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WORLDING POLITICS: JUSTICE, COMMONS AND TECHNOSCIENCE

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ABSTRACT

The commons' movements are often interpreted in social theory as political subjectivities aiming to address justice via struggles for social power. Rather than conceiving the commons' movement inside the framework of the 'autonomy of the social' and instead of conceiving politics as a purely human affair, this thesis explores the emergence of a form of activism that is radically renewing our understanding of the commons. This is a form of activism grounded and enacted in the middle of hybrid compositions of the social, the technical and the material that characterise our technoscientific era.

This thesis investigates the constituent practices of 'material activism' through analysing and discussing heterogeneous materials (e.g. practices, stories, artefacts, ethics and modes of thinking and relating) collected during a multi-sited ethnography. The research seeks to describe the emergence of a form of politics that attempts to make a difference in the ontological configuration of the world through exploring the ecological culture of permaculture, the practices of hardware hacking, the technopolitics of the 15M movement and the knowledge practices of the Science and Justice research centre. The politics of worlding which emerges is treated as the outcome of experimental processes of interaction, materialisation and mattering, which directly involves the active presence and participation of 'significant' human and non-human entities. The thesis asks how to think justice when politics comes to matter and offers an invitation for thinking about commoning and the worlding of justice as 'a power to act with' starting from the activity of crafting matter in situated ecologies.

In the middle of the many technoscientific metamorphoses that characterise our contemporaneity, this politics of worlding is oriented to craft ecologies of living that are thick enough, rich enough and responsible enough for cultivating modest flourishing and justice.

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INTRODUCTION

This doctoral thesis has been, for me, an occasion for moving from one place to another, both literally and metaphorically. This movement could be, in part, summarised in a couple of sentences: *a relation of power and the power of relations are not the same thing; and this difference matters in a politics of commoning.* This thesis has been an occasion for developing these ideas and for feeling them as more than words. Politics, I learned from a friend, has to do with inventing viable paths for action. As a dog smells around trails in order to follow a track, we should do the same in our exercises for thinking. This friend used to call this attitude 'the ethic of the dog'. I was always enchanted by one author for his capacity of inventing viable paths and for showing that certain concepts are more capable of inaugurating viable paths than others. The concept of Michel Foucault that for a long time fascinated me is that of 'subjectification'. In an essay called 'The Subject and Power', written as an afterword to 'Michel Foucault: Beyond Structuralism and Hermeneutics' (Dreyfus and Rabinow 1983), Foucault takes us inside his work from a particular perspective. Reflecting on his work of the last twenty years – the essay was written in 1982 – the author presents to the reader the objectives of his theoretical adventure. The relevance of this essay resides in the fact that Foucault explains the main lines of problematisation that forced him to think, study and write. For this reason, this essay could be read as a sort of introduction to his work. As Foucault explains at the beginning of the essay, the question of the subject occupies the foreground of his interest:

> 'I would like to say, first of all, what has been the goal of my work during the last twenty years. It has not been to analyse the phenomena of power, nor to elaborate the foundations of such an analysis. My objective, instead, has been to create a history of the different modes by which, in our culture, human beings are made subjects. My work has dealt with three modes of objectification which transform human beings into subjects'. (Foucault 1982: 777)

The question of the subject, or better, an attempt to understand the many ways through which human beings are made subjects, represents the general theme and the goal of his research: what forced him to engage with the question of power. According to Foucault, an exercise of power is 'always a way of acting upon an acting subject or acting subjects by virtue of their acting or being capable of action. A set of actions upon other actions' (Ibid.: 789). Power has something to do with the capacity of structuring, influencing and

conducting the possible actions of others. This means that power presupposes freedom: 'power is exercised only over free subjects, and only insofar they are free' (Foucault 1982: 789-790). If subjects are free, resistance is possible. The 'intransitivity of freedom' is the condition of possibility of resistance. And it is thanks to the existence of practices of resistance that the theme of power can be opened to what Foucault calls 'the antagonism of strategies'. Power is not a closed circle and the very fact that relations of power are dynamic implies the strategic nature of power. Moreover, following Foucault, in order to investigate how power relations work, we need to follow what is resisting. As such:

> 'in order to understand what power relations are about, perhaps we should investigate the forms of resistance and attempts made to dissociate these relations.' (Ibid.: 780)

Understanding power via resistance: in this way the relation between power and subjectivity can be established not just by looking at the many ways through which human beings are made subjects, but also by looking at the ways through which human beings refuse to be a certain subject.

If there is a permanent political task in Foucault, it consists (definitely) of putting into question power relations, showing us the possibility of thinking 'the 'agonism' between power relations and the intransitivity of freedom' (Ibid.: 792). Through resistance the concept of subjectification becomes, in Foucault, something not independent from the ways in which a technology of power works, but definitely something irreducible to it. It cannot be independent because the refusal is always a refusal of an historical and determinate form of power. But what leads this refusal is something irreducible to power; an intransitive freedom. According to the intransitivity of freedom, a process of subjectification might be thought and experimented without being conceived as an effect of power. Here, according to my reading, we can trace 'the path of Foucault'. How is it possible to develop a form of subjectification not directly derived from the element of power? How could we be subjects in another way?

There is a clear point of connection between the specific way through which Foucault develops his articulation of the concept of power – in relation to the problem of subjectivity – and the emergence of a field of struggles that insist exactly on the same questions. According to Foucault there are basically three kinds of struggles: struggles against domination, against exploitation and against subjection. As such:

> ‘Generally, it can be said that there are three types of struggles: either against forms of domination (ethnic, social, and religious); against forms of exploitation which separate individuals from what they produce; or against that which ties the individual to himself and submits him to others in this way (struggles against subjection, against forms of subjectivity and submission). I think that in history you can find a lot of examples of these three kinds of social struggles, either isolated from each other or mixed together. But even when they are mixed, one of them, most of the time, prevails. For instance, in the feudal societies, the struggles against the forms of ethnic or social domination were prevalent, even though economic exploitation could have been very important among the revolt's causes. In the nineteenth century, the struggle against exploitation came into the foreground. And nowadays, the struggle against the forms of subjection against the submission of subjectivity is becoming more and more important, even though the struggles against forms of domination and exploitation have not disappeared.’ (Ibid.: 781-782)

The struggles against forms of subjectivity and subjection – putting in question ‘the power of men over women, of parents over children, of psychiatry over the mentally ill, of medicine over the population, of administration over the ways people live’ (Ibid.: 780) – ‘politicise’ the social beyond the borders inside which the question of politics was thought within the paradigms of exploitation and domination. These are struggles that, starting from specific questions, crisscross the entire social field, refusing to think about the political within the dichotomy of the public and the private. They are struggles distributed everywhere and at the same time they are local. They are ‘immediate’ struggles, whose goals consist less in developing a long-term strategy oriented to taking power and much more in refusing the actual effects of power on the everyday life of the subjected. Moreover, they put in question a form of power – the pastoral power – and the techniques through which an individual is tied to his or her own identity in a constraining way. Through the refusal of this kind of individualisations, they are struggles that put into question the power of making individual subjects in this way, affirming ‘the right to be different’: affirming new forms of subjectivity and inventing other ways of being a subject, other forms of life and ways of living.

A question that emerged during the first year of my doctoral studies, thinking with Foucault, was whether we are witness – 33 years after his essay – to the emergence of new political intensities. Whether, along with the struggles against domination, exploitation and subjection, we are witness to a constellation of movements that are experimenting with forms of politics in which practices of transformation are enacted toward the material modification of entities and ecologies that are populating the world.

From the global development of the ecological movements to the practices of solidarity inside the health movements, from the emergence of the free software movement to occupied factories all over the world, a multitude of movements do not just – or do not primarily – oppose power. They are constructing other ways of living, mundane alternatives of existence. More than resistance, the 'immediate' creation of alternatives seems to come first here. They are experimenting, starting from specific domains of practices, alternatives as material alternatives, thinking about politics from within the processes of materialisation that create entities and ecologies. Through inaugurating other ways of relating — between persons and persons, things and persons, plants and things, things and things — these movements are not just inventing new forms of self-organisation, they are performing new forms of interaction that often involve the active presence of more-than-human entities. They are also performing new regions of intelligibility of what counts as politics, creating new matters of concern and experimenting 'practical' ways of mattering and enacting justice.

At the beginning of my doctorate, the driving question for me was whether an account of these new political intensities could be developed inside a Foucauldian analytic of power. And, consequently, if an understanding of relations as relations of power could be an adequate framework for thinking about politics with the 'affirmative' and 'constituent' features of these contemporary movements. I thought for a long time around these questions. Luckily, it has not been a solitary exercise in thinking. Many encounters have been essential in developing another frame for my research. One day I encountered a book, *Modest Witness* by Donna Haraway (1997); another day Dimitris Papadopoulos started asking me what the connections between a material object – for example the table in front of us – and politics are; another day I read an article from Steve Brown (2002) on the work of Michele Serres. The list of favourable encounters, lucky readings, interesting conversations, curious trips – reading or moving geographically – is long. At the end of this adventure I can say that I used this PhD as a way to move from one place to another, to another line of problematisation that I can summarise in a sentence: to change the way of conceiving of a politics of transformation moving from a perspective based on the emergence of a collective subject of resistance capable of reconfiguring determinate power relations to a perspective based on the aim of affecting the material and ontological configuration of the world.

This point of turn brings with it the necessity of framing the category of the commons in a different way; insisting on the 'productive' and 'affirmative' role that

certain mundane and everyday practices have in reshaping specific domains of human and more-than-human activities via experimenting with alternative ways of relating to significant others. The commons' movements are often interpreted in social theory as political subjectivities aiming to address justice via struggles for social power. Rather than conceiving the commons' movement inside the framework of the 'autonomy of the social' and instead of conceiving politics as a purely human affair, this thesis explores the emergence of a form of activism that is radically renewing our understanding of the commons. This is a form of activism grounded and enacted in the midst of hybrid compositions of the social, the technical and the material that characterise our technoscientific era. The main transformative force of this form of activism consists of generating alternative forms of everyday existence by reclaiming, reworking and reworlding the ontological constitution of life.

This thesis investigates the constituent[1] practices of 'material activism' by analysing and discussing heterogeneous materials collected during a multi-sited ethnography. The research seeks to describe the emergence of a form of politics that attempts to make a difference in the ontological configuration of the world through exploring the ecological culture of permaculture, the practices of hardware hacking, the technopolitics of the 15M movement and the knowledge practices of the Science and Justice Research Centre. The politics of worlding that emerges is treated as the outcome of experimental processes of interaction, materialisation and mattering, which directly involve the active presence and participation of 'significant' human and non-human entities. The thesis asks how we think justice when politics comes to matter and offers an invitation for thinking about commoning and the worlding of justice as 'a power to act with' starting from the activity of crafting matter in situated ecologies.

In recent years, a series of contributions in science and technology studies, cultural anthropology, philosophy of science and related fields have invited us to take seriously what Braun and Whatmore (2010b) called 'the stuff of politics'. This expression emphasises the need to develop a fully materialist conception of politics — one that does not separate politics from the sociomaterial basis of life and from the concrete practices through which forms of life are created. These contributions resonate with what Martin Holbraad, Morten Axel Pedersen and Eduardo Viveiros de Castro (2014) call the 'politics of the ontological turn', and, in particular, with their insistence

[1] With this term I refer to a practice that is capable of making a significant difference inside a socio-material context, inaugurating a new epistemological, political, ethical, aesthetic paradigm.

on thinking of politics as the experimentation of possible 'otherwises' in the ways in which people and things relate to each other. Starting from these two precious contributions, it has been possible for me to find precious 'allies' for constructing a field of intelligibility of politics in which ways of relating matter for inhabiting our common worlds. But how to think about justice when politics becomes the 'stuff of politics'?

In Chapter 1 I continue this debate by analysing the theories of the commons (Hardt and Negri 2009; Caffentzis 2010) and their implications for thinking about a radical politics of justice. The central aim of this chapter consists of analysing to what extent theories of the commons – which represent a significant attachment in my political belonging – could offer us tools, concepts and useful categories for thinking the 'stuff of politics'. In this chapter I highlight how 'the autonomy of the social' is the terrain on which the theories of the commons project their own 'modern' intelligibility of politics, and how this way of dealing with politics ignores the many ways in which humans are connected with more-than-human entities in their everyday life.

In the attempt to rethink what a politics of the commons means beyond the categories of the modern political mediation, in Chapter 2 I look at a series of semiotics, contributions and authors with whom I think through possible paths for developing a framework for my central question: what a politics of the commons beyond the autonomy of the social might look like? One contribution comes from Bruno Latour (1993) who conceives the social not as a stable and ready made aggregate, but as something that can be traced only by taking into account the traffic of human and more-than-human relations that perform 'the social'. Another tool for developing a more-than-social politics comes from the notion of technoscience. In the thought of Donna Haraway (1997) this concept designates what emerges inside a hybrid composition of the social, the technological and the material, what comes inside the many processes of implosion, condensation and fusion that characterise collective life in our century. But how do we think of a politics of transformation in technoscience? The contributions of Dimitris Papadopoulos (2011) and Donna Haraway have been, for me, decisive for thinking about 'activism' as a capacity of affecting material change within a multitude of practices of alternative materialisation. Since several trajectories of technoscience create new ontologies, new worlds and new forms of life, a politics of alternative materialisation refers to the plurality of possible engagements in a specific socio-material arrangement. If the point of activism is making a difference in the material world – i.e. in the many ways in which people and things, people and people, organic

and inorganic elements relate to each other – a politics of transformation could be understood as a politics of worlding. Acting, as Haraway reminds us, means always acting *with*. And 'acting with' is demanding. It demands us to conceive of a logic of transformation always as a logic in construction.

The methodology (Chapter 3) I choose in order to investigate the constituent practices of what I call material activism, is a multi-sited ethnography (Marcus 1998). By analysing and discussing heterogeneous materials (e.g. practices, stories, artefacts, ethics and modes of thinking and relating) collected during a multi-sited ethnography, my research seeks to describe the emergence of a form of politics that attempts to make a difference in the ontological configuration of the world. Through my four sites of inquiry I investigated different experimental processes of interaction, materialisation and mattering, starting from specific practices of making. From Chapter 4 to Chapter 7 I develop the empirical part of this thesis. In each of these chapters I engage with a site of inquiry, in an attempt to think with my practitioners about what a politics of commoning looks like, starting from very different contexts of practices. In each of these chapters I introduce concepts for thinking a politics of commoning in technoscience.

Looking at the technopolitical practices of organisation inside the 15M movement, in Chapter 4 I develop an idea of what interaction means starting from the concept of 'pink noise'— a fractal pattern of 'noise' produced by the interaction among several accounts on Twitter. Dealing with a qualitative analysis of the 15M movement, I show how the contour of a post-identity politics requires an ability to feel and act with significant others. Understanding 'acting with' via noise – which means understanding a process via the noise generated by the interconnections that populate such process – is a lure for thinking about how what counts in a politics of 'acting with' consists of the qualities of the interaction dynamics. This movement brings with it the idea that, in a collective process, being inside a flux of mutation is much more relevant than taking control of the collective process. The experience of the 15M movement taught me that the construction of meanings and paths for action is a matter of interaction. What matters for an actor in this context of practices consists of cultivating a disposition for the collective process, being inside an ongoing speaking-listening feedback and being synchronized in a rhythm, which means being connected with a flux of mutation.

Ecological practices of permaculture are the object of Chapter 5. I understand permaculture as an ethic of making in which making worlds is a matter of 'acting with' and exchanging. In permaculture an ecology is understood as a co-producing

relationality, in which matter is fused in its environment and the environment enters into the nature of each thing. Constructing resilient forms of life with the many actors that populate an ecology is the fundamental ethic of permaculture. By thinking of permaculture as an ecology of canals it is possible to understand what kind of contribution the practices of permaculture offer us in theorising processes of worlding as a matter of asymmetrical exchanges. Worlding is a matter of asymmetrical exchanges in a 'multi-species engagement'. In permaculture such webs of relational cooperation seem to be conceived both as the unstable ground in which life happens and as a decisive plateau in which inventing ways of making 'islands' and 'forests of resilience' with significant others. In doing that, emotional and physical feelings are, in permaculture, the *fabricant sentinel* of such forests. But of which kind of science of construction are we talking about? A rigorous science, even if not an exact one. A science made of rhythms, waves and passages of thresholds, of inter-surroundings and interruptions. Permaculture is a science of canals fostered by multi-species alliances where 'acting with' means exchange, and exchanges seem to take the form of thefts and gifts.

In Chapter 6 I ask what it means to think about the use of things via hacking practices, putting at the centre of my analysis the use of a microcontroller called Arduino. Exploring hacking and its open-source culture, in this chapter I reflect on what 'the use of things' is becoming in our technoscientific era and which political practices and imaginaries are linked with a DIY culture of distributed invention. Insisting on the potentiality of a politics of the commons in an historical moment in which the open-code culture is affecting the composition of material objects, I look at what does it mean to act with significant humans and more-than-human entities via a relation of use. Developing an ontology of relations called 'medial ontology', I show how through using something we are affected by our relation with a thing. Such a power of relation sometimes has the potentia not just to associate pre-existent entities, but to reshape them via their relation.

In my last site of inquiry (Chapter 7), through the knowledge practices developed in the Science and Justice Research Centre (UCSC), I reflect on what happens when justice comes to matter. How do we conceive a politics of worlding as the worlding of justice? This is the central question that crisscrosses my last chapter. Thinking about justice respectively as a force operating on our collective ability to develop complex accountabilities of the many worlds that contemporary technoscience conjugates, as a

lure for the invention of ethical constraints and, above all, as a force of action, I develop the idea that the enactment of justice in technoscience has less to do with the emergence of collective struggles able to contest power by visible resistance and much more with generating alternative modes of interaction, materialisation and mattering: alternative technoscience. Justice is a force for action, for crafting ecologies of living that are thick enough, rich enough and responsible enough for cultivating modest flourishing; for materialising alternative forms of existence. Since a politics of worlding refers to the power of difference, justice in a politics of worlding consists of 'enacting justice' by making material differences with the many significant others that are – here and now – suffering from the everyday consequences of power differences. By thinking about commoning respectively through the concepts of pink noise, exchange, the use of things and justice, I develop a framework in which the worlding of politics has to do more with the power of relations than with relations of power.

CHAPTER 1
THE POLITICS OF THE COMMONS

In recent years a series of contributions in science and technology studies (STS), cultural anthropology, geography, philosophy of science and related fields have invited us to take seriously 'the stuff of politics'. This expression, that I borrow from Bruce Braun and Sarah J. Whatmore (2010b), emphasises the necessity of developing a fully materialist conception of politics, one that does not separate politics from the socio-material basis of life and from the concrete practices through which forms of life are created. A couple of relevant examples of this trend are represented by a roundtable generated by the text *The Politics of Ontology: Anthropological Positions*[2] – in the journal *Cultural Anthropology* – and by the book *Political Matter: Technoscience, Democracy and Public Life* edited by Braun and Whatmore. In *The Politics of Ontology* the actuality of a 'demand of politics' is posed starting from cultural anthropology and its ontological turn – a field of knowledge production particularly relevant in social sciences. In describing the peculiar way in which ontology and politics are correlated in the politics of ontology, the authors of this text introduce us to 'the anthropological concept of ontology' describing it as 'the multiplicity of forms of existence enacted in concrete practices, where politics becomes the non-sceptical elicitation of this manifold of potentials for how things could be – what Elizabeth Povinelli, as we understand her, calls "the otherwise"' (Holbraad et al. 2014). In this quote 'ontology' is synonymous with forms of existence, ways of living and forms of life 'enacted in concrete practices', and anthropology is seen as a 'lure' for making visible 'possible alternatives' for crafting other conditions of existence and forms of life. If the production of the 'otherwise' is a matter of ontological politics, following these authors' anthropology in itself – as a technology of description – can represent a way of enacting this form of politics. So, in the ontological turn of anthropology, politics is conceived within anthropology as a proposal for a situated knowledge politics in anthropology.

Through the study of ethnographic difference or 'alterity' the goal of the politics of anthropology consists in fact in 'passing through' what anthropologists themselves are studying, in making the otherwise visible 'by experimenting with the conceptual affordances present in a given body of ethnographic materials' (Holbraad et al. 2014). Articulating 'what could be' in this way, which implies a peculiarly anti-normative

[2] The authors are Martin Holbraad, Morten Axel Pedersen and Eduardo Viveiros de Castro.

stance, is recognised as the peculiar way of making a difference via anthropology. Moreover this exercise of making the otherwise visible as a non-normative way of sustaining and articulating 'what could be' is conceived as a science of 'the ontological self-determination of the world's peoples' (Holbraad et al. 2014). This is another way to say that ontology – as the multiplicity of forms of existence enacted in concrete practices – is, in itself, a matter of difference; 'the power of difference'. From this perspective what counts as politics consists in sustaining the power to differ, without ignoring the many connections between 'power differences' and 'the power of difference', which means without ignoring the many ways in which power differences could destroy, exterminate and annihilate the material existence of differences. For this reason this proposal brings with itself an ethical commitment to sustain the many other-wises 'as possible indefinitely'. Now, if we try to abstract the idea of politics from the situated terrain in which it is conceived here – the politics of anthropology – and if we try to think what does politics mean *per se* inside this proposal, we can say that politics is synonymous with a possible otherwise. A possible otherwise that refers to the processes of everyday constitution of things and beings: the politics of ontology in fact is about the question of how persons and things 'could alter from themselves' (Holbraad et al. 2014). The power of difference and the otherwise are political concepts that refer directly to the ontological constitution of entities: to what they could become. Thus, according to the ontological turn, taking seriously the stuff of politics means taking seriously forms of life and material practices for what they could become. Thinking together what is becoming and what could be is not a way of projecting a future in the present. Rather, it is a way for making the present thick, for opening it to a manifold of possibilities.

If in the ontological turn politics become synonymous with ontological politics, in the book *Political Matter* (Braun and Whatmore 2010a) the word politics is questioned, starting from the acknowledgment of the significant role of more-than-human agencies and technological objects in the fabric of social conducts and political association. The expression 'materialisation of politics' in this context of meaning in fact suggests 'the constitutive nature of material processes and entities in social and political life, the way that things of every imaginable kind – material objects, informed materials, bodies, machines, even media ecologies – help constitute the common worlds that we share and the dense fabric of relations with others in and through which we live' (Braun and Whatmore 2010b: ix). Politics, as we can see clearly in this citation, means 'the politics

of matter', that is, the politics that partially shapes and emerges inside the ecologies in which we live, inside our common worlds made by more-than-human relations. A politics of matter is capable of taking into account artefacts and technologies, animals, plants and bacteria, modes of materialisation and mattering in the analysis of how situated collectivities are assembled.

How are collectives assembled? This question is at the heart of the last thirty years of research in STS. The explorative dimension of this collective book consists in evaluating the significant role of science studies in showing how much the everyday technoscientific practices and more-than-human entities are significant elements of our common worlds. At the same time – starting from this fully materialist idea of politics – the book asks what does it mean to imagine and open new possibilities of relation between scientific and political practices. Once it is said that the common consists in a contingent unification of things and bodies, and that it is always a matter of a provisional assemblage, the question becomes: how could our common worlds be different from how they actually are? Taking seriously 'the stuff of politics', for the editors of this collection, means actively engaging with this question. It means thinking a form of politics directly involved in shaping alternative forms of materialisation and mattering. Here again the demand of politics is a demand for an otherwise. But if, in the 'ontological turn' in anthropology, this kind of politics is suggesting, first of all, a knowledge politics within anthropology, here the 'demand of politics' as a proposal of discussion is more open to a fusion with ideas and concepts that come from political theory. This urgency is induced by two reasons. The first reason refers to the fact that, often within STS literature, concepts such as citizenship, representation, democracy and politics are evoked without a clear account of what they mean, or even worse, without any critical distance in relation to the political traditions that forged these concepts. The second reason refers to the necessity of rethinking a space of connection between techno-scientific practices and political practices. This demand of politics interrogates frontally the question of political transformation – how could our common worlds be different from how they actually are? In this chapter, I extend the contamination between STS and political theory by analysing the theories of the commons and their implications in thinking a politics of transformation.

If the 'stuff of politics' is about experimenting possible 'other-wises' in the ways in which people and things relate to each other, and if this form of politics is enacted starting from the material practices through which relations are enacted, the central aim

of this chapter consists in analysing to which extent the theories of the commons could offer us tools, concepts and useful categories for thinking the 'stuff of politics'. The concept of the commons offers us an intelligibility of politics grounded, similarly to the 'stuff of politics', inside the traffic of relations between 'nature' and 'society' – 'the commons is an activity and, if anything, it expresses relationships in society that are inseparable from relations to nature' (Linebaugh 2008: 279). Theories of the commons place alongside this intelligibility, an affirmative political hypothesis based on the transformation of society. By changing the actual power relationship, it is possible, from the perspective of the theories of the commons, to establish more sustainable relations. My challenge here is understanding how far the theories of the commons can guide us in thinking about the question of transformation and how we think other common worlds via commons. Since the notion of 'common worlds' – with this expression I refer to an understanding of the common in which the existence of various forms of life is based on contingent unifications of things and bodies – qualifies an intelligibility of politics in which relationality matters, I will concentrate my attention in exploring what relationality means in the political theories of the commons.

In order to engage with these questions, in this chapter I introduce different theorisations of the politics of the commons. In particular I focus on how these political theories engage on one side with the question of appropriation (section 1.1) and on the other side with the one of production (section 1.2). Starting from these two different points of departure, we have different accounts of the notion of commons. In the last section (1.3), I analyse what does it mean to think about 'relationality' – the ways through which persons and things, persons and persons, things and persons relate to each other – starting from the categories of appropriation and production, and which figurations and intelligibilities of politics are implied in thinking about transformation via the theories of the commons. Finally, since the goal of this chapter consists in understanding to what extent the theories of the commons are useful for thinking about the material and ontological dimension of what we provisionally are calling the 'otherwise', I will explore what the otherwise means in the theories of the commons, how struggles are conceived in politics of transformation and to what degree non-human entities are taken into account in these political perspectives.

1.1 The Commons and 'the So-Called Primitive Accumulation'

> 'In the history of primitive accumulation, all revolutions are epoch-making that act as levers for the capital class in course of formation; but, above all, those moments when great masses of men are suddenly and forcibly torn from their means of subsistence, and hurled as free and "unattached" proletarians on the labour-market. The expropriation of the agricultural producer, of the peasant, from the soil, is the basis of the whole process. The history of this expropriation, in different countries, assumes different aspects, and runs through its various phases in different orders of succession, and at different periods. In England alone, which we take as our example, has it the classic form.' (Marx 2001 [1886]: 1023)

In the 1980s and the early 1990s, in the middle of the 'idyllic' rhetoric surrounding a new world order, Midnight Notes Collective (1990) reintroduced the notions of enclosures and primitive accumulation as applicable for a critical interpretation of the significant transformations of the capitalist mode of production underway since the mid 1970s. Even if strong attention is paid to the World Bank and International Monetary Fund's Structural Adjustment Plans attacking the commons in the 'global south', the process of enclosure and expropriation they describe does not exclusively concern the 'south' of the world; it affects the global space of contemporary capitalism as it keeps redrawing its geographical coordinates. From the expulsion of people from their community-owned land in Nigeria to the processes of privatisation and demonetarisation that characterised the impacts of the Structural Adjustment Plans in Asia, Africa and Latin America, passing through the gentrification of New York City, the conditions of exploitation that portray 'the free enterprise zone' in Manila and the decline, since 1973, of real wages of the mass of workers in the US, the enclosures are synonym of a global process of capitalistic expropriation and accumulation. In the words of Midnight Notes Collective:

> 'Under the logic of capitalist accumulation in this period, for every factory in a free-trade zone in China privatised and sold to a New York commercial bank, for every acre enclosed by a World Bank development project in Africa or Asia as part of a 'debt for equity' swap, a corresponding enclosure must occur in the U.S. and Western Europe.' (Midnight Notes Collective 1990: 2)

The enclosure here is understood as a category able to give a large-scale understanding of different processes and events in the global space and as the common denomination of proletarians' experience across the world. In the middle of these complex capitalist transformations, the members of the collective considered it useful to propose reflection

on the efforts to separate populations from their means of production and subsistence, describing the emergence of a multitude of figures of the proletarian as the main effect of processes of dispossession. As such:

> 'The main objective of this process has been to uproot workers from the terrain on which their organisational power has been built, so that [...] they are forced to work and fight in a strange environment where the forms of resistance possible at home are no longer available. Thus, once again, as at the dawn of capitalism, the physiognomy of the world proletariat is that of the pauper, the vagabond, the criminal, the panhandler, the street peddler, the refugee sweatshop worker, the mercenary, the rioter.' (Midnight Notes Collective 1990: 3)

During the last twenty-five years this kind of project of connecting the 'spectrum' of Marx's picture of the English first modernity to our global present, has gained a strong relevance within various attempts to pose the notion of commons as a relevant one inside several contemporary objects of reflection and eco-social movements. From water to air pollution, from land to knowledge, the struggles around the commons are proliferating globally. The political centrality of the category of the commons is strictly connected with the emergence of a multitude of struggles around the so-called 'natural' and 'artificial' commons. In these struggles, the commons are often a synonym of resources that provide the basis for various forms of life. The struggles for the commons are struggles for not being separated from access to resources and means of production and reproduction. The commons are natural and cultural resources. Communities struggle against their privatisation and for holding and managing in common access to them. In grasping the contemporary 'success' of this term, in the next paragraphs I will introduce some rereading of Marx's contribution on commons and the so-called primitive accumulation.

In *Capital* Marx proposes an analysis of what he called 'mode of production': the fundamental structure of his understanding of history and politics. In the first chapters of *Capital* he engages with 'the secret' of the capitalist mode of production – surplus value. Later, in the chapter on primitive accumulation, Marx speaks about the prehistory of the capitalist mode of production. Marx wants to show that the capitalistic mode of production does not presuppose itself, that workers and capital are preconditions of the capitalist machine. These preconditions are grounded not in the right of property, nor in the right and duty to work, but in the 'fire and blood' of extra- and pre-juridical acts of violence. 'The so-called primitive accumulation' is the expression through which Marx describes the violence of the enclosures, which means the eviction of tenants from

common land and the private appropriation of common land by the landed aristocracy. First the violence of the enclosures, then the right, Marx seems to suggest. In continuity with this interpretation – 'the primitive accumulation stays to the political economy as original sin does in theology' (Marx) – this chapter on the so-called primitive accumulation represents for Read 'an understanding of the capitalistic mode of production itself' (2003: 20). Or, as De Angelis (2007) says, the violence that inaugurated 'the beginning of history'.

Pinpointing in the primitive accumulation a genealogy of the present means not just collocating the violence of the expropriation of the commons at the heart of the origin of capitalism, but also reading the movement of accumulation of capital as the immanent logic of commons' enclosure. Primitive accumulation, in authors such as George Caffentzis (2010), Silvia Federici (2004) and Sandro Mezzadra (2011), occupies, in fact, the place of both an historical fact and an internal logic that from 'the beginning' to our days marks the inauguration of new cycles of capitalist expansion. In this perspective, primitive accumulation becomes 'a logic of repetition', a decisive trait that comes along with the development of capitalism. Dealing with the theme of the commons through a logic of appropriation means insisting on the private appropriation of the commons and on its consequences: the dispossession of entire populations from their means of production. Starting from this kind of reading of Marx, the question of the commons becomes not just an understanding of the capitalist logic of reproduction, but also an attempt to see, in the struggles against the processes of accumulation of capital, the political perspective of the commons. Such a perspective is often developed in two directions: as a movement of dis-accumulation of capital and as a movement of re-appropriation of capital. These two political hypotheses propose a different articulation of class struggle, history and commons, as well as a different accent in their understanding of the capitalist mode of production.

Reappropriation brings to a dialectic and progressive understanding of history and class struggle: in synthesis the antagonistic relation between classes – the distribution of individuals in two distinct and antagonistic poles is often understood in Marxism as the main social effect of the primitive accumulation – has the potentiality to determine a collective process of reappropriation, realising 'the negative of the negative'. This 'double negation', a Hegelian dialectic figure, seems to characterise the logic of reappropriation: as the so-called primitive accumulation has defined a 'negation' of the pre-existent commons, in this perspective a second negation, an expropriation of a

second level – the expropriation of the expropriators in Marxian terms – can realise the negation of the capital. In this sense when Mezzadra (2011), speaks about the question of reappropriation he refers to the collective appropriation of wealth and means of production generated during the capitalistic development: here the goal does not consist of restoring pre-capitalist modes of production, but of the collective appropriation of the wealth produced by the capitalist mode of production. This political understanding is grounded on two correlated hypotheses. The first consists of the idea that the capitalist mode of production is not 'a totality' or a unitary object. Quite the contrary, capitalism is understood as a social relation between two molar and antagonistic subjects: capital and labour. The second one refers to an interpretation of the role of labour as a partiality potentially capable of reappropriating – via social struggles – the whole (wealth produced and means of production). Here the commons are not just the condition of possibility for the development of capitalism, but the common becomes a singular name, a 'universal', an object of desire that can be gained through the struggles of an antagonistic subject. In Mezzadra's words:

> 'The point I would like to stress is that we need to leave behind the image of the commons as something that is exclusively given and existing, and work toward the possibility that the common is something to produce, something that is built by a collective subject that is capable, in the process of its own constitution, of destroying the basis of exploitation and reinventing the common conditions of a production structured on the synthesis of freedom and equality. What is communism, if not the "dream of a thing" that we need to start dreaming again?' (Mezzadra 2011: 318)

In Mezzadra the commons are thought outside the centrality of the meaning 'resources'. Quite the opposite, the common – singular – is an object of production that deserves to be 'realised' through a dialectic understanding of history. Here the common is another name for a humanistic project called communism. And communism, the collective appropriation of the wealth collectively produced, is what comes after capitalism. Not an historical necessity, but the dream of a 'whole' that deserves to be produced.

Even if the theme of reappropriation is present in Caffentzis' thought, in this author's work the notion of commons refers more to a process of disaccumulation of capital, defined as an anti- or extra- capitalist use of the commons. In the reading of Caffentzis and Federici, and in their attempt to contextualise this 'primitive' event in our contemporaneity, the commons are often conceived as the antecedent (what there was or there is before) of an event of dispossession. As in the case of 'the common

land', portions of population are separated by their means of production and reproduction. Consequently, disaccumulation refers to the capacity of subtraction from the capitalist power of dispossession; it implies a capacity of resistance against the processes of privatisation and it often alludes to a communitarian, pre- or post-capitalistic relation with commons. Disaccumulation can be interpreted directly in opposition to primitive accumulation and it is based on an antagonistic logic between capitalism and anti-capitalist commons. Such antagonistic logic crosses the history of capitalism and at each stage the development of capitalism is exposed to the struggles of communities for not being separated from their resources and means of subsistence. In fact, for Caffentzis, at every point in the history of capitalism new commons are formed: following Caffentzis three examples of such anti-capitalist commons are those created by the eighteenth-century Atlantic pirates, the late nineteenth and early twentieth-century hobos of US Hobohemia, and the late twentieth and early twenty-first century programmers and hackers of the free software movement throughout the planet.

> 'After all, the pirates expropriated the most advanced machine of their period, the ocean-going ship, ran it on new communalist rules and used it to plunder the plunders of American wealth. The hoboes similarly expropriated the railroads and railroad land for their own purposes, and developed new codes for appropriating these machines and land. Finally, the programmers and hackers of the free software movement are expropriating the most sophisticated technology of the age, creating new rules for sharing it (such as the 'creative commons license'), and using it to undermine the power of the large software monopolists like Microsoft, Inc.' (Caffentzis 2010: 34)

Building up alternative forms of relation between resources (i.e. land, water, technology, knowledge) and communities, the theme of the commons alludes directly to new political constitutions. Here, the notion of commons refers to a multitude of movements and practical experimentations that share an antagonistic attitude in relation to capitalist society, often interpreted as equivalent to a regime of private property. This antagonistic point of view defines a conception of the commons as a time-space of practices that emerge against the capitalist society, prefiguring – here and now – a reality outside capitalist society itself. Inside this linear symmetry the commons represent the 'other of property'; as both a resistance against the violence of the (new) enclosures and as an attempt to create new resources, means of production and forms of organising outside the proprietary regime. Following Caffentzis the anti-capitalist commons are resources and practices of organising not captured by the capitalist mode

of production; 'common goods' external to the capitalist appropriation and valorisation. Entities, whose 'use value' is not (yet) translated into the language of 'exchange value'. But what happens if commons, instead of something external to the capitalist social relation, are understood as productive forces within capitalism?

1.2 Knowledge, Social Cooperation and Forms of Life as Direct Forces of Production

> "The development of fixed capital indicates to what degree general social knowledge has become a *direct force of production,* and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it. To what degree the powers of social production have been produced, not only in the form of knowledge, but also as immediate organs of social practice, of the real life process." (Marx 1973 [1941]: 638, emphasis original)

If, in the previous section, I referred to the notion of commons starting from the question of appropriation, in this section I see the commons in relation to the question of production, dealing with a literature on commons more inclined to develop an analysis of the role of commons inside capitalist society. For the authors I will introduce in this section the themes of dispossession and expropriation are not absent but, more than insisting on the reappearance of the primitive accumulation as a logic of dispossession, they focus their analytical attention on 'the productivity of living labour', proposing, with Marx, an understanding of capital as a productive system that generates wealth through labour power. What these authors propose is a re-reading of this Marxist analysis inside the contemporary transformations of the capitalist mode of production. In order to deal with this, these authors – Michael Hardt and Antonio Negri (2000; 2004; 2009), Maurizio Lazzarato (1996), Christian Marazzi (2008), Cristina Morini (2007), Carlo Vercellone (2007) – propose an understanding of the post-Fordist – or cognitive – technical composition of labour and of the metamorphoses of the composition of capital. The theory of 'cognitive capitalism' redefines the contours of contemporary political constitution through an analysis of the transformation of labour and the forms of capitalist production.

The first trait around which the authors of the 'cognitive shift' concentrate their attention is the hegemony of the cognitive production in the processes of contemporary capitalist valorisation. Authors as Vercellone, Hardt, Negri and Marazzi approach

cognitive capitalism as a provisional and exploratory concept that does not refer to a supposed disappearance of manual labour. Cognitive production points to the role of knowledge, cooperation, language and affect in the processes of capitalist accumulation and organisation without ignoring the fact that in our global landscape the production of languages, signs and knowledge are contemporary with the existence of factories and manual labour. Moreover, these authors are understanding the cognitive traits – that are the elements of affects, codes, knowledge, information, social relationship – as the output of working activities. In other words, theorising the becoming cognitive of work – these authors see in the enactment of 'cognitive' production an embodied activity of making – does not mean theorising the end of work. Quite the contrary, it means reflecting on the metamorphosis of the qualitative traits of an embodied activity of working.

What characterises this first trait is the emergence of new qualities of labour as well as the role of knowledge, affects and relational attitudes as directly productive of value: the human 'qualities' seem to be both the outcomes of work as well as the most relevant ingredient inside the work process. For Vercellone, in this scenario 'the law of value founded on the measure of abstract labour-time immediately dedicated to production enters into crisis' (2007: 29). Labour, particularly in the form of knowledge, science and affects production, remains the principal source of the creation of wealth, but it can no longer be measured on the basis of labour time directly dedicated to production in what Vercellone calls the historical passage from the time-value of labour to knowledge-value. In this context, in which the category of labour time has exploded and in which life is directly put to work, we are witnessing the breaking down of the traditional division between productive and reproductive labour: the traditional opposition between labour and life loses any foundation.

Another feature of 'the cognitive shift' described by these authors consists of the role of social cooperation and the network of connections inside the on-going activity of production: the inter-subjective and trans-individual 'nature' of knowledge and affects installs the activity of labour power in what they called the common. But what is the relation between common and knowledge production? The centrality of the element of knowledge inside the contemporary strategies of accumulation of capital is traceable also in a wide range of scholars involved in a critique of the political economy of knowledge production (Florida 2002; Virno 2003; Benkler 2006; Vercellone 2007; Marazzi 2008; Hardt and Negri 2009; Ross 2009; Gorz and Turner 2010). These authors

describe, in different ways, the main features of contemporary knowledge production, all insisting on the centrality that practices of cooperation, sharing, circulation and relation occupy in the proliferation of network production of knowledge. All of these scholars insist on showing that these processes of cooperation and networking are the source of knowledge production. Basically, knowledge production cannot be conceived without practices of sharing and cooperation. That is another way to say that knowledge production is always a matter of collective and common production. It involves a tissue of exchange and collective cooperation without which knowledge cannot be produced. And something similar can be said about affects and social relations: they cannot be understood without a trans-individual dimension of experience. They are generated in the common.

Here common is synonymous with general intellect; the diffuse intellectuality. One point of departure for understanding this hypothesis is represented by the reinterpretation of the notion of 'general intellect' in Marx (1973 [1941]). Following Vercellone (2007) one central condition for the emergence of what is called general intellect – understood as a specific step inside the development of capitalism – is constituted by the transformation of the intellectual quality of living labour, that is the presence of a massive amount of diffuse intellectuality. This phenomenon gives an impulse to the beginning of a new phase of capitalism where knowledge and its diffusion are affirmed as the principal productive force. In particular, the research of Vercellone, Marazzi, Hardt and Negri – where the theme of the common is at the centre of their analysis, both as a creative and cooperative force and as a form through which wealth is produced – have stressed how the concept of the common is capable of revealing the intensities through which the process of capitalist valorisation tends to become increasingly internal to social networks: in the cognitive hypothesis, social production has become production of the common and the common is the field where a multiplicity of singularities produces and is produced via their interrelations. For Marazzi, the hegemony of the general intellect is directly connected with a passage in the contemporaneity towards an 'anthropogenic model', where the object of production is a human subject. In synthesis, the cognitive turn defines an understanding of capitalist production based on the production of knowledge, social relations and forms of life, where the production of 'man by man' characterises what Negri and Hardt (2009) called 'the biopolitical turn of the economy'.

Following this interpretation of the 'general intellect', the common is not just a tissue of exchange and cooperation in which knowledge and languages are generated. The common becomes the territory in which culture, social relations and forms of life are generated. In this hypothesis, human subjectivities are both the main social force of production and, at the same time, 'what is produced' in this process. For this reason, as we will see later, the production of subjectivity – in the double meaning of the genitive – is at the heart of the political meaning of the theory of the common. Following this 'biopolitical turn of the economy', the categories of value creation and accumulation of the common are both functions of the expansion of the social productive forces. In extreme synthesis, for these authors, what produces value today is the social production in the common. And the term common – a singular name – qualifies the trans-individual nature of work. Cognitive capitalism explicates and radicalises its need for social cooperation; capital is dependent on the general intellect, and capital can exercise the capture of these processes of networking only by organising systems of artificial measure on these flows of cooperation.

But how is the hegemonic role of the common inside the cognitive shift able to redefine the 'organic composition of the capital' (Marx 2001 [1886])? For Marx, capital is composed of two elements: fixed or constant capital (machines, raw material, commodities and money) and variable capital (living labour). What Negri and Hardt (2009) argue is that the autonomy of living labour in post-Fordism is grounded on the fact that capital does not organise directly the productive process any longer. Capital is in a certain way external to the processes of cooperation, external to what they called, following Marx, 'general intellect'. Capital exercises a command on the common not directly; not at the level of productive cooperation, but through a process of 'verticalisation' (Papadopoulos et al. 2008; Hardt and Negri 2009). For these authors, the governance of cognitive capitalism consists primarily in the capacity of imposing forms of verticalisation on the level of cooperative production through measures, proprietary regimes, processes of individualisation of social production and the pervasiveness of the techniques of control and valuation that characterise the financialisation of the economy (Lilley and Papadopoulos 2014). These forms of command over the common are understood as a sort of 'parasitic rent'; as a technology of control that works 'externally' to the processes of social cooperation – as a parasitic surface installed on the surface of the common. For this reason, the common here is the equivalent of all social production. In the logical movement that concerns the 'partial'

internalisation of fixed capital in the common, knowledge, machines, science and technology become productive forces immersed in the common.

