour. It puts emphasis on the behavioural patterns occurring in specific environments, and stresses the study of relations between an organism and its environment. That is, between an *ethos* (a way of being) and an *oikos* (the habitat of that being).

Heterotopia: In the context of this work, I use Michel Foucault's concept of *heterotopia* in its 'discursive' (1994) and not in its spatial sense (1967; 2010). Foucault explains that heterotopias un-

dermine language, because they destroy the 'syntax' with which we construct sentences "and also that less apparent syntax which causes words and things (next to and opposite to one another) to 'hold together'" (1994:Xviii). It is in this, de-stabilizing way that the design projects of this thesis can be said to be heterotopian (from the Greek *héteros*: the other of two, other, different; and *tópos*: place); they propose unlikely combinations and thus, a dislocation of experience by means of illogical vicinity (as in figure 4.2), by displacing the ground on which our human experience operates through the use of language.

Hospitality-hostility: These words share a common etymology, from the Greek *hostis*, meaning "a guest" and "an enemy". In this sense, *hostis* suggests the possibility of both, hospitality and/or hostility. I hyphenate these words with the intention to capture their reciprocal conformation, pointing at alternative spatio-temporal scales where hospitality-hostility might manifest itself. For example, our hospitality to another person by means of offering food (mangoes from the Philippines) might, at a later stage — due to the unsustainable practices in the production, distribution, consumption and/or discard of these goods— become hostile not only to our guest, but also to us, the hosts of the gesture of hospitality, by causing a deterioration of the environments where 'hospitality' took place.

Information: I understand *information* in its etymological sense, as in in-*form*-ation, where the Latin *form* is a translation of the Greek *morph*. From the Latin *form* arose the verb *informare*: "to bring something into form", which is the root of the word *information*. Thus its relationship with the biological discipline of *morphology*. (Hoffmeyer and Emmeche 1991; Varela 1979:266). According to Gregory Bateson, *information* is difference that makes a difference to a system (2000:486). Information is a perceiver-dependent event, what in-forms must be valued by a given organism, in its capacity to perceiving specific signs. Information, in the context of this work, relates to the notion of *exformation*, that is, to information excluded but contextually meaningful (Nørretranders 1998) and also, to the sense of exformation that stands for the tactics of defamiliarization (Hara 2008).

Languaging: As the process of "communication about communication", languaging is a form of enaction and communication characteristic of the human species. Although other beings communicate through 'language', they are not aware of their use of language. Humberto Maturana exemplifies with a communication

between a cat and her owner. He suggests that "if the cat were somehow able to communicate to me something like 'Hey, I've now meowed three times; where's my milk?', that would be language. Her reference to her previous meowing would constitute a communication about a communication." (See Capra 1996:280-281). In this sense, the 'language' would qualify as *languaging,* which the cat is not capable of performing. However, although languaging can be said to be the most characteristic feature of the human species, other primates such as chimpanzees, by creating new expressions by combining signs, seem to blur and thus point at a need not to distinguish these two modes (language-languaging) too sharply (see Maturana and Varela 1998).

Ontogeny: The combination of the Greek words *onto* (being) and *geny* (Latin: generation, from the Greek *génesis*, source, origin) indicate the becoming of a given organism. Ontogeny is the origin and the development of an organism, as in the development from the fertilized egg to a mature form. Maturana and Varela mention that ontogeny is the history of structural change in a unity without loss of organization in that unity (1998:74). While individual organisms *develop* (ontogeny), species *evolve* (and thus develop phylogeny).

Structural coupling: Humberto Maturana and Francisco Varela identify structural coupling "whenever there is a history of recurrent interactions leading to the structural congruence between two (or more) systems." (1998:75). The notion of structural coupling is valid for all kind of system, living and non-living. One can speak of the structural coupling of a car with a city and the mutual perturbations/changes that each system triggers on the other. In this sense, cars have developed structural congruence with, for example, the streets of cities. Both systems are structurally coupling, imposing and allowing a range of possibilities and constraints on each other.

Symbiosis: The biological notion of symbiosis groups three forms of association and categories; mutualism, parasitism and commensalism. A mutualistic symbiosis is an association in which both symbionts benefit; an association in which one symbiont benefits and the other one is neither harmed nor benefited is a commensalistic symbiosis; while a relationship in which a symbiont receives nutrients at the expense of a host organism is called a parasitic symbiosis. Partly, what this work attempts is to identify and articulate the metaphorical, anthropocentric, and biological registers of these categorizations in design manifestations.

Symbiogenesis: In biology, symbiogenesis stands for the merging of two separate organisms to form a single new organism. In this work and in a more general sense, I refer to symbiogenesis to emphasize co-evolution among both, autopoietic and allopoietic systems. Thus, symbiogenesis becomes a synonym for 'collective becoming'. It refers to the history of structural coupling, and the history of the lineages of systems and organisms as they change through time, and in symbiosis to one another. Pointing at ways of affecting and being affected that lead to mutual behavioural or systemic change.

Umwelt: The concept of *umwelt*, which could be translated as the 'world brought forth' by a given living being, was developed by Jakob von Uexküll. In his conception, an umwelt is a perceptual sensory sphere constituted by an organism's capacity to perceive signs. Thus, it is the semiotic world of the organism: all that has meaning for that organism depends on its capacity to perceive those signs. In this work, umwelt corresponds to the notion of *world*, as Francisco Varela understands it (and to the enactive approach to cognition), being a world brought forth by the possibilities of the cognizing organism itself.

The appendices that follow assemble a range of imagery and attempt to describe or suggest some of the modes of engagement with practices which are not evident or have been shortly described so far. They are not meant to provide a complete overview of the processes for developing the projects, they complement what has been already discussed in ways that some might find clarifying or simply be curious about.

The projects presented here, *prepositiontools* and ¡Pestes! are two of several projects developed throughout the PhD work. The entire work has ranged from the development of collaborative projects such as 3Ecologies, to single papers not included in this publication, developed for and presented within specific academic environments.

Two instances of a series of design exercises using

prepositiontools

The following ideas are mere sketches generated under no longer than five-minute sessions, performed at the early stages of this work while trying to understand the potential of the tools. Thus, the value of the sketches below lies in the illustration of the approach, rather than in the usefulness or validity of the design concepts.

These three particular artefacts were cases suggested by Ramia Mazé, and stand for well-known cases of design influencing everyday behaviour.
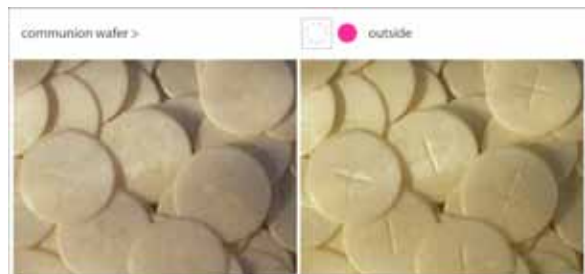
Ideas using the prepositions 'under': Can be implanted on the skin... also: The film under the pills will change colour preventing broken (or faulty) packages from being used (illustration above).

Other suggestions included the preposition 'in/into': the pills leave a trace in the mouth that cause a strong taste if two pills are taken by mistake within 12 hours.

Ideas using the prepositions 'outside': sunlight 'crunches' crosses on the wafers (illustration above).

Other suggestions included 'behind': the wafers glow (on the chalice for example) when not being seen directly.

Ideas using the prepositions 'of': of different materials, suggesting for example edible ones (that might leave traces of particular tastes when in contact with the mouth), washable ones, etc. (Illustration above).

Other suggestions included 'via': designed to fit on a tray that will after being used, allow them to be easily placed in a recycling post.

The playful procedure of taking a card or a stamp, and by chance thinking associations with the situation dealt with, has led to the development of a relational logic which tends to raise awareness about the interconnections of things and processes at alternative scales.

Among others, the two sets of *prepositiontools* (cards and stamps) where used at the "Future of Play" in April 2009, a seminar leaded by Rolf Hughes, which is part of the Master program in Experience Design at Konstfack in Stockholm. The card set and the rubber-stamp set were given to a group of eight students to work individually and in groups to develop ideas and situations based on "prepositional play". The brief was:

> By focusing on grammatical prepositions, you will explicitly conceive projects that enact/embody relations-with; that is, with other artefacts, with other humans, with the context in which they are immersed.

Thus, there were two levels of playfulness in the assignment: on the one hand, the methodological one, by using the rubber-stamps and the cards randomly, generating ideas by the free associations opened up by the prepositions; and on the other hand, the play assignment itself, that is, a brief where the final design outcome was a play/game.

The following images (Fig. A.4) were taken/generated during the workshop. The concepts featured were designed by Farvash Razavi.

Instances of the design process of

¡Pestes!
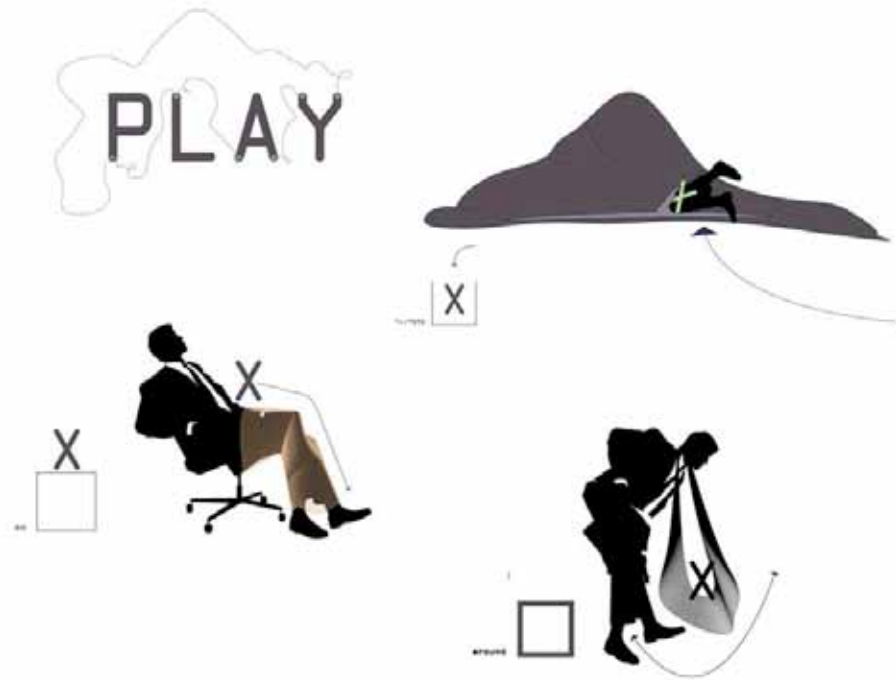
I initiated ¡Pestes! in Stockholm during 2010. The project was partially funded by Iaspis (The Swedish Arts Grants Committee's International Programme for Visual Artists), the Lars Hierta Foundation, the Anna Ahrenberg Foundation and the Designfakulteten (The Swedish Faculty for Design Research and Research Education).

The project was developed in Córdoba, Argentina (Fig. B.1) during a three-month period, between March and June 2011.

I designed the radios in collaboration with industrial designer Leonardo López. The photographs published here are a combination of my own, as well as commissioned ones to local photographers Natalia Pittau, and Diego Combina.

Leonardo and I designed each radio considering a specific 'ecological niche' that ranged from a 'natural' context to an 'artificial' one. A variety of environments, systems and beings were taken into account, some of which can be seen on the pages of my personal sketchbook in figures B.3-4.

The radios were meant to function as generic 'artefacts', thus, ideally, by being easily recognized, their presence would highlight the symbioses established rather than attract the attention of the viewer to their own design configuration. In other words, and more specifically, what should result attractive were the terminals of the radios rather than the traditional radio receiving devices. The photographs of the scenarios and the scenarios with the devices were taken in such a way as to give a 'realistic' impression. Following in this way, the design intention to focus on the niches and the relations established by the devices, rather than on the devices themselves.

Through the design process, Leonardo and I developed study models, as well as models and working prototypes to test the proposals sketched. All electronic components derive from existing parts commercially available in Córdoba. Several parts of the final models and prototypes were commissioned to local workshops. Technical drawings such as those in figures B.5 and B.6, as well as the physical models that we produced were used to communicate with the people manufacturing them.

Specialists in food design as well as fish breeders were consulted during the ideation and materialization process of the mutualistic radio. Electrical engineers and technicians were consulted during the ideation and materialization processes of the parasitic and commensalistic radios.

B.1 Project locations in Córdoba, Argentina.
A- Parasitic radio
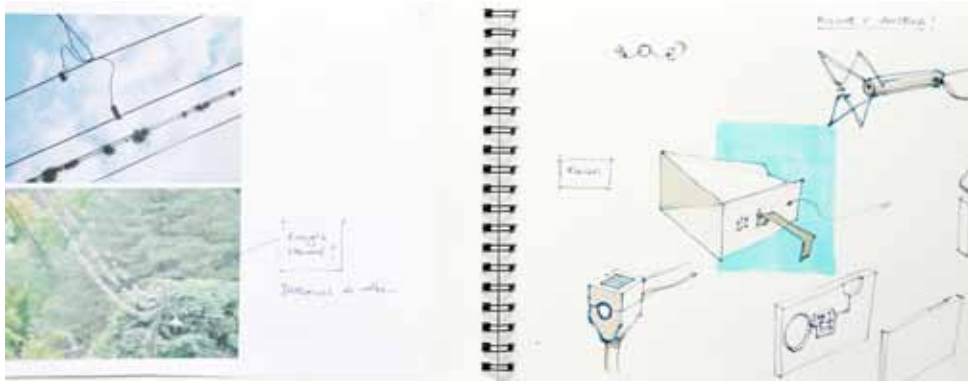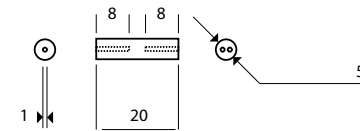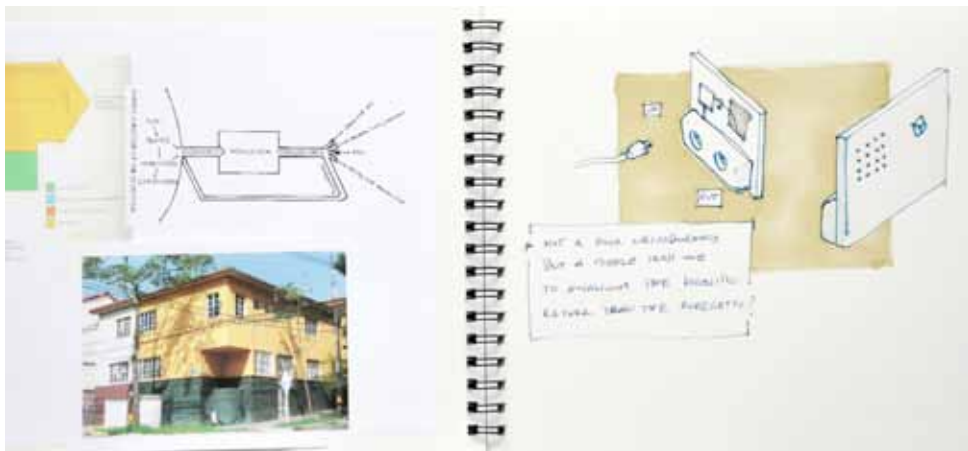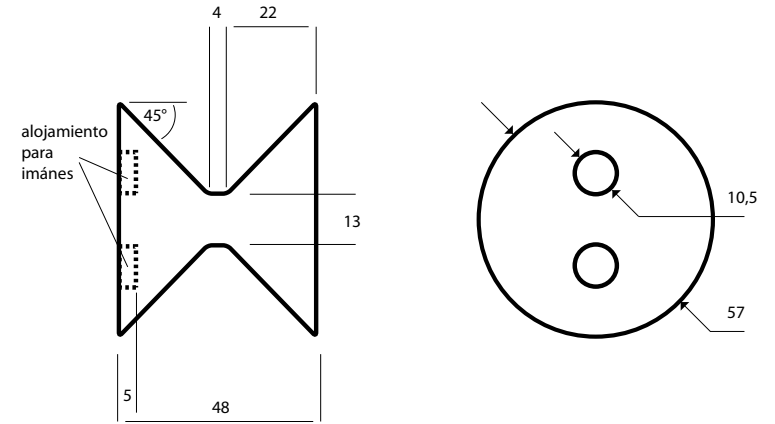B- Mutualistic radio
C- Commensalistic radio

córdoba

argentina

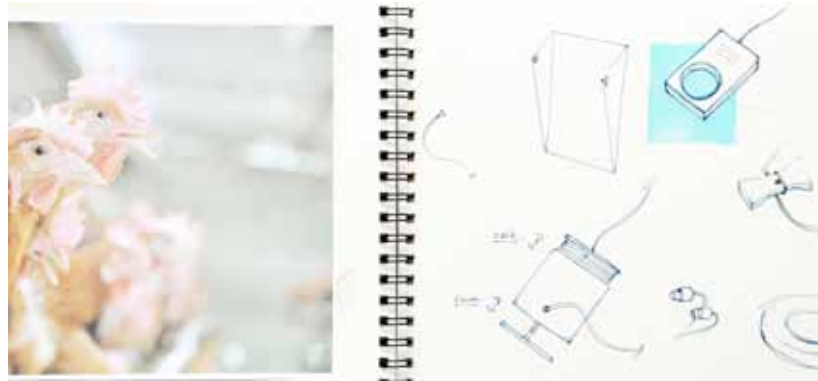south pacific ocean

south atlantic ocean

B.2 Modelling process.
Above: failed pieces
due to faulty mecha-
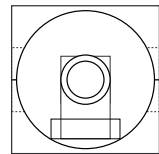nization. Below: Leon-
ardo Lopez at work.