Following Negri (2012), we can see that, in Hegel, science and technology are conceived as a medium between human and nature; a tool for acting on nature. With Marx, and especially with the Marx of Capital, the machines (the fixed capital that 'incorporates' science and technology) are the first element in the series machines-human work-wealth. Here the workers are the use value for the capitalistic machine and human work is controlled by the machines of capital. Work is disciplined in the factory and the machines work for capital accumulation. Inside the post-Fordist transformation of work, where the autonomy of living labour re-appropriates a part of fixed capital, the variable capital becomes a hybrid: a machinic variable capital that occupies the foreground inside the process of production. Following Negri (2013), in this scenario it is not possible to separate humans from technologies, humans from machines. Living labour has reappropriated the machine. In the passage from Fordism to post-Fordism we are witnesses to an 'anthropological turn': living labour is not just the central force of production, it has also partially reappropriated its means of production. Exactly as in Fordism, when the machinic dimension of production was 'controlled' by the owners of the means of production, here, following this hypothesis, 'living labour' controls the machines. The hegemony of the common inside the process of production brings with itself the 'incorporation' of the technological devices inside the body of the general intellect. So, following Negri, technologies and means of production are in the hands of human beings, which despose of them as tools for their ends. Technologies are means in the hands of capital or tools in the hand of living labour. In both cases, giving the fact that technology is understood only as an extension of the logic of class antagonism, humans control and master them.

After the definition of the qualities that characterise the new traits of labour, Hardt and Negri reconstruct a quasi-linear connection between the technical composition of class and the political one. Here the question is: how can the hegemony of living labour become a political hegemony? The political intelligibility of the common seems to be transformed from an analysis based on the degrees of autonomy of a machinic living labour to the problem of class struggle starting from a conception of class as the emergence of a collective subject. And it is following this field of political research that the question of the production of subjectivity becomes the centre of an emancipative idea of politics.

In the history of Marxism, the question of giving an account of politics starting from the productive centrality of an antagonistic social subject has a strong tradition, and in Hardt and Negri (2000) a peculiar rereading of Foucault is used in order to develop this question. With Marx, they proposed, as we have seen, an understanding of the subject starting from an analysis of the processes that constitute it inside a specific relation of production and, with Foucault, a theory of subjectification (called production of subjectivity) oriented to highlighting the constituent role of practices of struggles, insurgences and resistances in shaping new forms of subjectivities and new realities: an epistemology grounded on the terrain of the struggle.

From this perspective the 'political reason' is a constituent force traced by struggles inside and against the capital; a reason immanent to the processes of the constitution of a 'common subject', a reason that can be retraced following the practices inaugurated by resistances. What Negri calls 'the experience of the common' (2000) in fact refers to a biopolitical conception of rationality where the truth is constructed from the struggles, or better — the truth is a sort of 'common knowledge' or a Gramscian 'common sense' forged by the practices of resistance. The events of resistance seem to reveal in Hardt and Negri the path of a teleological materialism, where the primacy of resistances to power defines the irreducibility of life to the dispositives of power that try to entangle it. This irreducibility is a form of freedom, conceived as a strategy towards the common:

> 'A materialist teleology, that is, a conception of history that emerges from below guided by the desires of those who make it and their search for freedom'. (Hardt and Negri 2009: 59-60)

If for the authors of the cognitive, the notion of subjectivity defines the heart of the capitalist valorisation, here we can see how, in Hardt and Negri, this analysis is put next to a Foucauldian analysis of the genealogy of biopower, where life has become the privileged object of power. For Hardt and Negri (2000) it is possible to read in Foucault a point of tension between two polarities immanent to the notion of life. Life is both: an object of power, as well as an affirmation of being. The fact that the relation of capital is spread along all life (I refer to the crisis of a separation between productive and reproductive activities), which means that capitalism has become a biocapitalism, does not exclude the creative invention of forms of being: that is, an expressive capacity or power to act that exceeds the relations constructed by the dispositives of biopower. The

dissymmetry between the powers over life and life's power of invention (*puissance d'invention*) can be seen, following Negri, as an 'ontology' (2014), a term that appears more frequently in Foucault's later writings.

Yet this ontology is both an 'ontology of actuality' and an 'ontology of ourselves'. If the central question for an ontology of actuality is 'what are we?', the decisive question for an ontology of ourselves is 'what are we becoming?'. If the first expression refers to the historical and power determinations that characterise a specific time-place, with their specific knowledge and power configurations, the latter qualifies the idea that a subjectivity has the power to escape these configurations, inventing new conditions of existence, forms of knowledge and transforming power relations. This 'duplicity' of the notion of subjectivity allows Hardt and Negri to theorise at the same time determinations and freedom, the objectification of singularities in an historical diagram and the paradoxical power that the latter have, in spite of everything, to escape and to constitute themselves as (new) subjectivities. Starting from the primacy of this power of invention the discourse on subjectivity is open to an ontology – an ontology of the possible.

But which kinds of events can inaugurate this constituent dimension? The processes and the events starting from which new forms of subjectivities and ways of life are inaugurated are, according to Hardt and Negri (2009), struggles, insurgencies and resistances against biocapitalism. In this way the power of invention and the processes of ontological creation are conducted back inside an intelligibility of history and class struggle where the events of subjectification need to be thought about inside a process of the constitution of a revolutionary subject. The multiplicity of singularities that produce and are produced in the biopolitical field of the common do not spontaneously accomplish exodus and construct their autonomy. Political organisation is needed to cross the threshold and generate political events. The *kairos* – the opportune moment that ruptures the monotony and repetitiveness of chronological time – has to be grasped by a political subject.

Along this argumentation we can introduce another meaning of the notion of the common: common here is not just what allows the development of contemporary social production, common is the name of what is generated by struggles; of the events of resistance that define a new configuration of both subjectivity and historical reality, the subject and the object of history. The ontological profile that is implied in Hardt and Negri's argumentation is folded inside the notion of production of subjectivity, and this

production is thought through the conditions for the possibility of the emergence of a collective subject. Here common means a collective project that becomes visible through struggles and starting from which all epistemological reasons are re-conducted. Common is the name of an ontological dispositive that emerges as a creative gesture which is readable only starting from a materialistic teleology where the intelligibility of history lives in an antagonistic struggle between two subjects in action. In these terms the ontological tissue of the common constitutes one pole of the struggle – a pole that inaugurates its power of metamorphosis as an act of resistance against biocapitalism. In this way what I have called the 'anthropogenic model' of production defines the terrain on which politics is thought and the common is the name of the social and collective reappropriation of this project of constitution: a process of production of subjectivities generated by the struggles that can inaugurate a line of escape toward a post-capitalist society. A human being produced by human beings, this is the possible communism for Hardt and Negri in the time in which the production of subjectivity is the heart of politics.

1.3 The Autonomy of the Social and Its Troubles

In the previous two sections I introduced different theoretical perspectives through which the notion of the commons is currently understood as a politics of transformation. In particular I focused on how these political theories engage with the questions of appropriation and production, and on how by starting from these two different points of departure we have different accounts of the notion of commons. Dealing with an analysis that puts the notion of appropriation at the centre – and consequently an understanding of capitalism as a force of dispossession – the notion of the commons refers to the instauration of a political system in which the traffic of relations between society and nature are not lead by a logic of private accumulation. In this perspective the struggles for the commons are struggles for both not being expropriated from a relation with resources that qualifies the socio-material basis of life reproduction, and/or for enacting forms of relationality 'external' to the capitalist system. In both cases the commons are defined 'negatively', as the other of capitalism: commons is another name for communism. The commons is the otherwise as the other of capitalism. In the theories of appropriation the dimension of the commons is negatively defined starting from a position of exteriority in relation to 'exchange value': the commons are what exists outside capitalist forms of relation.

But, as we have seen in the last section – synthesising the main ideas of the cognitive turn – common is not just another name for communism, it is also another name for work. The notion of the common is used in order to show the emergence of new qualitative traits of work, and to show what production could mean in large portions of the world. Thinking the common as a productive force and highlighting his autonomy and hegemony inside 'the production of the world' seems to me another way for actualising a central point of Marx's critique of capitalism: the contradiction between the capitalist mode of production and the expansion of the social forces of production. In fact, following Hardt and Negri (2009), in becoming cognitive, work has gained a form of autonomy. But, in order to be free, the general intellect needs to break its dependence from the processes of verticalisation that characterise the new capitalist forms of command and control. In fact – and this is the political heart of this argumentation – the processes of verticalisation on the level of cooperative production – such as measures, proprietary regimes, processes of individualisation of social production and the pervasiveness of the techniques of control and valuation that characterise the financialisation of the economy – limit the expansion of the general intellect. Only by breaking with a capitalist social system and with the limits that its command and control imposes on the development of the general intellect, will it be possible to reach communism as the production of humans by humans. From this perspective an idea of the 'otherwise' is not just conceived as starting from a logic of 'negation' – the negation of the capitalist mode of production – but also from a logic of 'overturning'. In the theories of the anthropogenic model of production the conditions of possibility for an autonomous production of subjectivity lay in the biopolitical turn of economy. A logic of overturning, from a productive centrality to a political centrality, needs a subject of transformation, a partiality capable of breaking its relation with capitalism.

The last two elements that characterise the politics of transformation in the theories of the common are the centrality of the human subject and struggles as the main agents of transformation. Given the fact that the general intellect is produced by human collective cooperation – that is another way of saying that the world is shaped and produced by human work and activity – in humans reside the possibility to enact processes of transformation. And, given the fact that the main logic of transformation consists in a confrontational attitude, the main means through which to change the world are conflicts and struggles. For this reason the third decisive element in order to

understand what commons means is struggle. There are no commons without struggles for the commons. There is no politics without struggles. The question of transformation in this political perspective is thought via social antagonism. The theory of the commons could be reduced, following this interpretation, to a simple scheme in which there is a subject – work – a state of being to overtake – capitalism – and a motor of history – struggles.

Since politics is framed inside the paradigm of the social, theorising transformation here means theorising social transformation. At this point we can ask: what is a politics of transformation in the autonomy of the social? It refers mainly to an agonistic struggle around the question of social power. The appropriation of a resource and the production of a subject are in fact two coextensive dimensions through which the profiles of a struggle amongst two molar figures are set on the stage of history. In the theory of the commons the intelligibility of politics is reconnected to an intelligibility of the social: the social, we can say, is the region of veridification of the political. Understanding politics through the autonomy of the social means bestowing the truth of the political on the social. Moreover, the analysis of the social is mainly based on the analysis of the modes of functioning of capitalist production. If the truth of the political is based on the social, the truth of the social is based on the critique of political economy. In this way the critique of political economy offers to authors of the commons the principle cartographies through which to read the political dimensions of the praxis of transformation. As we have seen in the previous sections, the political perspectives of the commons bring with them an understanding of ontology and materialism quite far from both the politics of ontology and what we have called 'material politics'. The 'stuff of politics' is about experimenting possible 'other-wises' in the ways in which people and things relate to each other, while in the autonomy of the social we have a 'totalisation' of our understanding of relations on the pole of power. Relationality is attributed to a matter of social power. In this way, thinking other common worlds via commons suggests to us a politics of transformation saturated by the question of the social and by the question of power.

At the beginning of this chapter I asked how far theories of the commons could 'guide' us in thinking about the question of transformation. Since the notion of 'common worlds' – with this expression I refer to an understanding of the common in which the existence of various forms of life is based on contingent unifications of things and bodies – qualifies an intelligibility of politics in which relationality matters, we can

say that here what counts as relations are human relations. Another feature of what we have called 'the stuff of politics' refers to the recognition of the significant role of more-than-human agencies and technological objects in the fabric of social conducts and political association. Starting from the autonomy of the social, the role of non-human agencies in the theories of the common is simply outside the intelligibility of politics. If politics is understood as an antagonistic struggle around the elements of appropriation and production, the spaces of agency and politics are entirely occupied by human practices. Humans appropriate a resource as well as humans produce a subject: from this perspective any non-human entities are relegated to the status of resources or tools. They enter into political theory but only as instruments and not as constituent forces. The concept of the commons refers much less to how different relations between human communities and resources can be experimented with, and much more to the antagonistic struggles for the appropriation of these resources.

In this landscape technologies are seen as tools, as a medium element between communities and resources. In this schematisation and, in particular, in the case of the so-called 'natural' commons, the role of technologies as tools consists in their capacity to 'objectify' and 'activate' resources, dealing with a balance between the needs of human production, of reproduction and the necessity to maintain a dynamic equilibrium with nature. In the case of the so-called artificial commons, knowledge, science and technology can be seen both as tools and as resources. In any case, what is implied in our understanding of commons as resources and science and technology as tools consists in the consideration of commons as 'a common good', as well as an 'humanistic' understanding of science and technology: science and technologies are means in the hands of humans who master and control them. But how much is the anthropocentric series 'common goods-tools-humans agency' put into crisis by theories of cognitive capitalism?

Through the analysis of the theorists of cognitive capitalism, I have showed how the common can be conceived not as something given – as a resource to preserve – but as an 'entity' that is on-going created and recreated in processes of networking. Here the trans-individual dimension of the common is recreated by human activities. This understanding of the commons allows us to collocate the elements of knowledge, artefacts and technologies inside the processes of constitution of the common. But as we have seen following Hardt and Negri's interpretation of what we can call with Marazzi 'the communism of capital' – that consists in the partial appropriation of fixed capital

by living labour – technologies and means of production are in the hands of human beings, which dispose of them as tools for their ends. They are conceived as functional, as directly controlled by the production of humans by humans: they are outside the intelligibility in which the heart of politics is thought. The more the forces of the socio-material transformation are analytically redirected to retrace a collective human subject of transformation, the more non-human actors and forces are conceived as 'objects of politics' – something over which politics is projected. In this way, in the historical materialism of the theories of the common, the analysis of the social 'saturates' the political, mainly interpreted as the production of a subject or as the appropriation of a resource.

If liberal theories of 'modern' political mediation posed the beginning of the political civilisation inside a human contract that separated a supposed state of nature from the political order, the theories of the commons substitute the 'peaceful' dimension of the narration of the contract with the original violence of the primitive accumulation. In this way the logic of the contract is substituted by the logic of the (social) struggle. But what these two different traditions of political thought have in common consists of insisting both on the foundation of the political inside a 'gesture' of purification: in both cases, politics is what comes after an 'active purification' of human society from the material world, and politics is reduced to actions of humans alone[3].

Many authors in the last decades are inviting us to think politics beyond this gesture of purification. By refusing the essentialist distinction between nature and society, Latour highlights how 'we have never been modern' (1993). Which means that the materiality of life of humans cannot be separated from the many active interactions that link one specie with many other actors. As such: 'Humans, for millions of years, have extended their social relations to other actants with which, with whom, they form collectives' (Latour 1999: 198). The emphasis on the notion of collectives underlines how humans and more than humans actors compose each other in common worlds. Different and heterogeneous actors in fact participate and make possible different sociomaterial assemblages, materialising certain material constraints rather than others. Jane Bennett emphasises in her *Vibrant Matter* (2010) how this understanding of

[3] Similarly, a disjunction of human society from the material world can be found in those authors that articulate the political question of the commons inside a liberal tradition (e.g. Gibson-Graham (2006) and Mason (2015)).

collectives needs to conceive a notion of agency[4] that puts radically in question the humanist understanding of politics to which it is traditionally linked. Rather than being localised in a human body, in Latour and in Bennet the notion of agency is distributed across a heterogeneous field of actors. By acknowledging that 'as human beings we inhabit an ineluctably material world' (Coole and Frost 2010: 1), Coole and Frost invite us not to ignore politically the power of matter in our ordinary experience, which means not ignoring the 'more than social' bases of every form of life. If politics matters, we cannot elude the role of more than human entities in the fabric of the contemporary conduits and political association. How can we be anything other than materialist? This question, I think, need to be posed again and developed behind the borders of historical materialism. Only putting in question the gesture of purification on which it is anchored, it is possible to think politics of transformation not only as a human affair. In the next chapter I will explore what it means to think politics of transformation outside the modern perimeter in which politics is usually thought.

[4] The term agency designates the capacity of an entity of every kind – a bacteria, a text, a human being or an artefact - to act in a network or in an environment. In Latour agency does not presuppose intentionality.

CHAPTER 2
THE POLITICS OF WORLDING

In the first chapter I introduced the theories of the commons respectively starting from the perspective of the appropriation of an object and from the aim of the production of a collective subject, highlighting how 'the autonomy of the social' is the terrain on which the theories of the common project their own 'modern' intelligibility of politics. Moreover, inside the socio-historical materialism that characterises these political theories there is a clear ontological division between subjects and objects, a clear line of separation between the political agency of humans and 'the rest'. In this way, a politics of transformation, deeply connected with this understanding of materialism, becomes a politics that ignores the role of non-human entities in shaping our everyday worlds and that 'evacuates' humans from the many ways in which humans are connected with more-than-human entities. But how do we rethink 'the stuff of politics' without abandoning 'the bonds that connect us to the world' (Serres 1995: 39)? How can more-than-human agencies come into politics? And how is it possible to conceive a politics of transformation passing through the constitutive nature of material entities and processes in ecological, social, technological and political life?

In this chapter I develop a framework in which to pose these questions adequately. In order to deal with them I look at how different theoretical approaches collocate an understanding of politics outside of the modern and 'fixed' ontological distinction between subject-object, human-nonhuman and nature-culture. With the help of several material-semiotics (e.g. Latour and Haraway) mainly grounded in the field of science studies, I explore and discuss how, through these semiotics of accounting, it is possible to appreciate the ways in which objects, entities and technologies, including the technologies of the body, shape our eco-socio-technical worlds, materialising certain forms of life rather than others. How could more-than-human agencies come to politics? And moreover, how could the emergence of more-than-human agencies displace the 'modern' understanding of politics? In the second part of the chapter I connect my ways of dealing with these questions with an attempt to rethink what a politics of the commons could mean beyond the categories of the modern political mediation.

2.1 More-than-Human Agencies

Bruno Latour, giving his account of materialism, writes: 'there are simply more agencies in the pluriverse, to use William James's expression, than philosophers and scientists thought possible' (2005: 116); in this sense the notion of multiplicity alludes more to a property of things rather than a multiplicity of points of view in the human activity of interpretation of the 'same' thing. This conception of multiplicity in fact has nothing to do with 'interpretive flexibility' (Ibid.: 116). Rather, following Latour, it 'is the thing itself that has been allowed to be deployed as multiple' (Ibid.: 116). This understanding of materialism is based on the idea that a thing could not being understood simply by multiple representations. Rather than symbolic representations, a thing is always a pluriverse of material agencies. This multiplicity of matter crosses several theoretical perspectives – e.g. Donna Haraway (2003), Bruno Latour (2005) Annemarie Mol (1998), Isabelle Stengers (2005a), Marilyn Strathern (2004) – in the contemporary debate in science and technology studies and related fields, and brings with it a sort of uncertainty related to the nature of materialism: what is to be built and who/what is responsible for the emergence of new configurations of matter?

Moreover this agential understanding of ontologies brings with it not just a performative idea of realities – realities are performed and enacted rather than observed – but also it permits us to think about agencies and actions beyond the realm of human beings. What is this universe made of? Starting from this point of view Latour's book *Reassembling the Social* argues that 'the social' aggregate is not a stable object. Latour sustains that 'the social' does not exist or, better, he thinks that 'there is nothing specific to social order', nothing like a specific rationality, a logic of intelligibility or a distinct area of reality covered by the label 'society' or 'social' (2005: 4). Here realities are seen as exercises of making and remaking, a matter of relations and connections, and the architecture of the present is always an open-network architecture. Such a performative understanding of agencies brings with it the idea that an entity can be understood by analysing the practices and actions that it enacts in the many material worlds in different ways connected to it. Moreover, an open-network approach underlines the idea that these exercises of making regard not just human beings but also a connection between humans and not humans: a co-extensive and co-participate production without clear distinctions or lines of essential separations; a hybrid composition. And if, in this hybrid composition, we can see aggregates, points of condensation, groups or boundaries, the analytic attention should be focused on the acts or *dispositives* which produce and

reproduce them, rather than 'naturalising' or taking for granted their own existence. Moreover, this kind of production, that is literally the construction of the world, avoids the temptation to indicate human beings as the central actor; conversely human beings have to share their agency with an indeterminate number of actors over which they have neither mastery nor control. Following this perspective, the continuity of any course of action would consist of human-nonhuman connections and this strong starting point animates Latour's view of science in action and also his contribution to social sciences. Following Latour the goal of research in the social sciences consists of the attempt to understand how technoscience creates ingredients necessary for making socio-material worlds and, in accounting the human-nonhuman traffic of relations implied in these exercises of making. In a certain way his constructivism consists of highlighting the collective process that produces constructs 'through the mobilization of heterogeneous crafts, ingredients, and coordination' (Latour 2005: 30): exactly in this sense social science could become a science of heterogeneous associations.

This analytical style suggests that a cartography of knowledge is the output of an exercise of mapping connections. Moreover, the traces of these connections show that an actor[5] is what is made to act by many others. From this perspective, action is borrowed, distributed, suggested, influenced, dominated, translated. Acting is dislocated. Following Latour, to be an actor is to be an actor–network. The notions of network and translation are used by Latour in order to underline that the social-material realities have to be grasped and traced by the circulation of mediators. Each translation is seen as an act of singular creation in a network and each mediator cannot be substituted by another one. As such:

> 'We don't know yet how all those actors are connected, but we can state as the new default position before the study starts that all the actors we are going to deploy might be associated in such a way that they make others do things. This is done not by transporting a force that would remain the same throughout as some sort of faithful intermediary, but by generating transformations manifested by the many unexpected events triggered in the other mediators that follow them along the line. This is what I dubbed the 'principle of irreduction' and such is the philosophical meaning of ANT: a concatenation of mediators does not trace the same connections and does not require the same type of explanations as a retinue of intermediaries transporting a cause.' (Ibid.: 107)

[5] 'An 'actor' in the hyphenated expression actor-network is not the source of an action but the moving target of a vast array of entities swarming toward it' (Latour 2005: 46). With Latour we can say that an actor acts, but it never really acts alone.

The existence of translations between mediators permits and may generate traceable associations: this is the core of the Actor Network Theory (ANT) narrative style, where 'instead of simply transporting effects without transforming them, each of the points in the text may become a bifurcation, an event or the origin of a new translation. As soon as actors are treated not as intermediaries but as mediators, they render the movement of the social visible to the reader' (Ibid.: 128). From this perspective, ANT is thus a test of how many actors the writer is able to treat as mediators – a mediator transforms, translates and modifies the elements or the meaning it is supposed to carry while an intermediary is what transports forces or meanings without transformations – and how far the researcher is able to 'achieve the social'. Follow the actors to achieve the social! This slogan defines a sociological understanding of the real based on the idea that the fields of force that populate a specific domain of activities can be achieved through an analysis of the actors in a determinate hybrid assemblage. If the social is a trace, then it can be retraced, if it is an assembly then it can be reassembled: this is Latour's point of view about rethinking sociology in an ANT approach; as a way to follow the traced connections starting from the ontological priority of actors, or mediators, in a network. Moreover Latour thinks all the mediators inside a principle of symmetry (Callon 1986): that is the idea that all the entities (institutions, people, things, virus, artefacts, animals, etc.) play an active role inside a network. On the one hand, this assumption permits us to avoid 'totalisation', that is the risk to add total domination to the real domination (Latour 1993) of some clusters inside a network. On the other hand, it risks being close to an undifferentiated understanding of the difference of forces and disequilibrium inside the network's knots and links. In this way, Latour's coverage of network does not give an account of the existence of processes of socio-material subordination inside a network. There is an open question about how to deal with the existence of neglected voices and asymmetries of power inside the relations that affect certain humans as well as certain non-humans inside a network. The politics of inclusion seems to be Latour's answer to this question.

At this point, having introduced the specific way in which, in Latour, a non modern understanding of materialism is deeply connected with the emergence of a sensibility of knowledge production committed to giving an account of the presence of non-human entities in the construction of the 'social', we can ask ourselves what are the political dimensions of this displacement? In his W*e Have Never Been Modern,* Latour introduces the speculative proposal of a 'Non-modern Constitution'. Starting from the

idea that 'modern humanists are reductionist because they seek to attribute action to a small number of powers, leaving the rest of the world with nothing but simple mute forces' (Latour 1993: 138), the idea of a Non-modern Constitution consists of recognising a right of intensive negotiations between all participating actors in a network. Such right of intensive negotiation can be realised, following Latour, thanks to the inclusion of non-human actors in a speculative political arena called the Parliament of Things, where a form of management emerges through connecting actors and creating alignments among them. The proposal of a Non-modern Constitution seems to be the logical translation of ANT's technique of reassembling socio-material emergences from sociology to politics and the slogan 'achieve the social!' resonates with a political proposal for 'managing the social'.

If the politics in Latour refers to the capacity to extend intensive practices of negotiation, the Non-modern Constitution represents a way to include new agencies in politics in order to achieve better conditions of negotiation. In this way, following Papadopoulos 'new forms of agency are reinserted into the constituted form of polity' (2011: 187). Latour seems to suggest that a more than modern politics could be achieved by enlarging the borders of the modern political constitution. A new political constitution in fact is based on the inclusion of new mediators inside what, in the previous chapter, I called 'the modern political mediation'. How can we think about politics without reconnecting the emergence of new agencies to the predicament of inclusion in the modern political mediation is the problem that arises. How do we theorise the constitutive nature of material entities and processes in ecological, social, technological and political life without ignoring the neglected experiences that certain participants in a network enunciate? And how can a politics of transformation in nature-culture be thought not as a politics of inclusion, but as a constituent politics – where the term constituent refers directly to the creation of worlds – immanent to the processes of materialisation?

2.2 The Politics of Worlding

Something similar to the category of hybridity in Latour is retraceable in Haraway's concept of implosion (1997). The idea of implosion in the thought of Haraway is focused on the historical shift from a fixed separation between the natural and the artifactual to the impossibility of thinking with this stable separation. It is only by starting from this implosion that she gives an account of contemporary collective life.

The concept of implosion in Haraway alludes to the crisis of the modern chronotope, that is, the specific way in which topos and chronos have been conceptualised in modern science. The modern chronotope represents a past-present-future drama narration grounded on the centrality of a linear time-machine that develops in a homogenous space. Haraway reads technoscience inside the crisis of the 'modern' framework, in the middle of the materialistic collapse of the human and non-human distinction, and technoscience itself designates a condensation in time and space: a condensation among social, material and semiotic technologies. So the concept of implosion is strictly related to that fusion and condensation and, in a certain way, Latour and Haraway share the idea that it would be impossible to theorise perception, action, knowledge and production where there is a clear distinction between objects and subjects, nature and culture, social and material. Technoscience is what emerges inside an hybrid composition of the social, the technological and the material, what comes inside the processes of condensation and fusion that characterise the collective life of our century. As such:

> 'Technoscience extravagantly exceeds the distinction between science and technology as well as those between nature and society, subjects and objects, and the natural and the artifactual that structured the imaginary time called modernity. I use technoscience to signify a mutation in historical narrative, similar to the mutations that mark the difference between the sense of time in European medieval chronicles and the secular, cumulative salvation histories of modernity.' (Haraway 1997: 4)

A new configuration of knowledge and new practices emerge in the midst of this implosion of boundaries and, reflecting upon the hybrid production of technoscience – the implosion of science and technologies into each other – could be an occasion to think about the possibilities of new human-nonhuman assemblages grounded on the experimentation of new forms of life. For Haraway indeed technoscience regards practices as human-nonhuman activities that shape the material configuration of worlds. If technoscience is about socio-technical production – the knowledge-power processes that inscribe and materialise the world – the central political question becomes: how can practices and narrative activities shape certain forms of life rather than others? In Haraway's words: 'the point is to make a difference in the world, to cast out lots for some ways of life and not others. To do that, one must be in the action, be finite and dirty, not transcendent and clear' (Ibid.: 36). If, for Latour, politics in technoscience needs a new form of representation, for Haraway, a constituent politics in technoscience

doesn't require new forms of representative politics, but new practices of making; other life forms that bring humans and non-humans together again. And, perhaps, in more sustainable ways. Alternative materialisations, not alternative representations: on this terrain of intelligibility it is possible to rethink, with Haraway, a constituent politics in technoscience. But what does constituent mean in a present characterised by the proliferation of the sprawling net of natural-social-technical associations and by the implosion of the 'modern' chronotope? How can we theorise a better politics beyond the categories of modern political thought? And, what kind of intelligibility of politics emerges with the idea of 'alternative materialisations'?

Papadopoulos (2010) has proposed a reading of Marx's *Economic and Philosophical Manuscripts* based on a definition of political activism[6] grounded in an understanding of materiality: all that exists is matter and each transformative activity is material. Which means that 'matter itself cannot be conceived as an outside or an object of human practice: matter is humanity's body' (Ibid.: 66). Matter is a vital force and inorganic as well as organic life are movements of matter. In this context, activism and matter are conceived simultaneously and a collective activism is defined by its capacity to affect material change. If the several trajectories of technoscience create new ontologies, new worlds and new forms of life, a politics of materialisation refers to the plurality of possible engagement in a specific socio-material arrangement. Following Papadopoulos 'politics here means that by performing only one of the existing options rather than any other we change the very constitution of being in a very specific direction' (Papadopoulos 2014: 71), materialising certain ontological possibilities rather than others, certain forms of life rather than others. In the middle of the current technoscientific transformations, Wittgenstein's maxim 'what has to be accepted, the given is – so one could say – forms of life' (1958) is, more than ever, useful for thinking about the ontological consistence of a radical politics.

If a constituent politics refers, first of all, to the material capacity to affect material change, we can theorise, with Papadopoulos, a politics of worlding in technoscience as a capacity of crafting matter[7]: a capacity to act that does not designate

[6] In my thesis I embrace an understanding of activism as 'a call for action' which aim consists in enacting practices of radical socio-material transformations in the middle of our technoscientific world.

[7] I borrow the expression 'crafting matter' from the work of Papadopoulos. Although some feminist authors (e.g. Federici) collocates the term 'crafting' inside a masculinistic understanding of production, the way in which Papadopoulos articulates this concept does not

a ‘substance’, a ‘human agency’ or a ‘universal wholeness’, but a ‘capacity to act with’ (Haraway 2003) enacted from situated practices. In a politics of worlding in fact acting means always acting with. The concept of worlding comes from the work of Chris Connery and Rob Wilson (2007). In their understanding this term designates the making of social worlds that crisscross global space in variable and divergent trajectories. This notion has been created in order to put in question an abstract and universalistic reading of globalisation, valorising the plurality of tensions and routes that populated the global dimension. Their work constitutes an invitation for thinking the proliferation of differences in our contemporaneity and the notion of worlding suggests an attitude for opening our thinking and practices to other ways of being, ideas, everyday practices and narrations. Papadopoulos (2012) extends the meaning of this term ‘from society to matter’. As such: ‘I want to think of worlding as an opening to material processes and practices and as a possibility for crafting – literally – common, alternative forms of life’ (Ibid.: 2).

Along this perspective, a politics of worlding in technoscience is synonymous with a form of politics and a style of activism which engages directly with ‘the materialisation of worlds’: a politics immanent to the processes of relating and crafting that directly affects the materialisation of the forms of life that inhabit the world. What I am calling, with Papadopoulos, a politics of worlding is, in fact, a way of thinking activism as a direct engagement with matter: it regards forms of human and non-human compositions, modalities of collective assembling and everyday experiences of making ecologies of living. Here politics, rather than designating an external and a sort of second temporality that impacts life and material existences from outside – as it is in representative politics and in policy – or a terrain of struggle around the big signifier of ‘social power’ – as it is in the politics of the commons -– is conceived as a constituent politics that refers directly to the conditions of possibility through which different modes of existence can live together in ecologies of living thick enough, rich enough and responsible enough for cultivating modest flourishing and justice: the politics of worlding is a political ecology. But what does ‘a capacity to act with’ mean in a political ecology?

Another perspective through which it is possible to read a space of an alliance in technoscience between materialism and practices of making is represented by the

want to involve a gender character. For this author in fact ‘crafting’ designates a notion of activism that consists in an immediate relation with matter (see Papadopoulos 2012).

reflection of Felix Guattari (2000) and Isabelle Stengers (2005b) on the category of ecology. If the question of ecologies pertains to 'the connection between what has come into existence and the many differences it can make to the many other existences with which it is connected' (Stengers 2008: 48) and, moreover, if all existences do not pre-exist their relating, a politics of worlding refers directly to the fact that acting with significant others means to open our practices to other ways of being and forms of life. Becoming with them, experimenting with them new ways of relating. For Stengers, in fact, a pluriverse is never something given, conversely it is always a pluriverse in the making, where the creation of a 'rapport' is not separable from an event of creation. Here the ontology of pluriverse becomes a lived force grounded in the capacity of divergent singularities to operate in partial connections, to create symbiosis, to experiment (within) ecologies and their material constraints and to deal with unexpected presences and entities. Following Stengers this relational and deeply constructivist understanding of ecology brings with itself a conception of making common worlds that emphasises the situational capacity of a common concern or a common issue to gather together different actors and practitioners. A common is what causes them to think, to act, to invent, to work together depending on each other; what re-activates a collective capacity of composition amongst different actors able to imagine and act together (see Stengers 2015).

A similar compositionist and ecological approach to the theme of the common has been developed by Latour too. From his perspective 'a common world has to be slowly composed instead of being taken for granted and imposed on all' (Latour 2010: 488). This emphasis on the notion of composition marks a clear discontinuity with every idea of politics in which agreement and unity are starting conditions based on a supposed common nature that fits all. By thinking 'ecology beyond nature' Latour is inviting us to take seriously the constitutive role that heterogeneity and disputability have in these activities of composition,

> 'forcing all of us – scientists, activists, and politicians alike – to compose the common world from disjointed pieces instead of taking for granted that the unity, continuity, agreement is already there, embedded in the idea that "the same nature fits all." The increase of disputability – and the amazing extension of scientific and technical controversies – while somewhat terrifying at first, is also the best path to finally taking seriously the political task of establishing the continuity of all entities that make up the common world' (Ibid.: 485).

By thinking a political ecology beyond the foundational role of nature Latour remembers us that acting with significant others is a never ending demand and a necessary condition for making common worlds populated by heterogeneous parts that will never make an 'universalistic' whole, 'but at best a fragile, revisable, and diverse composite material' (Ibid.: 474).

According to Guattari such a notion of ecology alludes to a space of alternative politics that emerge when, as in our time, 'the Earth is undergoing a period of intense techno-scientific transformations' (2000: 27) and such transformations constrain the whole of the social movements to think 'transversally'[8] between different ecological registers – the environment, social relations and human subjectivity. Moreover Guattari's eco-logic is concerned 'only with the movement and intensity of evolutive processes' (Ibid.: 44), that is the idea that the production of new ecosophical assemblages – a politics of making as a transversal praxis that enables making the world 'habitable' – inherits to the creation of new socio-material assemblages as the core and the line of consistency of politics, where the hybrid territories of the self, of social relations and the human-nonhuman concatenations are re-constructed on an on-going basis. More than a definite political program, this notion of ecology seems to suggest a 'machinic ecology' in which, starting at the most minuscule level as well as large-scale political involvement, such 'politics of making' is able to open new vectors of singularisation, 'new systems of valorisation' and new techniques of construction as processes animated by a logic of event-bifurcation. As such:

> 'This new ecosophical logic – and I want to emphasize this point – resembles the manner in which an artist may be led to alter his work after the intrusion of some accidental detail, an event-incident that suddenly makes his initial project bifurcate, making it drift [*dériver*] far from its previous path, however certain it had once appeared to be.' (Ibid.: 52)

A similar logic 'in construction', where science is seen from the perspective of a 'nomadic' or 'minor science' opposed to the so called 'royal science', is developed by Deleuze and Guattari in *A Thousands Plateaus* (1988). As it is in an ecosophical logic, their nomadic science is based on problems-events so, more than focusing on the creation of theorems that presupposed the fabrication of a model 'as an object of

[8] A logic of transversality is a logic that crisscrosses different domains of practices. Transversality is a notion that I borrow from Guattari. In his *The three ecologies* Guattari invites us to think an ethico-political perspective – called ecosophy – as a logic that crisscrosses different domains (e.g. social relations, human subjectivity and environment).

reproduction', it is in the invention-emersion of problems that this style of crafting matter proceeds as a field of continuous variation. A minor science shows a logic of heterogeneity and becoming because it operates starting from the immanence of the event-accidents that always happen in the middle of the making: more than representing a space of construction, it operates within it proceeding in a dynamic relation between forces and matter, in an exploration that is developed step by step. It is a science of 'deviation' where the space is a territory definite by 'actions of contact' and where such contacts and interactions are possible in a topology of variable affects. Such lines of variations that make, not an exact but nevertheless rigorous, science are not referable to the extraction of constants, standards and measures because this style of crafting does not proceed through a logic of reproduction, rather it subordinates all the operations to the sensible conditions of intuition and construction, following the flux of matter and tracing the space of new techniques of creation. 'It is, should be, a question of technique, exclusively a question of technique' (Deleuze and Guattari 1988: 342), seem to suggest Deleuze and Guattari in their understanding of what 'acting with' means in a minor key.

If a politics of worlding is a politics of alternative materialisation, making significant differences inside the knowledge-power processes that inscribe and materialise worlds becomes decisive for inaugurating alter technoscientific practices. But how does this politics of 'alternative materialisations', or saying it with Deleuze and Guattari this 'science as practice' interrogate 'the modern science practices' and the peculiar way in which modern science theorises the subject-object split? Following Haraway, the answer lies in problematising and not ignoring the epistemological and socio-political power implications of 'the modern science modesty'. In fact, Haraway defines the possibilities of a better account of the world, that is a better science, as practices in discontinuity with the modern epistemology of self-invisibility. Western modern science, in fact, theorises objectivity as the existence of a clear and transparent object to which needs to correspond a transparent subject. In this movement of adequacy, in which the objectivity – the clear and distinct object of science – deserved to be grasped by a transparent and neutral subjectivity – the scientist – a discovery becomes an act of epistemological adequacy to the facts of the world. And this gesture produces the invisibility of the researcher's partiality (Haraway 1997).

The question of method is central in this gesture of neutralisation, because the 'methodology' is the 'magic tool' that allows the scientific adventure, the tool that

‘realises’ the scientific act. Exactly for this reason the question of method is so central in modern science because it is figured as the main guarantee to avoid errors, the condition of possibility to speak in the name of reality, as it is. The modern scientific ‘human’ is equipped with a potent capacity for describing facts and, at the same time, his narration is considered to be ‘neutral’. This neutrality is, in a certain way, the condition that makes it possible for modern experimental science to be ‘not just an idea’, but an apparatus of production; something that could count as ‘universal’ knowledge; as objective knowledge. Modern science thinks itself as a matter of fact, and Haraway’s research shows how this supposed neutral knowledge had the power to create a region of objectivity in modernity called science, a new space independent from politics and religion, with the capacity to ground a social order ‘objectively’. Haraway shows how this ‘founding’ gesture produced immediately a strong separation between expert knowledge and opinions. This separation codified science as the edification of a major knowledge. As such:

> ‘This separation of expert knowledge from mere opinion as the legitimating knowledge for ways of life, without appeal to transcendent authority or to abstract certainly of any kind, is a founding gesture of what we call modernity. It is the founding gesture of the separation of the technical and the political.’ (Ibid.: 24)

Modern science is a technology of ‘objectification’ that created a new kind of visibility, that is the visibility driven by what is called by Haraway ‘the culture of no culture’: ‘as men whose only visible trait was their limpid modesty, they inhabited the culture of no culture. Everybody else was left in the domain of culture and of society’ (Ibid.: 25). What are the effects of power implicated in this epistemology? It configures a special community of knowledge, a public space but with restricted access and a line of knowledge-power separation that distributes singularities inside or outside the science domain. For example: ‘how did gender in the making relate to establishing what counted as objective and subjective, political and technical, abstract and concrete, credible and ridiculous?’ (Ibid.: 29). Haraway suggests that this kind of visibility has a lot of political implications: ‘to be the object of vision, rather than the "modest", self-invisible source of vision, is to be evacuated of agency’ (Ibid.: 32).

Following Haraway, the alter that characterises alter-technoscientific practices cannot be experimented without challenging the ‘culture of no culture’. Without locating every attempt to reclaim a form of objectivity inside, and not outside, situated and partial visions. From her point of view, objectivity without situated localisations

and partial visions does not exist. But situating is not an easy exercise. It forces us to think about justice, questioning the existence of asymmetrical knowledge-power relations inside the current technoscientifical production. At the same time Haraway's interpretation of the notion of 'partiality' moves from the standpoint that the given 'relations of power' do not cover all the options of a self positioning, that is always an artificial, complex and contingent act. If a politics of worlding is a politics of making that teaches us to 'see from below', it represents also a force that invites us to resist the temptations of reification. 'Situatedness' in fact is not about reification or fixation of the prismatic experiences of life in a configuration of subjectivity that reflects the linear and objective positions of determinate subaltern figures. Without ignoring the existence of social structures, subjectivity is not a reflex of given social positions. Situated knowledge does not theorise subjectivity as a pure effect of power: '"being" is much more problematic and contingent' (Haraway 1988: 585). Conversely, positioning is a mobile gesture that concerns more critical re-examinations and interpretations, responsibility and artificial re-localisations, translations and identities that are always in process. A politics of worlding is a form of politics that inherits the processes of materialisation of worlds and it cannot be enacted outside the ecologies of the existence of embodied lives. An alternative politics of making and a politics of justice, from this perspective, is a sort of objectivity in becoming, where resonances and partial connections are occasions for new epistemological conversations and political solidarities and where the indeterminacy of matter and the persistence of vision are the conditions of possibility for unprecedented assemblages, relationships and narrations.

2.3 Commoning

In Chapter 1, I introduced a discussion about what it means to think about politics in the frame of the politics of the commons. Dealing with different authors who belong to the tradition of Autonomous Marxism, I discussed how the question of transformation is thought about inside the perspective of what I defined as the autonomy of the social. As a way of thinking the 'otherwise' and justice inside the frame of class struggle, these authors, even if in different ways, are proposing an understanding of politics in which the question of social power is at the centre of the region of intelligibility in which politics is thought. It brings with itself an understanding of politics in which, as I discussed in Chapter 1, non-human entities of various types are outside the intelligibility of politics. If politics is understood as an antagonistic struggle around the element of

appropriation and production, the spaces of agency and politics are entirely occupied by human practices. If liberal theories of 'modern' political mediation posed the beginning of the political civilization from a human contract that separated a supposed state of nature from the political order, the theories of the commons substitute the 'peaceful' dimension of the narration of the contract with the original violence of the primitive accumulation, or with the violence of human exploitation. In this way, the logic of the contract is substituted by the logic of the (social) struggle. What these two different traditions of political thought have in common consists of their both insisting on the foundation of the political inside a 'gesture' of purification. In both cases politics is what comes after an 'active purification' of human society from the material world and politics is reduced to actions of humans alone. In this way, thinking of relations as relations of power, the question of justice is relegated to a matter of humans. Evacuating non-human entities from the region of objectivity in which they theorise politics, these authors offer us an understanding of the commons inside the perimeter of 'modern' politics. In Chapter 1, I developed a problematic around how to theorise the commons and justice beyond the perimeter of the autonomy of the social. Different semiotics helped me to find a way of theorising the commons beyond the troubles of the autonomy of the social.