B.3 Pages, personal
sketchbook.
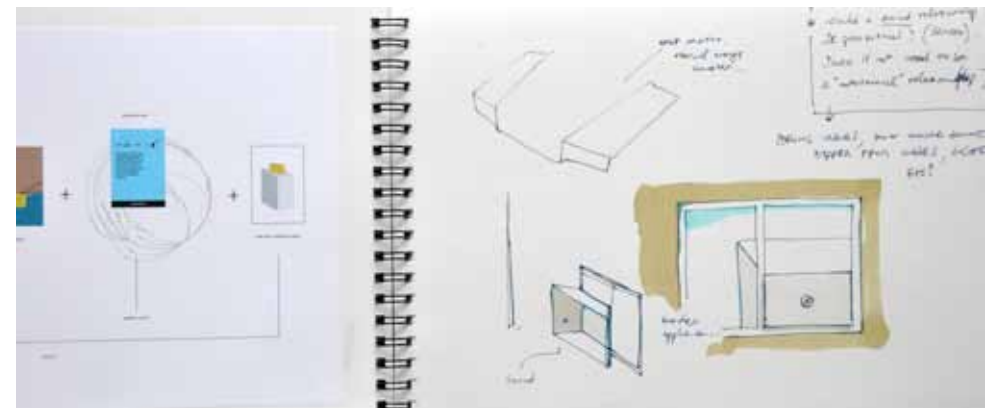
B.4 Pages, personal sketchbook.

B.5 Example of technical drawing (reel and cable connectors, commensalistic proposal).

alojamiento para imánes

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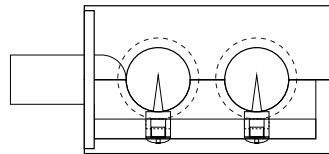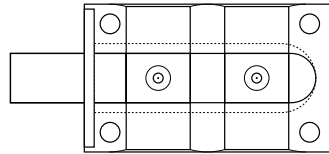
PARASITISMO
Pieza "Gancho"

C 01

B.6 Example of techni-
cal drawing. (Terminal
of parasitic radio).

B.7 Above: samples of
food, for the terminals
of the commensalistic
radio. Below: model-
ling with components
of an existing radio.

B.8 Process: staging
the scenario of the
parasitic radio.

B.9 Staging scenarios:
Above, parasitic radio.
Below, mutualistic
radio.

B.10 Staging scenarios:
commensalistic radio.

NOTES

SETTING OUT - (*Notes to Pgs. 15 to 39*)

1.   See Guattari 2008 and 1995. In his book *The Three Ecologies*, Félix Guattari sketches an *ecosophy*, which is composed of three ecologies: a psychological ecology, a social ecology and an environmental ecology. These three interdependent domains prefigure a knowledge strategy that stresses the need for an ongoing interdisciplinary approach to ecological complexity. It is important to understand not only the ethical implications but also the aesthetical dimension of this conception. Guattari emphasises that his notion of *ecosophy* finds itself under an "ethico-aesthetic aegis" and mentions "I have stressed the aesthetic paradigms because I want to emphasize that everything [...] has to be continually reinvented, started again from scratch, otherwise the processes become trapped in a cycle of deadly repetition. [...] The increasing deterioration of human relations with the socius, the psyche and 'nature', is due not only to environmental and objective pollution but is also the result of a certain incomprehension and fatalistic passivity towards these issues as a whole, among both individuals and governments" (2008:27-28). A version of the potential of this conception applied to design can be found in our "3Ecologies". Following Guattari's conception, and in contrast to other existing models, 3Ecologies is a human-centred model that explicitly emphasizes the individual dimension, social construction and situated nature of ecological costs and benefits. This modelling allowed us to consider additional and other factors than those typically in focus, such as the social conditions and contingencies of product use, gender, culture and class dimensions of environmentalism, ethical and equity issues in globalized production and consumption. The diagrammatic and narrative versions of the conceptual models of 3Ecologies open for ways of communicating, learning and debating sustainability that are often left out of scientific and economic discourses, and challenge the reduction of sustainability to statistical data that is often solely based on environmental aspects of material origins and offsets. Instead, qualitative aspects are visualized and potential futures are 'forecast'. See Ávila, Carpenter and Mazé 2010.

2. The notion of *semiosphere* was coined by semiotician Yuri Lotman, who was inspired by Vladimir Vernadsky's concept of *biosphere*. According to Lotman, the semiosphere is the *unit* of semiosis, "the smallest functioning mechanism (...) the semiosphere is the result and the condition for the development of culture; we justify our term by analogy with the biosphere, as Vernadsky defined it, namely the totality and the organic whole of living matter and also the condition for the continuation of life." (1990:125). The notion of semiosphere in Lotman's semiotics of

culture presupposes a 'remaking', a modelling. Lotman writes: "A schema consisting of addresser, addressee and the channel linking them together is not yet a working system. For it to work it has to be 'immersed' in semiotic space. All participants in the communicative act must have some experience of communication, be familiar with semiosis. So, paradoxically, semiotic experience precedes the semiotic act. By analogy with the biosphere (...) we could talk of a semiosphere, which we shall define as the semiotic space necessary for the existence and functioning of languages, not the sum total of different languages; in a sense the semiosphere has a prior existence and is in constant interaction with languages." (1990:123)

In spite of Lotman's references to Vernadsky, his concept of semiosphere remains a metaphor of the biosphere, operating within cultural parameters. Today the field defined as biosemiotics (which studies "the life of signs and the signs of life" Hoffmeyer 2008), has assimilated or expanded the notion of semiosphere and makes it 'coincide' or overlap with that of biosphere. Jesper Hoffmeyer defines semiosphere "as a sphere like the atmosphere, hydrosphere, or the biosphere. It permeates these spheres from the innermost to outermost reaches and consists of communication: sound, scent, movement, colours, forms, electrical fields, various waves, chemical signals, touch and so forth – in short, the signs of life" (2008:5), shifting thus from an anthropocentric process to a more general biological one, with the implication that it becomes cyclic instead of dialogic (see Sebeok 2000). It is in this last sense that I understand *semiosphere*, as the sphere where humans, as living beings immersed and participating of the biosphere, participate in the production and circulation of signs. It remains to be highlighted however, that Lotman's notion of semiosphere, as stated in the quote above, does not depart from the concept of sign, as in Peirce (the source of most biosemiotic speculation), but from the concept of *text*, "immersed in semiotic space". References to this debate can be found in Kallevi Kull's "On Semiosis, Umwelt, and Semiosphere" (1998).

3. According to philosopher Manuel DeLanda, *assemblages* are wholes characterized by *relations of exteriority*. "These relations imply, first of all, that a component part of an assemblage may be detached from it and plugged into a different assemblage in which its interactions are different. In other words, the exteriority of relations implies a certain autonomy for the terms they relate, or as Deleuze puts it, it implies that 'a relation might change without the terms changing'." (2006:10-11). See also "Glossary" Pg. 167.

4. As will be developed, languages *as* devices should be understood as having a modelling aspect that influence our world views (see "Relation as order" Pg. 71). However, languages treated as modelling systems must be understood in their fluidity, as dynamic systems which are human re-

sponses and ways of enaction with-in natural and cultural environments (see "Boundaries" Pg. 73, and "Relating by languaging" Pg. 78).

5. This is an expression by Isabelle Stengers, who explicitly addresses this etho-ecological position in the essay "The Cosmopolitical Proposal". Latour and Wiebel (Eds.) 2005:997. See also "Whose worst-case-scenario?" Pg. 61.

6. Jacques Derrida would say that the origin is always crossed out. *Of Grammatology* (1997). Gilles Deleuze, that "if we call each proposition of consciousness a 'name', it is caught in an indefinite nominal regress, each name referring to another name which designates the sense of the preceding. However, the inability of empirical consciousness here corresponds to the 'nth' power of the language and its transcendent repetition to be able to speak infinitely of or about words themselves." (2004a:194).

7. I understand *affordance* following James Gibson 1979. Within design discourses, the notion of affordance has been, most notably, developed by Donald Norman (2002; 2004). I find however, Gibson's original approach more productive, since, in my view, Gibson's notion tends to highlight distributive agency rather than agency (see Pg. 58 and note 17 Pg. 196). Also of relevance to this work is language's capacity to modify our perception of affordances (see in note 5 Pg. 206).

8. Bruno Latour includes in the list of words ("weak terms") of an *infralanguage*, the most important words of the vocabulary of what is understood as "Actor-Network Theory" (ANT), including: network, group, actor, agency, translation and fluid (2005:174). To this list, and for the same reasons (the importance to avoid "global" overarching concepts with the intention to remain "local" and situated), this work will incorporate the notion of *device*. For understanding the general tensions in and of the ANT discourse and practice as a theory, see for instance John Law's "Actor Network Theory and Material Semiotics" in Turner (Ed.) 2009.

9. My translation. The development of these thoughts can be found not only in Morin's *Introduction á la pensée complexe*, but most notably, in Isabelle Stengers' *Power and Invention*, where she traces a history and a genealogy of complexity, studying its implications in terms of knowledge representation. See Stengers 1997.

10. Although the word *thing* here could be paralleled to 'object', it is loaded with a distinction following Bruno Latour, where 'thing' is used in an etymological sense, referring to *ting, ding, res, chose*, that is, were its etymological roots suggest what Latour calls "the collective", as in *res publica* (the public thing), thus implying a form of collective construction

required not to settle or determine what some-thing *is*, but what it may become, by acknowledging the "political ecology" at stake. See Latour 2004. Related to this, and following Deleuze, one would not say 'the tree *is* green' but 'the tree greens...' as "'a manner of being' of the thing, an 'aspect' that exceeded the Aristotelian alternative, essence-accident: for the verb 'to be' they [the Stoics] substitute 'to follow,' and they put manner in the place of essence." (Deleuze 1993:53).

11. In linguistics, a *natural language* is any ordinary language such as English, Spanish, or Japanese. That is, languages used for everyday communication, which can be written, signed or spoken. Linguists mainly distinguish natural languages from *formal languages* such as computer-programming languages or the languages used in formal and mathematical logic. Natural languages can also be differentiated from so-called *constructed languages*, such as those devised by groups or individuals to develop language games or artistic sensibilities. Although the approaches developed through the *prepositiontools* (Pg. 86) oscillate between natural and constructed languages, I believe that the playful use of grammatical constituents (in this approach, prepositions) does not formalize a language (which may be seen as constructed). The uses suggested by the *prepositiontools* imply non-formal or informal uses of a natural language, in this case, English.

12. The sentence has been repeated or referred to over and over and is pervasive throughout the body of Borges work. This particular quote refers to a saying by Ralph Waldo Emerson and can be found in the Norton Lectures that Borges gave at Harvard between 1967-68. See/listen Borges 2000.

13. See for example, the overview on *framing* in relation to ecology provided by Lakoff 2010.

14. Deleuze and Guattari 1994; 2004. Deleuze and Guattari elaborate upon Bernard Cache who believes that architecture is a primordial force that deals with the manipulation of the frame (1995:2) My approach in this work, deals with the notion of frame mainly through Elizabeth Grosz's development of it in *Chaos, territory, art. Deleuze and the framing of the earth* which is a particular elaboration that reflects Grosz's concern with the ontology of art as a manifestation of sexual difference. See "Framing" Pg. 118.

15. The notion of *excess* is here related (following Grosz, 2008) to the process of sexual selection as a form of "artistic" expression, a manifestation of surplus signification. It refers to the attraction exercised by bodies, as in the case of insects stimulated by the perfume of plants,

birdsongs, and all kind of erotic display. These forms of excesses *exceed* mere survival, being a form of affirmation of the excessiveness of the body. In this sense, sexual selection stands in close relation to natural selection (Charles Darwin). In this work, the notion of *excess* also refers to Francisco Varela's *surplus signification*, as that which must be valued (or not) by a given cognitive agent (Varela 1999:56). Thus the insect's capacity to perceive the smell of the flower *and* its assessing it as 'valuable' is what constitutes the perspective and the origin of the cognitive agent's world. See "Framing" Pg. 118.

16. Every time we come across words ending in 'able' or 'ible', as in something being walk*able*, read*able*, do*able*, invis*ible*, expand*able* and so on, we are facing something that is *made possible* due to our (or someone's/something's) relation to some other thing: an *affordance*. When we talk about affordances we understand that a bridge would be, for example walkable: it affords humans the possibility to walk over it. Water, does not afford that possibility (walking) to humans, but to other organisms, such as insects light enough to encounter the material support that allows them to walk on it. A linguistic and semantic study of our uses of these words can be found in Samuel Weber's *Benjamin's -abillities*, where Weber studies (2008) the implications of Walter Benjamin's use of *barkeiten* or abilities, as in *Übersetz-barkeit* (in "The task of the translator") or *Reproduzier-barkeit* (in "The work of art in the Age of its Technical Reproducibility"). Examples of design's capacity to explicitly en*able* can be found in Otto von Busch's *Fashion-*able*: Hacktivism and Engaged Fashion Design* (2008).

17. Grosz follows Deleuze, Guattari and Bernard Cache in this particular claim: architecture as a foundational gesture, which, in its delimiting of a territory, enacts a basic feature of animal territoriality and in this way, a manifestation of our own animality. See "Framing" Pg. 118.

18. Grosz writes: "By arts, I am concerned here with all forms of creativity or production that generate intensity, sensation, or affect: music, painting, sculpture, literature, architecture, design, landscape, dance, performance, and so on." (2008:3). Once again, it seems to me that referring to "design" in this sense, points at the specific disciplinary practices of design such as graphic, or industrial design, rather than at the more general approach suggested here, that of design as 'a way' to produce these sensations, affects, intensities.

HOSTING - (*Notes to Pgs. 41 to 64*)

1. Skeat 1993:208-209. This etymological and semantic tension has been

clearly exposed by Emile Benveniste who in his studies of Indo-European languages, explores not only the concepts of hospitality-hostility, but also that of gift (to which hospitality-hostility relate to) in all its diversity of forms of exchange (1973:53; 71).

2. In relation to the notion of *structural coupling* and *autopoiesis* (as the realization of the living), see also "Boundaries" Pg, 73 and "Glossary" Pg. 167.

3. An *Actant* is: Whatever acts or shifts actions, action itself being defined by a list of performances through trials; from these performances are deduced a set of competences with which the actant is endowed; [...] an actor is an actant endowed with a character (usually anthropomorphic). See "A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman assemblies" by Akrich and Latour in Bijker and Law 1992. See also the glossary in Latour 2004.

4. For an overview of types of expectations affecting design outcomes see, Lidwell, Holden and Butler 2003:68.

5. I understand 'information' in its etymological sense, as in in-*form*-mation, where the Latin *form* is a translation of the Greek *morph*. From the Latin *form* arose the verb *informare*: "to bring something into form", which is the root of the word *information*. Thus its relationship with the biological discipline of *morphology*. See Hoffmeyer and Emmeche 1991. See also Varela 1979:266. For information's relation to *exformation* see "defamiliarizing hospitality-hostility" Pg. 53. See also "Glossary" Pg. 167.

6. von Uexküll 2001a:107. Dorion Sagan, in his introduction to von Uexküll (2010), expresses that it would be premature however, to talk about a distinctly human umwelt. John Deely, on the other hand, mentions that "the Umwelt is first of all, even within semiotics, a vehicle for expressing especially the role of biological heritage in the use and function of signs, rather than for expressing what is species-specifically human in the use and function of signs" (2001:126). Deely suggests the word *lebenswelt* to describe a human specific umwelt. (note 7 in this page). See also Floyd Merrel's "A distinctly human umwelt" (2001). And "Relating by languaging" Pg. 78.

7. The term *umwelt* is contemporary to Edmund Husserl's *lebenswelt* (life-world). It would be possible to trace similarities between these terms. Without reference to Husserl, John Deely has suggested the word *lebenswelt* to be the species-specific human umwelt, alluding to our specific relationship with language. What in Maturana and Varela's terminology, and in this work, stands for *languaging*. See Deely 2001.

8. Similarly, John Deely distinguishes: "The concept of environmental niche simply identifies that part of the environment as physical upon which a given biological form mainly depends in deriving the physical aspects of its sustenance. The concept of Umwelt, by contrast, shows us how a given 'environmental niche' is merely the physical part of a larger, objective, not purely physical whole which is, as it were, fully comprehensible only from the perspective of the particular lifeform whose world it is, whose 'environment' is meaningful in the specific way that it is thanks only to an irreducible combination of relations many of which have no being apart from the lifeworld and all of which contribute to the contrast between the physical environment as neutral or common respecting all organisms, on the one hand, and parts of the same physical environment interpreted and incorporated within a meaningful sphere of existence shared by all the member species, on the other hand." (2001:129-130).

9. "Well the groom [the artefact that closes the door] is indeed anthropomorphic, and in three senses: first, it has been made by men, it is a construction; second it substitutes for the actions of people, and is a delegate that permanently occupies the position of a human; and third, it shapes human action by prescribing back what sort of people should pass through the door." Latour in Bijker and Law (Eds). 1992.

10. My reference to harmony relates, to Maturana and Varela's notion of *structural coupling* as the structural congruence between two or more systems (1998:75). See "Boundaries" Pg. 73. It also resonates (while aware of the risks of teleological interpretations) with Jakob von Uexküll's conception of the biosphere as a great symphony, were beings are in tune with one another "in counterpoint". Thus "Every Umwelt has its own spatial and temporal dimensions. The Umwelten intersect in many ways without disturbing each other. They do not interact mechanically but are still connected according to a plan as the notes of an oratorio are harmonically connected. It is thus musical and not mechanical laws that we need to study if we want to find out about the laws of Life. [...] the performances of animals are not products of a harmonic build of the body, it is the harmony of the performance that determines that of the body." von Uexküll 2001b. See also "Framing" Pg. 118 and "Other devisers" Pg. 121.

11. This is an extension of the discussion on morality. See the arguments on "de-scription", "inscription", and "prescription" in both Akrich's and Latour's essays in Bijker and Law (Eds.) 1992.

12. Note that one might not be aware of being 'participating' in any given 'use', as when we find ourselves, for example, triggering systems, humans, or nonhumans by being perceived by cameras or sensors.