With Latour we have seen how non-human entities could enter into the intelligibility of politics. Understanding non-human entities as actors among other actors inside the fabric of the constitution of the world, Latour offers us a key ingredient for questioning the supposed 'autonomy' of the social. The 'social' aggregate is not a stable object according to Latour and, moreover, there is not a possible intelligibility of the social without accounting for the traffic of human and more-than-humans relations and associations that perform 'the social'. Continuity of any course of action would consist of human-nonhuman connections: following this perspective, hybridity — not the autonomy of the social — is the terrain upon which to theorise politics. In this way, the unstable borders between the social and the material, the natural and the artificial, the technical and the political start to totter. Something similar to the category of hybridity has been developed by Haraway with her concept of technoscience: this concept designates what emerges inside this hybrid composition of the social, the technological and the material; what comes inside the many processes of implosion, condensation and fusion that characterised the collective life in our century. At this point, we can ask what does it mean to develop a politics of the commons – and a

politics of justice – in technoscience. But instead of addressing this question – which is at the heart of my research project – immediately, it is better to add other ingredients – with other semiotics that are helping me in thinking through this question – in order to create a framework through which it can be adequately dealt with.

In Chapter 1 we saw how transformation is conceived in the theories of the commons as essentially a social transformation toward justice. Moreover, we have seen how the element of struggles is a decisive ingredient for making these transformations happen. This constitutes a sort of 'foundation' for understanding activism through these perspectives. Without ignoring the relevance of struggles against social injustice, approaching activism as a mundane and an everyday praxis – as Papadopoulos and Haraway, amongst others, suggest – of material transformation means thinking about 'activism' within a multitude of practices of alternative materialisation; as a capacity to affect material change. Moreover, a politics of material transformation in technoscience could not be enacted if not starting from situated ecologies of practices, from specific practices of crafting matter.

Since several trajectories of technoscience create new ontologies, new worlds and new forms of life, a politics of alternative materialisation refers to the plurality of possible engagements in specific socio-material arrangements: it is a politics of worlding. If the point is to make a difference in the material world, in the many ways in which people and things, people and people, organic and inorganic elements relate to each other, such politics of worlding can be understood as a political ecology. Moreover, rather than following a logic in which the conditions of transformation are already configured in advance, this form of thinking about activism is inviting us to stay with the constituent role of situated interactions amongst heterogeneous actors involved in a process of materialisation. To say it another way: if acting is first of all a 'capacity to act with', the conditions for actions are immanent to the process of interaction themselves. As in an ecosophical logic, the logic of transformation is always a logic 'in construction'. And, in contrast with what Haraway defines as 'the culture of no culture', an experimental logic is open to the emergence of a plurality of ways of mattering, vectors of singularisation and systems of valorisation. Giving the minor key in which the processes of materialisation, interaction and mattering are conceived here, 'acting with' the commons does not mean acting for a 'substance', an 'human agency' or a 'universal wholeness'. Rather, activism here is conceived first of all as an activity, as a verb; as a commoning. In a politics of worlding commoning means acting with the

commons, experimenting other ways of relating in which the many possible 'otherwises' refer directly to the processes of everyday constitution of things and beings.

How could our material worlds be different from how they actually are? At the beginning of the first chapter I asked what kind of intelligibility of politics is able to take seriously a demand of politics that insists on the centrality of this question. After having introduced – with the help of Haraway, Papadopoulos, Stengers, Guattari and Deleuze – the main modes of attention that characterise a form of politics and a style of activism which engage directly with 'the materialisation of worlds', the politics of worlding seems to be a speculative answer to my starting question. In this understanding of politics, the many 'possible otherwises' refer directly to the processes of everyday constitution of things and beings. As I want to understand something more about what a 'material politics' could be in technoscience – engaging with different experiences of worlding politics – in the following chapters I will explore – starting from specific relations, modes of doing and contexts of practices – what a 'power to act with' could mean. Starting from concrete examples of social-techno-knowledge and ecological movements, I will learn something from different practices of alternative materialisation. At the same time, I ask how emergent forms of activism are transforming the ways in which different entities relate to each other through the experimentation of processes of interaction, materialisation and mattering. Finally, I will ask what justice means in nature-culture and to what extent a politics of worlding can be understood as a politics of justice inside the technoscientifical transformations that characterise our global present.

CHAPTER 3
METHODS FOR THINKING WITH EMERGENT PRACTICES

3.1 On Multi-Sited Ethnography

In the last chapter I have introduced my research questions. They can be synthesised in three topics. First, how a politics of commoning can be understood as a power to act with significant others? Second, how emergent forms of activism are transforming the ways in which different and heterogenous entities relate to each other? And finally, what does justice mean inside these practices? In order to answer my research questions, I developed empirical research that examines how different forms of the 'politics of making' are shaping alternative forms of interaction, materialisation and mattering. I chose four sites of inquiry – one located in environmental activism, specifically the ecological practices of permaculture; the practices of hardware hacking; 'technopolitics' and the political engagement of the 15M movement in Spain in 2011; and, finally, an academic institution that sets as its aim the exploration of the interrelations between politics and science practices, the Science and Justice Research Centre at UCSC.

Each of them constitutes different ways of rethinking, via practical experimenting, the ways in which humans relate to both other human and non-human entities. They are experiments for reclaiming, reworking and reworlding the material culture of living, starting from specific practices and specific domains of human activities. They represent different modest attempts to enact a politics of transformation in the middle of the technoscientific transformations that are reshaping forms of life and lifeforms on a global scale at the beginning of our century. The main research method I use in order to engage with my research questions is that of multi-sited ethnography. In order to introduce this method of inquiry, in the next lines I deal with the main differences between the ethnographic sensibility that characterise a multi-sited approach and a traditional ethnography.

Ethnography is a methodological choice traditionally conceived as a qualitative social research, in which the production of data is gained through a daily interaction in a contextually rich environment. Through participant observation, and thanks to a relation of trust between researcher and researched the accumulation of data is usually understood as the output of an intense and situational interaction that characterises fieldwork activity. Conventionally ethnography implies the idea of a long term stay in a site of inquiry. The importance of living for several months in a determinate context is

often linked with the idea that only a deep presence in a location will allow the researcher to become a sort of container of a set of social, material, cultural or linguistic relations. In order to become such a container, a deep and prolonged presence in the fieldwork is interpreted as a decisive chance for offering a dense representation of a determinate context of practices. Multi-sited ethnography (Marcus 1995; 1998; Hine 2007; Falzon 2009) claims to break with this convention. Rather than offering an holistic representation of a singular locality, a multi-sited ethnography involves a plurality of spaces through which the researcher moves, focusing her attention much less in representing a singular context with a significant corpus of data, and operating through a logic of data juxtaposition. By juxtaposing different local situations, and focusing on situated elements of interest, thanks to this ethnographic approach it is possible to gain an accumulation of perspectives starting from heterogeneous practices and contexts. In this way an ethnography can be seen much less as a deep immersion in a context with the goal of producing a detailed and representative description of it via a significant accumulation of data, and much more as an activity of tracing connections through different sites. According to this approach, rather than providing a general portrait of a site of inquiry, the goal of an ethnography consists in establishing resonances and specific translations across different locations and practices. The means through which data is generated and collected remains unchanged, compared to traditional ethnography; a combination of field techniques, such as audio-visual recording, written taking, examination of literature, interviews, mixed with a daily participant observation to the 'local' life.

A multi-sited approach, and its methodological constraints, however implies a shift in the way in which fieldwork is conceived. Understanding fieldwork with Clifford (1997) as a travel practice, we can say that a multi-sited ethnography is much less oriented to a long time immersion in a single location, and much more to a travel through different locations. Rather than having access to the roots of a singular social environment thanks to a long time immersion, a multi-sited approach is based on the idea that an ethnography of routes (Clifford 1997) can be fostered by traveling amongst different locations. This reformulation of conventional ethnographic methodology affects the amount of data accumulation and the consequent detailed descriptions that traditionally characterise ethnography as a method of inquiry. Consequently spending less time in a singular environment could imply a lack of depth in understanding the various sets of relations that inhabit each location. As Falzon (2009) remembers us, time

is traditionally conceived as the key factor that enables the ethnographer to achieve depth. But if on the one hand you loose depth and time, on the other hand you can gain connectivity and space. Investing time in order to travel to different contexts of practices, which means taking more spaces in exam, it is a way for thinking ethnography as a practice of travel that takes seriously the possibility of an investigation starting from the proliferation of spaces in exam. By thinking not just the element of time, but also the element of space as key dimensions for fostering an ethnography, what is usually considered one of the main implicit risks or limits of a multi sited approach, can become a strength.

Privileging a logic of juxtaposition and partial connections between heterogeneous sites, a multi-sited ethnography highlights the very fact that it is not just time that transforms and makes, but also space. Thickness is not just a matter of depth, it can be gained by an accumulation of surfaces. By attenuating and making thinner the power of a singular fieldwork, the goal of a multi-sited approach consists in the capacity of inventing new paths of connections and forms of association amongst different locations and local practices. A multi-sited approach allows the researcher to bring heterogeneous spaces and practices inside the same frame of study, enlarging her capacity to trace connections amongst distinct practices and discourses from one site to another. Focusing on the emergent dimensions that it is possible to appreciate thanks to the composition of diverse material coming from different locations, a multi-sited method allows the ethnographer to construct the main theoretical trajectories and topics. The important contribution that this method offers consists in fact, regardless of the variability of the quality of the data accumulation at different sites, in the possibility of constructing the object of research.

The notion of multi-sited ethnography, following Hines, not taking for granted a ready made object of research, allows the researcher to construct the ethnographic object of research. Starting from the recognition that defined territories are always a matter of artificial construction, a multi-sited approach to ethnography deliberately pursues a construction in the making of the objects of ethnographic study. Marcus offers an account of the constructive nature of research project, which signifies also an acknowledgement of the agency of the researcher in determining the focus. As such:

> "In short, within a multi-sited research imaginary, tracing and describing the connections and relationships among sites previously thought incommensurate is ethnography's way of making arguments and providing

its own contexts of significance." (Marcus 1998: 14)

For Marcus the multi-sited imaginary offers the possibility of crafting a research object specifically designed to engage in a situated argument, or to be significant to an identified context of attentions and concerns. In other words, a multi-sited approach enlarges the possibility of intervention of a researcher by offering her not just a way for making arguments, but also the possibility of determining the context of significance of these arguments. This method could be conceived as a form of construction, a mode of constructivism in which the production of knowledge is immediately a form of intervention. Thanks to its generative tension, this method is gaining a strong relevance inside Science and Technology Studies.

A significant example of the relation between ethnography and the ability to intervene in STS is offered by Mol (2003). Giving an account of what atherosclerosis is starting from different enactments and manifestations that are taking place in various locations around an hospital, Mol moves her strategic attention place by place in the attempt of offering us a description of the local practices that are enacted in each of these locations. This multi-sited approach offers her the possibility to follow an object, and to see how a specific object is enacted in different localities. This method allows her not only to develop different accounts on what atherosclerosis is by following diverse practices, but it also lets her conceive an ethnography as an occasion for developing a specific theoretical intervention. In fact Mol's way of developing what we are calling with Marcus a multi-sited imaginary consists precisely in using an ethnographic attention on the different modes of enacting a specific object as a way to show how reality is multiple and enacted, rather than observed. Following Mol we can appreciate the very fact that this methodological sensibility can be conceived less as a method in a traditional sense, and more as a form of knowledge production. A form of knowledge production in which the need of offering several accounts of a technoscientific experience through an ethnography is mixed explicitly with the need of offering a theoretical contribution in thinking the question of ontology. Mol deliberately thinks with her data in order to develop a new theoretical hypothesis: reality is enacted rather than observed, and it is multiple. By developing her notion of multiple ontologies Mol makes an intervention. She is not just reading and analysing her data, she has deliberately chosen the region of intelligibility in which she is making an intervention. Data in fact are not 'just there', but they are inseparable from what the ethnographer is able to do and say around them. We can go further and ask ourselves whether she is

doing social sciences or philosophy. What is the object of her research? Is she interested in understanding atherosclerosis or in making a point about ontology? Probably both.

Thanks to its capacity to trace things in and through contexts in order to develop new theoretical trajectories, a multi-sited imaginary reformulates what ethnography means. Rather than a way of offering primarily a representative portrayal of the world, here ethnography is much more conceived as a lure for thinking the emersion of new partial objects of study. For this reason several authors as Star and Jensen, prefer not to describe themselves as ethnographer, but as scholars who are bringing an ethnographic sensibility (Star 1999: 383) or who are conducting a "quasi-ethnographic study" (Jensen 2004: 3). The ethnographic experience is conceived as a lure for the emersion of partial objects, as a lure for the emersion of new theoretical insights. What brings together different case studies in a multi-sited ethnography consists precisely in the insights made possible by the theoretical route that connects the sites. Thinking theory as intervention does not constitute a way for making a hierarchy between the empirical and the theoretical, the practices and the ideas, the knowledge of the informants and the reflexive knowledge of the ethnographer. Quite the contrary, the emersion of theoretical insights does not mean that the reflexive knowledge of the ethnographer counts more than the everyday experience of the practitioners. Theory is not synonymous with the power of truth and its aim does not consist in offering a synthesis of the essence of a practice. Theory is conceived here as a way for offering lateral insights and for adding dimensions to a situation. Theory is a way of thinking with significant others, not for silencing them. Moreover, conceptualising the world is not a prerogative of scholars; our 'informants' do it as well. This offers us, as highlighted by Gad and Jensen (2016) 'the possibility of enriching our own conceptual repertoires by letting them be inflected by the concepts of those we study'. For this reason theory is nothing less and nothing more than a situated exercise of thinking with practices and situations that are, for the ethnographer, relevant.

3.2 On Partial Encounters

There are several reasons that convinced me to use a multi-sited ethnography as the main methodology of my research. First of all, having a significant number of sites is a way of mapping different sets of practices, allowing me to inquire into what 'acting with' looks like in very heterogeneous contexts and locations. Collecting data through a multi-sited ethnography allowed me to not concentrate my attention on a deep and

committed ‘localism’. Ethnography is traditionally understood as a ‘long’ active presence of the ethnographer in a community and with an ‘intimate’ face-to-face or group immersion in this community. Moreover, the goal of an ethnography is often associated with the capacity to offer to the reader a detailed and global description of local knowledge and practices. Conversely, as Marcus (1998) reminds us, the goal of a multi-sited ethnography does not consist in developing a holistic representation or a global portrayal of a world as a ‘totality’. Rather, it is an exercise of ‘mapping terrain’ (Ibid.: 83).

The way in which I conduct my ethnography is based on the idea that mapping terrains is always a partial exercise, an exercise of encounter in which multiple and partial focuses, concerns and encounters orient the ethnographic experience. Staying with the aleatory, unpredictable and always variable trait of each encounter is a way in which I could conceive of the experimental feature of ethnography. Collecting data through an active presence in my fieldwork – via qualitative interviews, conversations, observations, attending meetings and training programs, collecting artefacts and pictures, etc. – was my way of mapping terrains and exploring practices. Being conscious of the fragmentary nature of these data, the decisive move is looking at the relationship between these heterogeneous and often ‘dispersed’ materials. As it is usual in research, what moved me at the beginning of my ethnography does not necessarily correspond with what I have developed in my analysis. Data influence other data and research is naturally exposed to these fluctuations.

Another feature of a multi-sited ethnography consists of accepting and valorising the emergence of different degrees of significance inside both the different sites of inquiry and the corpus of data collected. As Marcus wrote ‘multi-sited ethnographies inevitably are the product of knowledge based on varying intensities and qualities’ (Ibid.: 84). This valorisation of the qualitative difference of materials has been, for me, not just a way of dealing with my data, but also an occasion for dealing with my sites through different methods of inquiry. In my research, not all sites are treated with a uniform set of fieldwork practices. Giving centrality to qualitative interviews and conversations in certain locations; accumulating data through active observation and ethnographic notes in other sites; following a specific material object as the main ‘local’ tactic of inquiry in another case: an explicit strategy of differentiation allowed me to approach different strategies of data accumulation moving from one site to another.

Finally, the use of a multi-sited ethnography gave me the chance to trace connections amongst distinctive practices and discourses passing from one site to another, constructing the object of my research through these points of passage and transition. Indeed, the 'capacity to make connections through translations and tracings among distinctive discourses from site to site' (Ibid.: 84) is what constitutes the heart of such a method. Stressing a logic of association, relationship and translation among different sites, this method allows me to juxtapose phenomena that 'conventionally' could be understood as 'worlds apart'. Moreover, such a method allows the ethnographer to design the way in which one site is connected to the next. And, as I will explain further in the next paragraphs, a logic of problematisation is what guides me from one site to another.

Building up a map of concepts on what worlding politics means, starting from very heterogeneous contexts of practices, is the main goal of my ethnography. Diffracting an initial hypothesis called 'politics of worlding' with different 'objects' of inquiry is an exercise of extending and adding dimensions of intelligibility to this starting hypothesis. Such mapping is the resultant of a performative cartography inhabited by concepts, ideas, practical experiments, stories, topologies, artefacts and imaginations. The analysis of each site of inquiry comes after another one and each site of inquiry interrupts, prolongs and transports a situated problem or a perspective inside another context of practices.

The choice to adopt a multi-sited ethnography as the method for collecting data is determined by the necessity of tracing a space of circulation amongst different locations. As Marcus (1995) says, a piece of multi-sited research is designed around chains, paths, conjunctions or juxtapositions of locations in which the ethnographer establishes some form of presence, with an explicit, posited logic of association or connection among sites. In my case, such a logic of connection is traced by the accumulation of problematics. A new problem inaugurates each chapter. The line traced by an on-going accumulation of questions, traced by a logic of problematisation, constitutes and animates my performative activity of mapping. A conception of mapping as a performative act has been developed in recent years by several authors (Crampton 2009; Dodge et al. 2011) oriented to an 'ontogenetic approach to mapping'. For these authors, and it is the same for me, such performance is constantly redefined by the process of making new territories of meaning. A similar account of mapping as a participatory and generative act is proposed by the work of Annemarie Mol (1998),

where the concepts of performance and intervention are used, starting from the theoretical presupposition that reality is multiple and that it is done and enacted rather than observed. The map is enacted and generated by an open-ended unfolding of encounters between my situated questions and the variable entanglements emerged in the different sites that compose my multi-sited ethnography. The resultant of this activity, or at least the most visible 'facts' produced in my text, is a map of concepts useful to theorise what a politics of worlding could be.

A stubborn fact is something that cannot be undone. It is the result – following Stengers – of imagination, passion and invention. Something that cannot be undone and something that, at the same time, is contingent. A fact is not more factual than others per se. Moreover it is not closed – each fact belongs to its becoming: it is 'how an actual entity becomes', Whitehead wrote, that 'constitutes what that actual entity is' (1978: 23). This conception of facts, borrowed from Stengers and Whitehead, can be useful to introduce another layer of what it means for me to think with my sites of inquiry: my relation with the sites and to the ways in which I relate with people, stories, artefacts and imaginations that I met in the course of my ethnography. I tried to take all these entities, persons and facts seriously, approaching opinions and practices as both ingredients for thinking (with) my research questions – as a lure for thinking and reshaping them – and, at the same time, as entities that have a value per se, in their divergence and with their power to become something else, independent from their relevance for my writing and thinking. In understanding what 'worlding politics' means for 'my practitioners', I collected accounts of their practices and dealt with and experimented with questions that I felt relevant for them.

According to Stenger's reading of Whitehead 'to feel is 'to be affected by', that is, at the same time, to confer upon what is felt 'there' the power to have an effect 'here'. The point is thus to take literally the common-sense statement 'this thing is present in my experience insofar as it is elsewhere' (2011: 294). Dealing with what 'elsewhere' is constitutes for me an invitation to take seriously the habits of practitioners, for thinking with what animates their everyday doing and for giving to situated contexts of practices the power to make me think. Since every practice comes with its environment and with its universe of meaning, thinking with practitioners for me means first of all dealing with issues and questions that I felt relevant for them. Taking seriously their interests, it is possible to conceive an ethnographic experience as an occasion for being affected by significant others. Rather than using my writing for judging the ethical and political

risks or the theoretical aporias potentially present in their practices, I preferred to put myself in the situation of experimenting with what it is possible to see, or better, what I could see, watching with them and their own practices.

I feel particularly connected with what Marcus defines as 'circumstantial activism' (1998: 98). From his perspective, the strength of an ethnographic project consists of making an intervention in the ways in which problems are conceptualised. In doing this, there is a primacy of the willingness to establish connections rather than engaging in an ethnography in which field boundaries seem to be obvious in advance. Tracing connections and relationships amongst very different fields of practices is, for me, a way for making arguments and performing 'its own contexts of significance' (Ibid.: 14). How to rethink activism in the middle of the many technoscientific transformations that characterise our world? The relevance of this question, for example, brought me to engage with very different locations and socio-material practices. Offering different accountabilities to this question: this is what matters for me. Learning something through encounters with people, objects and practices that I had never met before this research and thinking with them: this is the main concern I feel committed to. Rethinking a politics of the commons beyond the autonomy of the social: this is my circumstantial activism that I try to feed and sustain with all my limits and responsibility.

3.3 Four Cases of Study

The goal of my research consists of theorising alternative accounts of the notion of commons via exploring what a 'power to act with' could mean, starting from different contexts of practice. In choosing my sites I followed a logic of interest and commitment. I feel committed to sustaining the practices of my sites, I am interested in understanding them 'locally' and I feel lucky to have the possibility of thinking, writing and discussing justice, commoning and technoscience with their practices in mind. All the sites I introduce below exposed me to encounters with constrains, material interventions, ethics and discourses that I had never met before starting my PhD. I chose four sites that represented, for me, relevant practical experiments of rethinking the ways in which humans relate to both other humans and non-human entities, and four sites that – even if in different ways – constituted for me a lure for thinking politics as the materialisation of alternative forms of existence.

The first case study (Chapter 4) refers to a social movement generated by an

event. At the end of a demonstration organised on the 15th of May, 2011, by the Democracia Real Ya (Democracy Now) platform, a group of more or less 40 people decided autonomously in a spontaneous assembly to occupy Puerta del Sol (one of the main squares in Madrid) and to camp there. The movement of the occupied squares, called 15M, proliferated within a few days throughout Spain. I was fascinated by the capacity of this social movement to invent new forms of online and offline participation and by its capacity to inaugurate a form of radical democracy. I started to read articles and interviews and, following the adventures of this movement online, I started to understand how, in the middle of the current crisis of representative politics, such a significant movement was able to proliferate to the point of involving millions of people in Spain. More than a social movement this seemed to be a society in mobilisation. I have been engaged in mass movements in recent years, but I had the sense that we were witness to new practices of activism and to a movement of a new nature. A new force was emerging and maybe also a new way of thinking and experimenting with processes of self-organisation. A new sensibility and a transversal process of political subjectification – these seem to be the novelties that such an event brings. But to what extent was a political sensibility performed and enacted through the experimentation of new forms of 'acting with' significant others? The question became: what counts as relations in the 15M? I tried to understand this movement through the modes of interaction that were enacted by its participants.

If I think of the 15M movement starting from its practices of mobilisation and organisation, two macro features appear to me immediately. First, its capacity to reappropriate urban spaces – the squares as the space of the public assemblies; second, the strong role of technologies of connection – text messages, social networks, online platforms – for communication, discussion and decision-making. I concentrated my attention on the role of the technologies of connection in experimenting with new forms of interaction and, in particular, on the relation between technologies and forms of subjectification inside the movement. How are forms of hacking and using technologies of connections reshaping the forms of organisation of emergent social movements? And how are these technologies redefining forms of activism and ways of thinking, imagining and acting the politics of transformation? And finally, which forms of politics of interaction can be theorised from the experience of this movement? In order to deal with these questions I organised, in Spring 2014, a workshop on technopolitics at the University of Leicester with three activists from Spain. I travelled to Madrid and

Barcelona in order to interview other activists and to follow conferences and workshops on technologies and social movements. I collected impressions, stories, points of view, emotions and analysis starting from the situated experiences of fifteen people involved in this movement. Analysing personal perspectives, texts, analysis and reports produced inside the movement and ethnographic notes, I have paid attention to the features, qualities and rationalities that seemed to me to be 'transversal' to different experiences. I stayed with what I felt relevant for people directly involved in the mobilisation. I tried to give an account of the movement, and of its forms of organisation and cooperation, following the objects of 'attention' that I felt relevant in my conversations. Given the fact that I was not in Spain during the mobilisations, my analysis is mainly driven by materials that guided my understanding of the political features of this movement. The main goal of my analysis consists of theorising the concept of commoning through the modes of interaction that were enacted in this social movement, so I focused my attention on the forms of participation that emerged through this collective experience.

While, in my first case study, I tried to understand what 'acting with' means inside the ethics, the ways of proceeding and the material culture of a contemporary social movement, my second case of inquiry (Chapter 5) diffracts 'the politics of worlding' with an ecological movement. Permaculture is a movement of alternative ecological design that takes multiple shapes: rural or urban, projects of local food production, natural building, knowledge production and experiments with forms of social organising. I met the ecological culture of permaculture thanks to long conversations with a friend in Leicester. After these conversations I went, at the beginning of August 2013, to Vicchio nel Mugello, in Italy, where I participated in an intensive module of training on permaculture. I stayed twenty days in an eco-village called Tertulia where I conducted my micro-ethnography. What brought me there? The sense that the human-nonhuman interactions were at the core of this ecological and practical philosophy. Permaculture is a global movement that insists on the transformation of human-soil and human-landscape relations. What does it mean to act with significant others in the culture of permaculture? I tried to relate to permaculture starting from this question, in the attempt to see what a politics of worlding means through the lens of permaculture's ethics and ways of proceeding: with a series of attentions, procedures, sensibilities, techniques and principles that constitute the everyday doing of permaculture. I collected various materials during my ethnography (interviews, ethnographic notes, video, pictures, and I have notes from all the sections

of the module training) and read several books and articles on permaculture both before and after my trip in Italy. In the analysis of my material, I privileged two main knots of attention, reciprocally correlated: the intimate relation between permaculture as an ethics of doing in nature-culture and permaculture as a specific technique of design. I piled all the heterogeneous material that, in different ways, informed this intimate relation, and I analysed them following the articulation of knowledge suggested by this pile. Second, I collected a large amount of stories and biographical episodes during my fieldwork, letting myself be fascinated and enchanted by these stories. I also collected stories on how practitioners had developed their own ways of dealing with certain techniques. I selected some of them and gave them the role of an entry point for understanding practices in the culture of permaculture.

The politics of hacking represents my third case study (Chapter 6). Visiting several hackerspaces, makerspaces and makerfaires in California, New York, Milan, Rome and Leicester, doing interviews with makers, attending meetings and training sessions, I focused my attention on how the global movement of makers is reshaping the art of manufacturing beyond the Fordist chain of production. A new revolution is operating on matter: the revolution of the code. Code is taking the place of the fire of Industrial Revolution at the beginning of our century. What are the consequences of this replacement? Or better, how do the makers, in the middle of such transition, enlarge the culture of open code from software to hardware and to the art of manufacturing? And what does the use of things mean in this context? These are the main questions that I engaged with, starting from my account of the material culture of hacking. In particular,following an object-oriented approach, I focused my attention on a micro controller called Arduino, a 'cult' tool in the culture of the makers. I investigated the style of crafting matter that lives in places like makerspaces in an attempt to understand what 'materialising ideas' means and create worlds through sharing knowledge and materialising artefacts in the politics of hacking. If, in the case of my site on permaculture, I had occasion to collect the greatest part of data in a single temporal and spacial framework, in this case it was the opposite. Developing an ethnography in which the main strategy was based on visiting a large number of locations, situated also in different geographical contexts, and for maximum of six days each, I had a significant number of items in my material box: a lot of information, but very repetitive; a lot of general descriptions and very few accounts of actual practices of making. So, rather than following interviews and conversations, I concentrated my analysis of data around

a material object – Arduino – and, in writing my chapter on the politics of hacking, I put a material object at the centre the analysis as a way of entering into the culture of hacking. Understanding the makers' movement, the use of things and the open source culture via Arduino is the situated strategy of analysis I developed in this section of the thesis.

My last site of inquiry (Chapter 7) does not refer to a movement. But to a question: what does it mean to think about justice in technoscience? In order to theorise the many implications connected with this question, in Spring 2013, I visited a centre of research called Science and Justice, located in the University of California-Santa Cruz. I attended several public events; I interviewed teachers, researchers and students connected in different ways with the activities of this research centre. Focusing on a wide range of topics at the intersection of science and society, this research centre provides space for natural scientists, engineers, social and human scientists and artists to gather around issues of common interest. As more and more aspects of society are shaped by scientific and technological practices and narrations, what this centre is trying to do consists of developing critical and productive dialogues across disciplinary differences. In doing this, they are experimenting with the pragmatics of conversation and collaborations that allow experimentation with forms of dialogue and circulation of perspectives starting from the many ethical and political implications of 'making science' today. What kind of knowledge politics is enacted here? I tried to understand not just how the category of justice is understood in this location, but also through which techniques justice becomes not just a topic but also a pragmatic of conversation and knowledge production. Here the main strategy of inquiry and data analysis consists of thinking with the qualitative data collected in my conversations.

Exploring what 'acting with' could mean starting from different locations and contexts of practices, I developed a framework in which to thinking about technoscience, commons and justice with emergent forms of activism that are transforming the ways in which different entities relate to each other through the experimentation of processes of interaction, materialisation and mattering. Starting from a social movement, a form of environmental activism, the open-code culture of the makers' movement and with the knowledge practices of a 'committed' research centre, I used my sites as a lure for thinking of politics as the experimentation of possible otherwises in the ways in which people and things relate to each other.

3.4 Situational Analysis

My multi-sited ethnography is a practice of travel which aim consists in collecting data about what does 'acting with' could mean starting from heterogeneous situations. In section 3.2 I introduced the idea that mapping terrains is always a partial exercise, and the resultant of this activity of mapping consists in the accumulation of data: concepts, ideas, practical experiments, stories, topologies, artefacts and imaginations. In order to analyse these data I choose situational analysis as method, that is a mode of analysis based on the idea that digesting and analysing data means giving them the power to provoke new insights about the relations amongst the actors that are populating a situation. If what matters in fact is analysing modes of relating in different locations, using a situational analysis allows me to have a relation with data mainly based on their capacity to enlarge my understanding of different ecologies of relations.

Based on the attempt of actualising the strength of grounded theory inside the cultural sensibility of postmodern turn, situational analysis has been developed by Adele E. Clarke (2003; 2005; 2007). Conceived as a way for taking into account several actors that are in different ways present in a situation, this approach 'explicitly takes the nonhuman elements in the situation of inquiry into account both materially and discursively' (Clarke 2005: 63). The emphasis on the term 'situation' designates an understanding of the object of analysis – a situation – as the output of processes of co-constitution through conditions and actions. By refusing to make in advance any distinction between context and action, for this method the conditional elements of a situation are constitutive for defining a situation. In contraposition to any attempt to define action starting from key conditional matrix, and refusing the structure/process binary, what we are used to conceive as contextual elements in a situational analysis becomes object of analysis. According to Clarke in fact 'situations, then, are particular configurations of conditions' (Ibid.: 298), and these conditions of action can not be placed outside the action. Quite the contrary, a situational analysis places both conditions and actions inside the analysis of a situation. In synthesis we can say that this method insists on delineating processes of constitution that involve many actors through specifying modes of relating and conditions of action. Even more significant, situational analysis pursues this kind of analysis by making map a tool of analysis. What does make a difference in a situation? This is the central question at stake for my situational approach. A way for dealing with this question consists in writing a list of pertinent elements – a list of data – for each of my sites of inquiry. By distributing these elements

– framed by my informants or extracted from my participant observation – for each site of inquiry in a piece of paper I construct a sort of map populated by my data. Taking each element in turn, I think about a single data in relation to the other elements of the map. By specifying the 'nature' of each relation, and sometimes writing down small sentences in order to put into words how a data can relate to another one, I create a sort of concatenation amongst heterogeneous data. Proceeding in this way, and privileging the relations amongst data that resonates more with my research questions, the map becomes a diagram in which there are data – I call them knots – that become more connected with other data than others. By attributing to these knots the role of strategic elements in a situation I try to see if through these knots it is possible to make a difference in my understanding of each location. If I feel that the way in which these knots articulate relations with other data makes a difference in my understanding of a situated location, I give them the power to become conceptual operators.

Each conceptual operator needs to manifest a 'conceptual affordance' of the empirical material coming from each site, which means that it need to capture an intensity of expression that is present inside a situation. Once that the analysis of data of a single site offers me a list of conceptual operators, I sort them out and I start writing a paragraph for each conceptual operator. The discussion that animates each of my empirical chapters is articulated following a sequence of different conceptual operators. The entire logic of juxtaposition that characterised my multi-sited ethnography is based on the capacity of certain conceptual operators to enter in partial resonance with others, tracing paths and bridges and establishing connections amongst different sites of inquiry. Conceptual operators constitute a sort of medium term between primary data and the general discussion, for this reason primary data are sometimes not explicitly mentioned inside a discussion. This happens for example when concepts 'eat' and 'digest' data, up to the point of making them invisible to the reader. Other times a conceptual operator is not able to synthesise a field of intensity, its grasp is slackened, and this allows the presence of many data inside the discussion. This provokes a disequilibrium inside my ethnographic accounts: in certain sections of my empirical chapters, primary data are explicitly mentioned inside the discussion, other times they are 'incapsulated' inside what I call conceptual operators.

A situational analysis poses the ethnographer in the position of calibrating which relations amongst data to pursue, that means which kind of story tell to the reader. By acknowledging the very fact that there are many (other) possible directions to follow

between domains of knowledge and practice, the ethnographer choses certain paths of connections between data, defining the specific interpretation of data given in a process of analysis. In other words, a situational approach enlarges the possibility of intervention of the ethnographer by offering her not just a way for making arguments, but also the possibility of determining the context of significance of these arguments. I am aware that there are many other possible paths of connection between my fieldwork and the specific interpretation of the data given in the thesis. The situatedness of each interpretation makes data analysis something not irreducible to matters of fact or to matters of concern. Analysing data means precisely exploring this zone between situated data and situated interpretations, a thick zone between the conceptual and the empirical, where many mutual captures take place.

CHAPTER 4
PINK REVOLUTION

> 'Sometimes I have the impression that our people sees its relationship with Josephine rather like this: that she, this fragile, vulnerable, somehow distinguished creature, in her opinion distinguished by her song, has been entrusted to us and that we must look after her; the reason for this is not clear to anyone, only the fact seems to be established. But what has been entrusted to one's care one does not laugh at; to do so would be a breach of duty; the utmost spite that the most spiteful amongst us can vent on Josephine is when they sometimes say: 'When we see Josephine it is no laughing matter'.'
> Franz Kafka, *Josephine the Singer, or the Mouse Folk* (2009 [1924])

15 May 2011. Puerta del Sol, Madrid. A new political animal has been found in the middle of a plaza. A new force is emerging in the middle of the current economic crisis. A new actor is challenging our understanding of what a social movement is. Storytellers don't stop to give us accounts of its shape, words and pragmatics. Many people say that its singing, as in the short story of Kafka above, is quite irresistible and that such an animal has the power to reactivate the memory of faraway days in the history of Spain: the radical and melancholic days of the 1936 Republic. Such a memory for Toni Negri (2011) reactivates and reopens the entire story of modern Spain – a story 'incomparable with other European countries' and a memory of struggles against the capitalistic and clerical, reactionary and repressive, liberal and reformist forms of governance. But, where does its singing come from? Some activists say that it comes with the Sirocco (Observatorio Metropolitano 2013), a Mediterranean wind coming from North Africa. Maybe it comes from Maghreb, where in one season (early 2011) – the so-called Arab Spring – the reigns of Ben Ali in Tunisia and Mubarak in Egypt were dissolved by 'popular' uprisings. Others insist on the crisis of the middle class, as if the desire of the middle class met the effects of the current economic and financial global crisis. This last thesis makes a direct connection between the Occupy movement, and in particular its relevance in the US, with the 15M movement, insisting on the common centrality of middle class impoverishment as the main enzyme of these movements. Otherwise, all these movements have been called 'revolutions 2.0' (Gerbaudo 2012; Trottier and Fuchs 2014), highlighting modalities of revolts and revolutions that, without identifiable leaders or headquarters, are able to exercise a 'destituent power' – the power of a social

movement to contest and dismiss a government – thanks also to their ability to 're-appropriate' public spaces, such as squares and streets, and to build up a peer-to-peer architecture of organisation, sustained by a massive use of social media and, more generally, by the web's technologies of communication and information. The hypothesis I will develop in this chapter consists in thinking the song in relation with the feelings, the pragmatics and the semiotics that make it occur. If we want to understand something about this song, we need to have a look at the political animal that generated it: thinking the song in relation with the processes of subjectification that generated such an entity called 15M and taking seriously the very fact that this entity is an historical contingency produced, first of all, by its self-making. Understanding a social movement from the starting point of its practices is the goal of this chapter. What does 'acting with' mean in the forms of activism that emerge from this collective experience? What count as relations in the 15M movement? I try to understand this movement through the modes of interaction that were enacted by its participants in the attempt to define which kind of 'politics of commoning' is enacted in this context.

In the first sections of this chapter I introduce the 15M movement, with the help of activists who have lived this experience. These sections focus on the elements of novelty inside the 15M. First, the co-investing relation between the dimension of the square and the web; second, the fact that such a multilayer system produced a plateau of consistency, an entity called 15M capable of creating enunciates, common notions, affects and feelings. Thirdly, it considers the relation between new forms of democratic participation and the strong role of technologies of connection – such as Twitter – inside this political process. Following that, I discuss the extent to which the question of communication and organisation are central to the movement's ways of proceeding. The use of Twitter, the technopolitical approach to politics and the activists' oscillation between crafting new technologies of connection and living inside existing highly-populated media ecologies are three ways through which to theorise the question of self-organisation inside the 15M movement. In the second part of the chapter I introduce, with the help of the analysis of 15M DatAnalysis Research Group, the hypothesis that practices of self-organisation could be understood through noise. Or better, that the analysis of the noise produced by the interactions of participants inside a process could be a good indicator for understanding what is, and what could be, a politics of self-organisation inside a social movement.

4.1 The 15M Movement: The Square and The Web

At the end of a demonstration organised on the 15th of May by the *Democracia Real Ya* (Democracy Now) platform, a group of more or less forty people decided autonomously, in a spontaneous assembly, to occupy Puerta del Sol and to camp in this square of Madrid. They quickly started to organise themselves in order to defend their right to occupy the square. The energy coming from the demonstration was translated by a group of people in an 'acampada' (a camp) that, unforeseen to anyone, territorialized and embodied the date of the 15th of May. Inside this group there were several hackers and communication activists, who inaugurated a twitter account called @acampadasol and started to communicate what was happening through that account. They invited people to join them and to express their solidarity with the acampada starting from the next day. Toret, a member of *Democracia Real Ya*, found out about the acampada in this way: 'a hacktivist friend from Madrid, told me in a chat 'we are camping in Sol, *Democracia Real Ya* is a virus that is infesting society and, from here, we are seeing what will happen'. There were many mobiles and computers in the acampada, and the news started to circulate quickly through the internet and social media. As Toret told me, on the morning of the 16th of May a thousand people attended the assembly in the square, and acampadas started in Barcelona and Valencia as well. On the same day, Sol's acampada in Madrid was attacked by police. The acampada did not organise a physical resistance to the police attack, avoiding a face-to-face confrontation with the repressive power of the police. They did not reproduce the so-common triangulation between resistance, eviction and protest. More than measuring its force of action in relation to a counterpart, the acampada organised a form of resistance strongly connected with the viral effect produced via web by the eviction. Pictures, videos, narrations, tweets and messages proliferated. The point was to produce 'a strong wave' capable of transforming an act of political repression into a point of force. Avoiding a direct confrontational trap, the online network stretched the event in time and space and made it speak and circulate. In this way, the event got amplified. The contagious virus moved fast and vastly, and the day after the 16th of May – thanks also to the images and the narrations of the violent eviction of Plaza del Sol operated by the police that circulated via social media, blogs and web pages – acampadas appeared in the squares of almost each city, town and sometimes village of Spain.

Acampadas became permanent assemblies: self-organised structures of the politicisation of life, representing a key point of diffusion, extension and concretisation

of the movement in a situated territory and in its concrete problems and issues. Assemblies constituted a strong pole in the process of identification of the movement, so participating in them was central for taking part in the movement. The assemblies were characterised by their long duration – 'we are going slowly, we are going faraway' was one of the movement's slogans – their gestures – a long list of bodily gestures that indicate consensus, disagreement, unnecessary repetitions and so on, regulated the relation between speaker and listeners – and the fact that each speaker cannot represent anyone else except herself – avoiding the representative game of speaking in the name of this organisation or that collective. The request for short interventions strictly related to the topics of discussion was another visible characteristic. Next to the general assemblies, workshops and operative groups are organised. These had the duty of guaranteeing food, information, communication, waste management, 'respect' – the 'respect commission' was the name of the operative group appointed to guarantee a 'good cohabitation' in the acampadas – and so on. The report of the interventions, as well as the main points of discussions, were online, so that even people not physically present in the acampada could interact with the development of the meetings and assemblies. Along the same line, assemblies were always diffused in real time by different streaming channels.

Following Raul, an activist from Madrid, the network form became the main infrastructure of organisation and communication of the movement. It is not just about the social networks such as Facebook and Twitter or other socio-technical 'tools' supported by the web without which 15M is not imaginable, the network became the form of cooperation and communication in which the movement experimented with a form of organisation radically peer-to-peer in its styles of relationing and decision-making. This form of relation was activated both in the acampadas as well as in the online spaces. The metaphor of the network seems to fit with the work of making human and nonhuman collectives, articulating through such 'net-work' political and collective identities. But what I want to highlight is precisely that such net-work is able to perform a feeling of belonging, a plateau of consistency called 15M, an emergent movement capable of self-organisation; a machine. Now we can understand better: the 'political animal' called 15M, that is also the name of an unpredictable event, refers, first of all, to a machine that invests, and, at the same time, is produced by the co-investing dimensions of the square and the web. In this multilayer machine, web cooperation and acampadas crisscross each other, constituting a circuit made by

continuous integrations and fostered by an accumulation of inputs in real time. The vectors that are produced in such a circuit are recurrently created inside the process of the (self-) making of the circuit.

This machine 15M is able to produce enunciates, affects and common notions. Its main layers – the network's technological structure and the square – produce a plasticity, an emotional body and a collective intelligence; an intensive production of reality that reinforce not just synapsis and cognitive dimensions, but also the qualitative and affective sensibilities of what is happening around you: maybe this machine, as Raul is suggesting to us, is a body machine. In the next section I will introduce the capacity of this body-machine called 15M to proliferate, producing enunciates and affects.

4.2 A Matter of Rhythm: Autopoiesis of a Body-Machine Called 15M

The 15M started as an 'affective virus', a linguistic vehicle which can be synthesised with the main slogan of that day: '*No somos mercancía en manos de políticos y banqueros*' (We are not goods in the hands of bankers and politicians); a sentence that immediately locates the emersion of this social process in the middle of the current financial and economic crisis, but that, at the same time, strictly links this crisis with a crisis of representative politics. '*No nos representan!*' – they don't represent us! – is a refrain that circulates as fast in the assemblies as in the social networks and that shows clearly the refusal of the main structures of the political mediation: the political parties and the unions. Pantxo – an activist based in Barcelona – told me that Facebook, in this germinal phase, was the main space in which a list of enunciations started to proliferate well beyond the individual profiles of known activists, as well as the collective profile of organisations existing before the 15M started. 'Facebook was the place in which the first enunciates of the 15M circulated broadly, producing a 'de-ghettoisation' of political messages, thanks to a language and to a style of communication that privileged simple and direct ways of saying things', says Pantxo. 'They don't represent us!' was, for example, a sentence able to resonate in many different ways with a multitude of singular experiences, and to proliferate quickly on Twitter. If the logic of the political enunciate is historically characterised by its declarative nature, here the production of enunciates responds to a logic of proliferation and circulation: what counts in an enunciate here is much less its capacity to reflect 'a right political discourse', a

declarative truth, and much more its capacity to proliferate, to resonate with the heterogeneity of singular experiences and perceptions.

Moreover, the flux of hashtags on Twitter is in tactical relation with the situated contingency in which the movement is temporarily collocated. It follows the contingent perspectives and issues that are confronted moment by moment. For example, if the police was attacking an acampada, the proliferation of comments would be connected with a more 'defensive' hashtag, such as #sinmiedo – #nofear – and, the day after, once the right to camp had been defended from the repressive attack, the hashtags would reopen to a more expansive or open perspective, such as #yeswecamp or #spanishrevolution. The general intellect produced by thousands of people connected – a 'connected multitude' as Toret told me – is capable of continuously redefining the collective process, of producing day-by-day a performative dimension capable of self-organisation, of orienting the flux of discussion thanks to a logic of transversality. A structure of transversality, that is a logic of open participation, inhabits a collective process facing, time after time, a particular and situated problem always as a transitory problem. In this way the rhythm of the movement is articulated by the variability and the transitional nature of situated urgencies.

This tactics of intervention are sustained by the architecture of Twitter, in which the performative feature of hashtags (labels used in Twitter to identify conversational topics) proceeds with algorithms that work more in relation to the growing of a hashtag in a medium period, rather than in relation to the total amount of followers gained in a long-term period. Becoming a trending topic in a particular moment, especially in a decisive moment inside the development process of the movement, becomes more important than the number of followers. 'The techniques and the tactics of the movement mirror the strategies of valorisation developed by the algorithms of Twitter', Pantxo told me, as a way of saying that the working logic of Twitter is deployed inside its 'tactical and opportunistic' use made by the movement. The song of Josephine here seems to lay on top of the architecture of Twitter. Twitter gives a partial shape to the movement, configuring through its ways of working both modalities of interactions and temporalities of political action. In fact, if the logic of proliferation is at the core of the movement's tactics, the movement's capacity of collocating its daily 'situated urgency' as a trending topic on Twitter is a significant goal. In this way, the present – sometimes a 'large present', capable of configuring itself in relation to tactics of a medium period – becomes the main temporality of political action. The fact that the words are rolling on

Twitter means also that the refrains of the movement – refrains capable of producing contagion and concatenations – are rolling inside the social networks. They are potent refrains – e.g. 'we are not anti-system, the system is against us' – that often allow replication *ad infinitum* – what the mainstream media tends to hide. In a particular situation in which 'everyone is speaking around and about the movement's initiative' (Raul) both the political parties and the mainstream media lose, at least in relation to the movement's actions, their hegemonic role in the production of information, reality and discourses. Given the fact that social media are becoming a central actor in the media system and a source for mainstream media, the 15M tactics become a way to have also an impact on the mainstream.

This active participation inside Twitter has developed through a form of self-organising based on a permanent feedback logic; a logic of participative connection. The capacity of being connected here is the capacity of being inside a process, of being synchronised in a rhythm. This rhythm is the product of on-going feedback between the events that are generating both online and offline. The regime of enunciates is internal to this game of on-going recurrence and it is this kind of recurrence, crafted in this continuous feedback between the square and the web, that configures the present as the main temporality of political action. But this logic of situated intervention – in which the communicative flux on Twitter is synchronised with the specific situation of the movement – is sustained by an emotional and collective feeling, as a force that allows you to believe in the collective process. The machine called 15M is a body-machine. 'There is a confidence in the social cooperation developed through the net that allows the invention of dynamics of subjectivation', Toret told me. To say it another way, the very fact that a social network, such as Twitter, became a territory of discussion and intervention – allowing a practice of connection and cooperation amongst different users in real time – is not enough to explain the development of the song of Josephine. What transformed this infrastructure of communication into a political weapon was an active participation and an attitude of believing in the process. A confidence in the process produced an intensity of cooperation capable of sustaining and enlarging the force of concatenation of the movement. Moreover, this rhythmic capacity of connection, capable of producing processes of subjectification, is not just a peculiarity of the cooperation via social networks, but it also animated the experience of the acampadas. As Adrià told me: 'for me the acampada was an absolute novelty. You don't

know who the person sitting beside you is, but, in a certain way, you know everyone and you share emotions with everyone'.

The same confidence in the collective process that animated the online discussions also inhabited the life of the acampadas, transforming the squares into places of cooperation in which the emersion of an 'emotional possible' became the main lure for empowerment. As Adrià told me: 'It is not a matter of class consciousness, here what you are feeling is an emotional possible, a feeling of sharing indignation and that, starting from there, everything is possible and that cheerfulness is a form of empowerment. The more bodies are in contact, the more we think that everything is possible, the more we have the perception, in the middle of a very chaotic situation, that everything is easy'. This power of cooperation comes from a process of the composition of bodies – a process that crisscrosses both the acampadas and the net interface. A new perception of 'the possible' – this is the main feature that the emersion of a social movement brings. An ecology of proximity has been produced, in which 'having a body' is a power of being affected through contacts. In such an ecology of proximity, emotions are continuously transformed by interactions and contacts, proliferating in an anonymous complicity:

> 'The acampadas represent themselves as a spatialisation and, at the same time, as a pretence of representing the 15M. The acampadas put on stage the bodies and their words, and give back the word to the body and its resistance. They pretend and fabulate sovereignty and an assembly of the many in the street, in the powerful nakedness of the unauthorised multitude. They replicate the contagion with the indiscriminate eroticism of the contact, of the composition of whoever and of the anonymous complicity' (Sanchez Cedillo 2012)

A notion of singularity seems to resonate with this 'whoever' – a being that, in any case,matters. The collective dimension of the acampadas – the experience of being together, of struggling together – brings with it an attention to who is 'next to you'. And it is exactly this idea of singularity, as Pantxo told me, that affects a particular way of conceiving the notion of person:

> 'In the 15M we have a re-signification of words: democracy means revolution and person means multitude. There is a double cut in the words'. One pertains to an everyday life language, able to proliferate, of being familiar. The other one re-signifiers them, making them alive in a singular and never experienced before state of proliferation. We can take for example the word 'person'. Inside the common, notions generated by the 15M person means immediately the right of a singular experience'. (Pantxo, interview)

Thinking a person as a multitude here means thinking about a person as composed of a multitude of singularities, as the encounter amongst a multitude of singularities. And the right of a singular experience seems to me to be the right to diverge, to differ, to disagree. This accent on the notion of person seems a way to highlight how, in this context, there are no *a priori* reasons capable of silencing a singular attitude or point of view. Or saying it in another way, there is not an *a priori* point of transcendence able to establish a universal reason, a universal political intelligibility or a universal praxis. Saying 'person' in this context means that there is not an *a priori* reason thanks to which something is a good political argument or not. It means engaging in conversations in which nothing is given. Only what has been constructed inside a process of active listening counts. Being a person is 'the right to be listened to', because it is exactly continuous listening that produces a flux of continuous experience, and such potent flux proceeds in an 'in between', the between generated by the continuity among singular experiences. Writing-reading or speaking-listening here become relational verbs; speaking is not as much an active verb, as well as listening is not so passive. Speaking-listening, as in the Zapatista movement, is a verb *per se*.

But this right of a singular experience is not synonymous with the impossibility of an individual and collective metamorphosis, quite the contrary. As Ector told me, 'for me, participating in a workshop or in an assembly means putting in question the main methods that I am used to employing in my work as a professional or in my political experience as a militant. It means accepting that those methods can be put into discussion, that they cannot fit with the situation in which the movement is, or that they are not necessarily the best way to do things'. An exercise of questioning stratified habitus, postures and ways of seeing and doing: this is the intensity that the 15M produced. This intensity of mutation is not defined by an agonistic confrontation between different big truths, or global visions of politics. The form of subjectivation that belong to this democratic experience is not the agonism between 'free' human beings. Rather, it seems to me a process led by a logic of on-going feedback, inside which the construction of the collective experience of the common is produced, passing from one urgency to another, from one singularity to another. A collective experience called 15M is what has been created inside this path full of curves and metamorphosis. This practice of continuous feedback configures itself as an open process, where the 'we', the 'we from the 15M' is 'an open we'. Such a body machine, in fact, is an

emergent body, capable of self-organisation and its nerve endings are very difficult to trace. It is 'an autopoietical body, but a body without preconfigured borders,' as Raul told me.

Here, what matters is being inside this speaking-listening feedback, and being synchronised in a rhythm, which means being connected with a flux of mutation. This movement brings with itself the idea that, in a collective process, the flux of mutation is much more relevant that taking control of the collective process. The greatest part of political thought, belonging to both the reactionary as well as the revolutionary tradition, does not believe in a process of transformation of this kind. In fact, this way of proceeding subordinates the formation of a centre of decision, capable of strategy and of a coherent and efficient decision-making process, to the process itself. Every decision, in fact, develops inside a long process, inside a complex exercise of partial synchronisation. The question of consensus, and the collective decision process, is sustained by what Raul defined as a disposition for the common: 'There was an ecology, a disposition for the common. You have trust in what whoever is saying, this one was a strong ecological element'.

From this perspective, the democratic theme seems to appear as a practice of actualisation. The actual in fact is produced by the synchronisation of a multi-layered system, through a complexity of feedbacks, inside a process of cooperation technologically mediated. Every data of reality, each trace, point of view, or relevant fact is mediated and transformed inside a multi-layered circuit. Such a context of decision-making places controversies as dynamic poles inside a process and, moreover, configures the multi-laterality of points of view inside a circuit that discourages the formation of structures of identity inside the process.

4.3 Technopolitics as Distributed Democracy

The idea that a political plateau is not separable from the on-going development of 'an open we' criss-crosses also the relation between practices of communication and practices of organisation. There is a word in the 15M movement experience that designates this capacity of not separating the process of organisation from the process of communication. This word, indicating also a new style of activism, is technopolitics. The main feature of technopolitics is represented by thinking the web as a space, a space that can be populated by virtuous forms of political participation. In this sense, it is a strategic use of the web. A strategic use focused on the organisation of the ecological

effects produced by entering elements in a network, with their strong implications for the production of subjectivities invested by such dimensions. But technopolitics does not think the web as a space in which spreading pre-configured 'buzzwords', or a neutral space in which spreading is a specific political position. Technopolitics designates a form of intervention that is not characterised by the goal of the diffusion of specific enunciates or by a logic of conductivism. The goal of technopolitics concerns more than the online diffusion of a set of practices. More than an innovation of the political discourse, technopolitics is conceived as a new dynamic, a new form of distributed politics.

Technopolitics is a kind of intervention that tends to a post-identity politics and it is, in a certain way, connected with what can be conceived as the passage, marked by the 15M, from a social movement to a society in mobilisation. The existence of a 'critical mass' active online is one of the conditions of possibility for creating an expanded ecology in which technopolitical practices can proliferate. From this point of view, the relation between communication and social media inaugurated by technopolitics appears in strong discontinuity with previous experiments such as Indymedia. Indymedia – a web channel particularly central during the alter-globalisation movement – concentrates its intervention directly linking its practice of communication with the idea that the movement needs to become a media. And, in a certain way, through Indymedia having news 'from the movement to the movement' was possible. This communication process is structured around a strong form of belonging that constitutes a standpoint in relation with this media. Indymedia is mainly concerned with producing an independent point of view on what is going on. In contrast, a technopolitical practice is less concerned with producing a political perspective, with its contents and its meanings. Its target is a 'general user' of the social media rather than a 'traditional activist'. Technopolitics is concerned with the capacity to organise an active participation able to inaugurate new political processes of self-organisation. It is less a vehicle of contents, and more a predisposition to invent or use existent forms of communication, platforms and tools able to multiply the capacity of self-organisation and co-ordination inside and outside the social media and the web. Crafting and using dispositives that help forms of decentralisation, of distributed democracy, technopolitics works through its capacity of facilitating decision-making and local assemblages. If the slogan of Indymedia is 'don't hate the media, become the

media', the slogan of technopolitics can be 'discussing, assembling, deciding: who is participating is constructing!'.

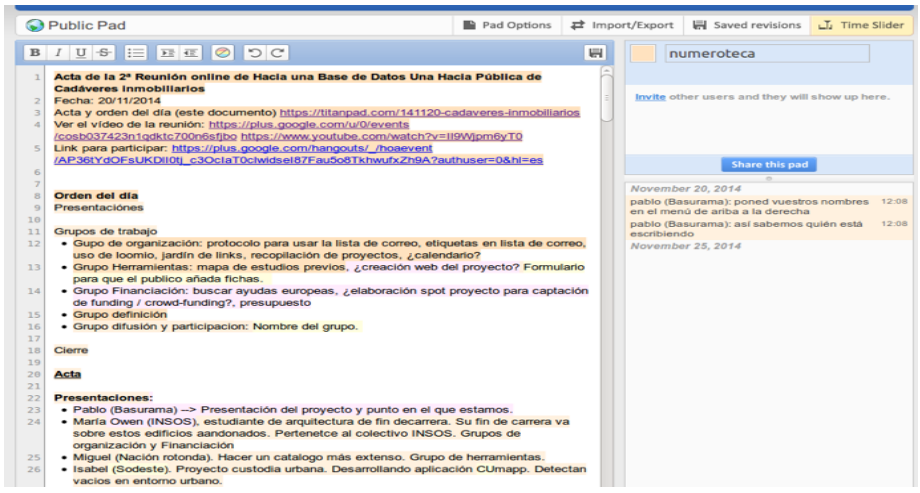
Indymedia and technopolitics differ not only because they are two distinct ways of experimenting the relation between communication practices and organisation practices. The passage from one to the other corresponds to the technological change from the web 1.0 and the highly interactive web 2.0. In this second technological environment it is politically less relevant to add another (independent) knot to the network, while crisscrossing the web and playing with its highly interactive features is more significant. The idea that technopolitics is very much about sharing practices is confirmed by my conversation with Lotta, an activist from Madrid:

> 'We have learned that, instead of creating fixed organisational structures and strong coordination, it is more efficient to share practices, tools and processes to create what could be called a *network ecosystem* of a plurality of users communicating over different media platforms and during different occasions. Once established, such an ecosystem will function as a latent network that is capable of emerging when needed – and to adopt and replicate the ideas with more virality. Proposals don't need to be unified or accepted by consensus, rather they are launched into the network ecosystem that can filter what is considered most important, and adapt it to the local contexts of the users. A central part of technopolitics, in fact, consists of enabling the quick sharing of the strategies and methodologies that are found to be efficient. By creating memes out of these strategies and methods, the struggles in different areas can easily become familiar with the "source code" of a certain form of action and replicate it locally – possibly improving it and adapting it to their local needs. In this sense, the construction of an *a priori* container between subjects does not match the way the networks work. Instead, we want to create places for sharing and exchanging practices, ideas, languages and tools. This way we can push for aggregation around ideas and empowerment'. (Lotta, interview)

This is the point of technopolitics: the viral diffusion of a set of practices and 'source codes' that would facilitate a process of participation amongst users in relation to their local needs. So, basically, the goal of technopolitics is the online diffusion of a set of tools and practices. But, following Lotta, a set of practices or a tool bring with them also a set of relations. Or better, the types of relations and the types of connections allowed by a tool strongly reconfigure the quality of a political action. In the words of Lotta: 'The types of connections we establish within our networks also modify the types of connections we make with the surrounding world.' And again: 'the goal of a technopolitical practice should be that technopolitics and the use of digital networks rewrite the relationships between people and consequently the effectiveness of the

forms of political organisation'. Lotta is telling me that there is an effect of the tool that we are using on the way in which we are doing something together. So, a tool, a socio-technical device is much more than a tool. Such a device becomes a form of politics *per se*. Though arranging actors in different possible ways, they define the form of composition and participation inside a process. And, as we will see in the next sections, the ways in which a process of synchronisation happens is decisive in terms of political efficacy.

A basic example of what I am discussing can be represented by the activity of writing a text collaboratively; a political document. Let's pretend that ten people, situated in different localities, write a document together. Let's pretend that they use PDF format in order to send each other the draft of the text. In this case, what the first person wrote arrives to the others in a closed format. No one else can actively intervene on the body of the text if it is in PDF format. If the text is sent in a .doc format, the other people can intervene one by one on the text, but not in real-time; in an initial moment the first person writes a section, in a second moment the second person can add something, and so on. Now, in the 15M movement a widely used tool is the ether pad (see picture below for an example).



With this tool each participant can contribute in real time to the development of the text, seeing live what other participants are adding or deleting. This tool configures another way of crafting a text compared to our first two examples, and maybe another way of thinking together. It configures a very different feeling and ecology of participation; it disposes the way of interacting in a different way. In the words of Xavi, more than a tool, this is a way of creating 'a collective mind'. The idea that a technical

machine is also a social machine and the consciousness that the forms of interaction matter for a practice of distributed democracy are the core points of technopolitics as a form of activism. But, in order to better understand technopolitics as a logic of socio-technical intervention, it is useful to introduce the actual kit of technopolitics.

Technopolitical practices include the use of proprietary and mainstream media such as WhatsApp, Facebook and Twitter – as Ector told me 'Facebook is good for allowing ideas to arrive to your grandmother, Twitter for generating ideas with ideas'. While Facebook is a form of interaction based on 'online friendship', which means a more communitarian and local form of interaction, Twitter is more a vehicle of transversality, in which discussions and comments can proliferate in a long network of interactions. Most of my respondents agree on the strategic relevance of Twitter as the main social media inside the online rhythm of the movement. In fact, Twitter has strong importance in the technopolitical kit of practices and tools. I spoke with Ector, an activist in Barcelona, about what it means, from a technopolitical perspective, to be a good user of social networks. He said that a 'good' enunciate is one that is able to proliferate on Twitter, Facebook and WhatsApp: simple, short and perhaps ironic. There are abilities to develop in order to become a good user of Twitter. First of all making a good narrative: 'the sequence of tweets needs to have the force of producing a narration'. Better if the narrative is ironic, but 'more importantly, your tweets have to pass from one account to another'. Again, as we have seen in the previous section, Twitter has a relation with a logic of proliferation. A tweet must be able to be re-tweetted and, at the same time, to generate a concatenation of comments, capable of entering a zone of resonance with other messages and appearing within the region of attention that, in a situated contingency, is capturing the discussion on-line.

Even if mainstream social media has a strong importance inside the technopolitical kit, for activists and hackers the activity of crafting new platforms able to allow more distributed forms of participation is a relevant element. A technopolitical perspective, in fact, gives value to the use of free and open source softwares. 'Mumble' for example is an online platform in which you can share documents, have audio-video conversations or get informed about different campaigns. A technopolitical approach to politics is intimately connected with the idea of crating and using artefacts, tools and software – non-proprietary and with a hacker attention on privacy – for inventing new forms of participation. As Ector said, 'we believe in tools as world-making; as a necessary component in making new democratic processes'. This is often seen as a

strategy to ‘anticipate and accelerate social processes technologically and politically,’ as Toret from Barcelona told me, where the bet consists in creating new machines able to facilitate new socio-technical assemblages. But if the bet of creating new laboratories of connection and new collective machines is at the core of the political imagination of several activists, ‘people’ do not very often use open-source and not commercial platforms. According to my interviews, during the movement we did not witness an increase in the use of open-source platforms. Quite the contrary, during the 15M movement the flux of online cooperation, discussion and communication passed quite exclusively from the mainstream social networks. This fact opens an oscillation, especially amongst activists. In fact, if many activists imagine a transition from proprietary social networks – such as Facebook and Twitter – and proprietary software – like Skype – to open-source and non-proprietary medias, from the other side, technopolitics, as a way to feel and live inside the processes of subjectivity transformations internal to techno-social intensities, needs intensive traffic and channels strongly populated by users. For this reason, during 15M the song of Josephine passed much more via Twitter, rather than via independent and autonomous online platforms. And consequently, if we want to understand something more about the qualities of synchronisation amongst singularities that populated the rhythm of the 15M movement, we need to look to what happened on Twitter during those months of mobilisation. This is what I will do in the next sections.

4.4 Self-Organisational Processes: A Matter Of Signals

Six months after the end of the movement or, better, after the end of the experience of the acampadas, Fernando Savater, a Spanish philosopher, wrote an article whose main thesis was that 15M is not only an organisational structure, but ‘above all a new social climate’ (Fernandez-Savater 2012). In that climate ‘we return to a new life: touched, traversed, affected by the 15M’. In the middle of such a climate, a group of young researchers decided to dedicate time to the analysis of what happened in the middle of such an explosive collective experience. They called themselves 15M DatAnalysis (Toret 2015). The 15M DatAnalysis research group was formed in 2012. For Antonio, a member of the group, this is a ‘boundary collective’, in which the several disciplines from which each component comes from are visible in the many ways of constructing the research. This boundary collective includes scholars and researchers with a background in data science, philosophy, sociology, psychology and network science.

But what provides the glue for the components of the group is the very fact that, even if with different intensities, all of them were involved in the 15M movement. Such common experience collocates this exercise of analysis between movement and academia, in a zone of experimentation in which knowledge production and activism have a strong relation. We can say that they occupy a territory of knowledge production positioning themselves inside both academia and social movement. The 15M DatAnalysis research group operates in a strict collaboration with the 'Networks, Movements and Technopolitics' team, a group of investigation – directed by the well-known sociologist Manuel Castells – from the Investigación del Internet Interdisciplinary Institute (IN3) – Universitat Oberta de Catalunya. At the same time, the 15M DatAnalysis group organises workshops in squats and in other places strongly connected with the recent history of social movements. It is exactly the experience of being directly involved in the 15M, that played a strong role in the starting process of this research group. As Toret said: 'living the experience of this monster of energy that took control of our life in May 2011, we felt that a new future was growing inside ourselves'. A month later, a group of researchers and activists felt the necessity to analyse this collective experience and to accept the challenge that the movement presented.

The challenge in question was exactly to understand something more, starting from the different fields of knowledge in which, as researchers, they were involved in, about a phenomenon that surprised them for both its complexity and novelty, as well as for its capacity to inaugurate new horizons of political experimentation. According to my interviews, a long list of research questions was circulating inside the group. Such as: what kind of methods do we need in order to understand a movement radically mediated by the technologies of communication? How do we give an account, through the data, of its inclusive and creative characteristics? Can we observe patterns inside the production of data inside the 15M network system? Which kind of specific characteristics belong to the 15M as a prototype of network counter-power? Is the 15M the first episode of a new autonomous politics, of a new self-organised social being? Is the 15M an occasion to build up new analytical models for political uprising? Can we build a knowledge that allows producing a capacity of influence on such phenomena? How can we, starting from an analysis of the pragmatics of collective actions in a network, theorise a science of political organisation?

Many questions but, at the same time, an enormous amount of data was in the hands of the research group. In fact, given the centrality of social networks in the development of the movement, the web – and, in particular, a social network like Twitter – constitutes a surface of inscription through which to try and assemble what happened in those days. Collecting Twitter data means having an enormous amount of comments, hashtags, followers' migrations, etc. For the first time activists have the possibility to analyse a movement starting from a rich amount of 'inscriptions' of what happened and maybe for the first time activists can make a big data analysis of these proportions. A big amount of data, but how to analyse them? 'The problem was that we had a big amount of data, without knowing how to organise it,' Antonio told me. At the same time the theoretical tools in the hands of such activists and the political categories used in order to analyse social movements seemed to be inadequate in relation to the phenomena in question. For example 'we had categories such as multitude but we found them not specific enough, very large political categories without the power to shape this data, to structure data' (Antonio). As Xabier, another member of 15M DatAnalysis, told me:

> 'Those who were very involved in *Democracia Real Ya* and in the movement, for example Toret, immediately had the sense that something new was happening, something that cannot be understood with the classical political categories and he wanted to write and explore the new phenomena. Everyone was feeling that a new subject was emerging, but not a classical one. It was not an identity of a movement where you have a group that fights for ecology, that you meet once a week in a space where you go to chat, it was not a union with a membership with your name, it was not an internet activism. It was something else. It was something consistent for everybody, maybe one million people interacting in the squares and on the web. These are properties that the brain also has, where neurones in a region of the brain are very much highly connected amongst themselves like in the square, and you have long brain connections between brains regions.' (Xabier, interview)

Two elements seem to emerge from my conversation with Xabier. The first refers to the sensation of having attended a movement of a 'new nature', whose characteristics are scarcely ascribable to previous waves of social movements. Second, the problem of not knowing how to analyse such a big amount of data could be solved thanks to an analogy. So, theorising a movement as a brain became a concrete possibility to experiment with.

Following Xabier, it seems that the existence of regions highly populated by connections and, at the same time, the presence of a long network of connections

amongst these regions, represent a common feature of both brain and 15M movement. Or at least the possibility of establishing an analogy started from this intuition. Again Xabier: 'we started to write in a more intuitive level about a lot of ideas. For the first time we had the data to support some of those intuitions. So we find in the vocabulary from complex systems and neuroscience the ideas of neuronal assembly, large scale synchronisation in brain dynamics, etcetera.' (Xabier). A movement described with so many psychological categories – feeling, indignation, sentience, consciousness – is seen as a brain. 'In neuroscience you have neurons, anatomy and macroscopic psychological categories like perceptual consciousness or emotions. That resonated a lot' (Xabier). So they decided to explore this analogy further, establishing bridges between technopolitics and neuroscience. More than an exercise of comparison, it seems to be a one-way direction, where the intelligibility of brain processes is applied to the interpretation of the movement. A sort of 'as if' where we have from one side – the supposedly known one – several studies on the anatomy and dynamics of neuronal activities and several psychological categories and, on the other side, squares, people, the information flows on the web and, inside the square and the web, phenomena of global consciousness and the emergence of a new subject with its own capacity to feel.

The analogy between the movement and the brain was inspiring them. Moreover neuroscientists' work with data, with big data, and the ways in which they structure data became a tangible clue for their own project. A region of knowledge, a domain, could be used in order to understand something more about the movement. They became neuroscientists in a certain way, applying and borrowing from neuroscience the tools and methods to explore the 15M movement. A metaphor, the movement as a brain, became a domain of analogy that could provide some analytical categories to understand what was going on. They studied the movement as if it was a brain, collocating at the core of their research these two questions: how does complexity arise spontaneously without an organising centre? And what kind of patterns of self-organisation is it possible to find? This kind of research, that is still a work in progress, started with an analysis of the main surface of visibility and data inscription that they had in their hands: the traffic of data that populated Twitter during the movement. The basic idea consists of the hypothesis that analysing data on Twitter can be a good way to understand social self-organising processes in the context of social media political activism:

> ‘Unlike previous studies of network analysis of the 15M movement and the similar uprisings, the focus of this paper is on characterising more global aspects of self-organisation processes and exploring indicators of the kind of emergent communication patterns. More specifically, we will focus on the constitution of the system as a coherent whole which can maintain a dynamic identity for a period of time. Since this type of self-organisation into a coherent dynamic unit is hypothesised to be the core of mental life and neural organisation, we want to explore the possible analogy with social life and political consciousness.’ (Aguilera et al. 2013: 396)

At this point, the analogy was assumed as a way of proceeding and self-organisation processes as the main object of inquiry, they need a sort of ‘formalism’, a methodological tool through which to operationalise their analysis. The method of fractal analysis seems to be the direction that they choose:

> ‘One of the greatest challenges for the understanding of cognitive and social systems is finding formalisms to understand how complex activity emerges from processes of multi-scale organisation. During the last decade, different authors have proposed methods of fractal analysis as a solid candidate for this task’ (Ibidem)

But what is fractal scaling all about?

> ‘Fractal scaling is characteristic of critically self-organised systems. In these systems we can find an interesting mix between stability and instability creating complex structures of the variability of the system’s activity. Thus, processes with fractal scaling present a constant relation between the size of their fluctuations and the scale in which they occur: systematically larger fluctuations for longer scales and smaller fluctuations for shorter scales. We often describe fractality in a process through its spectral density function S(f), which in the case of fractal scaling exhibits the form: S(f) / f where f stands for the different frequencies in which the activity of the process takes place, and defines a log-linear relationship between the spectral power content at different scales of f. The presence of log-linear relationships in the spectral density suggests that the activity of the system is self-organised into a nested temporal structure, in which the different rates of activity of the components of the system are coupled into a coherent macroscopic whole. More specifically, it shows what is the relative influence of each scale in the system. Different values of ß describe different relationships between the weight of fast, medium, and slow timescales in the composition of a self-organised system. The analysis of the fractal coefficients of a system’s activity has been widely used in neuropsychology for characterising different states of interactivity among the components of a cognitive system, as well as to predict the emergence of new cognitive structures. More concretely, different values of the parameter allows us to characterise different types of processes: white noise (ß = 0) describes fully random fluctuations with no correlations in time (processes with no memory). White noise processes show a strong dependence on short time scale events (scales with higher frequencies). White noise processes display fast

changes in their activity but are unable to maintain structured and coherent patterns. Brown noise (ß = 2) resembles a diffusion process with no correlation between increments, but with a strong dependencies between the position of one sample and the next, presenting a "memory" of previous events. It shows a strong dependence on long time events, where small frequencies give a much greater contribution to the noise structure than the rest. Brown noise processes are able to maintain stable structural patterns, but they are unable to flexibly modify their activity when fast changes are required. Pink noise (ß = 1) describes processes in which an equilibrium is found between the influence of short, medium, and long timescales. It finds an equilibrium between disordered states with high informational content (white noise) and states with strong memory but low informational content (brown noise). Pink noise processes display dynamics which can maintain stable patterns of activity while being able to flexibly regulate their level of activity.' (Ibidem)

The idea that fractal scaling is a characteristic of critically self-organised systems, and that this is the sort of underlying structure of a system producing complex behaviour seems to be, according to my respondents, quite popular in biology, psychology and neuroscience. The idea that fractal scaling is an underlying structure able to explain very different phenomena in different domains and that, here, we can find something useful in order to understand something about complex behaviour appears to me as a 'strong' idea. There is something here that makes me uncomfortable. I am not used to thinking that our understanding of very different phenomena of self-organisation could be grasped thanks to an underlying structure that crisscrosses different domains. And so I asked Miguel, one of the authors of the article, his opinion about that. Miguel told me that in the scientific tradition you need to propose a thesis and that this thesis needs to be true. 'When we say that something works in a way, we need to say that it is true. We need to say what is x and how it works'. I am still perplexed and I ask Miguel again: 'so scientists take the risk of saying what is true and what is not true? And you, as a scientist, how do you feel in relation to fractal scaling?' Miguel: 'For me, fractal patterns are not an absolute truth. But I assume that through fractal patterns I can work, I can analyse something and that, through this analysis, I can find indicators of different styles of process being made. More than a truth, for me, it is a useful intuition, useful to understand how it works and how it can work'. From this conversation I am not more convinced than before that there are structures of complex behaviour but I realise a bit more how science – as an activity of pattern making – and a politics of imagination are both strongly present and strictly connected in this experiment. The idea that through something we can understand something else and that there will be something useful to think and feel with this kind of experimental

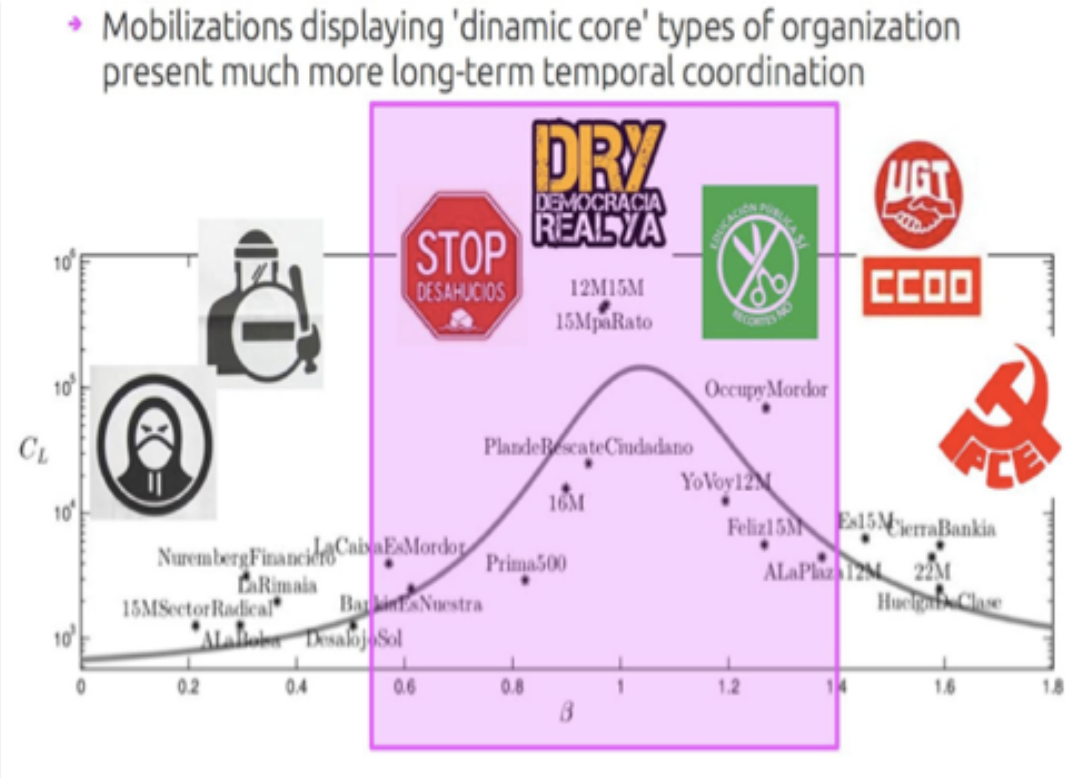
achievement seems to me the core of this project. Going back to their analysis, I try to understand what kind of indicators can come with the activity of pattern-making that characterises a fractal scaling analysis. I am not very comfortable with numbers and mathematical functions, but I am very interested in understanding the qualitative difference in self-organisation processes that qualifies the distinction between white, brown and pink noise.

> 'The measured coefficient can account for the type of underlying structures of complex phenomena. The absence of long-range correlations when ß = 0 implies that the different processes composing the system are highly independent, provoking uncorrelated randomness in the systems activity. This describes a situation where the ongoing activity is not self-organised at all and there is not a coherent collective pattern emerging from their activity. On the other hand we have ß = 2 processes where slow timescales dominate over others. These systems will display highly predictable patterns which will strongly constrain the individual dynamics of the system components, strangling the self-organisation in favour of rigid and inflexible collective dynamics. Finally, when ß = 1, slow and fast timescales are compensated, and the influence of independent and interdependent activity is perfectly balanced; the activity of the system is going to depend on the ongoing reciprocal interactions between timescales, finding an equilibrium between stability and spontaneity. As a result ß = 1 becomes an indicator of distributed self-organisation in a coherent whole: different parts of the system (with their characteristic frequencies) appear globally coordinated in a reciprocally influencing manner.' (Ibid.: 397)

Three different kinds of process, three kinds of noise and three qualitative matrixes of categorisation underlie the existence of three different patterns. At this point these methods can be applied to different communication processes related to the Spanish 15M movement. Now that there is an indicator for characterising different self-organisation processes, they apply it to analyse different grassroots political mobilisations. The task is to test whether fractal scaling analysis can provide a good quantitative index for these qualitatively different degrees of self-organisation of social communication and coordination expressed through Twitter. The basic idea is that different processes of mobilisation produce different kinds of noise and, through the noise analysis produced by each one, it is possible to read qualitative elements in the form of synchronisations that feed such processes. In this way, through a quantitative analysis it is possible to gain information around the qualitative features – the different ways in which a process of synchronisation happens; of different processes of co-ordination. There is a correspondence between the noises generated by a process and the ways in which this process of self-organisation developed. It is like putting a

microphone in an acampada, but here the microphone is put into Twitter. The microphone does not record contents, but signals; or better, the ways in which signals produce different concatenations amongst them.

The 15M DatAnalysis group collected Twitter data from different protests taking place during May 2012, one year after the start of the 15M movement. That month was chosen because of the high density of mobilisations, allowing them to compare different organisational processes taking place in the same period. They downloaded around 385,000 Twitter messages using 20 different hashtags. Following the advice of activists involved within the protests, hashtags were chosen as representative of different types of processes for mobilisation and protest. After analysing the scale invariance of the different processes, they completed their study by analysing the underlying networks generating those dynamics. They have taken the set of interactions between Twitter users (mentions, replies, retweets) using each of the hashtags to create a directed graph where each user is a node and interactions are represented by weighted edges. The results of the experiment can be seen in the image below.



Spontaneous or reactive mobilisations, mixed self-organised mobilisations and hierarchically structured mobilisations correspond respectively to white, pink and brown noise. This analysis suggests that pink processes reach some middle points between the

spontaneousness of white noise and the stability of brown noise. They have measured fractal scaling as the relation between the amount of variability of the system at different temporal scales, obtaining a parameter that describes the fractal relations between the amounts of activity in the system at different temporal scales. Measuring also other parameters like the temporal scope of the fractal scaling and properties of the network underlying the communicative activity, they have discovered that, when a process of critical self-organisation – this is another name for pink noise for them – reaches a dynamic equilibrium between independent and interdependent dynamics, it spans into much larger temporal timescales. That is, independently of the real duration of the communication process, pink noise processes present correlations that reach much further in time, maintaining a dynamic coherence that lasts up to days. So, pink noise means that such processes are robust enough but at the same time fast enough in the propagation of information.

Antonio told me that there was a correlation between processes of pink noise and his evaluation of the process that, from his point of view, were more politically interesting, as if there is a correlation between the topology of signals emanating from a determinate process of self organisation and the political qualities immanent to such a process. But which qualities qualify the processes of pink noise? 'They are processes capable of a great creativity but at the same time able to make a route; to produce meanings,' Antonio told me. Toret also highlighted the same aspect, adding that: 'white noise shows a great velocity of reaction — chaotic because here everyone is speaking at the same time. They are very important processes, fundamental to resist to an eviction or to answer to a repressive action. Brown noise is much more produced inside campaigns and processes that can be more assimilated with the traditional left: totally predictable and slow, with a hierarchical structure of mobilisation, and, moreover, incapable of connection with emergent new elements. The capacity of a pink noise, different from the previous two modalities 'can be defined as a capacity to generate a path, with its goals and targets but, at the same time, capable of being strongly affected from the emersion of new configurations' (Toret): their main quality consists, in fact, in their capacity to create a synchrony with emergent connections; in their capacity to be reconfigured by new actualisations.

Marshall McLuhan (2013 [1964]) wrote that 'the medium is the message'. Such a perspective, following Xavier, insisted on the fact that what matters is how you structure the telecommunication power, not the content. What these researchers are

suggesting is, instead, the very fact that 'the noise is the message', that is to say that nowadays we potentially have the capacity to communicate in a distributed manner and what counts becomes the quality of the dynamic inside the network. This is the message. The noise generated by interconnections.

4.5 Pink Imagining

The 15M is an entity capable of producing enunciates, common notions, affects, feelings and actions. I highlighted, with the help of activists who have lived this experience, how the co-investing relation between the dimension of the square and the web has been at the centre of its conditions of formation and development. Moreover I have explored which styles of activism correspond to the emersion of this entity, insisting on the technical and social aspects implied in the 'tools of organisation and communication' used in this collective experience. How is democracy thought and lived inside this ecology of connection? As a networking, distributed democracy in which imagination is strongly influenced by a peer-to-peer ethos – as grounded on a notion of person that means 'the right of a singular experience' – as a contagious experience of speaking-listening; as a synchronisation that simply happens. What emerges is the sense that this movement brings with itself the idea that, in a collective process, the flux of mutation is more relevant than taking control of the collective process. In the 15M what matters is being inside the speaking-listening feedback, and being synchronised in a rhythm, which means being connected with a flux of mutation. But how to analyse a process of synchronisation? A partial answer to this question comes from the work of 15M DatAnalysis research group.

The research of 15M DatAnalysis embraces different methodologies and different objects of analysis, proposing a trans-disciplinary analysis of data, networks, languages, emotions and narrations produced by the 15M. They propose a genealogy of the struggles on the web, putting in relation the analysis of several materials on the web with interviews taken during the movement. This genealogy is oriented more specifically to understand the processes of self-organisation in the movement. A relevant aspect of their research concerns an analysis of emotions – a mood and sentiment analysis – on the 15M networks on Twitter. This kind of analysis is focused on an analysis of the vocabulary used by followers, with a strong attention to the emotional aspects of these forms of communication. Here the attempt consists of understanding the dynamics of self-organisation, analysing the link between language

and emotions. Another body of research developed by the 15M DatAnalysis group pertains to an analysis of the topological structure of the network in different phases of the movement. The different relational articulations that are being defined during different waves of mobilisations are the object of this analysis. Through this analysis it is possible to see how different knots, catalysts or dynamic nuclei emerge and play a significant role in the 'power configuration' of the movement. Here, the goal consists in tracing the power distributions, which reflect different phases of the movement. Finally, they propose a fractal and multi-fractal analysis of the collective brain of 15M. Lying on a mathematical calculus of the dynamics of synchronisation of different scales and on a model of white noise, pink noise and brown noise, they describe different forms of self-organisational processes inside the movement. Analysing frequencies, it is possible to find patterns of self-organisation: brown, white and pink noise. They did the same with the 15M movement – or better with a particular but quite significant surface of inscription, i.e. Twitter signals – and found a correspondence between pink noise and the more interesting political processes – at least from their point of view – happening during the movement.

In synthesis their research offers me three layers through which understand what 'self-organisation' means in this context. Three lines of inquiry. The first refers to an analysis of the propositions circulating on Twitter; the second to an analytic of power diffusion amongst different Twitter accounts; the third to an analysis of the noise emanated on Twitter by different political processes. In this chapter I followed this third line of inquiry in the attempt to think through the song of Josephine and its capacity of proliferation as a matter of noise. What it is possible to see through the lens of their work on noise is the fact that the ways in which a process of synchronisation is developing matters. The analysis of signals seems to suggest an innovative approach to the analysis of social movements. Saying 'The noise is the message' in fact means to focus the analysis of a political process of self-organisation on the ways in which the process itself has been made through activities of interaction. Noise is not independent from the distribution of the proposition and from a power configuration. But it is not reducible to these two elements. Noise refers to the flux of mutation of an entity and understanding different modalities of synchronisation through noise means to appreciate the different ways in which an assemblage can happen. But what are the effects of observing pink noise? Or better, what kind of imagination – which DataImagining -– is coming with the activity of DatAnalysis and DatAnalogy? What modes of attention is

the observation of pink noise suggesting to us? And what does it mean to think of activism via pink noise? First pink noise cannot be 'artificially' created or, better, it cannot be conceived as a form of synchronisation that can be pre-configured. A subject cannot impose in any way the emersion of pink noise. There are not *a priori* conditions of knowledge or power distribution that can guarantee the emersion of a pink noise configuration. Quite the contrary, pink noise can be observed only *ex post;* as an output of a particular dynamic of synchronisation. But the very fact that pink noise can be observed just *ex post*, does not mean that observing pink noise is irrelevant in order to think about practices of political activism in social movement – quite the contrary.

This brings, as a consequence, a rupture with three common postures of the political and organisational culture of the social movements. The first consists of thinking that the goal of politics consists of organising a unified subject of enunciation able to take control of a movement. Pink noise teaches me that the attempt of controlling a process is not productive: the more you want to control a process, the less you pay attention to its flux of mutation, the less you can perceive the emergence of new inputs and intensities. Moreover, as in the case of brown noise, a dynamic that is organised starting from these requirements becomes slow and totally predictable. The second consists in thinking the political qualities of a social movement starting from a supposed symmetrical power position amongst actors and from the presupposition that everyone needs to agree about everything. Total symmetry and total consensus are often seen from this perspective as necessary pre-conditions for action. But these are not sufficient conditions for making pink noise happen and, moreover, the research of a global consensus before taking actions requires a very long time. Even if starting from two opposite standpoints vertical and horizontal 'conductivism' are both imagining politics as the realisation of a brown noise process. The third posture that observing pink noise puts in question refers to the idea that a political process does not require goals, targets, paths and intelligibility of meanings. Here, we are exactly at the opposite pole of brown noise; in the politics of no past and no future – in the logic of the 'pure' event. So, which mode of activism can be a lure for pink noise? Pink noise happens in the middle, between white and brown; it is a region in between – between the end of every brown 'identity politics' and the groping in the dark of white noise; a region that cannot be preconfigured in advance. If pink noise has no guarantee, what does it mean thinking a politics of commoning via pinkness?