13. Albert Borgmann has developed an alternative notion of *device*. I here introduce the reader to Foucault's and Agamben's conception since in my view, they are more inclusive and productive than Borgmann's. Borgmann distinguishes between *devices* and *things*, a distinction that I find particularly troublesome; [nontechnological or low-technological] things (i.e. a stove) being, in his conception, capable of engaging human beings while technological artefacts [devices] such as a central heating system invite disengaged consumption. See Borgmann 1984:40-48. For an overview and critique of Borgmann's work see Verbeek 2005:173-99.

14. Agamben 2009. The term *dispositif*, has been rendered into English as "apparatus", however, as the translators point out, the French word can designate any sort of device. See translator's note in Agamben 2009. See also *device* in "Glossary" Pg. 167.

15. From *Power/Knowledge: Selected Interviews and Other Writings, 1972-1977*, ed. C. Gordon (New York. Pantheon Books, 1980:194-96). Quoted in Agamben 2009:2.

16. Once again, I am referring to Bruno Latour's and Madeleine Akrich's arguments in Bijker and Law (Eds.) 1992. See also Stengers 1997.

17. I have mentioned that devices 'arrange', Gilles Deleuze believed that in formulating the notion of *apparatus*, Foucault could have been influenced by his (and Guattari's) notion of *arrangement* (agencement). See Deleuze 1995:89. Regardless of the accuracy of Deleuze's statement, it is relevant to point at a distinction in Deleuze and Guattari's philosophy between *arrangement* (agencement) and *assemblage*, since some translations have rendered these terms as synonyms. Martin Joughin, translator of Deleuze's *Negotiations*, mentions "... Foucault's 'apparatus' seems to me [...] more 'mechanical' than Deleuze's 'arrangement' (it might be noted that 'assemblage', which various translators have adopted for agencement, conveys neither the sense of preparation or orientation toward action nor that of reconfiguration –Deleuze himself [Critique et clinique, p. 27] translates 'arrangement' as agencement)." See Deleuze 1995:196. One could say, simplifying and using the logic of our arguments so far, that Foucault's notion highlights "agency" while Deleuze and Guattari's "distributive agency". For a development of assemblage theory based on Deleuzian philosophy see DeLanda 2006. For differences and similarities between Deleuzian and Actor-Network approaches to assemblages, see Palmås 2007.

18. This is the main criticism to be found in *Cradle to Cradle*, where McDonough and Braungart equate the logic of "less" (consumption, production, population...) to death, through the "triple R" of Reduce-Re-

use-Recycle. See, "Why being 'less' bad is no good" in McDonough and Braungart 2002. This critique has become more explicit after the debates and tendencies that originate from, for example, Al Gore's film, "An Inconvenient Truth" (directed by Davis Guggenheim 2006). "The key is not to make human industries and systems smaller, as efficiency advocates propound, but to design them to get bigger and better in a way that replenishes, restores, and nourishes the rest of the world. Thus the 'right things' for manufacturers and industrialists to do are those that lead to good growth -more niches, health, nourishment, diversity, intelligence, and abundance- for this generation of inhabitants on the planet and for generations to come." McDonough and Braungart 2002:78.

19. Gregory Bateson developed a concept of *mind* (2000 [1972]), where, simplifying, *mind* could be paralleled to 'nature'. "The individual nexus of pathways which I call 'me' is no longer so precious because that nexus is only part of a larger mind" (2000:471). Resembling in this way Varela's notion of "self", which "unit of identity" (In Bateson's terms) transcend the individual. As proposed by Fritjof Capra in "Bateson Revisited" (Capra 1996:297) Bateson's concept of *mind* can be developed in relation to Maturana and Varela's model of cognition as distributed agency.

20. See Latour 1997. Or rather, the efforts imply (human) social behaviour. In another passage Latour writes "I am a great fan of hinges, but I must confess that I admire hydraulic door-closers much more [...] Especially clever is its way of extracting energy from each and every unwilling, unwitting passer by. My sociologist friends at the School of Mines call such a clever extraction an "obligatory passage point", which is a very fitting name for a door; no matter what you feel, think or do, you have to leave a bit of your energy, literally, at the door. This is as clever as a toll booth." (in Bijker and Law, Eds. 1992).

21. See for instance Rockström et.al. 2009.

22. Stengers in Latour and Wiebel (Eds.) 2005:997.

23. See Stengers in Latour and Wiebel (Eds.) 2005:995.

24. Holling, Gunderson et. al. coined the word *panarchy,* to explain ecosystemic resilience drawing "upon the Greek god Pan to capture an image of unpredictable change and upon notions of hierarchies across scales to represent structures that sustain experiments, test results, and allow adaptive evolution." See Holling and Gunderson (Eds.) 2002:5.

25. The idea that an ecosystem 'hosts', provides, the conditions of existence for an-other, might suggest a network of 'spheres' (starting with

the bio-sphere) enveloping one another. Pointing at the work of people such as James Lovelock through his *Gaia* hypothesis (2000) described by Margulis as "symbiosis as seen from space" (1998:2), to the work of Vladimir Vernadsky, who proposed the notion of biosphere as the enveloping sphere of life on this planet; as well as the work of Yuri Lotman (semiosphere), Jakob von Uexküll (sphere of the senses), and contemporary biosemioticians. In contemporary philosophy, the idea of enveloping spheres, has been developed by Peter Sloterdijk, who in his *sphären* explicitly discusses the integration and interconnection of several spheres that range from the intimate to the global (2009). Bruno Latour, unaware of Lotman and the work of biosemioticians (personal conversation with Latour 2010), suggests that Sloterdijk's work stands for a "philosophy of design". See Latour 2008, and 2009. Although I agree with Latour's suggestion of the potential of Sloterdijk's philosophy to develop design. I believe that the metaphorical register of the work of Latour himself (networks) as well as the work of Deleuze and Guattari (networks, lines of flight, flows), DeLanda (nonlinearity), in their *transversality* (see Pg. 99), are capable of more fluid and empowering thoughts than the spherical conceptions named above.

UNFOLDING - (*Notes to Pgs. 65 to 103*)

1.   Quoted in Easterling 2005:123.

2. Not to mention the energy required for running the washing machine, the production and acquisition of the machine itself, the use of detergents and conditioners, the water consumption and the logistical systems they in their turn require, to name but a few of the most evident aspects of energy and material flows. Others similar cases might be found in, for instance Rivoli 2005; and Ávila, Carpenter and Mazé 2010.

3. As well as the water and environments of the areas where the t-shirts have been produced. These studies have been developed by Prevodnik 2008.

4.   Not that the accident itself is creative, but in the sense that it creates (transforms) possibilities.

5.   Virilio 1997:118, my translation. The theme is recurring in Virilio's work (2003, 2005). See also Virilio and Lotringer (1997, 2005). In engineering, failure's and error's relation to the evolution of useful things has been studied by Henri Petroski 1992; 1994; 1997; 2003. In relation to design Ezio Manzini talks about "rebound effects" see for instance Manzini 2003, while Edward Tenner 1996; 2003, suggests that "things bite back".

6.   See Serres and Latour 1995:202. Michel Serres asks "Why should philosophy continue to speak this telegraphic language consisting only of verbs and substantives, without any prepositions, without any declensions or pronouns, when without them we can express neither relations nor subjects nor objects? (Serres and Latour 1995:202). Consider however, the epistemological implications of distinguishing, as Martin Heidegger does *at*-hand and *for*-hand; or J-L. Nancy's use of *with* (2000), to name a few philosophical cases. In the context of design research, one can think of Christopher Frayling's distinction between research *by* design, research *through* design and research *for* design, the prepositions acting as the key to each particular approach.

7.   The denominations of the nine Aristotelian accidental categories vary, but the concepts remain. More important than the subcategorizations (some of them overlap) is the categorical distinction substance-accident.

8.   DeLanda in Grosz (Ed.) 1999:39. This is (also) the argument of biosemioticians, who (mostly based on C. S. Peirce and J. von Uexküll) see relation, rather than substance and accident, as the basis for semiotic articulation. "The thesis is that relation, rather than substance or accident, is to serve as the basis for all semiotic explanation, and that the ontological explanation in the traditional categories of substance and accident, to whatever extent it is valid, is subordinate to the standpoint of semiotic reason of being assimilable to (and subsequently analytically derivable from) transcendental relation and ontological relation generally" (John Deely in Bains 2001:147). On a linguistic plane, George Lakoff mentions, "Most of the research on categorization within cognitive psychology has been in the domain of physical objects and physical perception. But perhaps the strongest evidence against traditional views of categorization (...) come from the study of verb particles and prepositions." (1987:418)

9.   See for instance Lotman 1988; Lakoff and Johnson 1999; Lakoff 1987; Tyler and Evans 2003. On this issue Ludwig Wittgenstein writes: "If language is to be a means of communication, there must be agreement not only in definitions but also (queer as this may sound) in judgements." §242 (2001:75). For an account of linguistic modelling explicitly interrelated with geology and biology, see DeLanda 2005a.

10.   Warning against an objectivist view of the world, Lakoff states that "A collection of symbols placed in correspondence with an objectively structured world is viewed as a *representation* of reality" (1987:Xii). Similarly, Deleuze mentions "difference becomes an object of representation always in relation to a conceived identity, a judged analogy, an imagined opposition or a perceived similitude" (2004a:174).