It means cultivating a confidence in the processes in which we are involved. Only through developing an attitude of believing in the process in fact it is possible to think and feel interaction as a force capable of producing an intensity of cooperation and an ecology of proximity. Only through a confidence in the collective process in fact is it possible to care for what has been constructed inside a process of speaking-listening, being affected and transformed by the many interactions and contacts that emerge inside a speaking-listening circuit. Commoning via pinkness means developing a disposition for the common, for what has been constructed inside this process of multiple speaking-listening feedbacks, and for 'what it could be'. Acting in an ecology of proximity in fact means cultivating a body without pre-configured borders. But in order to do this, we should be connected with a flux of possible mutations. Feeling, making and thinking with the emersion of significant others – it is in this way that an available body is able to feel the emersion of new intensities and configurations – this is, from my reading, what pink noise is about. Acting 'in between' – in the middle of the things – pinkness presupposes that every path and possibility for action could be affected by the emersion of new entities, meanings and configurations.

4.6 From Production of Subjectivity to Worlds' Making

The political perspective of the commons, analysed in the first chapter, is shown to be intimately connected with the centrality of the notion of the production of subjectivity. The role of struggles, insurgences and resistances is constituent of shaping new forms of political subjectivities. In these political theories, in fact, struggles come first because history is made first by resistances. How then, do we understand the development of capitalism? Starting from the resistances inside and against it, which means starting from the struggles of the working class. How do we understand how a relation of power works? Starting from who-what is resisting, starting from the struggles that are putting in tension, re-articulating or destroying a situated relation of power. The rhythm of history, following this perspective, seems to be articulated from the starting point of the emersion of forces, collective subjects and political actors generated by events of resistance. Understanding power via resistance, Marx and Foucault have never been so close to each other. Struggles produce subjectivities, new ways of acting together, knowledge, 'common sense', collective belongings, etc. What is it that Hardt and Negri called the 'experience of the common' if not practices, knowledge, forms of cooperation and belonging constructed inside the experience of struggling together? In this chapter I

focused on several characteristics of the 15M movement, underlining new forms of activism that are emerging from this collective experience of struggle. As in the case of the theories of the commons, inside the 15M movement there is a form of activism prevalently oriented toward the political knot of the production of subjectivity.

Connecting different subjectivities through technopolitics – a form of connection strongly technologically mediated – for the 15M movement the intelligibility of politics leads to the question of the production of subjectivity: under what conditions can the capacity to act and to struggle together increase or decrease? This seems to be the central question starting from which pink noise matters. In the 15M movement what counts as relations is the capacity to think, discuss, communicate and act together. Devices of connection define forms of cooperation arranging actors in different possible ways. Different devices of technological mediation (e.g. Twitter or Facebook) define the form of composition and participation inside a process, strongly influencing the ways in which a process of self-organisation happens and its political efficacy. As we have seen in the case of Twitter, the song of Josephine is not understandable without the medium that partially shapes its rhythm and dissemination. The awareness that a technical machine is always a social machine, or better, that these two dimensions cannot be thought separately, represents in fact the key feature of technopolitics.

Even if such awareness enlarges the perimeters in which the notion of production of subjectivity could be understood, from the point of view of the activists of 15M what matters is – as Lotta told me – the capacity of a socio-technical interaction to rewrite the relationship between people. In this form of activism in fact what counts as a relation is the effect of subjectivity generated by interactions. What has a value in a political process is the effect of subjectivity produced by the process itself. The production of political subjectivity is at the heart of this kind of activism and this is always thought starting from its becoming, inside an inventive and generative conception of relationality. And as constitutively exposed to a flux of variation. In fact, experimenting a politics of action via the capacity of feeling the emersion of new intensities and configurations was at the core of the experience of this social movement. Theorising the production of subjectivity via a generative and techno-mediated relationality radically renovates our understanding of activism. This qualifies a way of understanding the question of political subjectivity in which acting inside a flux of mutation is much more relevant than taking control of the collective process. Moreover, it qualifies an understanding of political subjectivity that resists to the temptation of attributing to

social movements any *a priori* point of transcendence able to establish any 'universal reason'. Quite the contrary, any logic of construction of a political reason is entirely attributed to the process itself. Far away from attributing to subjectivity any teleological role, understanding political subjectivity via pinkness allows us to break the tie that links the political theme of subjectivity to any pre-configured 'universal reason' to which a politics of resistance is often supposed to adhere.

How to understand the emersion of new ontological configurations outwith subjectivity? This question, as we have seen in Chapter 2, is at the heart of my research project. In my research I ask how a politics of transformation looks when it is conceived, not as a matter of resistance, but starting from everyday practices of material engagement. In other words, how to conceive a politics of transformation in technoscience moving from a perspective centred on the emersion of a collective subject of resistance to one that is based on the aim of affecting the material configuration of the world? In order to engage with these questions we need to look at forms of activism whose aim does not refer firstly to the question of social power but to their capacity to affect material change via crafting matter. We need to look at other practices. From forms of activism that concentrate their attention on the effect of subjectivity favoured by a practice of interaction, to forms of activism that are experimenting forms of material interactions, the aim of worlds creation takes the place of production of subjectivity. The next two chapters on 'terraforming with permaculture' and on 'the politics of hacking' explore these possibilities. They could be read as an inquiry on what does it mean to think commoning as 'a capacity to act with' that directly involves the active participation of more-than-human entities. What is at stake in the next two chapters consists, in fact, in understanding what activism means in a form of politics that leads to the material composition of worlds or, more simply, if it is possible to conceive of a politics of commoning as a politics of worlding.

CHAPTER 5
WORLDING 1: TERRAFORMING WITH PERMACULTURE

Permaculture is a movement of alternative ecological design that takes multiple shapes: rural and urban, projects of local food production, natural building, knowledge production and experiments with forms of social organising. Born with the observations on how a forest works as an ecosystem, the idea of permaculture consists basically of the aim of creating edible and resilient ecosystems. Permaculture is a situated and minor art of recuperation. It teaches us that worlds need to be inhabited in order to be transformed and that, even if we don't know in advance how to do it, the ways in which we are making it matter. Dealing with an analysis of practices and patterns grounded in my fieldwork, in this chapter I try to think 'the politics of worlding' through the lens of the ethics of permaculture and ways of proceeding: with a series of attentions, procedures, sensibilities, techniques and principles that constitute the everyday doing of permaculture. Exploring permaculture's ethics and permaculture as a technique of design will be the way through which I theorise what worlding means, starting from this attempt at transforming humans' relation to soil and landscape. In chapter 2 I defined a politics of worlding as a politics of direct engagement with matter, a politics of words' composition in which knowledge is conceived from the perspective of a minor science. In this understanding of science as practice, a territory is definite by 'actions of contact' amongst heterogeneous entities. Permaculture, as we will see in this chapter, is a technique of design based on an embodied experience of feeling significant others and constructing with them: a minor science.

The chapter is divided in three parts. In the first part I introduce the culture of permaculture, starting from current literature and from my participation to an intensive module training camp held in an eco village in Tuscany (Italy) in the summer of 2013. The second part – sections 2 to 5 – is dedicated to the theme of ethics. I engage with what acting means in permaculture, starting from the image of compost as a form of everyday materialisation of ethical doing in permaculture and I introduce the main ethics of permaculture. The first ethic – caring for the planet – is introduced through a fermentation story in section 3. In section 4, through an exercise of active listening, I deal with the second ethic – care for people. Sharing surplus, the third ethic, is connected in section 5 to a permaculture principle: thinking like an ecosystem. As compost does, permaculture is a way to add something in to a concrete situation and, what it is often called a 'cycle of design' represents the way through which 'acting' is understood in permaculture.

In the third part – sections 6 to 9 – I situate the question of design, so central in any permaculture training or reading, inside the permacultural understanding of ecology: here the attempt is to show that design is a practice that actively involves more-than-human actors. My analysis of permaculture design will continue with a focus on three moments: observing, planning and acting. These sections of the chapter are mainly oriented to explore the idea that in designing inside an unstable relation between bodies and landscape, the body becomes the main guide: here, in fact, a technique for feeling entities and their reciprocal connections - usually called active observation – becomes a technique of construction. Permaculture, as planning and as a science of interaction, concludes this section dedicated to permaculture as a system of design. If planning is seen as 'a way to make a storage', insisting on the pragmatic and functionalist aspect of permaculture, the section on acting represents an attempt to put permaculture in connection with what Deleuze and Guattari (1988) called a minor science.

In section 10, I connect the idea that a minor science is an ecology of canals with the material dimensions in which the permaculture's principle 'the problem is the solution' is grounded. It is exactly through thinking permaculture as an ecology of canals, it is possible to understand which kind of contributions the culture of permaculture offers us in theorising processes of worlding as a matter of asymmetrical exchanges. Worlding is a matter of asymmetrical exchanges in a 'multi-species engagement' and, in permaculture, such webs of relational cooperation seem to be conceived as both the unstable ground in which life happens as well as a decisive plateau in which ways of making islands and forests of resilience with significant others are invented. In doing this, emotional and physical feelings are, in permaculture, the *fabricant sentinel* of such forests. But what kind of science of construction are we talking about? A rigorous science, even if not an exact one. A science made of rhythms, waves and passages of thresholds; of inter-surroundings and interruptions. A science of canals where dealing with problems is not a drama, but the everyday experience of a permaculturist. A science fostered by multi-species alliances where exchanges seem to take the forms of thefts and gifts.

5.1 Introduction to Permaculture

The term permaculture was introduced by Bill Mollison to a public audience during 1975 or 1976 through the frequencies of an Australian radio station. In 1978

Permaculture One by Mollison and Holmgren was the first book published on permaculture. This book is often considered a starting point for both the evolution of the concept and the emergence of the socio-ecological movement that identifies itself as permaculture. As David Holmgren (2002) tells us, this book from the mid 1970s 'was a response to the environmental crisis facing modern society', in which permaculture is seen as a technical and philosophical, ethical and pragmatic response to environmental crisis. A positive and affirmative response: 'that means it is about what we want to do and can do, rather than what we oppose and want others to change' (Holmgren 2002: xv). A series of assumptions are implied from the very beginning of the permaculture movement: 'the on-going and future impacts of global industrial society and human numbers on the world's wondrous biodiversity are assumed to be far greater than the massive changes of the last few hundred years' (Ibidem); the impact of environmental crisis and its magnitude will 'certainly transform modern global industry society beyond recognition' and within it the continuity of everyday life as it is conceived inside a fossil fuels energetic system; an alternative response to environmental crisis is based on the idea that humans are subject to the same energetic laws that govern the material universe, including the evolution of life.

In *Permaculture One* (Mollison and Holmgren 1978), permaculture is described as an 'integrated evolving system of perennial or self-perennial plant and animal species useful to man'. The neologism permaculture, coined by Mollison and Holmgren, comes from the contraction of two terms: culture - in both senses as agriculture and as culture - and permanent. The first term suggests immediately the centrality of agriculture inside a project of transformation of the human relation to soil and landscape. If in its first phase, agriculture was the most significant domain of experimentation for permaculturists, nowadays permaculture is a movement of alternative ecological design that takes multiple shapes - rural or urban, projects of local food production, natural building, knowledge production and experiments with forms of social organising. The permaculture vision of sustainable and permanent agriculture is becoming a vision of sustainable 'material' culture beyond agriculture. Other, and more contemporary, definitions of permaculture seem to expand the meaning of permaculture, expanding the ecologies in which this practice of designing ecosystems can be applied. One of the most popular current definitions of permaculture is 'consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision of local needs' (Holmgren 2002: xix).

Following this broader definition, which reflects the extension and redefinition of permaculture in relation to different landscapes and communities of practices, permaculture can be seen as both an ethical-philosophical point of view and a practical approach to everyday doing: a mundane practical ecology. In the words of Patrick Whitefield, 'the central aim of permaculture is to reduce our ecological impact. Or, more precisely, to turn our negative impact into a positive one' (Whitefield 2004: 5).

Born through observations of how a forest works as an ecosystem, the idea of permaculture consists basically of the aim of creating edible ecosystems. For Ian Lillington the idea of permaculture is not a new one – 'the essence of permaculture is ancient in origin, taking inspiration from the civilisations of the world that have survived from thousands of years' – and permaculture can be understood, less as a discipline in itself, and more as 'an integration of many skills and disciplines, brought together to design ways of living sustainably in the 21st century' (Lillington 2007: 26). Collocating itself at the point of conjunction between ways of living and planet sustainability, permaculture is becoming a global sensibility and a word that can be met globally in a pluriverse of circumstances and locations. From shiatsu and yoga to practices of non-violent communication and transition movements, from agro-ecology and holistic medicine to experiments of organising eco villages and metropolitan community centres, nowadays it is quite impossible to track both the many edges of permaculture and the many ways in which permaculture is mixing with a heterogeneous number of sensibilities and cultures. Permaculture has many 'fellow travellers' on the journey towards a life sustaining Earth culture, and its process of 'bastardisation' – often it is said that there are as many permaculture definitions as there are permaculturists – follows the many connections established globally between different communities of practice and their own ways of using and experimenting with permaculture. Different thoughts, ideas, images and sensibilities emerge from different experimentations toward, what it is often called, a 'resilient future'. Permaculture has many meanings and shapes, but apparently most people involved in this eco-social movement have completed a permaculture design course – a format that, for more than thirty years, has been the first vehicle for permaculture inspiration and training globally. This curriculum represents a sort of first step of permaculture and a good occasion for me to understand what permaculture is.

At the beginning of August 2013 I arrived in Vicchio nel Mugello in Italy. Alessio comes to pick me up at the train station. We are waiting for other people coming by car

or train but, after twenty minutes, we are ready to go. The car moves slowly up and down the hills and, after other twenty minutes, we are in the middle of the countryside and almost at our place of destination. All around the landscape is green and brown – a never-ending succession of chestnut woods lines our trip and, just sometimes, it is possible to see some houses from the small windows of the car. In this piece of land in the north of Tuscany, called Mugello, a significant part was cultivated by peasants until the 1950s, until the time when peasants became working class in the factories in the nearby city of Florence or much further, in Turin and Milan, or outside the country. Within sixty years, the wood has occupied this land, and as Alessio explains me, the landscape has changed in a radical way. The wood grows fast, it takes just half a century in order to remove the traces of human work, of cultivated fields. Finally we are here, in this eco village called Tertulia. Two dogs, three goats and two families live here.

Giorgia and Francesco with their kids Ismaele, Flora and Samira were the first family to arrive in Tertulia. Giorgia and Francesco bought this place some years ago with the intention of leaving Milan and transforming this abandoned place into an eco village. In the main kitchen I immediately recognise the poster of an edition of EuroMayDay, a parade of precarious workers that, for more than ten years in the point of passage between this century and the last , rallied around in Milan every May 1; thousands and thousands of activists, cognitive workers, freelancers, students and, with them, thousands of stories of precarious lives. The pathway of this poster touches me and seeing it here in the countryside makes me feel a little more at home. The struggles of precarious workers in a metropolitan space and the everyday life in an eco village seem such distant worlds, but maybe they are not so distant or incommunicable if seen through the biographies of Giorgia and Francesco.

The other family is composed of Giusy and Alessio. They come from Sicily and, after years passed following jobs in the south as well as in the north of Italy, they told me that they feel they have achieved a condition of peace in this place. This place, which is designated to become an agritourism destination, at the present moment produces and sells firewood, honey and chestnuts. Thanks to these products Tertulia sustains itself, together with the vegetables and fruits that come from its garden. During our dinner the inhabitants of the eco village explain to us that the term Tertulia means ‘encounter’ in Spanish. To have a ‘tertulia' means organising an informal meeting in order to make and discuss together, or a call for reorganising ideas and collective projects. And we are here to have a tertulia, with the topic of permaculture at the centre.

As Francesco explains, thinking with permaculture is a sort of everyday ‘guide’ for this place, as a practical philosophy that orients the everyday ‘making’ of this place and the rhythm of its activities. More specifically we, 22 people coming from different regions of Italy, are here to take part in an intensive module of training in permaculture: 20 days in which we will live together, with the inhabitants of the eco village as well as with our permaculture teachers.

There are many expectations in the group for this training module. For most of the participants this occasion to deal with permaculture coexists with a choice to change their lives. In our conversations I feel an atmosphere of restarting: many of the participants are planning to quit their jobs and to leave their houses in order to move to the countryside to live in a farm, in a Eco village or simply in order just to work in the agriculture sector. Enzo, a permaculture teacher, tells me that, in his experience, four persons out of five taking part in these intensive modules on permaculture are in a process of changing their lives. He smiles and ironically says: ‘someone said that permaculture is about design, but can we call such radical changes in our lives a matter of design?’. This air of restarting is not new for the teachers, who orient the module as an occasion for introducing us to a community of permaculturists, as an occasion for knowing other people already involved and existent permaculture projects. The permaculture modules are conceived as ways of exploring ways of doing, establishing networks and as a lure for working toward possible collaborations. The classes are much less an occasion to learn agriculture techniques and practical skills and much more an introduction to permaculture as a way of thinking and acting, as a practical and holistic philosophy, in a certain way, transversal to very different situations and concrete projects.

The module is conceived as an occasion to introduce participants to some modes of attention, sensibilities and principles of permaculture and permaculture is introduced both as an ethics of doing and as a design system. What surprises us as students is the fact that, since the beginning, the teachers are much more concerned with introducing us to the ‘transversality’ of the permacultural style of doing and thinking rather than to specific techniques of land management. Permaculture is introduced as a practice philosophy or as philosophy of the ecological practices. ‘Permaculture is a tool for realising your dreams step by step’ told us one teacher called Saviana during the first lesson. In few minutes I realise that the permaculture approach, often defined as an holistic approach, criss-crosses transversally what Guattari (2000) defined as the three

ecologies: the planet Earth as a dimension of life in common amongst a togetherness of living beings, the human collective and the singular body-psyche. Among the teachers there is strong attention to conceiving together the ecological account of permaculture – as a reflection on the ways of relating with the soil, landscape and, in general, with living and non-living entities that populate our planet – with the social dimension that always goes with the construction of permaculture projects and with, what is often called in permaculture, 'the shadow zone' or the 'zone 00': the self body-psyche.

Permaculture is introduced as a practice of embodiment in an eco-social dimension and, as Saviana tells us from the beginning of the module, 'a devastated natural landscape is very often a landscape in which social relations are devastated and vice versa'. Such a logic of transversality, in which earth, human collective and a singular body-psyche are more different 'objects of attention' rather than separate and distinct entities, criss-crosses both permaculture's principles and the everyday practices of design. Permaculture has three main ethics: care for the planet; care for the people; and share your surplus, Saviana told us. They are broad ethics; wide principles, because 'permaculture is not law-based, it is not normative. Permaculture doesn't tell us how to solve a situation; moreover, it teaches us that every place and each circumstance have different solutions'. For this reason it is so difficult to design a project for someone else. It is a matter of acting on and with complex systems, of which *a priori* we don't know anything. Total ignorance. 'Yes, we can pretend to calculate or to know something, but this is an illusion,' Saviana told us. What we can do is observe, and observe through interaction: to observe how the ecosystem that we are modifying answers to each little modification that we are improving upon. Observing feedbacks, basically. Complex systems create surprises all the time and we need always to learn something. For this reason, a designer in permaculture is not 'the one who knows', she is not the one who knows what will happen in advance: 'A permaculturist sits down, tries to integrate her in a situation, observes, learns and slowly starts to interact deeply with people, soil and landscape. She interacts slowly, modifying the ecosystem but also herself, because she will adapt, for example, to the food that is produced from that soil in a determinate period of the year. For me this is a fundamental approach in permaculture' (Saviana). So, following Saviana permaculture has an ethical approach, but this approach is a form of everyday doing and a way of conceiving the question of design that always starts from a specific situation. A design process is continuously re-defined in practices starting from the forms of interaction that are developing – every time they are

developing in different ways – inside the co-constitutive and circular relations between observing, planning and acting. A form of interaction that, as we will see in the next section, is a matter of ecological relationality.

A permaculture classroom in Tertulia Eco village, August 2013

5.2 Understanding Terraforming Via Compost

The term terraforming comes from science-fiction literature of the 1930s and 1940s and it refers to a process of remodelling and making of the ecology of non-Earth planetary bodies in order for them to be hospitable to humans. It could be said that what is often called the Anthropocene – the era in which many geologically significant conditions and processes are deeply altered by human activities – represents a story of our actuality in which a gigantic process of terraforming is investing the earth, transforming in an uncontrollable way its whole ecology. In the middle of such an era, a global eco-social movement, called permaculture, is proposing to us other ways of transforming humans' relation with landscapes and ecosystems. Tearing terraforming from its 'original' context of meaning, we can say that permaculture is proposing to us another way of making Earth; another way of enacting processes of materialisation; another way of thinking about terraforming.

The permacultural way of thinking terraforming is one in which the place of humans is not at the centre of the scene of the processes of the Earth's ongoing transformation. Transformation involves more-than-human forces: elements,

substances, waves, organic and inorganic beings. What, with many authors (Choy 2011; Papadopoulos 2015), we can call 'ecological relationality' is a day-by-day, place-by-place and situation-by-situation biotic landscape in which terraforming happens. Terraforming is a force of co-making that involves an inter-species engagement as well as many socio-technical arrangements. Such ecological transversality can be defined as an interaction among artefacts, inorganic substances and different species, or as a biotic and more-than-human community of ethologies. As several authors insisted, ecological relationality is not synonymous with an absence of conflict and tension; of peace, symmetric relations or irenic cohabitation. Rather, it defines the very fact that each process of forming implies an involvement in the life of other living or not-living beings and a becoming with others. From a permaculture perspective, acting inside such ecological relationality means making an everyday contribution in seeding and nurturing life, conscious that we don't know in advance exactly how to do it, as well as the very fact that the ways in which we are doing it are relevant. In permaculture, becoming with others is a way to inhabit our worlds on Earth with the risk of meeting other unexpected worlds. Staying with this risk and with the many delights and vulnerabilities connected with it, the mundane play of terraforming with permaculture, in the many plateaus of consistency in which living on earth, implies a becoming with others in processes of formation. But what does 'nurturing life' mean in the middle of the many little and big deaths that characterise life on Earth? Exactly as what matters we use to think other matters with matters (Haraway 2013), we can say it matters what kind of seeds we are using for making other seeds with. The first seed I want to use in order to introduce what it means to think terraforming with permaculture is compost.

A bag of compost – a homemade bag of compost – is one amongst the many possible figures of everyday life of terraforming in permaculture. Compost is quite simple: it is just about a bit of attention to choosing the right bags to put your waste in and, collecting it just outside your kitchen, you are taking part in a curve of resilience. Paying a bit of attention to wind, lights and the material composition of your organic waste and, after one year, the break-down process of organic life is done. Adding humus to soil is a way to protect and nurture it. A good soil, in fact, is never naked; strata of organic matter always cover it. Compost is literally about nurturing as a way of spreading fertility, facilitating the growing of new things. Thinking terraforming with a bag of compost is not projecting an ideal world in our worlds, but it is a way to see, in a quite simple everyday practice, the possibility to think about seeds in the middle of the

many and little lives and deaths which inhabit our worlds. As compost does, terraforming with permaculture is a way to add something in the middle of a concrete situation, where concrete means that a piece of soil – and we can say the same about many pieces of technoscientific practices – can be, in many ways, compromised, sick and arid. Reconstructing worlds is a matter of terraforming, but this kind of socio-material practice cannot be imagined starting from a dreamed 'outside': there is not another Earth and we never start from zero in thinking and acting in ecologies of life. Any situation, with its proper socio-material constraints, is good for terraforming with a bag of compost. Understanding terraforming via compost is a good way of introducing how it is possible to theorise permaculture as a politics of worlding. In the next sections I will explore further permaculture's practices and principles in an attempt to add new elements for our understanding of what a politics of worlding could be.

5.3 A Fermentation Story

One day, in the permaculture training, Saviana teaches us how to make bread. She starts to knead and while she explains to us the relation between this human culinary practice and fermentation, she doesn't forget to tell us that humans did not invent fermentation, but quite the contrary 'humans have been created by fermentation'. If, for us, fermentation is a word that resonates immediately with alcoholic drinks and pizza, biologists use this term in order to describe anaerobic metabolism, the production of energy from nutrients without oxygen. Following the arguments of biologist Lynn Margulis, fermenting bacteria emerged relatively early on Earth, from the primordial prebiotic soup, before the atmosphere had a sufficient concentration of oxygen to support or evolve aerobic life-forms:

> 'In the first two billion years of life on Earth, bacteria – the only inhabitants – continuously transformed the planet's surface and atmosphere and invented all of life's essential, miniaturized chemical systems.' (Margulis 2007: 30-31)

The research of Margulis and others has convinced many biologists that symbiotic relationships between fermenting bacteria and other early single-cell life-forms became permanently embodied as the first eukaryotic cells that plants, animals, and fungi comprise. Evolution derived from such symbiosis is known as symbiogenesis. Microbiologists Sorin Sonea and Léo G. Mathieu elaborate on the concept:

> ‘Symbiogenesis with thousands of different bacterial genes has decisively enriched the limited metabolic potential of eukaryotic organisms, accelerating and facilitating their adaptation much more than would have been achieved by random mutation alone.’ (Sonea and Mathieu 2001: 67)

Fermentation plays such a broad and vital role in nutrient cycling that all beings coevolved with it, ourselves included: through symbiosis and coevolution, bacteria fused into new forms, spawning all other forms of life. While making bread with sourdough, we are listening to a story in which coevolved symbiotic relationships between bacteria and multicellular organisms are a prominent feature of life on Earth; ‘we cannot exist or function without our bacterial partners’, Saviana says. Looking at the importance of bacteria and our bacterial interactions is a good way to understand permaculture and its ethics, starting from the very fact that we are a composite of many species; that we live, for example, with our indigenous biota. ‘If WWF is not taking into account bacteria and microorganisms, I don’t want to be part of this organisation’ Saviana tells us. But such a joking statement reflects, not just an attention with the existence of species not so often accounted as living beings; more than that, it is a way to think about the ‘vital’ everyday relation between different species in coevolution; a form of essential coevolution in which, for example, our indigenous bacteria protect us everywhere and enable us to function in a myriad of ways: it is this extensive microbiota, ‘our’ bacteria that coexist with us in our bodies that enable us to exist. Thinking the mutual and co-constitutive relation between our body and bacteria is a good way to introduce the first ethic of permaculture: care for the planet and for all the living beings that are populating the Earth. Such an ethic is grounded in the recognition that all the process of becoming are infinitely interconnected, that co-evolution is a complex and multivariable process through which ‘all life is linked’ and implies a way of cultivating a form of biophilia through reclaiming such vital relationships. As Saviana explained to us ‘Rather than continuing to distance ourselves from interaction with the larger web of life, we must reclaim these relationships and work with them’. From this perspective, fermentation is just one of the tangible ways of cultivating such consciousness and these relationships: thinking with fermentation here means recognising in bacteria, not only our cellular origins and mutualistic partners, but also ‘our best hope for biological pathways into the future’.

This first ethic of permaculture puts in question human exceptionalism, collocating humans, just all living beings as participants in infinite interrelated biological feedback loops, as a contingent presence inside a vast multiplicity of

interdependent evolutionary processes. Thinking evolution with a fermentation story and fermentation as a nature-culture practice is a way of thinking through the relation between ethics and doing, starting from the ways in which we are participating, as actors amongst many others, in this world-making history. Moreover, ethos and ethology in this fermentation story are folded one into the other: fermenting, seen from Saviana's view and with the first permaculture ethic, is an ethopoietical and sympoietical process animated by the simultaneous creation of ethos and ontology.

5.4 Caring for the People

During our training module many meetings are dedicated to the social dimension of permaculture, with a strong attention to the capacity of the group to discuss and take decisions, but also to listen to each other and to develop forms of empathic communication. In particular with the help of Enzo, a permaculturist who stays with us during the whole module, we exercise ourselves in an everyday activity of active listening created through feedback and collective discussions. Enzo introduces us to a method useful to connect what each of us is feeling with the group: the stick method. A stick passes from handto hand and everyone speaks, starting from the sensations that she is feeling in that moment, generating an immediate flux of words, while the other participants of the circle listen in an attempt to avoid judgements or critiques. This is a form of listening that puts our capacity to develop our empathic communication at the centre, in which feeling with others is a way to feel the other in a relation that exposes yourself to the sensations that are passing inside the group. It is a modality that uses language as a way to stay connected, of feeling the emotive intensities that are emerging in this experience of living together. Such reciprocal listening is often used in permaculture communities also as a way of starting meetings orientated to planning and taking decisions with a consensus method. For example, in the commune in which Enzo lives – called Basilico and situated in a forest in the centre of Italy – the start of every meeting is dedicated to a moment in which each participant narrates stories, events or patches of her life in several ways related to the main topics of discussion in the meeting. For example, if the meeting is dedicated to taking decisions about how the commune will manage money or make investments, the meeting will start with a stick in movement and each participant narrates how, in her life, she related or is relating with money or how, starting from specific situations and contexts, different ways of experimenting different relations mediated also by money were lived by members of the

community. Listening is a form of doing together here. This exercise of active listening brings with it the relation between a passive verb as listening with the active role of feelings and emotions transported and transformed by listening. Such ethics of active listening, in which everyone exposes herself to speak and listen, introduces us to the second ethic of permaculture: care for people.

Of course caring is not just a matter of speaking and listening. But what this experiment allows us to live is a form of attention for significant others that develops, as friendship does, only with practices. And this exercise of cultivating a capacity to feel the others shows us, even if just partially, one of the ways in which this second ethic is materialised as an everyday attention inside a permaculture project. As Enzo told me, 'empathy and consensus here are not synonymous with agreement or with feeling the same sensations of others,' on the contrary, it is a way to make room for different desires, needs and emotions inside a common project. In such a method, in fact, the process is more relevant than the outputs, because the process is, in itself, a pathway of self-education in which conflicts and tensions are not eliminated but, rather, they are transformed, elaborated and collectively composted.

The second ethic of permaculture is, in a certain, way included in the first one; given the fact that people are included in the togetherness that I have introduced with the previous section: in permaculture, without caring for other beings, we can not care for humans either. Moreover, in both stories that Saviana and Enzo told us, the borders that separate 'us' or 'me' from the others are contingent and porous borders: it is more a matter of scale as embodied perspectives than clear and separate entities. For this reason, in permaculture these three wide ethics, rather than defining three clear and separated domains, work more as 'modes of attention'. Following Saviana, for example, 'this second ethic is important or, better, it is important that it exists as an ethic *per se*, for certain degrees distinct from the first one'. From her perspective, this second ethic is oriented also to develop a constant attention to one's body self. Not because one's body self is separable from people care or earth care, but because it is important not to forget yourself: 'Inside a permaculture project, in living permaculture, this is a decisive starting point for me – permaculture is an approach, a tool for realising your dreams'. But, as we will see in the next section, caring for the self here means, first of all, cultivating a constant attention oriented to understand needs and desires that are coming with our dreams; or, more simply, taking the time for asking ourselves what we 'really' need.

5.5 Sharing Surplus

One of the main principles in permaculture is 'thinking like an ecosystem'. One of the core ideas in permaculture is that natural ecosystems are guides for our making. As Looby Macnamara wrote, 'we can learn about ourselves through nature and about nature from knowing about ourselves' (2012: 14). Permaculture is often defined as 'consciously designed landscapes which mimic the patterns and relationship found in nature', a repertoire of models – patterns of natural and biological worlds – for low energy support systems. An ecosystem or an ecology is seen in permaculture as composed of interlocking patterns and each pattern has features that serve a variety of functions. What is often called 'biomimicry' – to be inspired and copy so-called natural patterns in technology – is the core of permaculture. What can we learn from basic patterns such as wave, spiral, branching, lobe-honey combo or net? And how can we construct building, gardens, technologies or arts thanks to our capacity to mimic such patterns? Recognising patterns means recognising connections, or better, trying to understand how the reciprocal connections between different elements and substances in a situated ecosystem work. Having 'natural ecosystems' as teachers here means trying to understand something about the many ways in which, in a determinate ecosystem, biodiversity works together. Moreover, patterns can be infinite in number, therefore the possible lessons to learn are many but also the 'biomes' are infinite – e.g. sea, forest, tundra, desert, etc. – inside which our body is immersed. A typical example in permaculture is a forest.

For Mollison and Holmgren (1978), a forest is so productive and self-reliant thanks to its diversity. More relevant than the amount of different species, what makes diversity work is 'the number of useful connections between them', the multi-scale webs of cooperation – especially between different species – that inhabit a forest. A typical example of a chain of resilience is the next one: 'different species specialise in extracting different minerals from soil and, when their leaves fall or the whole plant dies, these minerals become available to neighbouring plants' (Whitefield 1993: 2). This happens through the work of fungi and bacteria that convert dead organic material into a form which can be absorbed by roots. Meanwhile, the green plants provide the fungi and bacteria with their energy needs. Insects feed off flowers and, in return, pollinate the flowering plants. Many plants, such as the aromatic herbs, give off chemicals, which are good for the health of their neighbours.

In permaculture, as in the great book of Ursula Le Guin (1972), the word for world is forest. During my training module in permaculture the most common answer to any question was 'it depends', but the second one was 'let's go into the forest to search for your answer'. Starting from the image of the forest, identified as the maximum of resilience in the processes of self-organisation of matter, we can start to understand what the third ethic of permaculture – share surplus – means. Share surplus in a forest means not producing waste, it means acting inside a chain of resilience in which the outputs of a process are sustaining other processes. Sharing surplus means not producing pollution, where a pollutant is 'an output of any system component that is not being used productively by any other component of the system' (Mollison 1988: 111). Sharing surplus is a matter of resilience: in permaculture life is anti-entropic and, as in a forest, life tends to reduce destructive frictions and tensions, or at least frictions that, more than producing energies, are a waste of energy. For this reason, it is not possible to understand what the third ethics means without 'thinking as an ecosystem'. Here, everything is a hydraulics of energies: canals of energies transit from one element to another, and all outputs are used within the system. Pollution is a matter of quantum: it happens when an ecosystem is not ready to receive such energy excess. Pollution, in this energy based calculation is a waste that is not becoming a resource: a missed occasion! Finally, how much is enough? An ethics of sharing surplus means having a relation with our yields. Asking ourself how much is enough in order to share surplus means having an active relation with our needs. Having a relation with our yields as a piece of soil has a relation with a canal of water that is flowing over itself. Soil holds back a certain amount of water, but at the same time it allows water to flow in new directions.

5.6 A Matter of Design

In permaculture there is a strong emphasis on design. For Mollison, for example, design is the essence of permaculture. But what kind of ecology of matter is implied in a permaculture design? As we have seen with the image of the forest, the connections between different elements are at the centre and an ecology is always defined as a co-producing relationality, or what Whitehead calls 'a theatre of activity' (1978). Matter is fused in its environment and the environment enters into the nature of each thing. Many characters inhabit this theatre: bacteria, a particle of oxygen, roots, earthworms, etc. Each of them is an actor that works in symbiosis with others, worldling within the constraints of the environment. Organisms and behaviours are seen as a product of, and

as producing, what is called ‘the environment’. So, we have an ontology of relations where an actor is an intervener, a quasi-causal operator in Deleuzian terms: the intervener holds a particular situation and relationship and it is its location that makes a significant difference. In this ecology, the act of designing is a way to participate in these processes of evolution as an actor amongst many others. In these terms, designing is as natural as breathing.

Permaculture is a culture of modest intervention because, if it is true that there are not situations that you can’t work with, on the other side, you change when participating in a process of modification in which – as Saviana reminded us many times during our classes – it is possible to modify something, not everything. Quite far away from an engineering idea of design, or from a Promethean idea of intervention, permaculture conceives human beings as actors amongst many others, as inhabitants of Earth, not as their master. For this reason, thinking change in an ecosystem that is an open system of multiple interrelations can be difficult. But permaculture teaches us that any ecology is based on a dynamic system of entering energies and such energies that are entering from many different sides and dimensions are moving, often slowly, a situated ecology. So, also the dimension of ‘intervention’ is intimately related to a relation of dependency: you depend by who/what is giving you energy, and for this reason calculating interdependencies is the core of design in permaculture.

Permaculture and ecosystems are both based on the idea of putting useful partial connections at the centre and the aim of a careful design is to achieve this. If permaculture names a capacity to understand and to act with the patterns of interactions between organisms and their environments and, if symbiotic relations are the core of the permaculture understanding of ecosystems, the heart of design becomes a capacity to read and partially articulate the dynamic interrelationships between living things and their milieux. For this reason, to design here means valorising useful connections. Useful connections can only be made between things if they are put in ‘the right’ place relative to each other. For this reason, the notion of ‘relative location’ is very relevant in a design system. Given the fact that, in permaculture, ‘the connections between things are as important as the things themselves,’ the function of a self-regulated design is to place elements in such a way that each serves the needs and accepts the products of other elements. But how to achieve good ‘relative locations’?

As Saviana once told me: ‘If you put into synergy all the permaculture principles, it is a mess: everything is moving, small, slow, but everything is moving and, if you

enter into a single point of nature, a single knot of matter, if you enter deeply you find energy, you don't find anymore matter without energy'. It is not easy applying a technique of design inside an ecology where everything is becoming something else; in a landscape where what is permanent is exactly the impermanence of things: permaculture could be seen from this perspective as a permanent culture of relating with impermanent ecologies. In fact, a design in permaculture is continuously re-defined in practices starting from the forms of interaction that are developing – every time they develop in different ways – inside the co-constitutive and circular relations between observing, planning and acting. Inside a circle of active learning and experimenting in permaculture, the moments of observing, planning and acting represent the core of a permaculture design; the main techniques through which permaculture can be understood as a technique of construction. Such a recursive circle starts with the immersion of a body in a landscape. From this adventure, new images are generated and patterns are recognised and invented and, from such visions, ways of thinking and sometimes mapping are generated. After planning it is possible to take action, intervening slowly and carefully in a territory. And the circle restarts.

5.7 Observation Without Judgment

The first ingredient to interact with a landscape consists of having a direct experience of active observation. Observe and interact: a good design is not something that you can gain in isolation but inside reciprocal and continuous interaction with the subject. What is often called active observation does not consist in activating just the sense of sight. Rather, it indicates a multi-sensorial immersion in a landscape; a process of immersion. An exercise of active observation in fact consists prevalently in putting your body in a landscape; using your body as a porous edge. You try to find a form of relaxing without sharp-cornered tensions, cultivating the sort of energy able to embody empathy as the main method of relation. Exercising this kind of posture, with Vipassana meditation – 'a practice of silence' that includes contemplation, observation of bodily sensations, meditation and observations on life experiences – or touching materials such as wood or clay with your hands can be helpful in order to start this process.

What is very important here is trying not to think, to resist to your activity of judgment, in the attempt to make your mind an empty space: 'make yourself and other entities an empty space'. In a long chat that I had with Enzo, a permaculturist who considers observation without judgment the heart of a circle of active learning, he told

me: ‘Our rationality, our schematisation reduces very much what reality is and what is called rationality of planning is, *per se,* just a small thing inside our reality; what is happening in our life is, for the ninety-five percent, related to emergences’. In these terms, active observation is an adventure in which you try not to search things but, rather, to encounter the emersion of things and entities.

During an active observation it is very important to separate observation and valuation, if we combine them, we are attracted by the ‘mermaids’ of critique and we are ‘resisting the process’ according to Enzo: ‘There is a becoming child in this kind of process, a becoming that forces us to remove something from us.’ Am I feeling good where I am? Which images are growing in my brain? What do I need? Which needs are behind the sensations that I am feeling? And what kind of pleasures and desires inhabit what I need? You don’t need to exasperate your mind with this kind of questions but, on the contrary, to situate this kind of question inside a process where thinking is not so central. Feeling these questions with your body; through the sensations that you feel, with the images that are growing in your mind. The fold of an active observation on the self passes through the capacity of having a relation to these or other questions through your visions – ‘images are more important than planning in permaculture!’ according to Enzo – and your sensations. Immersion is a more-than-human affair, as more-than-human are the active presences inside a vision, an image, an idea.

An active observation is a process of immersion, a process of feeling entities that also generates new mental images, an exercise to see a territory starting from the forest, and step-by-step arriving at the ‘house’. Your sounding body is the first tool able to feel entities and energies, what comes from the materials that inhabit a forest: clay, stones, wood, etc. and the sensations which comes with them. An active observation is a way to improve this ethic of the body, and its reasons; an ability to stay with such feeling, with what I am feeling, not listening: ‘I hear birds, but not the singing, I hear the vibration that it makes on me’. And again: ‘When I listen, I don’t pay attention to ideas, opinions, maybe I can have a look at passing thoughts, but it is not decisive for me. When I hear you I discover sensations. The sensations provoked in me by my listening to you. I listen to the other, but I hear what you are saying provokes in me’. Sensations come, sensations protect and guide you, they touch us, and inside this being touched images are generated. ‘Through sensations the hard becomes soft’ (Serres 2008: 145), the hard things of the world become soft elements in our brain. Sensations are making brain in an exercise of active observation, they are making us: as Deleuze and Guattari wrote once

in *What Is Philosophy?* 'sensation is not less brain than the concept' (1994: 211). If sensation is the name of a way in which we are bound to the world, an active observation consists of being captured by sensations, of being affected by their capacity to generate images. The pedagogy of permaculture consists precisely in cultivating a symbiotic relation with landscapes as an onto-epistemology via sensations. Yes, but how does it work?

When I asked Enzo which techniques are required for a good active observation, he said that, for example, for him a forest is all that he needs. 'I need just to put my body in a forest. I hear with all my senses. I breath info that are not touchable – molecules of water give me info, the body feels them; my legs, my skin, my lungs. The forest is a lake of water, going inside for me is an experience rich in information. My energies come from there. Maybe after I can think or an idea can arrive, but what counts really is what happens in my feeling inside there. In an exercise of observation, my rationality is ash'. This osmotic experience for Enzo is a way for feeling energies but it is also a way to stay with the water that we are. 'We are made, for the most part, of water and, if we don't use the filter of our rationality, we are in osmosis with the water. We, as humans, we went out of the species; maybe the rationality is the ill of our species'. These sentences, beyond pointing out a dimension of feeling as a force of connectivity, insist continuously on a material continuity, in this case, a water continuity, that blurs the border of your body, the perimeter traced by your skin. The body is folded in the landscape; it seems to disappear to the point of not containing the osmotic resonances of water, a resonance rich of information, affects and memories.

In an active observation you create paths with your landscape, you produce the image of reality built by and 'beyond' your body. In his *The Five Senses. A Philosophy of Mingled Bodies*, Michel Serres (2008) proposed the idea of the senses as the mixing of the body. The senses are not channels, islands or continents that keep themselves to themselves: they do not operate on different frequencies, they are subject to interference, or to say it better with Serres, they are even interference itself: the senses are 'discrete varieties', 'they are eyes in the storm of the 'continuous variety' of which they form a part and from which they can never be wholly drawn apart' (Connor 2008: 7). So, from Serres' point of view, the senses produce variations of the skin, that is in itself fundamentally a body of variation, a common sense of all the senses. Such common sense, called skin, is a sort of bridge, a passage or a canal that allows the ordinary interconnection amongst the five senses. But the senses are not just the means

through which the body mingles with itself; the senses allow the body to mingle with the world, overflowing its borders. What we are to call soul is nothing but the mingling of soul and world that is given in sense, in which 'I mix with the world which mixes with me'. In Serres' argument, the skin is the ground of all senses, something as an edge, where soul and world commingle. Something similar happens when a body is immersed in a landscape in an exercise of active observation. Making your own body an edge here means making it a zone of transit, a membrane, and an exchanger. *Res cogitans* and *res extensa* meet each other in the pineal gland, following Cartesio. According to Serres, such a point of passage is not located in a situated point of the body, but is evenly distributed all along our own body, or better, in a body that is becoming the 'non verbose flesh' of the world:

> 'I only really live outside of myself; outside of myself I think, meditate, know; outside of myself I receive what is given, enduringly; I invent outside of myself. Outside of myself, I exist, as does the world. Outside of my verbose flesh, I am on the side of the world'. 'The flesh is made word, the word is made flesh'. (Serres 2008: 96)

At this point we can ask: what is a forest of resilience in an active observation? In fact, an active immersion is a way to make a forest, but what kind of forest? And which are its conditions of felicity? It is a togetherness – the togetherness that you feel in a moment – in a single situation. In a situation where there are no hierarchies between birds, plants, humans or whatever, as Enzo explains: 'Now, there in not a greater value in what I am saying than the pleasure to stay with you, or to hear the birds from there, or the air that I am feeling, there is no greater value than the entire situation in which we are. The situation is made by the emotions that I am feeling and by my ability to appreciate the togetherness in which we are'. In a forest, the self is nothing else than a capacity to feel a proliferation of entities without feeling a hierarchy: 'I am able to distinguish and, at the same time, to feel together, as a togetherness, what I feel'. The forest of active observation is the delight of feeling life that is passing between us, seeing things in the sweet light that passes through them. In an active observation, a forest is populating our brain – according to Enzo – when a fast capacity of distinguishing is in resonance with a capacity to feel a togetherness. At this point it is possible to recognise patterns.

Permaculture's knowledge is founded upon a conception of understanding based on a process of continuous observation through recognising patterns. As art and science,

design as well depends on inventing-recognising patterns of organic and inorganic worlds. Observation is a matter of interaction in the middle of things; an immersion through which to gain a design that is something of meaningful, islands of visible order in the process of the self-organisation of matter. Observation is a key point, and it can take one year without doing anything, but it is a necessary step, a conscious and intuitive effort of gaining a repertoire of models for low-energy impact solutions. Such form of active immersion is a lure for feeling and constructing: the most creative design involves the promiscuous hybridisation of possibilities from apparently disconnected or even discordant sources in order to create a new possibility, a singular pathway.

Observation is the way in which a body makes a chemistry of traces. Observation is a technique of feeling through which it is possible to make your empiricism: it is a practice of/for feeling entities, substances and the relations between them. Observing is a condition for identifying and inventing forms of relationality in a multi-species landscape and to figure out different modes of togetherness. It is a very generative moment inside a practice of design because here we establish, always in an aleatory way, patterns and pathways for our science of design. We make a sort of chemistry here, in the sense that we put into relation in a situated landscape a number of different patterns and pathways. We generate our table of elements, our entities through which to plan. Here we trace the traces to follow. We construct our way to stay in a situation, working with its complexities. The role of observation is to connect us with the many ways in which objects and entities influence and act with each other. And we have two matters of concern in this operation: a concern for the agency of each element, and a concern for the relations amongst them. When I say a concern for the agencies of an element, I mean that it is understood more for its functions and agencies than for its structure and properties – a concern for what it does more than what it is. Observation without judgment is an exercise for feeling: the point is to feel more and more vital substances, or particles – a particle of air for example – and it is in these connections, in this exercise of feeling and in its outputs, that we can find the force of association of permaculture: observing and interacting is the specific way in which, in permaculture, it is possible to become an active witness. Only through becoming an active witness is it possible to ‘organise’ a space with its topologies of energy.

5.8 Planning

The main task of permaculture, especially for the first permaculturists, was to rethink agriculture, or better, to experiment with a form of agriculture closer to gardening, or even better, a lazy gardening. The aim is to use the power of design to replace human brawn or fossil fuel energy. Another aim is to replace human stress and fatigue, working more with non-human forces and energies. You need to put less energy in, because you work with, not against, the existing energies. You work with an on-going process of self-organisation of matter where the human being's activity is not the central one. It could be said that permaculture is for 'lazy people'. And yes, permaculture teaches us that a good way in order not to get tired quite soon consists of not thinking of the human body as something that is able to substitute for the universe.

Another lesson that comes from permaculture is that what is natural is what happens without fatigue and that entering into a stress situation can be also good, but you need to go out of this situation quite soon - resilience is when an ecosystem deforms itself, but it is capable of gaining a new dynamic equilibrium quite soon. Such a perspective is oriented to transform human work and activities in 'a movement' of doing different things, cultivating different dimensions and obtaining different kind of yields at the same time. Permaculture is a logic of intensity[9] - a way of making multiple activities and obtaining multiple yields simultaneously - and planning is a strategic activity oriented to achieve it. Permaculture in fact exhibits a pragmatic emphasis on the outputs of practices – an intimate relation with the need to obtain a yield. What is often called planning – the activity of gaining useful 'relative locations' and useful connections between elements – is oriented to this goal. For these reasons, first permaculturists insisted on the centrality of notions such as planning and 'relative location'. The essence of permaculture planning consists of positioning things in the right place, making sure that each element performs many functions and that each important function is supported by many elements. And at the same time, it is very important to situate 'yourself' in a good position in relation to other energies, as a condition capable of guaranteeing a certain regime of functionality in a permaculture

[9] I borrow this expression from the work of Guattari. In particular in *The Three Ecologies,* Guattari qualifies the eco-logic as a 'logic of intensities' capable of inaugurating processual lines of flight. As such: 'Process, which I here counterpose to system and structure, seeks to grasp existence in the very act of its constitution, definition, and deterritorialization; it is a process of 'setting into being', instituted by sub-sets of expressive ensembles which break with their totalizing frame and set to work on their own account, gradually superseding the referential totality from which they emerge, and manifesting themselves finally as their own existential index, processual lines of flight' (Guattari 1989: 136).

project. As we have seen, the activity of planning is always consecutive to observing. In fact if, thanks to an activity of active observation, it is possible to understand and interpret patterns in a determinate ecosystem through planning, such patterns are referred to a situated centre of energy: the human activity.

A well known example through which we were introduced to the activity of planning is zoning. Zoning a site means dividing a limited parcel of land into different sectors, often focused on a central point that is generally your house, or the place in which you spend the most time in your daily life. Zoning a territory allows us to organise information about a site and it provides a starting point for an overall concept of a plan. Permaculture zones are quasi-concentric areas of intensities of use that follow one another 'starting from the back door'. The closer to the centre, more efficient and intensive is our use of the land, the further away we go, the more we must rely on self-maintaining elements that require a little input from us and generally yield less for us. In our case, zoning consists of dividing a territory into zones (often zones go from zero to five), in relation to criteria of frequencies and variable energies that you want to put into several activities. Zone zero is understood as a zone of daily life activity, where you spend more time and where the kind of activity that you will develop demands a high level of control over what is going on. It can be the house. And so on, until zone five, where you don't do anything, except observe. Usually you have a forest or a wood in zone five. Zoning consists of creating a map of activities and locations valorising at maximum the interconnections amongst different activities, multiplying useful connections amongst elements, and minimising human movements and energies.

In zoning, you relate a network of energies and fluxes to a central actor – for example the activity of a human being – and, starting from a variable logic of intensity of use, you design a specialisation of the territory; a topology of distances inside an economy of attentions and energies. It is a technique of simplification: you make a local strategy finalised to achieve good relative locations. Through zoning you refer an activity of patterning to a specific source of energy, referring a previous activity of establishing patterns via observation to a pathway. It is an economy of care, attention and energy depending on frequency of use and variable intensity of relations. Zoning – the division of a territory into different areas of interest – is a way to substitute a territory with a map. Here the image of the landscape is overlapped with a schematisation of the space, where an area is divided into sectors of intervention.

Doing what is often called a mandala, which is thinking from a situated centre of energy diffusion, is a way to install a machine installed onto and with many other machines. It is a way to inhabit and plan the space that does not ignore the many others existent, but that consciously tries to feel and construct with them. Zoning is an operation of addition to achieve carefully - creating a mandala that works with many other mandalas: as a spider web oriented to obtain a yield or a storage crisscrossing other spider and non-spider webs. There are different ways of making your pathways and, of course, there are many techniques and specific attentions in relation to what you are doing. All of them are grounded upon the very fact that many thousands of energies pass through and constitute an ecology, and these energies pass through the reciprocal relations between elements. 'From where is water entering? And sunlight? And so on…'. The dynamics of fluxes are central for every planning activity, and planning in itself is conceived as a transfer and as a relative accumulation of energies. 'Modifying something in order to obtain well enough': this means acting with a universe of energies in permaculture.

5.9 Acting

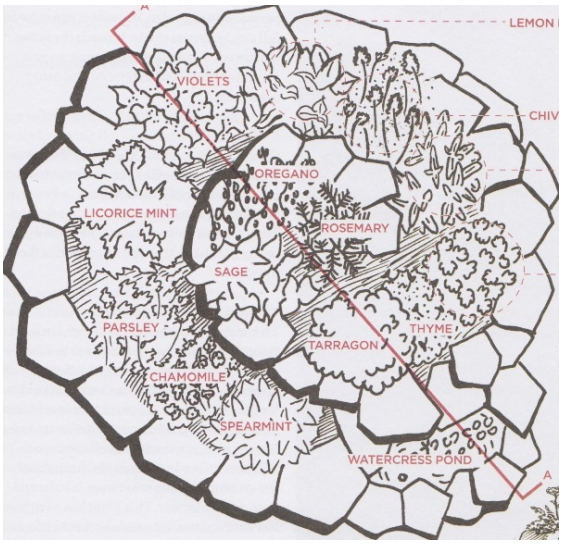
Permaculture is a practice of interrelation, where the immersion in an ecology of making requires a constant attitude to inhabit the relations implied in what you are doing and their fields of variation. Every time the measure is adjusted, finding a way to gain something starting from a specific situation. 'Tweaking' was a central term in my conversations with Dani, a permaculturist involved in the activities of Transition Leicester - a local association supporting the development of concrete projects, values and worldviews that recognise our interdependence with the rest of the natural world. It refers to an on-going adaptation/adjustment in the practices oriented to operate with the feedback that comes from matter, to the unstable relation between a plan of design and the material condition of a situated soil and landscape: 'it is essential to hit with little strikes. You are not the maker, because the strikes come from the relation'. A continuous dynamic of feedback and assessment that involves a long exercise of observation and an attempt to 'leave a tree to say where it wants to be cut'. An aesthetic of feeling not so distant from what Guattari called ecosophical logic – see Chapter 2.

A similar logic 'in construction', where science is seen from the perspective of a 'nomadic' or 'minor science', is developed also by Deleuze and Guattari in *A ThousandPlateaus* (1988). These authors explore, 'along and under' the historical development of the techniques of construction, the presence of 'a science as practice' (the minor science) that shows the following features: a primacy of fluxes in the composition of plans of consistency, a conception of space as an open space where things-fluxes are distributed and a science conceived as a science of problematizations. As it is in an ecosophical logic, their nomadic science is based on problem-events. It is a science of 'deviation' where space is a territory defined by 'actions of contact' and where such contacts and interactions are possible in a topology of variable affects. Such lines of variations – the effect of the continuous variation of variables – that make a not exact but nevertheless rigorous science, are not referable to the extraction of constants, standards and measures because this style of crafting doesn't proceed through a logic of reproduction, rather it subordinates all the operations to the sensible conditions of intuition and construction, following the flux of matter and tracing the space of new techniques of creation. A similar technique of construction is developed in permaculture.

Water is often considered a master of construction. In permaculture a 'perfect' form does not exist to be achieved, and the element of water is often considered a

significant element to mimic: 'water adheres to everything and transports everything,' for this reason it is considered the sculptor of the Earth. Water does not have a form in itself, but proceeds through the existence of differences – we can think of the different inclinations of soil - that produce a movement, a water movement capable of creating a situational form. Water, as permaculture, itself does not have a form, but water is the path that inaugurates a form. Deleuze and Guattari define this science of matter also as a science of canals – where gaining a 'smooth space' is a way to operate successive practices of crafting. Make canals is a style of making inside the stripes of matter. Smoothing down the wood is a way to carve it. Crafting matter is a way to leave traces, operating through soft stripes of matter. In *A Thousand Plateaus* this style of crafting matter seems to define the research of a rhythm. In their chapter on the concept of refrain, Deleuze and Guattari qualify the rhythm as the passage of trans-codification from one surrounding to another, as an occasion of translation, a possibility of new coordination amongst heterogeneous times and spaces.

The valorisation of edges and surfaces of contact is a strong characteristic of a permaculture design. As we have seen, permaculture is a logic of intensity that invites us to do different things and cultivate different dimensions at the same time; a logic in which thinking as an ecosystem means valorising useful connections. Often an edible ecosystem in permaculture looks like a forest, a forest garden, in which fruit trees and bushes, herbs and vegetables are all grown together, one on top of the other. 'Integrate rather than segregate' is a fundamental permaculture principle, and this attention for integrating valorises, in particular, the capacity to design solutions in which several crops are grown on the same spot at the same time, often in a small area of land. A logic of intensity that works with multi-species alliances and asymmetrical exchanges. The making of such exchanges is a matter of rhythm, and the rhythm happens between two surroundings, as a canal. An herb spiral (see image below) that works by multiplying the surfaces of contact amongst different elements is a typical example of productive inter-surrounding. In this kind of design solution there is first of all an attention to the complementary and asymmetrical features of each herb that leads the association process. The spiral shapes the space also in a way that offers a greater movement of interactions than a flat solution, favouring also a large amount of variations of light and shadow. It allows both a differentiation of niches putting each element in a good 'relative location' and, at the same time, multiplying the niches in a tiny space.



As the greatest part of the pathways in permaculture, herb spirals are conceived in order to play with inclinations and movements, where multiplying different scales of inclination is a way to engage with canals of water. This kind of shape also exalts the margins, the edges: the soil around borders is very productive and it supports healthy plant life. Edges create zones of interruption and, in a herb spiral, there are not inter-surroundings without interruptions, without perforating borders, without canals. When a new symbiosis comes into existence a new plateau has been created realising, not a simple addiction, but a plus-value of passage; a bridge. What constitutes an edge and what is an ecology in its own right is a matter of scale as perspective. Permaculture, as a technique of 'intensive' construction or as a construction of intensities, can be thought of as an art of ecotones – an ecotone is an edge between two or more bio-regions where the distribution of energies from both regions overlaps – or a bio-geography of canals.

5.10 The Problem is the Solution

'Stay with trouble!' is one of the slogans of Donna Haraway (2014). She is inviting us to stay with complex worlding, with the responsability to and for shaping conditions for multi-species flourishing and to do it with the troubles we are facing in our everyday life-making. To stay, in any situated contingency, with trouble means, not just accepting the partial, the partiality implied in any recuperation, but also to engage with, facing the concrete problem in front of us. Only in this way it is possible to find your way – always finite and dirty – to make a difference and, as the three ethics of permaculture remind us, difference matters in living together and in becoming with significant others. It seems to me that such a slogan resonates with 'the problem is the solution', a relevant

principle in the culture of permaculture. In permaculture a problem is a sort of interesting puzzle, where of what is there, nothing is lacking, and the solution to a problem is not one, but many. There is always more than one solution, and this 'more than one' is grounded inside, not outside, the ways in which a problem is matter related: matter works through a pluriverse of canals, of bridges. Multiplicity here is more a property of things rather than a multiplicity of points of view in the human activity of interpretation of the 'same' thing.

In permaculture this ontology of pluriverse became a lived force of crafting and commoning grounded in the capacity of divergent singularities to operate in partial connections, to create symbiosis and resilient exchanges. Solutions are achieved through passages of transcodification from one surrounding to another, when new coordinations between heterogeneous times and spaces are achieved: when a new process of 'fermentation' happens. But a solution in permaculture is never something given, conversely it is always a passage grounded in a situated interacting with, through which it is possible to explore and invent possible solutions. Permaculture, as a rigorous but not exact science, is an embodied science, a science based on the sensations that it is possible to feel inside an experience of immersion. In the section dedicated to the moment of observing I focused my attention on the ways in which the body becomes the permaculturist's main sounding element in the construction of such science, and on the role of sensation in such experience of immersion. Making his body an exchanger, Enzo interprets permaculture as a lure for feeling entities and their reciprocal connections, for feeling the liability of relations and the quasi-stability of such entities.

Through the activity of active observation, not in other ways, in permaculture the exploration and the creation of 'rapports' between different entities is possible. Through sensations that guide us it is possible to establish patterns – isn't it called science such human activity? Through our capacity to become an exchanger it is possible to invent a new pathway; a solution. But what kind of exchange is involved in this capacity of feeling? In permaculture the universe works through multi-species alliances: a trans-species and trans-molecular economy of affects, which includes obtaining a yield and sometimes a storage. A form of exchange – a form of commoning – that is neither a matter of contract nor of conflict, but a question of theft and gift.

At the end of Chapter 4, I asked if a politics of commoning could be understood as a politics of worlding. What is at stake in this point of passage consists of understanding what activism means in a form of politics that inherits to the material

composition of worlds. And my analysis on permaculture can be read as an inquiry into what it means to theorise commoning as 'a capacity to act with' that directly involves the active participation of more-than-human entities in processes of Earth making. As we have seen, permaculture could be understood as both a technique of construction and as a lure of feeling entities, because a circle of design is based on an embodied experience of feeling significant others and constructing with them. In permaculture what allows us to make an intervention – to make a modest difference in the ontological configurations of the world – consists of our capacity to recognise and create 'rapports' – via active observation, planning and acting – between different entities. Thinking about resilience in permaculture means thinking like a forest, often recognised as a sort of symbolic and material 'mother' of what interaction means. But how is it possible to theorise the creation of 'rapports' without having the image of the forest as the main guide for our techniques of construction? In the next chapter, with the help of the 'empty head' of Petite Poucette and with the pragmatics of hacking, we will see how a politics of worlding could be enacted without having 'natural systems' as the main guide for crafting matter.

CHAPTER 6
WORLDING 2: THE POLITICS OF HACKING

6.1 The Adventures of Petite Poucette

In his *Petite Poucette* Michel Serres (2012) tells us a story of our actuality. Petite Poucette – it has been translated in English as Thumbelina – is the main character of the story. More than a defined character or one who belongs to a sociological category, Petite Poucette is at the same time a singularity – e.g. a girl, a worker, a student – and code for an anonymous, a pseudonymous, a singular case in resonance with other cases. In Serres' narration Petite Poucette exists as an individual person, even if we know nothing very specific about her nationality, loves or social class. She is a singular existence, an individuality and anonymous at the same time; a togetherness of qualities in third person. Her forms of existence and her relations with knowledge practices are the subjects of the narrative. It is through this third-person character and her adventures that Serres introduces us to a portrait of our historical present. The portrait is driven by the description of the character and the imaginings that emerge during the reading of the book offer us a qualitative account of our coming world. But for a world that is coming, another world must be finishing. Let us start to see, following Serres, what is no longer part of the body-psyche belonging of our Petite Poucette.

Following Serres every moral – religious or laic – epitomises itself in exercises that directly sustain an inevitable and daily pain: illness, starvation and cruel things of the world. Petite Poucette has not experienced, via suffering, the vital need of a moral. She has never experienced such daily pain and therefore she does not need the crutch of a moral. And, moreover, any adult – Serres is not very kind with his own generation – inspired in her an 'appropriate' one. To morals correspond forms of belonging. Until a short time ago, we lived via belonging, belongings to what now are imploded collectives. So Petite Poucette lives in a time where collective belongings are in crisis: being woman, French, catholic, member of a party or of a social class is no longer the same thing that is was some decades ago. Collective belongings are more or less all imploded, and those that are still there tend to fall apart. Everywhere we are listening to the refrain of the dissolution of ideologies. But more than ideologies, what is vanishing are the forms of belonging – nowadays felt as expressionless fetishes according to Serres – recruited by ideologies. After that suspicion, critiques and indignation have destroyed new and old forms of belonging, making of collectives and abstract

virtualities a desert, new relationships and bonds remain to be invented. Yes, but how to invent these? Serres does not give us an answer, but he is proposing a way of thinking about this question via the forms of knowing-making that frame the conduct of such singularity.

What is at stake in this narration is precisely the attempt to make a report of the knowledge practices that inhabit the world of our little girl. It is a report full of praises for her sweetness and full of hope for our present. During the reading of the book the contours of our character and the frame of our actuality tend to overlap. What emerges in this operation is a mosaic of tendencies and constituencies that, starting from the 1970's, are redefining topologies of knowledge and practices of learning. The main feature of Serres' narration refers to the emersion of a topological space of proximity. In contraposition to a metrical space measured by distances – the distance from a sacred knowledge, the distance from the word of a sage, the distance from the body of the decision maker (the politician) – our little girl lives and constructs her meanings in an ecology of proximities; where knowledge practices are both distributed and extended beyond the logic of concentration that characterizes a segmented society and the disciplinary logics that populate its institutions. Like air unable to circulate in the modern buildings of knowledge, these practices inhabit the diffused online and offline technologies of connection. They live in the web. In these diffused spaces of proximity that are taking the place of the concentrated spaces of distance, knowledge is not just more distributed, it appears in the objectified form of an accessible big archive. The proximity of knowledge practices defines a space of thinking and acting where the agility and the velocity of movements on surfaces take the place once occupied by the verticality and the vertigo of the deepness of declarative knowledge. If until not so many decades ago light was a synonymous with clarity, now light as a metaphor of knowledge resonates first of all with velocity; with the power of a search engine.

In a little mobile phone you have a greater amount of knowledge than ever and more or less everything is there, available with a couple of clicks in few seconds. The web is the main archive of such codified knowledge, the global support of information and messages, where knowledge is spread out and, in a certain way, already transmitted. This distributed knowledge, accessed with a thumb, is the first knowledge tool in the hands of our Petite Poucette. Someone could say that from parchment to printing, knowledge was all along objectified and, moving from support to support, several political and pedagogical forms of knowledge emerged in relation to different machines

of knowledge organisation. So, the question becomes, which kind of knowledge politics can correspond, can be allowed or is favourite with, for example, Wikipedia? It is a matter of technology but also, as always, a matter of body, a matter of head. While techniques are changing, the bodies are subjected to metamorphoses, and vice versa. Everyday tools externalise our forces, this is the central thesis of Serres. Leaving our bodies, muscles and articulations steer becomes simple machines – levers and wheels – that imitate the ways that muscles and articulations operate. High temperature, emanated by our organism as a source of energy, generates engine machines. Contemporary technologies externalise messages and operations from our neuronal system: information and codes. Since a body that works with the help of levers and wheels is not the same body as before such inventions, the embodied experience of reading a book or writing in a notebook activates different neuronal areas than sending a text message or consulting Google search.

Starting from this kind of consideration, Serres arrives at the idea that we are confronted with a new head — a head removed from the neck. By opening her computer, Petite Poucette takes in her hands her head. It is full of information – a full head – but this is also a well shaped one, because images and messages are available in an excellent way thanks to search engines. Moreover, the treatment of data managed by ten softwares is as speed as organised. Our head is thrown out in front of us, in a box full of memories, images and logic reasons: a cognitive and objectified box full of faculties. Now, what happens when the forces of invention are directly connected to a similar knowledge box? The answer for Serres is full of hope for a time where everything needs to be reinvented, and he affirms: falling and folding in this box, learning can become synonymous with the joy of invention.

If inventive smartness is defined by our capacity to take a distance from objectified knowledge, at the end of the era of knowledge, we are condemned to be smart. After Guttenberg, Montaigne preferred a good shaped head to a head full of things. With the technology of printing it was not so necessary to know by heart a text of Tacitus; it became more relevant to remember in which position in the library you could find his book. Now we are confronted with a more radical economy of attention: a search engine locates Tacitus's text in a few seconds. Knowledge is objectified in the machines. Petite Poucette thinks when her thinking is separated from knowledge. She invents if she takes a distance from objectified knowledge, if she believes in such emptiness. In his *Legenda Aurea* Jacobus de Varagine tells us about a miracle. Denis,

the first bishop among the first Christians of Paris, was condemned to eradication by the emperor Domitian. The emperor's soldiers cut his head along the staircase of the actual Montmartre. While his head is rolling along the staircase, he stands up and takes in hands his head. Something similar is happening to our Petite Poucette. Petite Poucette thinks within the sweet light that comes from her decapitation. Her cut head is in her hands, close to her, in the realm of objectified knowledge. An empty head is growing, an imperceptible air, a spirit, now wind is passing easily in a hole. If the inventive smartness is measured by the distance from codified knowledge, Serres invites us to stay with this empty space, and to believe in the wind. In the courage of this emptiness a new autonomy of intellect is coming, and such cognitive subjectivity corresponds to a body characterised by a capacity of movement without constraints. Paradoxically such a form of autonomy that is deployed inside a gesture of separation is favoured by a topology of immediate vicinity, a proximity of superficies of connection; a big archive of objectified knowledge available, ready to be used.

Petite Poucette searches and finds knowledge in the machines. She knows what she needs. She finds something in order to do something, not for cultivating a knowledge reserve. Knowing, as in the hacker culture, is always a form of knowing-making: maybe at the end of the era of knowledge, the use of knowledge is emerging as the only possible knowledge politics. Knowledge no longer has a stable centre of orientation, nor a stable classification. Its spokespersons are not anymore the secure guides of progress. And reason – where does reason end up in the middle of such a story? In the middle of the book, what Serres seems to suggest is the happy ending of the reason. Or better, that the disparate – the game that induces invention, the game made possible by the fact that between the neck and the cut head air is passing, allowing to play – is taking the place of the age of classification, of the classes of order. The classes, the rank discipline of order, are substituted by the serendipitous intuition. Petite Poucette drafts a page or a code with order, with reasons, but without an order of reasons. Above, I asked how it would be possible to create new bounds and relationships without belonging to stable categories of subjectivity or abstract belonging. Following Petite Poucette's knowledge practices, we can say that in the same way in which a practice of the disparate – disparate as a landscape is in permaculture – takes the place of an order of reasons, immanent virtualities take the place of abstract virtualities: the connective takes the place of the collective. If the school class, with a teacher at the centre of the scene and a long list of desks, which detain mute and

immobile bodies in front of him is a good example for localising a knowledge made of concentrations and classes of order, from where can we understand something more about the disparate as a mode of knowledge production?

6.2 In the Laboratory of Electronic Chips

We are leaving now Serres' book, in an attempt to enter, with Petite Poucette, the inside of a laboratory of electronic chips: it is a fablab, a laboratory of fabrication-fabulation, where making knowledge and building artefacts she can play with patches of matter and superficies of connection. It is a nice place, probably more comfortable than a high school class, for hanging around and building a branch of the university of landscapes. It is a Tuesday evening of July, and it is very hot in Brooklyn. Petite Poucette introduces herself at the weekly open day of a hacker space. 'A hacker is, quite simply, someone who messes around with stuff,' Stephen is saying. And Emmanuel goes on: 'it does not have to be a computer. It doesn't even have to be technology. A hacker is someone who figures out how to get around barriers, won't take no for an answer, asks an insane amount of questions and believes in sharing the information he or she discovers'. She likes the idea of taking an artefact designed for one purpose and reworking it in order to let it do other things, having fun modifying objects. Now Max is speaking:

> 'In the beginning there was the hacker and the hacker was lonely'. He rented an unventilated room from a college humor website. She soldered on a wooden cutting board under the kitchen fan. He survived on the gleanings of barcamps and podcamps. Then in August 2007 at Hackers on a Plane, two hackers met. George Shammash and Bre Pettis spent 8 days saying 'we should totally get one of these hacker collective things.' On the 8th day they realized they lived in the same borough of New York City, and not only could they get themselves a hackerspace but they were morally obliged to do so. Four hours of brute forcing domain names later, NYCResistor was born. George says: "Maybe that's why Resistor's not the best name." Bre and George reached out to the hackers they knew in NYC. The first meeting was just six people. Many didn't come back, but Nick Bilton, he brought it. Together Bre, George, Nick and Peter, the lost founder, hatched the Microcontroller Study Group (NYCR MSG). Often the MSG met at LemurPlex, thanks to Eric Singer; sometimes it was just a crowd around the back table in a cafe. For three or four hours on any given night the expanding crew would demo and build projects like a free-soldered LED cube, an LED oscilloscope or an on-the-spot 3D silicon mold. Around the projects and diner coffee of the MSG the rest of the nine founders came together: Diana Eng, Dave Clausen, Zach Hoeken Smith, Rafael Abrams, Eric Skiff and the lost founder mark 2: Pat Gallagher. Skiff says the MSG was key to sustaining the hackerspace in progress: "Every week there was something new and interesting to play with, while alongside that

> we were working on the hard infrastructure stuff. There's a lot of slogging, so you have to mix in the fun stuff that gives you the hint of what's to come." The first public meeting of NYC Resistor was on September 21, 2007. By January the hunt for a space was on, and at 9:33 pm on February 4, 2008 Resistor signed its lease. Each of the founders put down $1000 and signed on to the NYC Resistor LLC. Some were more sanguine than others about the money. Raf recalls: "I wanted this place and I happened to have some money. Normally I don't have a thousand dollars to plunk down on something like this. The timing was good." Diana says: "We weren't in recession then, so it didn't seem like a lot of money." Dave was more hesitant. He was careful to get some concrete explanations of what was going to happen with the money. But once the vision was articulated, all the founders were of one mind. Skiff sums it up, "This needs to exist. And we are the people with the power to do it." Zach is yet more direct, "Why'd I do it? Because I believe in the do-ocracy! You gotta put something on the line. If you're not willing to put something on the line to follow your dreams, then they don't deserve to come true." The core principles of Resistor have remained steady from the start: We learn, share and make things. Just about every Resistor teaches a class. Everybody's got some weird spectacular skills just dying to get out. Half the time half the students are other Resistors. Everything gets documented as we go. It can be Bre or Skiff with the video camera, or just a few quick snaps and a parts list plopped on the blog. Documenting Resistor lets us both share and remember. It's amazing the blur a 3:00 am fix can be by 5:00 the next day. We are equal parts collective and hacker: everyone who joins is someone you would give your apartment keys to. None of it exists without the hacking though. We make things. Barbots, firefly skirts, RepRaps, music interfaces, spooky boxes, planetary gear cards, LED cylinders of beauty, roller skate robots: every project idea is a good idea. They may not all pan out, and sometimes you have to pull the fire extinguisher's pin, but there's nothing that's not worth trying at Resistor. A lot of that is possible because of the fundamental trust we share, but some of it's just because we're adventuresome morons with the smarts to wear safety goggles. The last word on Resistor has to be given to our founding treasurer, Zach Hoeken Smith, who learned how to form a limited liability corporation so that we could have a hacker collective: "Resistor shouldn't be unique. This shouldn't be read as like 'Wow, look at what those guys did!' It should be like 'I'm going to do that too!' Using your brain beats the hell out of not using your brain.' (Baichtal 2011: 52-54)

NYC Resistor is a hacker collective with a shared space located in Boerum Hill, Brooklyn. They meet regularly to share knowledge, hack on projects together, and build community. It is a clubhouse, where Petite Poucette can find a cold beer in the fridge, many people to talk with and an incredible amount of tools and things through which to build other things. Members see themselves as an artist collective, in which each one is capable of developing her own individual project as well as of taking part in collective projects or in small research groups. Members come from different backgrounds: software programmers, micro engineering, a Gameboy musician, an amateur radio artist, light designers, or just hacking amateurs who are joining the space. This club of

artists-artisans seems to Petite Poucette a big living room where a bunch of friends are sharing sofas and coffee and, at the same time, a garage where storing cables, lights, machines and tools for working. It seems the living room that you cannot build in your house, a garage where the tools for hacking are shared and bought collectively.

In this friendly environment pace is based on consensus decision-making, members are animated by a strong will of compromise and they try to avoid conflicts and tensions. 'Take initiatives and be excellent to yourself and to others'. In this way William describes respectively the motor of the processes of organisation and the collective ethos of this place. NYCResistor is an autonomous space where people experiment with tech-related projects. William puts attention to separating the idea of hacking with the evil image of hacking that comes from the mainstream media. 'We are not interested in destroying things, we are not criminals'. Hackers are people who reclaim technology, a way to have an every day relation with crafting in an independent, cheerful and creative way. The goal is not making troubles to public or private institutions, but to create tools useful for a community and objects that can be re-appropriated, replicated by everyone, freely distributed, and open to modifications. Hacking is, first of all, a way of making things, enjoying the positive relation with a process of creation that is always thought as collective. Not only the process, but also what is created out of it needs to be collective. Objects that need to benefit a large amount of people, potentially the whole society. For this reason, making their know-how accessible is a strong component of the hacker ethics and, in fact, NYCR hosts a big number of tutorials for beginners. NYCR is a place where Petite Poucette can exercise her right to be wrong, a basic right implied in the ethical practice of tinkering, a way of dealing with technologies that avoids a dogmatic approach.

Resistor is not unique, quite the opposite: in the last six years hacker spaces, makerspaces and fablabs are growing like mushrooms from the west to the east coast of the US. And this process of diffusion is crossing also to other continents, such as Europe and Asia. Someone joins a makerspace as a step toward the possibility of opening a new company, someone else finds in this kind of place an interesting way to spend her free time developing forms of cooperative relations and an ethics of sharing ideas and tools. Starting from the idea of learning by doing, these fabrication shops allow people from different backgrounds to work together, often composing different specific knowledge and experiences in collective and open-source projects. A hacker space is a monstrous synthesis of carpentry, the big toolbox of an electrician, the manual

drafts of a design artist, the style of 'show and tell' of a hobbyist, the network culture of a software hacker and the guaranteed tools (3D printer, Raspberry Pie and Arduino overall) of the postmodern artisans. Often a big table full of personal computers and coffee cups constitutes the central stage, around which people of any age work. This complexity of relations, this transversality of competencies and this machinic connectivity are the ecology where a desire – e. g. the joy of making a karate champ game where, instead of moving pixels, you play the video game without the video pressing buttons to command humanoid robots to do battle – is turned into *n* possible paths confrontied with materials opportunities that allow them to be realised.

In these centres of everyday crafting there is a relaxed climate and expressions such as 'doing something' or 'having a project' mean immediately making a prototype. Prototyping means building an early model, an example able to test if an artefact or a system works. A prototype is designed in order to test if something works by using it. It is a way to enhance precision, where learning is embedded in proceeding with successive attempts. Prototyping serves to provide specifications for a real working system: it is a specific form of knowing by making. In this style of making, an idea or a theoretical approach to things need to be tested as a working system. Prototyping is a technique of making that insists on the centrality of the beta status of artefacts and circuits. It means that the productive uncertainty about how different elements can stay together is based on their reciprocal and potentially permanent redefinition. Prototyping is a way to stay with such uncertainty without dramas and vertigo; it is a practical way thanks to which our Petite Poucette can experiment with uncertainty, tinkering with the more-than-many possibilities connected with a quasi-permanent beta status.

6.3 Tinkering as a Value

Welcome to a university of landscapes, the university of disparate, where Petite Poucette is proceeding by playing and inquiring. Petite Poucette plays with technologies, exploring different possibilities directly on hardware and software, sometimes without a very definite goal. Reusing existing technologies, scratching, hacking, forking. Playing with the medium – playing in the middle of things – is an open-ended way to find the unexpected. Arriving in a hacker space in fact, Petite Poucette has found not just another place of knowledge production, but also another way of producing knowledge. Knowledge here is a practical thing. But what does it mean? First of all it means that knowing is in an intimate relation with doing. Learning

by doing. Knowledge in this context is not a matter of defining a good strategy of intervention, rather, it has mainly an anti-strategic attitude oriented to a culture of experimentation in which 'taking initiatives' is the central element. As it is often said in a hacker space, 'every project idea is a good idea.' You try to do something, without knowing in advance its change of realisation, knowing that prototyping is not a one shot exercise. Why doesn't it work? Or, if it works, how can it work better? There is an intimate relation with the art of failure in tinkering. An art of failure that considers the possibility of breaking things until the point at which a thing is relatively useless. Petite Poucette needs to develop a significant tolerance for frustration and a patient art of relating with the resistance of the things (Sennett 2008), with their friction.

Hacking – turning a thing or a system against itself (Coleman 2013) – is a process of using existing objects, technologies, comments and code. The point consists of letting them do something that was not initially inscribed in their previous design. It inaugurates a productive relation with what can be called a constraint: many objects are bound by certain limits but, at the same time, they exhibit potential excesses during the course of their existence. Hacking is this capacity to redirect them (or part of them) toward new paths. Hacking consists of an ongoing play on forms, confronting the very fact that there is more than one solution – as in permaculture - to a technical problem. Hacking implies a strong attention to details and experimenting in such an ecology of composition often requires an ability to build complex circuits and systems by connecting together simple devices. An art of modularity, an art gained by trying endless combinations, by patching together different modules: this is hacking. Such an exercise of trying often works better if Petite Poucette has tools of visualisation because, if she has an environment where she can watch what is going on, she can reduce the number of interruptions during her experimentation. The flow of tinkering works better if she can reduce the number of interruptions. These environments of visualisation are offered by the world of software and Max, Pure Data or VVVV are popular 'visual programming' environments that facilitate the user capacity of building 'patches' by connecting different boxes together.

Making is an exercise of trying, starting from a basic idea, an energy. Ideas then meet materials, folding their energy with what a material allows or doesn't allow you to do, scratching with it, and crafting with the constraints of codes and materials. For the hackers there is a relation with pleasure in outwitting constraints step-by-step. Do it yourself - do it together: you are doing something with ideas and patches of materials,

but also in an open source community of practices. In this community the tools you are using, the idea you have in mind, the advice of your friend sitting in front of you and the experiment done by someone you have found on the Internet are brought together. The mangle of socio-material relations – ideas, humans, objects – present in a hacker space is the necessary medium for making a new artefact. Making is immersing in the medium, a way to habit circuits of mediums without a stable separation between tools and outcomes, means and ends. 'What can I do with a stained glass wall that I cannot do with a statue or a painting?' and 'How I can make a karate champ game?' are more-or-less the same questions. Because both, starting from the presence of a specific material or from the desire to materialise an artefact, become vehicles of energies, inaugurate a 'little transcendence', an imaginative horizon of possibility. Petite Poucette proceeds via attachments. Her force is a force of connectivity. Connecting means making things closer, she acts as a plastic bridge in a topology of vicinity.

If 'making is thinking' (Sennett 2008) hackers are tinkerers because they are in a process of knowing-making, figuring out how things work by reworking them. It is a process between witnessing and discovering, where composing is patching things together. Tinkering is a knowledge-making relation where knowledge is used in order to make things that we expect to be capable of making a difference in a specific situation. It is a play of complexity, where the force of a finite number of components – and often a component can be broken down in many ways – offers a variability of quasi-unlimited combinations. All the components are folded on each other and on their differential circuits of interrelations. Using things is a way of thinking with things and receiving feedback in action. It is a sort of grounded truth: imagining possible connections, trying to make it real, and verify if that connection works. What is a moral valuation in this context? It refers to a practical feature: the capacity of an artefact or a circuit to make a difference in a situated context: whatever works is good, truth is practical, it belongs to practices. The do-ocracy of hacking consists precisely in the idea that knowledge consists of a capacity to act. Such a capacity to act, as we have seen, it is not just a matter of humans, but also involves more-than-human actors – that, through a relation of use, offer themselves to Petite Poucette.

6.4 A Computer in Electronics

Amongst the many artefacts that populate the hacker space, Petite Poucette is particularly fascinated by one of them, a blue one: 'What do we have here, in a blue box

that costs around $20?' It is a small chip, a microcontroller, which means a microcomputer that is at least a thousand times less powerful than a MacBook. It is the Arduino Uno board (Banzi 2011), a piece of hardware you work on when you build new objects, circuits and environments. But the board is just one of the components of Arduino. The other is the Arduino Integrated Development Environment (IDE), the piece of software you run on your computer. You use the IDE to create a sketch – a little computer program – that you upload on the Arduino board. The sketch tells the board what to do. With this easy programming language you can write sketches for the Arduino board. When you press the button that uploads the sketch to the board, the code that you have written is translated into C language, and is passed to the avr-gcc compiler, an important piece of open source software that makes the final translation into the language understood by the microcontroller. Basically the programming circle on Arduino moves around the following operations: plug your board through a USB port on your computer, write a sketch that will bring the board to life, upload this sketch on the board through the USB connection and wait a couple of seconds for the board to restart, the board executes the sketch that you wrote.

All the objects you will build using Arduino follow a very simple pattern, called Interactive Device (ID). The ID is an electronic circuit that is able to sense the environment using sensors (electronic components that convert heterogeneous measurements into electrical signals). The device processes the information it gets from the sensors. The device will then convert an electric signal into a physical action. Sensors and actuators are electronic components that allow a piece of electronics to interact with the world. As the microcontroller is a very simple computer, it can process only electric signals. For it to sense light, temperature, or other physical quantities, it needs something that can convert them into electricity. A simple device called light dependent resistor (an LDR or photoresistor) can measure the amount of light that hits it and report it as a signal that can be understood by the microcontroller. Once the sensors have been read, the device has the information needed to decide how to react. Basically the decision-making process is handled by the microcontroller, and the reaction is performed by actuators.

The roots of Arduino are in interaction design. Arduino was initially designed for teaching purposes in a well-known design institute in Ivrea, Italy. Ivrea is a significant place for the history of electronic manufacturing in Italy. Here in 1962 Olivetti produced the first commercial desktop computer: the Programma 101. In 2002,

Massimo Banzi, one of the founder members of the Arduino team, was teaching Interactive Telecommunications Program (ITP) in a school of interactive design in Ivrea. Contemporary, Tom Igoe, another key person in the history of Arduino, was teaching ITP in New York City and, quite peculiar at that time, he was experimenting with a sort of open curriculum: lectures, tools, references and bibliographies of his module were published online. Moreover, he was developing an experimental attitude, able to transform a class into a place of practical experimentation, a place where students craft electronic tools and circuits. How can you get students to the point that they build things with electronics? The route to Arduino has been traced by developing a practical answer to this question. Banzi needed something simple, easy to use, cheap: an artefact useful to teach students how to program without having previous competencies. He needed a way of learning by doing, a microcontroller able to make prototyping easier. From one experiment to another, in 2003 and 2004 two preparatory versions were crafted, and in 2005 we had the first early Arduino - the name comes from the bar where Banzi and his friends used to go for Campari drinks. From 2005 Arduino started to be distributed in schools of design, and step-by-step this microcomputer also arrived in the hands of electronic hobbyists.

In 2008 the trademark was registered, and the Arduino project became a business. Inspired by Ubunto's trademark policy, Arduino was the first open source piece of hardware. It means that the design is entirely open source: codes, technologies and assembling information are public, available and reproducible. The only existent copyright refers to the name. The Arduino team has dedicated quite a lot of attention since the beginning to making the Arduino microcontroller easy recognisable. First the colour: the board is blue rather than the more classic green. Second the choice of having a logo and graphics able to make an immediate link between the artefact and the brand. Branding is very important for this company. Given the fact that Arduino is both the becoming common name of microcontrollers able to connect software and hardware through an USB key, and one single trademark amongst many, the company is very committed to linking their brand with standards of reliability. The open source design is facilitating the proliferation of a large number of arduinos such as Freeduino, Hackduino, Paperduino.

A field that can be useful in order to think about proprietary rights and trademark policies is fashion. Here the point of connection is defined by the centrality of the brand. In fashion there are no patents able to protect the non-reproducibility of a

dress. If I am able to recognise cut, style and colours of an Armani, I can make a copy of it without legal troubles. What I cannot reproduce is the Armani logo on the dress. The same for Arduino. But here, rather than the logic of the rapid twist of styles that characterise the aesthetic obsolescence of the world of fashion, the proliferation of arduinos is more connected with a logic of innovation able to experiment little variations in relation to different strategies of use. This is the logic of the open source culture; a logic of digital innovation that, thanks also to Arduino, expands from Linux to hardware. Arduino is considered the first open source hardware, an attempt to fold the open code way of doing on the world of electronics. The open design is a very important feature of Arduino, a relevant characteristic that favoured the encounter between this microcontroller and the hacker community around the world.