11. There is a clear correspondence between Gibson's notion of *affordance* and von Uexküll's *carrier of meaning*. See also "Heterotopian propositions" Pg. 109 and note 5 Pg. 206 in particular for a connection between affordances and how they can be influenced through the use of language.

12. The notion of boundary is fundamental in Lotman's cultural semiotics. Influenced by Mikhail Bakhtin's notion of frontier, Lotman develops the concept to become one of the distinguishing features by which one understands a semiosphere. Being the boundaries of this (semio)sphere the field of tension "where languages come into being", and in opposition to its centre, the boundary is "the area of semiotic dynamism" (1990:134). As such, the boundary is conceived as an ambivalent notion that both, separates and unites. "It is always the boundary of something and so belongs to both frontier cultures, to both contiguous semiospheres. The boundary is bilingual and polylingual. The boundary is a mechanism for translating texts of an alien semiotics into 'our' language, it is the place where what is 'external' is transformed into what is 'internal', it is a filtering membrane which so transforms foreign texts that they become part of the semiosphere's internal semiotics while still retaining their own characteristics" (1990:136-137). See also Arán and Barei 2002. Although I do not develop the concept in this work, the notion of boundary deals, on a cultural, semiotic and anthropological level with issues of inclusion, exclusion, translation, and forms of arrangement. In this way, it relates to the key concepts of this work; device, frame. The issues of hospitality-hostility addressed here could be presented –if more specifically focused on the area of cultural dynamics- within the frame of (culturally produced) artefacts, which imply the assimilation, and/or transgression of physical and social boundaries at alternative scales.

In the context of physical processes, the notion of boundary could be interpreted and developed through studies of *phase transitions* and *symmetry-breaking* processes, as in DeLanda 2005b.

13. On this issue, Lakoff and Johnson point out that "Understanding our experiences in terms of objects and substances allows us to pick out parts of our experience and treat them as discrete entities or substances of a uniform kind. Once we can identify our experiences as entities or substances, we can refer to them, categorize them, and quantify them –and by this means, reason about them." (1999:25).

14. In Hoffmeyer 2008:301-303.

15. Maturana and Varela 1998:234. See also Varela 1992. The ethical implications of this view are exposed in Varela 1999, and are further developed in the sections "Devising" and "Concluding".

16. "…each language always implies a deterritorialization of the mouth, the tongue and the teeth. The mouth, tongue and teeth find their primitive territoriality in food. In giving themselves over to the articulation of sounds, the mouth, tongue and teeth deterritorialize. Thus there is a certain disjunction between eating and speaking, and even more, despite all appearances, between eating and writing. […] To speak, and above all to write is to fast. […] Ordinarily, in fact, language compensates for its deterritorialization by a reterritorialization in sense." (Deleuze and Guattari 1986:19-20). See also Maxine Sheets-Johnstone's notion of corporeal-kinetic forms, in the chapter "From animal to human" in Hoffmeyer 2008. Perhaps, the most compelling explanations against "representational knowledge" in favour of "embodied know-how" can be found in Manuel DeLanda's *A Thousand Years of Nonlinear History*. DeLanda writes: "…it is not the case that Eskimos perceive sixty (or whatever) different types of snow *because* they have sixty different words for snow. Rather, given the key role that snow plays in their nondiscursive daily practices, many synonyms for it can be expected to accumulate and then partially diverge, acquiring subtle shades of meaning. Thus, they have so many words for snow *because* they discriminate many different physically stable states for snow, using embodied intelligence. Besides […] the world itself is subject to processes of individuation which do not depend on human beings. In other words, reality does not have to wait for humans to sort it out into categories. Sorting processes that produce more or less homogeneous classes of individuals (rocks, species) occur independently of language." (2005a:322-323 n87). See also "Framing" Pg. 118.

17. *Cinema 2*, quoted in Lecercle 2002:252.

18. It has been observed that bees can communicate to other community members of the presence of, for example, a flower, this is done through direct visual contact among bees by means of a series of coordinated movements. What they cannot do is to communicate to a third party, for example, the bee that has seen the first bee telling of the flower nearby does not in its turn articulate these same movements to another bee establishing chain communication, since this second member lacks the sensory-motor stimuli to enact and pass along the message. In other words, they lack consciousness of their use of language and thus, they do not know that they are communicating.

19. Krause's recordings include comparisons of ecological niches before and after human management, testifying a radical shift in biodiversity, one that we do not see visually and that we do not perceive through our auditory system. See: http://fora.tv/2009/09/22/Dr_Bernie_Krause_The_Great_Animal_Orchestra. The evidence from Krause's studies would please Jakob von Uexküll, who pictured the biosphere as a great sym-

phony. Krause distinguishes among a biophony, a geophony and an athropophony pointing at the notion of *semiosphere* in the context of biosemiotic studies, and its relation to the von Uexküllian notion of umwelt through a variety of sound registers from different systems and beings. A description of an ontology of vibrational force can be found in Steve Goodman's *Sonic warfare: Sound, Affect, and the Ecology of Fear*. An ontology of sound can also be found in Grosz 2008.

20. Sagan in von Uexküll 2010: 23.

21. In more specific linguistic terms, these displacements of sense, refer to what is understood as a *functional* rather than a *logical* forms of containment. See Tyler and Evans 2003:181.

22. See Lakoff 1987:418. Chris Sinha and Tania Kuteva 1995, as well as Andrea Tyler and Vyvyan Evans 2003, have contested Lakoff's exposition of spatial semantics when describing the preposition *over*, due to its lack of syntagmatic information. They advocate for an approach based upon *distributed* spatial relational semantics (Sinha and Kuteva 1995:193). Agreeing with the critique, I have chosen to present the image schemata from Lakoff 1987 as in figure 3.5, for the reader to understand the basic assumptions of the conceptualization. Not challenging recent linguistic research, I am instead referring to a body of work that points out the complexity of language as enaction. Interestingly, recent linguistic studies depart from spatial semantics and subsume the logical and temporal relations to these forms of bodily associations, which my work with alternative formats (cards, rubber-stamps) reinforces.

23. In defining "central sense" Lakoff follows Claudia Brugman and also Susan Lindner. Based on this very model, the semantic network of the preposition *over* has been further developed and refined by Andrea Tyler and Vyvyan Evans. See Tyler and Evans 2003:12, as well as 2003:64.

24. Elizabeth Grosz writes, "Is knowledge opposed to the future? Is the future inherently unknowable? Although it may be true that certain forms of knowing or thinking are incapable of thinking about the new, the future, or becoming, there seems no essential opposition between them. If dominant modes of knowledge (causal, statistical) are incapable of envisioning the absolutely new, maybe other modes of knowing, other forms of thinking, need to be proposed. Only if thinking is itself part of the provenance of the new -which clearly involves a new account of what thought is- can thinking be an appropriate modality for dealing with the future, for coping with and producing the new." (1999:20).

25. The disruptions generated by alternating prepositions could be

compared with the method of random provocation under the tools of the green hat in Edward De Bono's *Six Thinking Hats*, where nouns are used to generate ideas. The principle of substitution is common to most 'creative methodologies' including TRIZ (Theory for inventive problem solving, Goldenberg et. al 2003). Any creative process does away with stability and rest, incorporating a tension that leads to asymmetry and reorganization. Lotman borrows from thermodynamics (Prigogine and Stengers) to talk about "the moment of creative inspiration as a situation of extreme far-from equilibrium which precludes any simple predictable development". (1990:101). Deleuze says: "Thought is primarily trespass and violence" (2004a:175). I believe that the main difference with other methods that use natural languages to create disruptions is that by using prepositions (*prepositiontools*) we become sensitive, more readily aware of the viewpoints, relations with, the stances adopted when creating or when the object in question was created.

26. Manuel DeLanda, following Deleuze. See for instance DeLanda 1999.

27. DeLanda mentions that Deleuze "affirms his desire for creating a *philosophy of difference*, and then denounces the categories of typological or representational thinking as obstacles to reaching that goal. The differences he has in mind are not the external *differences between things* that are part and parcel of classificatory practices, but productive differences perhaps best illustrated by *intensive differences*, differences in temperature, pressure, etc. within one and the same system, which are marked by thresholds of intensity determining phase transitions." (2005b:54 n60).

28. Among the implications of understanding cognition as a networked and emergent process, is that we should not attribute substantial identity (i.e. identifying cognition with the brain or the nervous system) to what is an emergent property of a complex distributive process, where several parts of an organism play a significant role. Another implication is that cognition does not flow seamlessly; in contrast, it is formed by a succession of behavioural patterns. See Varela 1999. Related to this, Winograd and Flores 1987:77 use the concept of *breakdown* (as in Heidegger but also Maturana and Varela) to develop computer design based on an ontological perspective of design.

29. Gregory Bateson believed that what is needed is to change our "unit" of identity in order to shift our perception of environments: "The most important task today is, perhaps, to learn to think in the new way. Let me say that *I* don't know how to think that way. Intellectually, I can stand here and I can give you a reasoned exposition of this matter; but if I am cutting down a tree, I still think 'Gregory Bateson' is cutting down the tree. *I* am cutting down the tree. 'Myself' is to me still an excessively concrete

object, different from the rest of what I have been calling 'mind'." (Bateson 2000:468). Related to the changes of units of perception is Steward Brand's work, most notably, *The clock of the Long Now* (2000), also *How Buildings Learn* (1997).

30. The notion of *transversality* was developed by Félix guattari and used in collaboration with Gilles Deleuze. Guattari's ecological conception of transversality is best exposed in *Chaosmosis* (1995). For an introduction to this notion see Gary Genosko's "The life and work of Félix Guattari: From transversality to ecosophy" in Guattari 2008.

31. In grammatical terms, when we try to identify an *object*, we ask questions such as "the weight of what, and for whom?". All objects —of a verb or of a preposition— answer the question *whom*? or *what*? To find the object of a preposition one needs to ask *whom* or *what* after the preposition. If I say 'her friend studied Arabic from an old dictionary', the object of the sentence is 'dictionary'. In this way objects of verbs and prepositions will become more explicitly articulated. The word 'object' in these sentences corresponds to its grammatical usage. As such, it does not necessarily correspond with the words 'artefact', 'thing', or 'device' in this work. Although it suggests a mode to inscribe artefacts from a grammatical perspective, it operates within its linguistic categorization and performativity. Working on this issue, Bruno Latour replaces the dichotomy object-subject for terms such as association and substitution, or syntagm and paradigm. See Latour 1999.

32. Rajchman 2000:56. See also Deleuze 1995:44.

33. Rajchman continues, "Connecting 'this' and 'that', moving 'here' and 'there', it has a different relation to language that Deleuze likens to the stammering of another language, not yet spoken, never completely understood" (2000:56-57). See also Rajchman 1998:3-4; 57.

34. See Rajchman 1998:56. Interestingly, the etymology of the word *absolute ab* (off) and *solver* (to loosen), suggests that the absolute is that which is loosened off and on the loose. When "a Catholic priest performs the act of ab-solution, he is the vehicle of a divine agency that loosens sins from their attachment to a particular soul" It is through the articulation of such "loosening" that Jane Bennett attempts to formulate a "thing-power" to acknowledge epistemological limits, the limits of human intelligibility in relation to what things can *do* (beyond our knowledge, control). See Bennett 2010:3.

35. In the chapter "The image of thought" Deleuze mentions: "A proposition by itself is particular, and represents a determinate *response*. A

series of propositions can be distributed in such a way that the responses they represent constitute a general *solution* (as in the case of the values of an algebraic equation). But precisely, propositions, whether general or particular, find their sense only in the subjacent problem which inspires them. Only the Idea or problem is universal. It is not the solution which lends its generality to the problem, but the problem which lends its universality to the solution." (2004a:201-202).

DEVISING - (*Notes to Pgs. 105 to 158*)

1. Sculptor Michael Joaquin Grey has explicitly developed proposals to facilitate thinking in relational terms. Grey, trying to understand the complexity of natural phenomena, studied relationships while and by developing sculptural elements such as "Zoob", and imagery such as "Object as preposition". Grey conceives the present moment in art history of "relational aesthetics" in terms of thinking with and through prepositions. Historically, in Grey's view, art has mostly been engaged with nouns, in the production of objects, and with verbs, in developing work that refers to processes. Today all these are accentuated through the relational logic made possible by focusing on prepositions. Personal conversation with Michael Joaquin Grey (2011). I have come across Grey's work after having completed the visual and material proposals of the *prepositiontools*. Closest to the work I have produced is, in its graphic form, the work entitled "Object as preposition". See www.citroid.com.

2. Similarly, Lakoff's book *Women, Fire and Dangerous Things* uses the same quote to introduce the category, from the Australian aboriginal language Dyirbal, which gives name to his book. What is at stake for both authors using this quote is the destabilization of *sense* in our (Western) culture, by means of the apparently illogical taxonomies.

3. Deleuze: "Aristotle invites us to consider 'the opinions accepted by all men or by the majority among them, or by the wise' in order to relate these to general (predictable) points of view, and thereby form the *places* which allow them to be established or refuted in discussion. The common places are thus the test of common sense itself: every problem the corresponding proposition of which contains a logical fault in regard to accident, genus, property or definition will be considered a false proposition." (2004a:199). John Law has written that "the ANT argument is that when a (network) object is performed, so too a (network) world is being enacted. But a network world is a topos. It is a set of spatial im/possibilities which defines the invariance of shapes as they are displaced." Law 2002. See also Mol and Law 2001 for alternative explorations of spatialities.

4.   Foucault further developed the notion of *heterotopia*, shifting his analyses from discourses to spaces. In this work, I have developed three-dimensional artefacts following what I understand to be the logic of his 'discursive' notion of heterotopia. I have consulted the Spanish translations of *Le corps utopique. Les Hétérotopies. Nouvelles Éditions Lignes 2009. And "Des espaces autres". "espace, savoir et pouvoir".* Editions Gallimard 1994. In *El Cuerpo Utópico. Heterotopías*. Buenos Aires, Nueva Vision 2010. In English see "Of Other Spaces, Heterotopias" ("Des Espace Autres", 1967). Available online, retrieved on February 19, 2008 at http://foucault.info/documents/heterotopia/foucault.heterotopia.en.html.

In this work, I sometimes refer to heterotopias as being (i)logical. The word logical being highlighted by the bracketing of the "i". With this, I do not suggest that they have no logic, rather, I point out the association of words and things which suggest unexpected sense-making that arises from a non-experiential logic or articulation of ideas.

5.   Regarding how language influences our capacity to perceive affordances, Umberto Eco writes: "Our capacity to recognize affordances is registered, so to speak, in linguistic usage itself. Violi wonders why, when faced with a table with a vase standing on it, we are led to interpret verbally what we see as *The vase is on the table* and not *The table is under the vase*. She suggests that 'the selection of linguistic expressions seems regulated by complex configurations of the intentional relations between the subject that moves in space and the objects that surround it.' But this is equivalent to saying that our CT [cognitive type] of the common vase also includes the sequence of actions that it permits, and so a vase is something easily movable that usually stands *on* something. On the other hand, our CT of the table includes not only its morphological features but also the notion (I would say, nuclear) that it is used to put something *on* (and never for being inserted *under* something). But Arnheim suggests that language can block our recognition of pertinency. Quoting a remark made by Braque, he admits that a coffee spoon acquires perceptual saliency that differs according to whether it is set alongside a coffee cup or inserted between shoe and heel like a shoe horn. But often it is the name with which we indicate the object that highlights one pertinency at the expense of others." (Eco 2000: 161-62). A debate on what Eco calls *pertinency* can be found in *Interpretation and Overinterpretation.* Eco et. al. 1992.

6.   In the particular Foucaultian way stated above. Foucault has emphasized that every culture orders codes and reflects upon order itself and establishes modes of being "In which knowledge grounds its positivity and thereby manifests a history which is not that of its growing perfection, but rather that of its conditions of possibility" (Foucault, 1990:XXII). I believe, following Manuel DeLanda, that although there are recurrent

features in these classifications (identity, resemblance, analogy and opposition) they do not form a global identity called an "episteme". See DeLanda 2002:39.

7.   "In all fictions, each time a man meets diverse alternatives, he chooses one and eliminates the others; in the work of the virtually impossible-to-disentangle Ts'ui Pen, the character chooses –simultaneously- all of them. *He creates*, thereby, 'several futures', several *times*, which themselves proliferate and fork. [...] Fang, let us say, has a secret; a stranger knocks at his door; Fang decides to kill him. Naturally, there are various possible outcomes –Fang can kill the intruder, the intruder can kill Fang, they can both live, they can both be killed, and so on. In Ts'ui Pen's novel, *all* the outcomes in fact occur; each is the starting point for further bifurcations. Once in a while, the paths of that labyrinth converge: for example, you come to this house, but in one of the possible pasts your are my enemy, in another my friend." Borges 1998:83. This recurrent theme in Borges is, as is well known, Leibinizian. Deleuze, in his *The Fold. Leibniz and The Baroque*, comments this passage from Borges and its particular position in terms of compossibility and incompossibility. Deleuze believes that contrary to Borges' (Leibnizian) God who plays a game without rules, Leibniz's "God palys tricks, but he also furnishes the rules of the game" (1993:62-63).

8.   Rajchman 1998:116. The notion of virtuality is recurrent in Deleuze and Guattari's work. See for instance Deleuze 1993:105; 2005 and Deleuze and Guattari 1994.

9.   See Deleuze 1993. Also Bruno Latour's "An attempt at writing a 'Compositionist Manifesto'" (2010).

10.   von Uexkull's fundamental starting point was that living organisms respond to signs rather than causal impulses. von Uexküll 2010; 2001a; 2001b. See also Paul Bains 2001:139.

11.   See Paracer and Ahmadjian 2000; Margulis 1998.

12.   Agamben traces back the genealogy of the concept of *life* in Western thought to Aristotle's *De Anima*, where one of the foundational concepts is that of nutritive power. See "Mysterium disiunctionis" in Agamben 2004. To this day, nutrition is still identified with life, thus, forms of parasitism, whether biological or metaphorical, tend to raise negative connotations by being associated with death.