The Arduino website, http://www.arduino.cc/, is helpful to visualise the strict relation between Arduino as a company, and arduino as a community. On the website there are all the Arduino boards, shields and kits products, the Arduino software - called Processing - available for free download, a long list of libraries of code that make it easier to connect your Arduino with sensors, displays or modules. Moreover the website hosts a long list of virtual spaces for the community of users: a blog; an Arduino Wiki where knowledge, tutorials and instructions are provided directly by Arduino users; a multi language forum of support; and the link to the Arduino project on GitHub, a space dedicated to codes exchange and to the development of software. But the link between the company and the community is not just related to the website, or more in general with the online exchanges of knowledge, codes and reciprocal supports.

In every makerspace you can find an Arduino. In every maker faire a big amount of space is dedicated to Arduino projects, and the magazine *Make* is always full of DIY projects crafted with Arduino. When a new hackerspace is inaugurated, Arduino is a key word printed on flyers. Arduino likes the makers as much as the makers like Arduino. Massimo Banzi and other components of the Arduino team are always present at maker faires and Banzi himself is one of the organisers of the first European edition of the maker faire. It is difficult to say if the fortune of Arduino, as other hardware open source technologies, is a product of the diffusion of the hardware hacker culture, or if such making culture gives it, in the material existence of artefacts such as Arduino, one of the conditions of possibility to exist. For sure there are no hardware hacking and makerspaces as we know them without artefacts as Arduino or 3D printers. As in the case of the relation between the open code culture and the developing of hardware

hacking, there are artefacts capable of deviating practices and rearticulating new spaces of action. Objects that act as a bridge.

But the Arduino's boom is not just connected with its open source feature. The encounter between the artefact turn of open source hacking and the Arduino diffusion is related also to the easy-to-use feature of this microcontroller. The Arduino design is strongly oriented to the centrality of users experience. Arduino is not a product crafted by engineers for engineers and this is its main characteristic. The power of Arduino consists precisely in its usability by non-experts in both electronics and software programming. Sure, sometimes it is a good way for programmers to explore the world of electronics and vice versa, but a significant role in Arduino's fortune is the simplicity that allows amateurs and beginners to experiment and play with it. In a certain way, Arduino is the tutorial, the hundreds of tutorials hosted by online websites and makerspaces: Arduino is more than a tool. It is a network of relations.

Arduino is a bridge between the hydraulics of electric flows and the language of code. A bridge between hardware and software. As we have seen, Arduino was born to teach interaction design, and it was invented with the purpose of allowing designers and artists and, in general, people without a strong background in electronics, to start building prototypes very quickly and with very little investment. How much do I need to know in order to build something? Arduino is a situated answer to this kind of question. Its force consists in the fact that it is designed in order to reduce at minimum this knowledge-making friction. You need a couple of hours, and you are already doing something. Arduino is a lure for prototyping. First of all, for this reason this object lives in symbiosis with the makers' movement practices. They make things and build objects that interact with other objects, people and networks and with Arduino they have found a simple and fast way to prototype. A central feature of Arduino is its plasticity, encoded in its design, which allows users of Arduino to take part in the invention and experimentation of very heterogeneous circuits. Arduino is made by the projects done with an Arduino and on YouTube you can see thousands of very different projects. For example you can create a system that updates you with a tweet about the wellbeing of your plant or you can make your television shut up automatically when your most hated politician is speaking. But where does such plasticity come from?

6.5 Using Arduino: Make It New!

Inscription is an important notion in Actor Network Theory. It refers to the capacity of engineers, scientists or designers to rely on non-human actors in order to enrol other actors in their projects. A technical object is, from this perspective, a way to inscribe in an object a predictable future that users will experience with such an artefact. As Akrich suggests to us, the concept of inscription can be understood with Goffman's idea of script: 'the technical realization of the innovator's beliefs about the relationship between an object and its surrounding actors is thus an attempt to predetermine the settings that users are asked to imagine for a particular piece of technology and the pre-inscriptions that accompany it. […] Thus, like a film script, technical objects define a framework of action together with the actors and the space in which they are supposed to act' (Akrich 1992: 208).

Woolgar (1991) similarly proposes that designers act out their users by the means of affordances and constraints enabling them to do one thing, but not something else. The circulation of scripts inscribed in designs affords the definition of certain reciprocal relations between users and designer. As De Paoli and Storni (2011) show, in the case of Arduino a very weak 'inscription' allows a strong intervention of users in reshaping such artefacts. In this open hardware project the role of users in terms of inscribed affordances and constraints is only partially defined by the developers. The Arduino board is intended to be the central core for the implementation and prototyping of interactive products or environments designed by the users themselves. In this sense, the design possibilities and the different ways of appropriation for users are endless also because Arduino developers have inscribed in their strategy quite weak forms of control over future uses. The board design does not anticipate the negotiation of its role as would happen in proprietary software. Instead, it remains equally open through a series of inscriptions that sustain a specific strategy (De Paoli and Storni 2011: 41).

In this case, we have a starting strategy, inscribed in the open source software licenses, capable of favouring a user-friendly re-inscription of the artefact itself. This means that a circularity of possible 'inscriptions' criss-crosses Arduino from the very moment of its fabrication to the distributed possible uses of this artefact. De Paoli and Storni show also the circularity of skills enrolled by this network of inscriptions through a basic example.

> 'During the first series of workshops, we had the Arduino assembled by students. We provided the board, the resistances, all kinds of pins and chips and asked them

> to build the board before starting the workshop. Then we realized it was too time-consuming and that the students might not be precise enough in the connection of pins, thus assembling boards that do not work or stop working . . . we decided to assemble our board ourselves and to provide students with already assembled boards.' (Arduino Developer, Interview October 2008).

The fact that soldering is an activity already done, incorporated in the artefact, is favouring the knowing-making friction reduction, and at the same time is reducing the possibility for students to learn soldering as an activity. Adding a breadboard, that is an Arduino extension, a technician in a university laboratory in Ireland solved a situated problem. An Arduino extension embedded a situated answer to a problem; it makes things easier and, at the same time, it is reducing the possibility for students to have a relation with soldering as an activity. This example is useful to show the circularity and relationality of skills and the very fact that this kind of circularity is defined in a more-than-human ecology. Skills are a more-than-human affair, something that is related to our interaction with technical objects in concrete situations. In this circulation of skills there is an exchange of one set of skills connected with soldering for the skills of rapid prototyping. As Latour and Marx remind us, the circulation and distribution of skills is embedded in sociotechnical transformations, and such transformations show us how artefacts are much more than neutral vehicles. What re-skilling and de-skilling are can never be said once and for ever. It refers to a situated perspective of an actor in the network.

Another notion that comes from ANT is the translation one. As we have seen in Chapter 2, what we can call translation is, in Latour's words, an account of what happens when a shifting network of actions is redistributing performances and competencies to both non-humans and humans in order to assemble a new association of things and human (Latour 1992: 379). Non-humans can, not only perform actions in place of humans, but they can also facilitate the associations between different entities. In this sense, a translation is a way also to favour interaction between other actors in the network, and sometimes a way to partially shape their performance. In a translation something is carried on, something is lost, something is emerging.

As we have seen in the case of Arduino we have a weak inscription. But such inscription, situated in a space in between electric flows and the code of a language of programming, enables many translations, creating a huge space of possible actions. Arduino acts as a bridge between the hydraulics of electric flows and the language of code. Arduino works via translations, operating ongoing material translations through

the creation of links that did not exist before and that, to some extent, modify elements, actors in relation. Alone it can basically do nothing but, as a material presence between the language of the code and the hydraulics of electric flows, it can do many different things. To a certain degree Arduino is an artefact but at the same time an emergent zone of transaction, an assembly that allows an easy prototyping, enabling and authorising users to act. Moving from one articulation to another is the activity of hacking, a way to use things characterised by a multiplication of the modalities of transformation. And the emersion of a new articulation is a matter of translation. Serres defines translation as something that happens in a state of uncertainty about goals, and something similar can be said from the perspective of hacking: in hacking in fact we cannot know in advance what, in a new articulation, we are losing or gaining. Here realism is a name for processes characterised by an alert uncertainty and serendipitous discovery is the logic of invention that characterises the knowledge practices of our Petite Poucette.

6.6 The Open Code Institutions

Arduino is an open source project. It means that all the code of the software, bibliographies, design drafts, instructions, files are available online. Not just the design of the 'original' Arduino is open source, but also its 'brothers-in-law': all similar to Arduino, makers all around the world make them. With a cost of between $5 and $7 you can buy components and assemble your own microcontroller, improving it in relation to specific necessities. In a certain way, and this is why Arduino likes the makers, more than its original software and hardware design, Arduino is the many ways in which they are recombined, and the thousands and thousands of projects that people are doing through it. The webpage of Arduino (arduino.cc) hosts a community page, where a global community of users share projects, design drafts and knowledge related to components and software codes. But this is just one of the many websites of reference for Arduino users. Another good example to have an idea about what is going on in the web communities of open source culture is GitHub.com, a web platform conceived to share codes and programming languages. The ecology of Arduino is the culture of open source: copy a code, differentiate it and make it open source. Copying is not an injury, quite the contrary: it is the base of learning. Innovation here is synonymous with an on-going process of forking: you copy a code and you make another one through a process of differentiation, or a process of singularisation, where remaking and reinventing are ways to add something and make a contribution. Add another variation, make it work in

another way in relation with local strategies of use: forking is the constituent practice of hacking, the constituent do-ocracy of hacking. The more my singular and pseudonymous – hackers inhabit the web in this form of presence – contribution is shared and useful to others, the more pleasure!

As Coleman (2013) told us, the society of making is basically an inventive one. Based on practices of crafting, hackers are inventing online platforms as positive models of action, infrastructures which sustain the production of artefacts and use values. Such infrastructures express in their ways of functioning, more than in any declarative philosophy, the makers' ethos of sharing. An ethos is directly connected with the positivity of institutional inventions: in our case they are platforms of code exchange. In these platforms that express themselves in the languages of programming, you can find formularies, a series of rules, ways of proceeding, procedures. The do-ocracy of code is a procedural language – an assembly code constitutes a system of correspondence between two systems of translation, where one is constantly reproduced in the other – and hackers are more interested in using it rather than in demonstrating it.

In the introduction of *Instinct and Institution*, Deleuze (2002) defined instincts and institutions as processes of satisfaction. Here Deleuze suggests to us that an institution is always an organised system of means and that, between institution and law, there exists a strong difference: the second consists of a power of limitation of action, while the first is a positive model of action, able to create artificial means of satisfaction. If the law describes the social as a territory articulated by limitations, an institutional logic sees lack, negative and need outside the social. Institutions are useful or, better, what is useful belong to institutions, to these artificial systems of means. An institution is described by Deleuze as a positive invention of indirect and oblique means. An institution is in relation with a tendency, the reflected tendency that makes an institution exist. Tendency and institution are in a relation of reciprocal satisfaction, but they are not the same thing. In fact, an institution can't be explained just with a tendency.

Funnily enough, in our case such artificial means of satisfaction express themselves, as the relation between jurisprudence and right, inside the form of codex. In fact, here we have a jurisprudence and a right of open code. Forking is the jurisprudence, the hackers' science of law. And the code is the open right: a positive right to act. It is a right that proceeds through a culture of addition by bifurcations and its nature is an inventive one. For this reason, here there are no laws that are prescribing what not to do. Such

platforms of exchange are institutions that do not have the normative imprinting of law. On the contrary, their open right is a way to sustain the emersion of new codes: what can I do to obtain a different output, or, better, how can I redefine an output through a variation of a code? This is the positive semantic of an institution of the open code. This is the network culture of open code, and Arduino, as well the present of the hacker culture, are exactly in a point of encounter between this kind of practice and the increasing development of the DIY-T culture of 'hobbyism' and self-construction.

Again the bridge: Arduino, like 3D printers, are situated now in the middle of a trend. Such folding of the open source culture from software to hardware is enormously increasing the diffused power to craft complex objects and artefacts. Outside the manufacturer system makers are building houses without being carpenters, bio-tissue in a garage, robots in a makerspace and bodily prosthesis in a living room. The culture of open source design represents, not just a culture of sharing and openness, but also a productive reinvention of the use value. Exactly because making is connecting (Gauntlett 2011), the large amount of objectified knowledge shared in the web constitutes a reserve of possible use values ready to be reinvented and recombined. The production of knowledge and artefacts is sustained by sharing in infrastructures of objectified knowledge. The ethos of a body with a cut head is constituted by making and these practices of sharing are enormously enlarging the autonomy of makers, that is, the capacity to generate new use values in interaction with human and nonhuman entities. Now we are witnessing the political relevance of the free software culture - the proliferation of creative commons licences and their capacity to strongly redefine the forms of access to knowledge and culture - but what kinds of friction of the proprietary regime can be generated in the point of passage between the peer-to-peer production from software to hardware? An answer is not available now, but the development of the open-design practices will strongly transform both the ways in which artefacts are fabricated-used, as well as the forms of proprietary rights. We don't know if a new 'industrial' revolution is ready to come, but open-source culture and digital making are already acting as a way to redefine the material and technological possibility of manufacturing new products: a form of distributed manufacturing, which implies a form of proximity with the processes of crafting things in our everyday life. More than 40 years ago Steward Brand published the first Whole Earth Catalog, a catalogue full of tools and ideas oriented to a self-sustained life. In a certain way the same attempt is enlarged powerfully by the interactive file sharing culture and by the jurisprudence of

hacking. Via coding, the fusion of the digital and the material (Papadopoulos 2014) is becoming an emergent feature of our material culture.

The very fact that Internet, technology and design to prototype new artefacts are 'available' for a significant amount of the population globally, brings with it an imagination of distributed innovation in which the language of programming will engrave matter. Michel Serres, engaging with the painter J.M.W. Turner, described the industrial revolution in these terms:

> 'What is the industrial revolution? A revolution operating on matter. It takes place at the very sources of dynamics, the origins of force. One takes force as it is or one produces it. Descartes and Newton chose the first alternative: force is there given by the biotope, the wind, sea and gravity. . . . With it one produces motion, work, by using tools. . . .Wind and water were tamed in diagrams. One simply needed to know geometry to know how to draw. Matter was dominated by form. With fire everything changes. . . . Turner no longer looks from the outside; he enters the boiler, the furnace, the firebox. He sees matter transformed by fire.' (Serres 1982: 56-7)

After having seen 'the matter transformed by fire', are we close to seeing a matter transformed by code. Such is the power of code, a language of writing that has a strong capacity of abstraction in itself, it reopens the quasi-dialectics between soft and hard techniques (Connor 2009). In his *Petite Poucette* Michel Serres told us that the techniques of hard sciences – techniques of hammer, stone, iron – had a strong efficacy on the things of the world. At the same time, soft technologies – such as writing, printing or coding – measured their own efficacy on the institutions of humans. As a way to say that the soft – human sciences, law and politics – is a way to federate and organize who is doing the hard work 'outside there', in the middle of the world. The very fact that a significant amount of the population are using now a hammer through software – that is an historical move larger than the hacker community – in order to have a relation with the things of the world is a relevant event. This significant change implies the necessity of asking which kind of impact the many and contemporary catalogues of sharing can have on the institutions of humans. The open code democracy of the 15M movement and technopolitics could be seen as a situated attempt to rethink the institutions of humans in the political era in which matter is transformed by code.

6.7 The Use of Things

In the previous chapter we have seen how permaculture is a lure for thinking commoning beyond the categories of contract and conflict. As we have seen, the notion

of exchange in permaculture could be understood beyond the categories of contract and conflict; as matter of theft and gift. The central category that crisscrosses this chapter on the politics of hacking is the category of use. How people and things could alter from themselves? This is a central question for understanding how practices of radical socio-material transformation can be achieved in a politics of worlding. A politics of worlding is a politics of alternative materialisation in which the many 'possible otherwises' refer directly to the processes of everyday constitution of things and beings. Things and people alter themselves in hacking via a relation of use. As we have seen, analysing Arduino, exchange in hacking is a matter of use. But what does the use of things mean? There is a long tradition in theorising human relations with things based on a subjectivist perspective: humans, agencies, goals, purposes, reasons on one side, and objects, tools, passive entities on the other. In this perspective things are often conceived as a tool, a neutral tool in the hands of human control. Here the use of things is a relation with things in which actors are conscious, rational and capable of defining and controlling the separation between means and ends. And, of course, ends pertain to humans and means are delegated to tools. Things do what we want them to do, but the distribution of agency is clear: we, humans have purposes, they, tools are employed, which means that they can be subdued to a pre-existing will.

To this history of mastery Heidegger (1977 [1955]) opposed a counter-story of modernity in which inside the modern modality of the use of things – called modern technology - humans are captured in a relation with things in which a force of domination frames the contours of human experience: *Ge-stell* is the name of such imposition. Technology, following Heidegger, is a step in our destiny. At this point we can ask what characterises this mode of relation - that is also a way of revealing - called modern technology. In his *The Question Concerning Technology,* Heidegger argued that humans are framed by such a modality, and that what moderns consider just a means inside an activity of production configures, on the contrary, the way in which humans are ordered by the activity of ordering nature and things. Humans not only order things and nature but also they are ordered, that is, they are challenged into the process of ordering. Humans are provoked into a relation of use that allows its experience of the world only in the form of the process of ordering. Technology, as a mode of setting in place, framing and ordering, is our modern destiny and it appears to Heidegger strongly different from *poesis*, the kind of making typical of the ancient craftsmen. Technology, following Heidegger, is a specific way in which Being is unveiled, and the use of thing

via technology becomes a knot, a quasi-entity, a destiny of domination on humans. Leaving to Heidegger's prose the questions of Being, essence and destiny, the important point here is his problematisation of means as not mere tools. Forcing through Heidegger's thought, it can be said that while we (humans) think ourselves as subjects of an available world, we are subjected to the specific modality through which we relate to the use of things. And the mean of technology is a monstrous and pervasive one. Another destiny of domination has been traced in the narration of the human-thing relation, but in this case with human beings in the position of being dominated by their means.

A radically different understanding of the notion of means, or better another interpretation of 'what mediation means in the reign of technique' (Latour 1994: 30) comes from Latour for whom 'the myth of the Neutral Tool and the myth of the Autonomous Destiny that no human can master are symmetrical' (Latour 1994: 32). Following Latour, means are a matter of mediations, and mediations are a matter of translation. The notion of translation, borrowed from Serres, here means drift, invention, displacement; and technique is a matter of translation. But translation is not just a human affair. Latour, for whom essence is a matter of existence and existence a question of action, introduces a way to analyse processes and actions outside the subject-object qualitative dichotomy, in an attempt to attribute a sort of symmetry in the subject-object relation. What is true for an object or, better, what can be said sociologically about the activity of an object, can be attributed to a subject as well.

So, following Latour and his 'principle of irreduction' – analysed in Chapter 2 – we can say that the continuity of any course of action is guaranteed by several discontinuities and, moreover, it is the existence of translations between mediators that permits and may generate new associations: a mediator transforms, translates and modifies the elements or the meaning it is supposed to carry while an intermediary is what transports forces or meanings not creating transformations. For this reason, for Latour, continuity of any course of action would consist of human-nonhuman connections: human beings have to share their agency with an indeterminate number of actors over which they have neither mastery nor control. Agency in this way is distributed amongst heterogeneous actors.

Is this a Nietzschean ontological monadism (Brown and Lee 1994) in more-than-human practices? What is relevant for us is that, in Latour, an understanding of the multiplication of agencies in nature-culture seems to be connected with the idea that the

network needs to be defined starting from an ontological priority of agencies on network. The network is an on-going product of the effect of forces exercised by actors. Different agencies, so different forces in relation. Around the centrality of the notion of force Foucault proposed an analytic of power as method. A force always has a potential of affection on other forces - power to affect, power to be affected. So, a reconfiguration of the network, following Latour, is the outcome of these forces in relation. A metamorphosis is generated by the effects of territorialisation caused by the action of different actors on other actors. In this way metamorphosis is conceived inside a logic of territorialised spaces and force; the exercise of a force is always a strategic exercise.

Sometimes spaces are not so territorialised, or, better, sometimes the metamorphosis of actors in reciprocal relation can be generated by the relation itself. Force, as a capacity to affect and to be affected, can be thought not just as a matter of power, but also as a matter of *potentia*, the *potentia* of an encounter. But what kind of relation can be theorised without posing at the centre the element of power? Or better, how can a force of relation inhabit experiences without being immediately reconnected to a relation of power? What happens if force is less a matter of codified strategies and more a matter of reciprocal capture? Is it possible to theorise a mutual co-constitution of actors in which using is more a 'medial' verb than an active or a passive one? Using, in an ontology of relation, defines a space of indeterminacy where the very fact of being in relation, in a reciprocal capture, is capable of redefining actors. In a 'medial' ontology the use of things is an informal indeterminacy of both subjects and objects, a zone of transaction/transition characterised by a metamorphosis, an in between experience capable of folding on the processes of constitution of the actors participating in such a relation. By using something we are affected by our relation with that thing. Such a relation of use is a matter of asymmetrical and reciprocal capture. Force in a 'medial ontology' is a matter of reciprocal capture: only in this way it is possible to find the unexpected.

An empty head is never empty. The very fact that Petite Poucette is continuously both crossed and constituted by an ecology of winds it is a way to not stay with an order of reasons, to not presuppose the necessity of a reason. This does not mean that reasons are not generating, quite the opposite. Superficies of contacts and forces habit winds, as cables and chips in a hackerspace. Cybernetics and objects are participating in doing reasons. The order of an idea in fact is in connection with the order of things themselves, it comes from an immersion in the perspectives of things. Here we are

proceeding for asymmetrical and reciprocal capture. An object as a point of view, an idea as energy, a sensation as a movement, an environment as an addition and so on. Tendencies and reasons are a matter of capture – the partial captures that articulate the adventures of an immanent virtuality in the era of the connective. There are winds able to become contagious, able to resonate with others, and the force of affection of things sometimes generates new things. Welcome to the university of the landscape, in the order of the disparate, in the laboratory of electronic chips, where the use of things becomes a 'medial ontology'.

CHAPTER 7
INSTEAD OF A CONCLUSION: CONVERSING ABOUT JUSTICE AT THE INTERSECTION OF TECHNOSCIENCE AND SOCIETY

> 'It is not in the name of a better or truer world that thought captures the intolerable in this world, but, on the contrary, it is because this world is intolerable that it can no longer think a world or think itself.'
>
> Gilles Deleuze (Deleuze 2013 [1985]: 175)

Santa Cruz, California, 16th April 2013

The area of Santa Cruz reaches the waves of the ocean, robust waves for surfing, and walking ten minutes from the beach you could meet a small town where the signs of the post-1968 counterculture are mixed with the presence of a long series of holiday homes, where wealthy people guarantee their place in the sun. In my imagination, Santa Cruz was a place full of people with bizarre hair and, I don't know why, packed with people. Instead there are not so many haircuts that grab my attention and the atmosphere is very calm and relaxed. In the middle of the redwoods, a friendly man is driving a bus. 'Hello, what's going on today?' A student is taking the bus from the bottom of a hill in order to go to class with his morning cup of coffee. Progressive music from the 1970s is waving the bus, sun is shining and the ocean is visible from the window seat. The bus door is open, four bicycles are well-tied on a trunk arranged at the top of the bus and the vehicle flows up and down on the little hill where the campus is located.

First stop: the Centre for Agroecology & Sustainable Food Systems. On this piece of land students from all around the world are trained in the art of agroecology, a form of alternative agriculture in which gardening and fruit tree workshops go together with classes on food and justice or on agricultural policy. The center is located exactly on the same piece of land where, in 1967, the master gardener, Alan Chadwick, created a student garden project. He invited students to engage with flowers, vegetables and fruit trees applying methodologies and ways of relating with soil and food production akin to the traditional knowledge of a peasant and now this site is a global point of reference for the design and management of sustainable agrosystems. Knowledge here seems to be a point of passage from one practice to another, from industrial agriculture to a culture of

biocomplexity through which cultivating multiple goals such as sustainable recycling of nutrients, protection of drinkable water, food production and social sustainability of rural communities. Agroecology is a form of knowledge whose hands are dirty with humus because the relation with soil and with all its inhabitants is at the centre of its goals. Thinking knowledge practices and science from the starting point of the materiality of food production and with an alternative experiment of farming, makes it possible to understand what knowledge production means as a field of political intervention. Knowledge here directly participates in the radical redefinition of a set of practices, redefining modes of attention, priorities, criteria of efficacy and what counts as a relation in more-than-human practices. This first stop reminds me how knowledge production can be a way of inaugurating new practices. How knowledge can make a strong difference in the modes of existence of situated practices – in this case in agriculture – contributing to a redefinition of the very everyday and mundane techniques through which a knot of relations between heterogeneous entities – vegetables, soil, worms, spades, farmers – is established.

Another three stops and the bus takes us to another relevant place in the history of University of California Santa Cruz (UCSC): the Department of History of Consciousness. James Clifford, Angela Davis, Teresa De Laurentis, Barbara Epstein, Donna Haraway are all nowadays emeritus professors here. Not just them, many of those names made a big contribution in a particular history of academic knowledge – as well as, of course, in many other fields. The university is a place where the production and the transmission of knowledge has a relation with forces, fields of tensions and knots of resistance that, in different ways, are emerging 'out there' – and often 'inside there' as well. A place where it is possible to think with resistances. Someone putting her body directly in the middle of struggles, someone else putting herself in resonance with the noise that was coming from 'over there'. I am thinking in particular about Angela Davis, a black woman, militant of the civil rights movement and of the revolutionary left. Knowledge as a toolbox for the struggles, as a useful weapon in the middle of a battle for justice: this kind of discursive imagination comes to me when I think of Angela Davis and her relationship with knowledge. Ways of seeing and speaking are not enough to struggle more and to struggle better, but often are part of the scene of what provisionally we can call justice. This stop brings in itself the idea that knowledge production is not external to the conflicts that cross society. The intimate relation between resistances and knowledge production is still here, as a form of

worlding politics at the beginning of our century.

I get off the bus near Oakes College in order to visit the Science and Justice Research Center. Jake Matcalf, the assistant director of the centre, hails me and with a calm voice starts telling me a piece of history of the research centre. The science and justice working group formed in September 2006 as a way to expand the campus' historical focus on social justice to questions of science and technology. From the beginning there was a strong focus on organising public debates and on building a cross-divisional intellectual space. So, from one side the goal was to organise well-attended debates and events with people from different intellectual backgrounds, and at the same time to develop an institutional relationship with various departments and centres of research active on the campus. A central question was how to set up a space and strategies for interdisciplinary collaborations, focusing on a wide range of topics at the intersection of science and society. The working group provides space for natural scientists, engineers, social and human scientists and artists to gather around issues of common interest. As more and more aspects of society are shaped by scientific and technological practices and narrations, what this working group is trying to do consists of developing critical and productive dialogues across disciplinary differences.

In this chapter we will explore how these goals have been organised around practices, ways of doing and fields of knowledge intervention. How has a central question – such as what is justice in technoscience – been articulated, starting from practices of research, formats, pragmatics, techniques and methods of discussion? At our first stop on the campus of Santa Cruz – Agroecology – the relation between knowledge and justice seems to be seen as a material and practical intervention capable of reinventing agriculture as a science and as a specific technique of relation between heterogeneous entities. At our second stop – History of Consciousness department – knowledge is seen as starting from the struggles that are animating society. But how does the experiment of Science and Justice contribute to making us think about a possible knowledge politics in technoscience, in a region of objectivity in which it is no longer possible to make a clear separation between matter, society, technology and science? What is justice when justice comes to matter? How could a politics of worlding become the worlding of justice?

7.1 The Politics of Worlds' Composition

Politics, often conceived inside modern political mediation, has been understood as the capacity of human beings to invent rules and ways of cohabiting among other humans. The emergence of the concepts of nature-culture and technoscience introduces the impossibility of separating humans from non-humans and nature from culture. If politics is a human matter, and the world in which we live is characterised by the implosion of nature and culture, how do we theorise a politics of justice in nature-culture? In Chapter 2 I articulated this question starting from a perspective called the 'politics of matter'. This way of posing the question of politics highlights the significant role of more-than-human agencies and technological objects in the fabric of social conducts and political association. The expression 'materialisation of politics' in this context of meaning in fact suggests:

> 'the constitutive nature of material processes and entities in social and political life, the way that things of every imaginable kind – material objects, informed materials, bodies, machines, even media ecologies – help constitute the common worlds that we share and the dense fabric of relations with others in and through which we live.' (Braun and Whatmore 2010: ix)

Politics here means 'the politics of matter', that is the politics that partially shape and emerge inside the ecologies in which we live, inside our common worlds made by more-than human-relations. A politics of matter is capable of taking into account artefacts and technologies, animals, plants and bacteria, modes of materialisation and mattering in the analysis of how situated collectivities are assembled. A new understanding of materialism comes with the idea that, when politics comes to matter, politics is a more-than-human affair. This new understanding of materialism puts in crisis the possibility of thinking of politics as the 'autonomy of the social', which constitutes the 'political foundation' of the 'emancipatory' theories of the commons. Politics of matter then urges thinking about the commons in another way and politics beyond its 'modern' and 'humanistic' mediation.

In order to deal with these questions, I analysed in Chapter 2 how different theoretical approaches collocate an understanding of politics outside the modern and 'fixed' ontological distinction between subject-object, human-nonhuman and nature-culture. In particular, I introduced two ways of dealing with these questions starting from the speculative contributions of Latour and Haraway. Latour shows how thinking

politics in nature-culture brings with itself the possibility of enlarging the 'borders' in which the modern political mediation is thought. In Latour more than human 'citizens' in fact are populating the imagination of a 'coming' politics, and the Parliament of Things is the name of a possible form of assembling that does not exclude non-human forces and entities. In this way new actors are introduced in the 'modern' political mediation, without putting in question 'representative politics' *per se*. Moreover, even if this form of 'representative politics' is conceived as a sort of intense negotiation between heterogeneous entities, the specific way in which 'action' comes first in this speculative hypothesis is strictly connected with an idea that relata have ontological priority over their relation. This political imagination is sustained by an 'agential' understanding of ontologies, which means a primacy of the performative role of singular actors - both humans and non-humans - in the configuration of an association. Different agencies, so different forces in relation: in this way an association – or a network – is defined by Latour as the effect of the forces exercised by actors. The persistence of 'representative politics', or better its 'extension' to new actors, and an understanding of relationality in which a network is the resultant of singular forces in relation: the point of convergence between these two lines of thought consists of conceiving politics as an exercise of intensive negotiation between heterogeneous actors. But practices of negotiation and exercises of force are not the only ways through which to think 'relationality', modes of action and the politics of worlding.

In Haraway, for example, action is much less a matter of power relations and much more a matter of encounter, in which 'acting with' significant others means 'becoming with' significant others. Something similar is present in the material culture of permaculture and in the particular way in which the 'use of things' is conceived in the makers' movement. In a garden or in a hacker space metamorphosis is less a matter of power relations and much more a matter of ecological transversality. Such ecological transversality can be defined as a interaction among artefacts, inorganic substances and different species, or as a biotic and more-than-human community of ethologies. As several authors insisted, ecological relationality is not synonymous with the absence of conflicts and tensions, of peace, symmetric relations or irenic cohabitation. Rather, it defines the very fact that each process of forming implies an involvement in the life of other living or not-living beings and a becoming with others. Saviana's story tells us that fermentation is conceived as a nature-culture practice. Such ecological Relationality is recognised as the 'foundation' of the web of life on earth as well as co-evolution is

the name of the togetherness of life. Thinking as an ecosystem in permaculture becomes a way of becoming with the entities and the forces that populate such ecosystem. An exercise of active observation in permaculture is nothing other than an attempt to feel the presence of significant others in order to 'make a path' with them. Permaculture is a way of reclaiming such 'relationality' via making 'our' constructions: a technique of construction that is, at the same time, a 'lure' for feeling entities and a lure of becoming with them, enacting relations that expose the permaculturer as well as the landscape to a process of metamorphosis.

Similarly, the 'use of things' in hacking is a 'medial ontology'; a way through which the metamorphosis of actors in reciprocal relation can be generated by the relation itself. Via hacking it is possible to theorise a mutual co-constitution of actors in which using is more a 'medial' verb than an active or a passive one. Using, in an ontology of relations, defines a space of indeterminacy where the very fact of being in relation, in a reciprocal capture, is capable of redefining actors. In a 'medial' ontology the use of things is an active indeterminacy of both subjects and objects, a zone of transaction/transition characterised by events of metamorphosis, an experience in-between capable of folding on the processes of constitution of the actors participating in such a relation. In using something we are affected by our relation with a thing. Such relation of use is a matter of asymmetrical and reciprocal capture. In an ecological relationality things and persons alter themselves by 'using' each other. Force in a 'medial ontology' is a matter of reciprocal capture: in this way it is possible to conceive the unexpected. Force, as a capacity to affect and be affected, is not always synonymous with a relation of forces. A force of relation – enacted in permaculture and in hacking via interaction – can inhabit experiences without being immediately reconnected to the strategic dimension of power. A relation of power and the power of relations are not the same thing here. And this difference matters in a politics of worlding.

The power of relations configures an intelligibility of politics in which the emersion of new ontological configurations could be understood without being connected to an idea of power as a strategic configuration of forces, as it is in Foucault and Latour. This kind of politics, in which metamorphosis is conceived, not as a matter of resistance but as something immanent to the ways in which different entities compose each other, is a politics of worlding in which relations come first. Making worlds is a matter of relations of interaction, and interactions are made in permaculture and hacking via practices of materialisation. Through the material interaction among

heterogeneous entities the constituent power of worlding becomes a matter of composition: the capacity to affect material change via crafting matter, participating in the worlds' material composition.

Dealing with permaculture and hacking, I engaged with forms of activism that focus their attentions on making a difference in the world via crafting matter. Materialising ontologies act in and within ecosystems in the case of permaculture and materialising ontologies assemble artefacts via hacking. In both cases we are witness to forms of activism that insist on the centrality of everyday practices of commoning as a central terrain for a politics of transformation. Transforming human relations with soil and landscape, or transforming human relations with manufacturing is, in fact, in both cases a matter of commoning. And commoning is not just a human affair. In permaculture nothing can be done without acting with existing entities and forces that are populating a landscape. The basic but essential knowledge politics of permaculture consists of cultivating a capacity to feel and act with such forces: in 'composting' your design with the activities of these entities, in calculating interdependencies and in the ability to think with what you are feeling inside an ecological immersion. Acting inside an ecology of canals, in which exchange is a matter of theft and gift: this is the way I described the form of commoning that comes from permaculture, a form of commoning that consists of cultivating resilient alliances between heterogeneous life forms and forms of life.

The commoning of hacking in the epoch in which code is fusing into matter seems to be represented by a capacity to act with what a material object or a code does, in using and remaking it, in developing platforms like Arduino that make patching available for a kid, and in creating infrastructures of open information that make codes and schematics available for other practitioners. Enlarging the capacity of materials to affect other materials, this is the job of hacking – a way in which commoning comes to matter. And, if in the case of permaculture, I insisted on a politics of knowledge based on thinking through feeling, here the main knowledge politics at work seems to be an activity of thinking through making: an activity of making that proceeds via tinkering and in which experimenting means figuring out how things work by reworking them.

'Making a difference' in these contexts of practices is central. In a permaculture design or in a hacking project to 'make a difference' is 'a practical stuff': a prototype could work and a garden could be resilient. An artefact in a hacker space works if it fits inside a circuit of interactions, enlarging the capacity of materials to affect other

materials. Arduino works because it is a bridge between the hydraulics of electrics flows and the language of code; a bridge between software and hardware. But it works also because it allows a kid to have a relation with electronic circuits, and again Arduino works because it is an open source platform that connects practitioners. These are just some of the many differences that Arduino makes. Facilitating the creation of relations, acting as a bridge, Arduino is a way to foster possible connections between heterogeneous elements – a lure for prototyping. A garden in permaculture could be resilient if things are put in the right place. Through gaining good 'relative locations' and giving value to useful connections, a permaculture design works via placing or assembling elements in such a way that each serves the needs and accepts the products of other elements. Thinking through making – which means understanding how things work by reworking them – a maker experiments with 'circuits' of possible interactions. Something fits with something else, not everything fits with everything. Thinking through feeling – in an exercise of active observation – a permaculturist understands and invents 'patterns', possible co-habitations. In both cases, what is at stake consists of organising circuits of resilience, constructing 'ecologies of proximity', digging up canals. In both cases something has value in relation with something else. In a politics of worlding the materialisation of an entity or the creation of a chain of interactions have value in relation with the many differences that they can make in relation with the many other entities and existences with which they are connected. Welcome to the forest of permaculture! Welcome to the laboratory of electronic chips! Welcome to the politics of composition in which it is not possible to make a difference without conceiving an entity as immersed in an ecology of material relations.

How to make a difference? 'It depends!'. This permaculture refrain is not the name of an unspeakable 'secret'. Rather, it refers to the very fact that the creation of a difference depends situation by situation, time by time, observation by observation to the constraints and to the constellations of forces in relation that are operating in a determinate ecology. As we have seen in permaculture, acting with means to deal with unexpected presences, experimenting, every time in a different way, within ecosystems and their material constraints. In a cycle of active observation, a permaculturist puts her body in an ecological niche. It is not possible to know in advance which kind of interactions will happen in this cycle of bodily immersion. In the creation of a 'rapport' existences do not pre-exist their relating. Every cycle of active observation is an event. The variation of encounters matters in an ecological relationality because without

variations we have no possibility for diversity. People and things alter themselves via their relations; this is what 'acting with' is about in a politics of worlding. For this reason a practice of composition in a politics of worlding is a minor composition: people and things could alter themselves because the creation of a rapport is a matter of variation. Every time a rapport is created we have an event, something that allows a permaculturist to 'visualise' an ecology of proximity and sometimes viable paths. In permaculture life is a knot of relations without a centre of emanation of variations. A territory in permaculture is defined by actions of contact, in which variables impact other lines of variation. For this reason permaculture is a socio-material semiotics without a centre of signification, and a practice in which action always means interaction.

Dealing with permaculture and hacking, I engaged with forms of activism that focus their attentions on making a difference in the world via crafting matter. A politics of worlding is a form of material activism, in which 'acting in the world' means actively engaging in its ontological configurations, materialising alternative forms of existence. But how do we conceive of a politics of worlding as the worlding of justice? In the theories that I explored in Chapter 1, the notion of commons brings with itself a 'universalistic' idea of justice. Theorising justice through commons implies the idea that the commons constitutes a sort of 'common good' for all humanity. It brings with it the supposed existence of a transcendental reason, in the name of which certain concerns count more - *per se* - than others. In this way, the risk of thinking politics inside what Haraway calls 'the culture of no culture' is always behind the corner. But how to think of justice outside a 'universalistic' framework? And moreover, how to conceive justice when justice comes to matter? Thinking with the Science and Justice's experiments of knowledge has been a good occasion for me to understand something more about what justice could mean in making alter-technoscience.

The main characteristics of the Science and Justice research centre are a strong attention to encounters between intellectuals and scholars from different disciplines, a commitment to justice as a central topic of discussion and an idea of knowledge practices as something useful for acting in the world. 'We started building the space, and ideas came later' Jake told me. Organising a PhD training program on science and justice was an idea that made a difference in the story of this centre. In fact, it provided the opportunity to turn a general question – how to think of justice when it comes to science and technology? – into a space of practical experimentation, in which a 'general

question' becomes an opportunity for experimenting with a pragmatic of research and knowledge production. Such an experiment was made possible by the fact that, in the last twenty years in the United States, a series of policy changes created an increasing attention on the relations between science and society. For example, in the funding criteria of the National Science Foundation there is significant attention not just on supporting science studies, but also on activities of research that explicitly try to develop a beneficial relation between knowledge production and society. In continuity with this goal, the NSF moved in 1997 to adopt broader impacts criterion in the evaluation of grant proposals. 'Engaging the public' or providing a benefit to 'society' became general statements and key words at the national level. Inside this 'interstitial space' the Science and Justice Training Program found the funding opportunities for experimenting with new ways through which think the science-society relation.

7.2 Critical Friendship

One of the first events organised by the Science and Justice working group on the 1st of February 2007 was a 'critical friends' discussion between Jenny Reardon and David Haussler on the topic of genomics and biomedical research. This public conversation focused, in particular, on questions about 'categorical practices' in genomic sciences. With the term 'categorical practices' I mean the intimate relation between the categories that are framing determinate scientific practices and their epistemological territory of foundation. For instance, how should scientists name or label samples and data when controversial and contested categories like race and heritage are at stake? How do new insights into human genetic history challenge or support such categories? And which kinds of narratives are implied in such categories? Jenny Reardon is the director of the Science and Justice Research Centre, she is an Associate Professor of Sociology and a Faculty Affiliate in the Centre for Biomolecular Science and Engineering at the University of California, Santa Cruz. She is a key figure in the history and in the present of the Science and Justice Research Centre. The centre started in 2007 and, according to my interviews, the energy of Jenny was a central ingredient in opening this new space of debate around the relation between science and justice. Genomic science, the specific field of analysis in which the research of Jenny refers to, was at the centre of a series of events through which the space of experimentation of Science and Justice is being progressively crafted. I did not have the chance to meet David during my fieldwork, but Jenny told me in a long interwiew the academic biography of David.

David Haussler is a biomolecular engineer and the director of the Centre for Biomolecular Sciences and Engineering at the UCSC. He is well known for his work leading the team that assembled the first human genome sequence in the race to complete the Human Genome Project. The Human Genome Project is a research project whose aims consist in mapping all the genes of the human genome. It is a relevant global project inside the contemporary history of biology, and at the same time both the implications of such an aim and the consequences of this research project are affecting a global debate that oversteps the borders of scientific debate. For example there was a moment at the end of the 1990s when Craig Venter and his company, Celera, announced they were going to challenge the public effort to sequence the human genome and to sequence it using private funds first and thus threatening that genomic information would fall into the private realm and be patented and not be available for public use and for public benefit. So David Hausler and his graduate student Jim Kent decided this was not going to happen and spent 80 hours a week in his converted garage working on these algorithms – what you have to imagine is that there were 40,000 sequences that were not all put together and they needed an algorithm to assemble them and get them together. Jim Kent was madly working algorithms and came up a month later with a computer program called Gig-Assembler which stitched together those 40,000 pieces of information and this was critical for establishing that the genome had been sequenced. It was important to announce that it had been sequenced and it had been done before the private company had been able to do it. His team posted the first publicly available computational assembly of the human genome sequence on the Internet on July 7, 2000. Moreover, his team developed the UCSC Genome Browser, a web-based tool that is used extensively in biomedical research and serves as the platform for several large-scale genomics projects. This browser contains working draft assemblies and the reference sequence for a large collection of genomes and, moreover, it is an 'open source' browser, which means that all the codes and data collected are available for non-commercial use for any research anywhere in the world.

In an interview about her first encounter with David, Jenny told me how they arrived step-by-step to discuss together relevant issues connected with their work as scientists and intellectuals:

> 'When I first came to Santa Cruz, David Haussler was the head of the bio genomics group. He was very keen to meet me. I had this practical problem which was to sequence the human genome […] we wanted to sequence many human

> genomes, I had a concern. Scientists say [that there is] a genetic variant of which we find the ancestral form in Africans and we find the derived forms in Europeans; and reflecting on that we have already a set of values […]. The idea that one is better than another, what we do about this? He framed the problem about that and proposed a discussion about that. People in leadership positions in science are very helpful when they recognise that they don't have all the answers and invite public discussions – what David did. I immediately said yes, but I also thought there has to be institutional support for that, so I asked to have an office in their centre, in order to build a form of everyday relation, a routine interaction with them. I need to understand what they are doing, we need to trust each other, we need a form of relation in which we can discuss things. The first time at the critical friends event, where Jake was investigating me and David, he was asking us questions. I remember some people, graduate students from bio molecular sciences and engineering, they thought 'there will be a fight', like science wars type of thing going on. I was quite surprised, but people were expecting a clash between social and natural scientists. Instead I think what emerged was a very engaged and interesting conversation, with a lot of mutual curiosity about very interesting and very difficult issues and unsettled issues. And we started to establish ourselves not as people that are coming and judging the scientists as being socially suspect […] but who understood that there is a lot going on in science and, a lot of social and political meanings, and what we needed was to pay attention to it and create a space in itself safe enough for people to really say what they are thinking and we developed some practices for how to do this […]. One [practice] is around languages […]. I remember David saying 'the humans', and I remember freezing up, my mind freezing up thinking what the hell does 'the humans' mean! […] And it made me think that we need to adjust that, so we started to put words on the blackboard, not in order to solve the issues behind the words, but as a way to recognise our differences, and keeping the conversation going'.

Jenny is telling the story of an encounter between a social scientist and a natural scientist. The social scientist has a long history of research on the role of genomics in biomedical research, with a particular attention on the controversies related to the material and cultural impact of this scientific field on society and the natural scientist is strongly engaged in the practice and idea of 'open' science, which means that the outputs of science should be accessible to everyone and not a matter of private appropriation. For sure this is a story of intellectual collaboration amongst colleagues, but what make this story particularly interesting for me is the very fact that, what could be considered a story amongst many others in contemporary academia, became the possibility of experimenting with a format of discussion and a trans-disciplinary territory of exploration that I would like to call 'critical friendship'.

This was the first of a long series of events, that were called 'critical friends' series, in which the academic attitude that emerges from the words of Jenny became a space of discussion amongst natural and social scientists and a way of thinking and

materialising a space of circulation of different matters of concern at the intersection of science and society. Starting from this pilot event, a cycle of public events called 'critical friends' were organised by the Science and Justice group and each of them reproduced a format of discussion: one natural scientist and one social scientist gathering around the many eco-social implications of science starting from a specific domain of analysis: for example exploring the intimate relation between bioethics and biotechnologies starting from human embryonic stem cell research.

The event of the 1st of February 2007 was literally an event, in the sense that it was able to inaugurate a possible future for the Science and Justice Group. A possible future, but also relevant features of a knowledge practice of discussion that is crossing transversally different experiments conducted by this group of researchers in which a style of conversation seems to emerge in the passage or in a zone of transition between social and natural sciences. We can call 'critical friendship' the Science and Justice way of inhabiting such a zone. In Jenny's long quote we have many ingredients of what we can call 'critical friendship'. First of all we have an energy, the urgency of relevant issues that deserve to be shared, even if such issues could be seen and explored starting from very different perspectives. Second, the feeling of not being sufficient by yourself, the very fact that there is no intellectual position able to guarantee, in itself, the availability of all the answers connected to an issue: curiosity and interest for what significant others are doing is part of the game of critical friendship. Third, that critical friendship requests not just the attempt but also the effort to understand what 'the other' is doing. That is, trying to understand the constraints, the regions of objectivity and the obligations that are framing their practices. Moreover, establishing a relation of trust allows frank discussions in which, even starting from different approaches, you and I are working together, rather than judging each other.

But critical friendship means also having respect for what 'makes my mind freeze up', conscious that 'freezing up' is a reciprocal and not an unilateral experience. 'Freezing up' it is not just a matter of not understanding what the other is saying. It is disagreement, an active and positive disagreement related to the ways in which we are narrating actions and things, rooted in the ways in which we build meaningful accounts of the world. There are many ways to explicate disagreement, as well as there are many ways to make a critique. There is the taste of deconstruction, the pleasure of debunking, and the attitude of making a desert in the territory of the meanings of the other. None of them seems at work in a 'critical friends' relation. Conversely, to be critical here means

understanding how things and meanings work, making explicit a difference, inventing practical ways and pragmatics to recognise our differences. It is to articulate what we are saying or doing in a way that the other can engage with it, make it available. It is taking the time to explain why and how something matters, without taking for granted the ways – the routes and the flows – in which you have arrived at a position or to a situated account of reality. 'Go with not just the critique, but with the wider space of construction inside which the critique makes a contribution', in this way Jenny gave me an account of critical friendship.

What we are calling critical friendship seems to be a way to lure a capacity to stay in conversation and to 'believe' in a process, even when not everything is so clear and transparent to make sense of things and events. Here understanding and taking as significant meanings and practices of the other seems to be quite far away from the appreciable politeness that habits academia, and its style of engaging in intellectual conversations. Making available an abstraction, a categorical practice, a point of view, a difference in critical friendship in fact is not a matter of creating a distance or a zone of indifference in relation with other practices and matters of concerns, on the contrary, it is a way for opening a space for partial and sometimes unexpected alliances. And alliances, as we will see, matter in a politics of composition.

Another account of this 'critical friends' event comes to me from an interview with Maria Puig de la Bellacasa. She was doing her postdoc in Santa Cruz when the project started, and she is one of the founder members of the project. Maria told me that this critical encounter between Jenny and David was the first public debate promoted by the Science and Justice working group that she attended. She was impressed by the style of the discussion and she enjoyed a lot this kind of intellectual engagement.

> 'When I went to Santa Cruz this was kind of starting. Jenny Reardon organised this meeting to start this group. I was excited about it because – wow – sociologists, STS people are meeting with scientists. And I was excited because, it comes from my PhD.In my PhD I wrote a lot about the kind of conflict that came about during science wars […]. At that time I came to this discussion from a feminist alliance perspective, that is the idea that it is not possible to work politically without the alliance with critical scientists'.

Maria, starting from this event, joined the Science and Justice Working Group, actively participating in their activities during her period of permanence in Santa Cruz. What we have called critical friendship represents, for Maria, a way of rethinking the relation between natural and social scientists after the long winter of the science wars. But in

which sense a feminist perspective can constitute an occasion for re-thinking an such alliance? In order to follow what Maria is saying it can be useful to quote Hilary Rose, a key author of the feminist alliance perspective. Amongst the many papers and interventions of Rose, a paper in particular called 'My Enemy's Enemy Is, Only Perhaps, My Friend' (1996), can be interesting in order to deal with this question. In the first lines of that article Hilary Rose writes:

> 'In these wars, the self-appointed defenders of Science are seeking to police the boundaries of knowledge and to resurrect canonical knowledge of nature, against the attempts of the Others (including feminists, antiracists, psychoanalysts, postcolonialists, leftists, multiculturalists, relativists, postmodernists, etc., etc., in all our bewildering diversity) to extend, transform, or maybe even dissolve the boundaries between the privileged truth claims of science and other knowledges. But first, just because any of us may find ourselves among the Others under attack, I must emphasize that this commonality may not automatically generate bonds of solidarity between this "us." My enemy's enemy is – only perhaps – my friend' (Ibid.: 61).

Rose is a feminist committed to transform and extend the boundaries between science and other knowledge and, moreover, she thinks that re-thinking the boundaries and the constraints of science is, in itself, something that is inherent to attempts to make science, rationality or what is considered reliable knowledge without excluding the role of emotions and ethics in knowledge practices. Certainly Rose is not on the 'police' side of the barricade. But what Rose finds not helpful at all, is the idea of reproducing for sociologists the 'authoritarian' scientific voice that they criticise. The privileged truth claim should not move from natural to social sciences. And moreover, what happens on the two sides of such a of barricade, where sometimes the word 'myth' is used in order to describe the patient and slow work of laboratory scientists? It produces a situation in which the dialogue with such scientists is pretty much foreclosed. And, following Rose, what defines, at the opposite, a feminist knowledge politics is precisely the fact that 'feminists are committed to building alliances, not least with other feminists, and consequently are very sensitive to the delicacy of the relationship between the feminist critics of science and feminists in science'. Rose is willing to listen to those voices that, in natural sciences, are committed to a socially and environmentally responsible conception of objectivity and rationality. The way in which Rose is taking justice as a matter of concern consists of reshaping the sciences with the neglected actors and voices of the 'Others' – who and what was historically excluded by modern western science. What Rose called a 'dream' cannot come into experimental existence through

binary and oppositional confrontations, but through multiple conversations and patient alliances.

It seems to me that what I am calling 'critical friendship' is a situated and contingent way to think and act with such a spirit of complex, patient and partial alliance. It is a spirit of collaboration, an availability to have passionate and constructive conversations. Moreover, the 'critical friends series' is a pragmatic and experimental space, a 'way out of this confrontational either you criticise the scientists for being part of the technoscientific complex, either you are part of the system and you become a neutral ANT type of scholar', according to Maria. From this perspective, a similar space of collaboration seems to me robust enough to make room for critics of the contemporary technoscientific apparatuses and, at the same time, porous enough not to bring back the exercise of critique to a sort of exteriority where a division of labour – to natural and engineering scientists the role of understanding 'nature' and craft technologies and to social scientists the role of analysing 'society' – is implied. Critical friendship is a way of luring partial alliances, concrete possibilities of imagining and materialising other technoscientific practices. If justice has something to do with altering material conditions of existence, starting from positions marked by exclusion, asymmetry and injustice, from a feminist perspective alliances matter, because it is through alliances that a possible 'otherwise' can be generated. 'Imagine that things could be otherwise', as Jenny told me, is at the heart of thinking about justice in technoscience. Challenging troubles and finding viable alternatives, in this sense Science and Justice is a space of 'reflexivity' in which justice comes to matter. As a matter of concern, or as Maria Puig de la Bellacasa (2011) says, as a matter of care. But also a space of reflexivity – a collective form of reflexivity – in which justice is conceived inside the material constitution of worlds, which means that justice can not be thought about without taking into account what technoscience conjugates: the many existences implied and affected in the contemporary constitution of technoscience. Alliances and friendships matter in exploring what Jenny defines as 'the possibility and need for a science and justice that is able to denaturalise and speculate about other possible worlds'. Critical friendship matters in accounting technoscience and its material consequences, and patient alliances matter in thinking about and enacting 'justice' as the materialisation of other worlds crafted with the neglected voices of this world.

7.3 The Cosmopolitical Meeting

Another important event in the process of constructing what is now the Science and Justice Research Centre and in the invention of its own pragmatics of discussion is represented by the organisation of a meeting called 'Genomics and Justice: Promises, Perils, and Paradoxes', that took place in May 2007. This conference can be seen as a form of continuation of the critical friends series, in which the formula of one social scientist and one natural scientist was replaced by an open arena – by a more complex articulation of the relevant issues related to the genomic science and to the administration of genomics research. Here, the scientific and political attentions, the concerns, the subjective biographies, the everyday activities of the figures invited in the meeting and the ways of positioning the interferences and the intersections between science and justice in debate multiply in relation to the previous format of discussion. It is sufficient to introduce some of the presenters and some of the arguments in discussion in order to have an idea of the heterogeneity of sensibilities and positions sitting around the table of the Genomics and Justice meeting. I had the chance to read transcripts and notes from the conference, and a report, even if inevitably partial, seemed to me a good way to introduce topics and contributions to the discussion.

A concern present in the arena is constituted by the political and ethical consequences connected with the risks of privatisation of genomics research. For example David Haussler introduces the shadows connected with the clusters – composed by researchers, companies and universities – who control and own data, connecting the question of privatisation of data with the significant and problematic power of such clusters to prescribe and set research agendas. Following Haussler, privatisation means a restriction of access to genomic knowledge, which implies a strong limit to innovation, with significant consequences for the prevention of life-improving and life-saving genomics discoveries. On the contrary, a science policy expert, Robert Cook-Deegan (Duke University) invites us not to exclude intellectual property in order to think strategically about a better distribution of goods. Cook-Deegan quotes a concrete case, referring to a policy statement from Stanford University as an example of how researchers and universities might include ethical concerns in their licensing agreements. The ethnographer of science Cory Haiden (UC Berkeley) invites the participants to question the notion of 'public goods', or better, to develop an ethical dimension that does not draw upon the public-private dialectics. Laura Arbour, a medical geneticist from the University of British Columbia introduces the principle of

'DNA on Loan'. Through such agreement researchers collect genetics material from participants – Canadian Aboriginal communities in her case – sharing benefits with participants. Such an agreement, strongly based on trust, activates a creative reinvention of notions such as property and private rights.

A long part of the discussion is dedicated to the themes of regulations and law concerning ethical protocols. Amongst various presentations the legal scholars Rebecca Tsosie (Arizona State University) describes how existing laws and regulations are strongly based on 'western' notions of individual ownership, property and privacy. They do not 'recognize cultural harms, immaterial injuries to a people, or intangible harms such as violations of deeply held community values'. This is, even if not certainly the only reason, a strong argument for why North American tribes are reluctant to be involved in genomic research. Significant attention at the Genomics and Justice meeting focuses on the unbalanced promises of the future benefits of genomics and the tangible present day concerns of communities asked to participate to genomic research. In particular Maile Tauli (Urban Indian Health Institute, Seattle Indian) reminds us of the history of exclusion, dispossession, and deprivation common to many Native communities – questions that need to be substantially addressed before any speculatively promises about better health outcomes in the future are made. 'There is strong reason to be suspicious of future orientations that ignore histories of injustice and injury' – says Donna Haraway (UC Santa Cruz).

In all the interventions in the meeting, justice comes as a common concern, as a way to discuss different implications of genomic research from different points of view. But more than a discussion about justice 'in itself', where the participants will be engaging in sorting out to which, amongst the many pre-existent ideas of justice, confers a sort of authority, here justice is an open question able to gather together activists, lawyers, scientists, policy-makers, anthropologists and so on. Justice has the power to gather together a multitude of experts, practitioners and activists, as something able to move them to gather around genomic research and its consequences. The meeting is not a place in which to make an agreement, it is not a place for decision-making, neither is it a starting point from which we have any guarantee concerning substantial discontinuities or possibilities of change in the everyday conditions of genomics research. But what is relevant for us in this example consists of the kind of contribution that a similar space in the university can make for thinking the intimate relation between knowledge production and knowledge politics. From this perspective,

such forms of discussion seem capable of fostering an idea of knowledge where the experience and the practices of each participant are precious for thinking through an issue and, at the same time, none of their 'own' knowledge seems to be sufficient or able to been recognised as decisive.

In the previous section we saw how critical friendship emerges from a refusal to split the right of giving an account of a situation starting from a division of labour – an account of justice as a matter of social scientists, the interpretation of facts as a matter of natural scientists, crafting new technologies as a matter of engineering – without ignoring the very fact that the ways in which we are dealing with an issue are not separable from our ways of being connected with an issue, to the many ways in which we relate ourselves and our practices of knowledge to an issue. Refusing a division of labour in discussing science and justice does not mean that our accounts of justice and science are not situated; quite the contrary. And, at the same time, 'recognizing our differences' is less a way of thinking of the reliability of knowledge as a summation of different accounts and much more a way of recognising the existence of other accounts, in engaging with issues without splitting them into facts – value terms. Reliability here is not a matter of universal objectivity or subjectivist relativism, it consists of giving to a situation the power to discuss together, thinking through the multiple consequences of a science practice. What counts as justice in this context consists, first of all, of thinking through the issues and the consequences of a science practice. There is not justice if not related to an issue. Justice emerges as a 'demand for justice' starting from the emersion of an issue. Rather than conceiving of a politics of justice as a political sphere conceived 'in advance', as something that pre-exists the emergence of a problem, it is a situated problem that matters in this context. Giving the power to a situation to make us think – this seems to be the knowledge politics at the heart of this arena.

As the etymology of the word 'interest' suggests, what is interesting consists of what dwells 'inter-esse'; what forces us to think with other attentions, what extends our rationalities, thanks to the presence of different people concerned with a situation. Interests are a matter of emersion and the specific pragmatic utilised in order to animate the meeting is a pragmatic of partial composition. I have the sensation that the difference that a similar kind of meeting can make consists precisely of betting on a possible concatenation between the exploration of heterogeneous accounts of what are now the knowledge practices related to genomics research and an attempt to expand both the analysis of the consequences of what is going on and the reflexivity amongst

those who are, in different and several ways, connected with such practices of knowledge. More than a space capable of promoting standard solutions, the efficacy of this kind of meeting can be reconnected to its ability to expand the capacities of imagination of possible alternative experiments.

Starting from this 'reflexive' attitude it is possible to put this exercise of knowledge politics into relation with Stengers' 'Cosmopolitical Proposal' (2005) and, in particular, with her plea for 'slowing down' science. This is not a way to say that the Genomics and Justice event 'realises' such a proposal, neither that it verifies the conditions of the possibility for it. The exercise that I am proposing is more an attempt to understand how much such a proposal can illuminate intensities and efforts that are actualising in this style of conversation. In her cosmopolitical proposal Isabelle Stengers suggests resisting the temptation of both thinking of politics as a plan for 'a good common world' and of transforming a situated practice of which we are particularly proud into a general key; a neutral universality good for all and in every situation. Her proposal is incapable of giving us a list of procedures that can grasp a definition of what is good in a 'good common world', while the idea implied in her enigmatic term 'cosmos' suggests 'precisely to slow down the construction of this common world, to create a space for hesitation regarding what it means to say 'good'' (Ibid.: 995). The cosmos, or better her enigmatic cosmos, is not an object of representation in itself: more than a definite program or a pre-designed aim to achieve, it refers to an unknown, 'the unknown constituted by these multiple, divergent worlds, and to the articulation of which they could eventually be capable' (Ibid.: 996). And more than a 'generalist' theory, this kind of proposal gains meaning in concrete situations, where concrete practices are at work.

This kind of 'suspension' is able to create a hesitation around the principle of equivalence with its roots strongly settled in the idea that politics implies the existence of a common measure and an interchangeability of positions. More than with an operator of equivalence, such politics of the cosmos resonates with a 'mise en égalité', that means a space where each actor has the feeling that she cannot master completely the situation in discussion. Far away from the aim of making an ecumenical peace, what is at stake in this exercise is the invention of constraints, inventing a way to expose ourselves, to decide – and here decision is a word that resonates with the question 'what are we doing? – in the presence of those that may turn out to be affected by the consequences of the decision. Stengers' ethical proposal seems to be something that

facilitated the creation of forms of self-regulation: an ethics capable of an experimental invention of constraints without advocating the authority of an arbitrator.

As in the case of Stengers's proposal, the open meeting of Science and Justice doesn't frame an issue as a matter of 'general interest', nor devolve upon a transcendent moral the necessity to engage with such an issue, rather it conceives the issue as immanently connected with its environment. Another ingredient that contributes to make a 'cosmopolitical meeting' is a knowledge politics based on a concern for relevance. What is important? A cosmopolitical meeting is able to pose this question and, at the same time, to avoid any differentiation *a priori* between what we count as relevant and what we don't. What makes of a meeting a political artifice is exactly this capacity to generate a possible accountability of what is relevant. A possible accountability rather than a measure to adhere to. The idea of justice has an historical legacy with divine law. But it is not in a promise of universal transcendence that justice has to change to live in our worlds. Nor the transcendence of God will be replaced with the transcendent principle of a 'common good' for human beings. Thinking through the consequences on the many words, with their thickness, that contemporary technoscience conjugates: this means thinking justice in an ecological relationality. Thinking genomic for example, as a scientific practice, with its material consequences, in order to take seriously the issues related with these many conjunctions. Slowing down science and justice means taking the time to engage with them.

7.4 Justice in Implosion

The Science and Justice Research Centre hosts a PhD program called Science and Justice Training Program. The aim of this training program consists precisely of creating an institutional space where the relations between sciences and engineering and the questions of justice and ethics can be discussed and explored. Students are invited to 'slow down' and to investigate these aspects from the ground and starting from concrete research projects. From this point of view the approach of this training program is focused on two mains goals: expanding the set of responsibilities and attentions inherent to what we can call scientific responsibility; and supporting collaboration and projects amongst students based on common attentions and concerns. Founded through a National Science Foundation grant in 2010, the program hosts and trains students from science and engineering, social science, arts and humanities. The training program works in synergy with the Science and Justice Research Centre. Students participate in

the constructions of public events and collaborate for specific projects with people involved in the research centre. The training program puts at the centre the aim of exploring the many science-society interfaces with the support of interdisciplinary methods. The aim is to create a space where languages and methods can be innovated together. In this section I will introduce one of these methods, called the implosion project, in the attempt to figure out which kind of knowledge politics is implied in it and how the concept of justice can be analysed starting from this pragmatics of discussion. Such method, called the implosion project, comes from Donna Haraway, and in the next lines I will introduce it starting with Haraway's words:

> 'I have taught a course called Science and Politics for a number of years and one year in particular, it was very early in the morning, a big lecture class at 8:00am. To get to the lecture hall we all passed this little shop that sold good coffee and chocolate croissants… And just as a way of waking up in the morning, I would ask people to unpack objects, to take a chocolate croissant and lead me through flour and chocolate and butter and sugar and coffee and connect us to world histories that way. I would ask people to pick an object, the T-shirt that the person sitting next to them was wearing, what was printed on it, the label, the very fact of labelling, the fibre composition. If it's got polyester, then take me through the history of Purity Hall and research labs at Du Pont; you know, back me up into nitrogen chemistry. If it's cotton, then back me into pesticides and the California water projects and where cotton is grown and the length of the fibre and what about what you are wearing on your chest? I would ask people, as a way of talking about science and politics, to take a pencil, a piece of paper, the architecture of the lecture hall that you walked past; pick something and get the class started by giving me an account of it.' (Schneider 2005: 127-128)

How many worlds live in a t-shirt or in a cup of coffee? Starting from this morning exercise Donna Haraway is teaching us something about science and politics. Seeing the world through the many connections in which an everyday object is crafted, has been circulated and used, manipulated, attached to something or someone is a way to put science and politics, not in the heaven of a deductive theory, but in the materiality of our everyday life. The exercise is an attempt to learn from the embeddedness of actions, people and things in the world and a way to explore the world in them. How many worlds are in a cup of coffee and how is a cup of coffee acting in the world? An object looked at in this way becomes thicker, attached to a form of relatedness able to project a sight – I am watching an object in front of me – in a series of visions, knowledge, curiosities and imaginations that are coming to my mind. The object has been populated, a global history is entering into sight. This exercise teaches us that

traces can be retraced; that a student can deconstruct and rebuild in a storytelling form an object through the many economic, material, cultural, sociological, mythical, biological and so on, dimensions that are touched by what such an object does or implies. But the cup does not need to be recomposed with glue. In other words, it is not just a matter of 'doubling' something, to follow a clear and unique possible pathway. The question is how to appreciate ontologically and epistemologically what a 'vision' is doing, what counts is what is going on in a class, the capacity to inaugurate a good conversation, the engagement of students in the topics, the possibility to find a way to 'slow down' our relations with actions, things and behaviours and to spend time in questioning them collectively.

Jenny and Jake told me how they are readapting this method for a graduate class and how it works, in particular, as a tool for discussing the question of justice with natural scientists and engineering students. A student chooses an object, an object relevant to her research project, and comes to the class with it. It could be a piece of organic as well as inorganic matter, an apple or a pen. She introduces the object and 'its place', the many implications of it in her research. The student who introduces the object tries to explain how the object matters for her research and the many connections that she can see through which the object is connected to the world. The object passes hand by hand in the class. Everyone adds something: sensation, stories, memories, knowledge, interests, concerns and points of view related to it. Through exemplars or elements of her object of study a student tries to read this object with different lenses and perspectives. Even as different students do the exercise with the same object, stories are multiplying. More stories, different ways in which the object is connected to the world. One object and many ways of relating with it. For Lizzy, a student from anthropology and a fellow of Science and Justice, this method is particularly helpful for understanding that 'criticism is about understanding how things work'. And if the work of critics is more about understanding than judging, the class discussion is a way to enlarge possible dimensions and scales of visibility, as well as a way to multiply the ways in which the places where her object of study meet questions of ethics and justice are brought into focus. In this way one object in circulation becomes a lure for comments and discussions about justice, in which, as Martha told me, 'you can speak about whatever, write on the blackboard difficult words, but all the time you need to explain to the class why it matters'.

Explaining 'why it matters', this is the positive constraint implied in having a

conversation about justice. Taking seriously what and why something matters in a conversation about how a pen is implicated in many worlds means not separating matters of fact and matters of concern, refusing to think justice inside the 'modern' split between primary and secondary qualities of an entity. This 'pedagogic' exercise is a way of giving a situated account of justice without separating what comes from inside the process of materialisation of an entity – with the many worlds drop-forged, transformed, enacted, affected by it – and the many ways in which we are connected with such worlds via a relation of facts, concerns or care. In the specific way in which justice comes to matter in the implosion project, the analysis of processes of materialisation and conversations on forms of mattering overlap continuously. Conversations matter in this exercise. Not because in conversations there are always 'magic' solutions but because, in conversation, there are possibilities for constructing complex, partial and collective accounts of justice. 'Justice is a matter of having conversations where you don't know in advance what justice is', Jake told me. And he added, 'if you define it in advance, you risk silencing someone else'. Accountability in this exercise in science and politics is approached as something that comes from conversations and collaborations, as something that helps us to see differently, staying in connection with other ways of seeing. But good conversations, according to Jake, are also something that restrain ourselves from silencing someone else.

I asked Andrew Mathews – the co-director of the SJRC – what is justice as a subject of discussion in a science and justice class?

> 'Justice comes in conversation, and the main goal of our project is having good conversations and nice forms of collaboration. Our interest is in having conversations across disciplines and knowledge boundaries. We work with an experimental failure logic in the attempt to develop on ontological diplomacy in conversation across disciplinary differences. For us, pedagogy means producing encounters amongst different imaginations. For this reason justice is a matter of hesitation and we can have only provisory answers on justice. We try to slow down, to think of justice as an emersion and a way to become contaminated. Justice is about the human capacity of imagination'.

In Andrew's words justice is about a capacity of imagination, an active force of being contaminated, something that trails us in a zone of indeterminacy. Also Karen Barad – an academic involved in the training program – puts this methodology in connection with a strong role of the faculty of imagination in thinking about justice: justice is not about developing a logic of contradiction, it is about cultivating indeterminateness and developing a bigger imagination'. So justice is not a matter of contradiction, or better, it

is not a matter of discovering and unmasking contradictions in the world, but it is about cultivating an active indeterminateness and enlarging our capacity for imagination; as a way to say that justice is about imagining other other-wises in making science. As we can see, following all these suggestions, 'justice in implosion' is a method for having conversations about justice that implies a politics of vision quite far away from a self-identity of vision. It is not a way to reinforce identities, or to annex someone to a 'proper' vision.

Jenny, as well, stresses the difference between an idea of ethics as a codified requirement and the idea of justice implied in this method of discussion: 'I think that this is a practice of knowledge production more interesting than ethics: we try to not know, to figure out together, we encourage people to engage with what they don't know, this is interesting'. Following Jenny, justice, in contrast to ethics, is a force that allows us to engage with what we don't know: justice in implosion means a situated, critical re-examination, a way to learn with prosthetic eyes. The question of vision is less a way to reinforce a territory of vision, but to question it. 'Vision is always a question of the power to see – and perhaps of the violence implicit in our visualising practices. With whose blood were my eyes crafted? Donna Haraway reminds us (1988: 192). Seeing and the apparatuses of seeing are not innocents, quite the contrary they bring with them ways of seeing the history of our ways of seeing, crafted in the middle of multiple connections – and seeing it is not so different to the history of our cup of coffee. So the point is less activating a self-reflexive vision, making of a vision a stable perspective, but using vision as a tool, a weapon to diffract with objects, people and actions. And diffraction as a politics of vision is a form of knowledge. Through diffraction we can understand why the question is not to reconstruct the object how it is supposed to be, diffraction in fact is not a matter of representation. Seeing is not a matter of representation but a way to generate new possibilities, a lure for an imagination to come. 'It might be otherwise!' This is more than a slogan; this is the knowledge politics of justice in implosion, with its risks and possibilities.

'Create the conditions for imagining other routes to knowledge and justice', this what is at stake in thinking about justice via implosion, and this is at stake in the knowledge practice of Science and Justice. And, moreover, enabling 'formulations of justice not from codified reactions but from responses to the specific conditions and consequences of knowledge production'(Reardon 2013: 192). In these two sentences of Jenny it is possible to connect the refusal to think of justice as a set of codified values

with the very fact that justice cannot be thought without a form of speculative commitment, without a form of activism. A form of activism that links us to a collective world, that put us in relation with the neglected voices of this world, a form of activism that demands of us something more than showing radical historical contingency and modalities of construction for everything. In Haraway's words:

> 'So, I think my problem, and 'our' problem, is how to have simultaneously an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice for recognizing our own 'semiotic technologies' for making meanings, and a no-nonsense commitment to faithful accounts of a 'real' world, one that can be partially shared and that is friendly to earth wide projects of finite freedom, adequate material abundance, modest meaning in suffering and limited happiness.' (Haraway 1988: 579)

This point of view on justice and knowledge is not a promise of transcendence, it is less a way to theorise the world, and much more a way to act within it. Exploring justice in implosion is a lure for the enactment of justice, a practise of knowledge that could work – without any guarantee – as a relay for making practical interventions in technoscience. The Science and Justice Research Centre proposes to us a form of knowledge in which the power of critics is not activated in order to deny meanings and bodies, but in order to build meanings and bodies that 'have a chance to live'. 'Create the conditions for imagining other routes to knowledge and justice', as Jenny told me, seems to be the specific way in which a space of discussion and knowledge production in contemporary academia is trying to make its difference. Collaboration is the keyword that transversally crosses the different methods of discussion that characterise the activities of this centre. Without collaborations, which means without interactions, it is not possible to create meaning and bodies, practices and narrations capable of exploring other routes. Solidarities and conversations are a matter of interaction in a practice of knowledge in which relations come before what they are relating to.

7.5 When Justice Comes to Matter

In the middle of the many contemporary technoscientific transformations, movements such as permaculture and the makers are engaging directly with the experimentation of practices of matter. The political intensity of these practices consists precisely in their capacity of materialising ontologies: reclaiming a relation with matter, recombining associations and recreating cosmograms. This means 'intervention' in a politics of composition. A politics of composition could be understood also as a science of

practice, a material activism fostered by techniques that enlarge the capacities of practitioners to craft worlds via interaction. In this form of activism, politics has less to do with the conquest of social power and much more with an ecological understanding of relationality, in which what matters in the materialisation of an entity consists of the many differences it can make in relation to the many other entities to which it is related. Starting from this ecological understanding of relationality, we can think of a politics of composition as a material possibility for worlding justice. When acting in the world means actively engaging in its ontological configurations, consequences matter.

The very fact that consequences matter is at the centre of the knowledge politics of Science and Justice, where the relation between technoscience and justice is seen as starting from an ability to 'recognise' the many implications and consequences implied in the constitution of the contemporary technoscientific apparatus. In the knowledge practices of Science and Justice, justice means thinking with the consequences on the many worlds, with their thickness, that contemporary technoscience conjugates; and taking seriously issues related with the worlding of contemporary technoscience, starting from a situated research agenda. No issue, no justice. Justice emerges as a 'demand for justice' starting from the emersion of an issue. Rather than conceiving a politics of justice as a political sphere conceived 'in advance'; as something that pre-exists the emersion of a problem, what matters in a politics of justice is a situated problem. Stay with the issue, because consequences matter. A politics of justice demands us to stay with what we feel intolerable, with what touches us. A politics of justice is something that demands that we cultivate a capacity to respond. What does it mean to take care of a situation, if not actively participating in making it different? 'It might be otherwise', this refrain does not suggest the existence of a ready-made solution. It is not in a promise of a universal 'answer' that justice has a chance to live in our worlds. Justice is a lure for fabricating responses, a force for passionate constructions. But this is not a matter of individual actions.

The ethical constraint that animates a politics of justice entails seeing from below, acting with neglected voices. With all the artificial relocations and contingent 'foundations' that this constraint demands, what matters in a politics of justice is the capacity to engage in practices that restore justice in situated ecologies that certain humans and certain non-humans are living in deeply asymmetrical ways. If a politics of worlding refers to the power of difference, thinking justice in a politics of worlding consists of making material differences with the many significant others that are – here

and now – suffering from the everyday consequences of power differences. This is a politics of worlding as the worlding of justice, or more simply what 'acting with' could mean.

Feminism and permaculture teach me that patient alliances and collaborations, through which we try to see with prosthetic eyes, are fundamental in a practice of justice. In permaculture nothing can be gained in isolation. Action always means interaction, and it is through interaction, as in a cosmopolitical meeting, that we learn to fabricate visual extensions, fabricating complex and dynamic accounts of justice. Thinking about justice in an ecological relationality is demanding. It constrains us to think about a situation with the many forces and actors that are inhabiting a landscape and we know from permaculture that the creation of a difference implies the activation of a variable that impacts other lines of variations. This makes the map of an issue unstable, since feeling its borders constitutes a decisive challenge in a politics of justice. A necessary challenge: learning to see with prosthetic eyes is not synonymous of infinite connection, but it means cultivating partial connections and responsible cuts. Partiality matters in a politics of justice. Taking part in certain compositions rather than others, cultivating situated accounts rather than others, partial connections are not a political call for infinite connectivity.

Permaculture and the knowledge practices of SJRS teach me that a finite idea of justice brings with itself the very fact that any recuperation is a matter of partial recuperation. Permaculture is a culture of modest intervention. If it is true that there are no situations in which you can't work, on the other side you make a difference through participating in a process of modification and composition in which it is possible to modify something, not everything. Partial recuperation means accepting the partiality of every action of justice, accepting the idea that every material intervention is a modest intervention and that – when politics comes to matter – none has the power to take the place of the universe.

AFTERWORD

This thesis has explored different ways of theorising, starting from heterogeneous and situated practices, what 'acting with' can look like. Dislocating this question in different locations, ecologies of making and ethics of doing, I have tried to understand something about relations. Or better, I have tried to understand relations via the preposition 'with'. The preposition 'with' is explored starting from different and partial accounts of practices and stories of interaction, materialization and mattering. These accounts have been collected through a multi-sited ethnography that brought me to an ecovillage in Italy, to many makerspaces in the US and in Europe, to offices and university rooms of Santa Cruz, to cafes, libraries, streets and squats of Madrid and Barcelona. Travelling amongst a significant number of locations, what forced me to rethink the question of the commons through relations was the feeling that what allows all my practitioners to construct, perform and enact various kinds of entities – a landscape in permaculture, a campaign inside a social movement, an object via hacking other objects, a conversation about justice in an educational setting – is their capacity to experiment with ways of relating with 'significant' others, both humans and more-than-humans. Analysing my data I had the feeling that, although I started from different ecologies of making and from different material constraints, the ways in which a body is populated by the active presences that it can feel within an active observation in permaculture, the ways in which an active presence – for example, a matter of concern – is welcomed in an academic conversation or in a political debate on Twitter have something in common. These 'ways' are modes; modes of relating. Letting 'significant others' enter into a process of materialization, giving them a power to act, to reconfigurate a situation via adding dimensions, making a situation 'thicker' is a mode of attention in which relating becomes a way of constructing *with*.

So, 'with', a preposition that evokes union – the federation of different entities – in our first understanding means conjunction. An accumulation of possible conjunctions that – as we have seen developed in Chapter 6 an ontology of relation called 'medial ontology' – sometimes have the power not just to associate pre-existent entities, but to reshape them via their relation. Hacking and permaculture are both techniques of conjunction. Or better, they are practices of material composition in which to experiment with how something can create a symbiotic relation with something else. But hacking and permaculture taught me that not everything fits with everything.

Rather, some things fit, or could fit, with something else. Infinite connectivity, as Marilyn Strathern (1996) in her 'Cutting the network' reminds us, is not a good politics of connectivity. Taking part in certain compositions rather than others: this is the art of ecology and another meaning of the preposition 'with'. Constructing with something or someone rather than with others. The art of material composition is demanding; it demands that we do politics by constructing ecologies of proximity in which something has value not just '*per se*' but in relation to something else.

Ecology is more than a metaphor here, exactly because the emersion of an entity brings with it a series of consequences for other entities. Experimenting with interdependencies in hacking and permaculture is a risky game and most of the time we don't know in advance the material and ecological consequences immanent to a new composition. Staying with this kind of risk, and with the many possible vulnerabilities implied by acting, is the everyday necessity of a politics of matter. At this point we could ask what justice means when politics comes to matter, when – in our technoscientific era – justice needs to be understood from within the processes of materialisation that create entities and ecologies. The Science and Justice Research Center taught me that taking account of consequences is a matter of justice. 'What are we doing?' Taking this question seriously in the middle of the many technoscientific transformations that are characterising our contemporaneity is what Maria Puig de la Bellacasa (2013) asks us to do: 'Think we must!'. According to Hannah Arendt (2006) this is one of the few weapons that we have in order to resist what she has called the 'banality of evil'. Thinking here means thinking with the active presence of those that may turn out to be affected by the consequences of certain decisions. Justice is what allows us to create forms of self-regulation, developing an ethic capable of an experimental invention of constraints without advocating the authority of an arbitrator. But justice can be more than a force, not just operating on our collective ability to develop complex accountabilities or a lure for the invention of ethical constraints. Justice can be a force for action, for crafting ecologies of living that are thick enough, rich enough and responsible enough for cultivating modest flourishing, for materialising alternative forms of existence. Since a politics of worlding refers to the power of difference, justice in a politics of worlding consists of 'enacting justice' by making material differences with the many significant others that are – here and now – suffering from the everyday consequences of power differences.

Thinking about activism and movements through the materialisation of alternatives rather than via resistance, my thesis constitutes an invitation to rethink the region of intelligibility in which the politics of social and more-than-social movements (Papadopoulos 2015) are conceived. In this sense I want to contribute to an understanding of social movements under new lenses. In social movement studies, social movements are often conceived for their capacity of enacting forms of contentious politics. Analysed as the bearer of political demands, whose goal consists of reshaping the political agenda of the governing, the capacity of movements to act is prevalently seen in relation to the governed and governing dialectics. My thesis, instead, insists on showing how – even independently from the emersion of moments of frictions, conflicts or political demands – a series of social, ecological and technological movements are enacting their politics of transformation irrespective of the relations between governing and governed. This is not to say that these movements do not care at all for this dialectic or that they are totally independent from it, but that it is crucial to identify that this is not their main objective. When the goal of a movement consists first of transforming ways of relating to significant others – for example transforming human relations' to land and their inhabitants – its constituent force of crafting worlds and experimenting material alternatives can not be ascribable to a dialectic between constituent and established powers. When politics comes to matter, everyday and mundane practices of material and ontological transformations come first.

A consequent contribution of my thesis is offered by the possibility of thinking through a politics of the commons beyond the paradigm of the 'autonomy of the social' and its insistence on the question of social power. Without ignoring the relevance of the practices of struggles against forms of exploitation, domination and subjection, this thesis represents an invitation to look at the contemporary movements starting from their capacity to invent and experiment new forms of relationality, constituent pragmatics capable of enlarging our understanding of what 'acting with' could mean. Theorising the worlding of politics from a starting point of the power of relations, rather than from relations of power, is not a way of ignoring the many and significant injustices that populate our contemporaneity. Rather, it constitutes an invitation not to give to injustices the power to make politics a matter of war; or, even worse, to give to the many violences of this world the power to anaesthetize our capacity to feel the active presence of the many significant others that populate our worlds. Thinking about commoning as a politics of 'acting with' constitutes, for me, a force for resisting both

these risky temptations; and maybe for changing some of the conditions of these injustices by experimenting with forms of solidarity and ways of relating capable of creating worlds thick enough, resilient enough and rich enough for cultivating modest happiness for all the entities that populate these worlds.

Following permaculturists, hackers, activists and committed scholars, during this thesis I learnt from them that each modest practice of transformation needs to be understood starting from its specificity, appreciating the local and situated ecologies in which fabricating sustainable alternatives matters. Reconfiguring what matters in a practice – for example in growing cereals, fruits and vegetables – via recognising the active role of a multitude of human and more-than-human entities and experimenting with other ways of relating with them, permaculture is a movement that is transforming the ways through which humans relate to soil, landscape and their inhabitants. Permaculture constitutes a way for experimenting a form of agriculture that radically puts into question both the regime of knowledge and the practices of modern industrial agriculture. By inventing new institutions of open-code – new platforms of knowledge sharing and laboratories of cooperation – hackers are enlarging the autonomy of the distributed invention power, generating new use values in interaction with human and non-human entities. The development of the culture of open source and of peer-to-peer production is redefining strongly the forms of access to knowledge and culture, putting in tension the forms of social relations that characterised modern industrial manufacturing production and its proprietary regime. Via the experimentation with forms of distributed democracy, the 15M movement shows us the possibility of experimenting new forms of acting together and new democratic intensities not attributable to the logic and the pragmatics of the modern and representative democracy. And by refusing 'the culture of no culture' the SJRC is developing a form of knowledge production in which science cannot be conceived without its socio-ecological and material consequences. Even if they start from different contexts of practices, in each of these sites, the experimentation of forms of commoning depends on the capacity of reclaiming an immediate relation with significant others, reworking the ways through which heterogeneous entities relate to each other and creating worlds, new ontological conditions of living that affect the existence of the many inhabitants of these worlds. Reclaiming, reworking, reworlding: this is what a politics of commoning in technoscience demands us to do, starting from specific nature-culture practices.

The field of research of Science and Technology Studies (STS) in the last twenty years has offered many tools of knowledge and methodologies to reflect and understand how much relationality matters in thinking through a radical politics of transformation. What my exploration through this thesis leaves to me as an open question, and as next step to take, is experimenting with significant others practices about how knowledge production can be used as a tool for creating new everyday and more-than-knowledge practices. In other words, this thesis presents a challenge to me: one of undertaking practical experiments in which knowledge can create productive concatenations and new forms of relations – within, but at the same time beyond, the boundaries and the constraints of academia – with some practices of justice that crisscross our common worlds. Rather than just thinking with and offering an account of practices of transformation, I want to develop a project in which a practice of research can be experimented with as a more-than-knowledge intervention. For example, in recent years the category of Anthropocene is flowing between natural and social sciences, humanities and arts and is strongly affecting the cultural debate both inside and outside academia. Since the industrial revolution a new telluric force has emerged on Earth. According to several geologists we are living in a new period of geological time called the Anthropocene. An era characterised by the fact that, for the first time in the planet's history, human beings and their habitus are the main drivers of environmental change, with a long series of consequences for the biological, chemical, geological and climatic composition of Earth. The impact of such a telluric force called humans is deeply and violently transforming habitats and species from one antipode of our planet to another: climate change, the sixth mass extinction and the geologic traces of atomic weapons testing programs are just some of the traces of the destructive force of humans. What does it mean to act in the Anthropecene? And how can knowledge practices create modest spaces of intervention in this situation? I would like to develop a project in which a way of dealing with these questions is constructed in a local perspective and starting from a situated practice of transformation.

A compost project inside the campus of, for example, the University of Leicester could be a modest intervention in this direction. The aim of this project would consist of composting our waste and in creating a chain of resilience between the waste of the University and several experiments of organic and community-based food production in and around the city of Leicester. By organising a material transfer, this project would also create a space of circulation of knowledge, ethics, practices and aesthetics of

composting. ‘Composting the University’ in this way would become a laboratory of fabrication/fabulation in which to experiment with the many dimensions of the material-semiotics of composting. A space of circulation where the activity of collecting waste is placed side-by-side with the organisation of cultural events, conferences, workshops and exhibitions. An action-based research project, whose main goal consists of the creation of this space for action and knowledge production. In this way it will be possible to add something to the ecological, social, political and cultural landscape of a campus and, at the same time, document, comment, reflect and write on the many ways in which composting could become more than a metaphor in our ecological future.

As I have described in this thesis, a multitude of movements are reinventing technoscience from within. Similarly, and along with these heterogeneous movements, academia can be conceived as a territory of political action in which experimenting with unknown alliances with significant practices of material transformation. In particular, ‘involving’ STS in more-than-knowledge-practices can be a way for experimenting with a form of knowledge production forged inside processes of making alternative technoscience. In this way, the production of alternative knowledge is a lure for becoming experimenters, practitioners and commoners.

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