13.   See "Parasite" in Ericson and Mazé (Eds.) 2011:284.

14.   For metaphors of disease, see Sontag 1991. For metaphors in Twentieth century biology see Keller 1995. It is relevant to note, that many parasites do not cause disease, "they do not disrupt or seriously diminish the performance of their host even though they take nutrients from the host. Parasites and parasitism should be viewed in the broader context of symbiosis and coevolution... *Pathogens* are defined as entities that produce disease conditions in their host." Paracer and Ahmadjian 2000:8.

15.   Although one can speak metaphorically of the wind or the whirlpool as autopoietic, the crucial difference, the crucial property of autopoietic cycles "is their ability to act not only as self-balancing, but also as self-amplifying feedback loops, which may push the system farther and farther away from equilibrium until it reaches a threshold of stability. This point is called a 'bifurcation point'. It is a point of instability at which new forms of order may spontaneously emerge, resulting in development and evolution." Capra 1996:167.

16.   This applies at all spatio-temporal scales. See for instance Manuel Delanda's warning not to compare cities with organisms 2005a:28.

17.   I am referring to human, as well as plant and animal sexuality: cell-fusion sex. What in biological terms is called meiotic sex. See for instance, Margulis 1998.

18.   Deleuze and Guattari: "Perhaps art begins with the animal, at least with the animal that carves out a territory and constructs a house (both are correlative, or even one and the same, in what is called a habitat). The territory-house system transforms a number of organic functions -sexuality, procreation, aggression, feeding. But this transformation does not explain the appearance of the territory and the house; rather it is the other way around: the territory implies the emergence of pure sensory qualities, of sensibilia that cease to be merely functional and become expressive features, making possible a transformation of functions." (1994:183). In their own footnote to this paragraph, Deleuze and Guattari differ from Konrad Lorenz's interpretation that territory and territoriality evolve in functional terms by being ecological zones established by species' intra-specific aggression; as when males from the same species fight for the possession of territory or the desired female. (Lorenz 2002). As framing, that is, as the rendering significant a spatial demarcation, the dispute can partly be referred back to Charles Darwin's *The Descent of Man*, where Darwin suggested that females choose males (sexually select) and thus shape the course of evolution. Although supported by some empirical studies, this is still controversial, and it is believed that both female choice as well as male signals and contests shape sexual selection. (Andersson 1994:31).

19.   See also "The Autonomy of Affect" in Massumi 2002.

20.   Kurokawa 1996. Also available at: http://www.kisho.co.jp/page.php/292.

21.   "Made by Products". Unpublished Master in design thesis at Goldsmiths, London UK, 2006. Personal communication with the author (2010), see for example: Sound waves, http://www.youtube.com/watch?v=aazkUTFczso. Steam while cooking, http://www.youtube.com/watch?v=LRwddo-lg28. TV-display magnetism, http://www.youtube.com/watch?v=SOZQ7Y9OlzQ&feature=related. Links retrieved in January 2011. Interestingly, this project explores what can be understood as Maxwell's Demon. J. C. Maxwell, stated in the Encyclopaedia Britannica of 1878 that "Dissipated energy is energy which we cannot lay hold of and direct at pleasure, such as the energy of the confused agitation of molecules which we call heat. Now, confusion, like the correlative term order, is not a property of material things in themselves, but only in relation to the mind which perceives them... It is only to a being in the intermediate stage, who can lay hold of some forms of energy while others elude his grasp, that energy appears to be passing inevitably from the available to the dissipated state". Quoted in Dorion Sagan's introduction to von Uexküll (2010). Sagan explains how this (Maxwell's) logic would eventually lead to the production of a perpetual motion machine, which "has been deemed impossible, not just theoretically but practically" (von Uexküll 2010:24).

22.   "The parasite light does not feed off EM fields and is in fact battery powered. [...] it uses an electric field sensor to relate the intensity of its function - in this case the amount of light emitted from 20 LEDs - to the strenght of the field it senses." Dunne and Raby 2001.

23.   See www.tuurvanbalen.com

24.   Cohen divides the instances as such: 1. A patient suffering from kidney failure gives a blood sample to the lab, the scientists cut from the patients' genome the regions that code for blood production (bone marrow tissues), and immune response (the major histocompatibility complex). They then extract the genome from the nucleus of a somatic cell taken from a sheep and substitute the corresponding regions of the sheep's genome with the DNA cut from the patients' genome. This recombinant DNA is then inserted into the nucleus of a pre-prepared sheep egg cell. Cell division in the egg is initiated and after a few divisions implanted into the receptive ewe. 2. The surrogate ewe gives birth to the transgenic lamb, which is given to the donor patient. 3. During the day, the dialysis sheep is free to roam in the patient's back garden, graze to cleanse its

kidneys, and drink water containing salt minerals, calcium and glucose. 4. At night, the sheep is placed on a special platform at the patient's bedside. The transgenic sheep's kidneys are connected via blood lines to the patient's fistula (a surgically enlarged vein). During the night, peristaltic pumps remove waste products from the patient's blood by pumping it out of the body, through the sheep's kidney (a natural, organic filtering system) and returning it, cleaned, to the patient. This happens over and over again throughout the night. Each time the "clean" blood is returned to the body, it picks up more waste products from the cells it circulates through, and brings these newly-collected toxins back to the sheep's kidney to be removed. The sheep urinates the toxins. See www.revitalcohen. com.

25. "This cyclical, cradle-to-cradle biological system has nourished a planet of thriving, diverse abundance for millions of years. Until very recently in the earth's history, it was the only system, and every living thing on the planet belonged to it. Growth was good. It meant more trees, more species, greater diversity and more complex, resilient ecosystems. Then came industry, which altered the natural equilibrium of materials on the planet. Humans took substances from Earth's crust and concentrated, altered, and synthesized them into vast quantities of material that cannot safely be returned to soil. Now material flows can be divided into two categories: biological mass and technical -that is, industrial- mass. From our perspective, these two kinds of material flows on the planet are just *biological and technical nutrients*. Biological nutrients are useful to the biosphere, while technical nutrients are useful for what we call the *technosphere*, the systems of industrial processes. Yet somehow we have evolved an industrial infrastructure that ignores the existence of nutrients of either kind." MacDonough and Braungart 2002:92-93.

26. The notion of *keystone species*, attempts to identify forms of life that produce a large effect in a given ecosystem. Robert Paine, who coined the term, originally exemplified the concept through the importance of sea stars (which he identified as a keystone species) in coral reefs: some sea stars may prey on sea urchins, mussels, and other shellfish that do not have other natural predators. If the sea star disappears or is taken away from the ecosystem, the mussel population proliferates without "control", driving out most other species, while the urchin population exterminates coral reefs. Case studies of ecosystemic resilience can be found in Holling and Gunderson (Eds.) 2002.

27. Our identification is stronger with the fish, perhaps by physical body correspondence. Judith Butler, on a human social scale mentions "...it seems that the ways that others act upon us, without our will, constitutes the occasion of an ethical appeal or solicitation. This means that we

are acted on, and solicited, ethically, prior to any clear sense of choice. To be impinged upon by another assumes a bodily proximity, and if it is the 'face' that acts upon us, then we are to some extent affected and claimed by that 'face' at the same time. On the other hand, our ethical obligations extend to those who are not proximate in any physical sense, and do not have to be part of a recognizable community to which we both belong. Indeed, for Levinas, those who act upon us are clearly other to us; it is precisely not by virtue of their sameness that we are bound to them." (2011:6). This passage highlights —to later challenge— not only the anthropocentrism of most forms of ethics, but also the racial identification (or lack of it) with an-other. The fungi, as entities to be considered in ethico-ecological terms is likely to be dismissed prior to any form of understanding of their ecological role in a given environment.

28. In Prevodnik 2008. At 3Ecologies, this type of diagramming was combined with three-dimensional animations. For our approach to diagramming, see Avila, Carpenter, Mazé 2010.

29. Note that the reference to scale is meant to indicate alternative spatio-temporal worlds (as enacted by other beings). At the human scale, Guattari's triple ecological register: psychological, social, and environmental, indicate our inevitably human perspective and capability or incapability to perceive and conceive other scales.

30. Guattari suggests that "Autopoeisis deserves to be rethought in terms of evolutionary, collective entities, which maintain diverse types of relations of alterity, rather than being implacably closed in on themselves. In such a case, institutions and technical machines appear to be allopoietic, but when one considers them in the context of the machinic assemblages they constitute with human beings, they become ipso facto autopoietic." (1995:39-40). In a sense, this was already addressed by Varela, when considering the perspectives or scales that can be adopted to look into autopoietic machines. He wrote: "Although an autopoietic machine can be treated as an allopoietic machine, this treatment does not reveal its organization as an autopoietic machine. In fact, autopoietic and allopoietic descriptions of a system are complementary pairs, depending on the observer's needs." (1979:16).

31. See Paul Bains' exposition of Deleuze and Guattari's development of the concept of autopoiesis, and its relation to the human capacity of perceiving/conceiving signs - Umwelt. (2001:159-61).

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