Ripensare la 'natura'
Rethinking 'Nature'

1. Questioni aperte/Burning Issues

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1. Burning Issues/Questioni aperte

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Indice

Flavia Monceri
Premise/Premessa, p. 5

Ted Benton
Get Real! Nature without Scare-Quotes, p. 7

Alexander Riegler
Towards the Consistent Construction of Nature, p. 33

Andrea Aguti
Perché e come ripensare oggi la natura, p. 45

Riccardo Manzotti
Galileo Debunked: A Neutral Foundation for Nature, p. 57

Marta Bertolaso
Why It Proves so Difficult to Pin Down a Definition of Nature, p. 75

Joseph A. Raho
Rethinking Nature Through Synthetic Biology, p. 93

Koen B. Tanghe
Robots on Spaceship Earth: A Theoretical Plea for Machine Metaphors, p. 113

Robert Zwijnenberg
Biotechnology, Human Dignity and the Importance of Art, p. 131

Theodore Grudin
The Artinatural and the Importance of Nature Studies, p. 149

Lars Tønder
Public Reason Renaturalized, p. 165

Flavia Monceri
The Nature of the "Ruling Body": Embodiment, Ableism and Normalcy, p. 183

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Premessa / Premise

The notion of nature is one of the most recurring, and perhaps questioned, notions in Western thinking, from «hard» sciences, to philosophy, human and social sciences. Although its definition was never obvious, nature currently seems in need of a more radical rethinking, also due to the increasing relevance of research fields that compel to its revision. This is just the goal of the present issue of «Teoria», which also aims to let a number of hints emerge to correct, modify or even replace current definitions and understandings of nature with more adequate ones to constitute an effective reference for the problems of our time.

The essays in this collection are the result of an international Call for Papers, which had a very important response in terms of number and quality of the submitted abstracts, as further proof of the fact that rethinking nature is in and for itself one of the burning issues of our time. And just by virtue of the number, quality, and interest of the submitted papers, it was decided to devote to «Rethinking 'Nature'» both issues of «Teoria 2014». Hence, to this first issue on «Burning issues» a second one will follow on «Authors and problems».

Il concetto di natura è uno dei più presenti, e forse anche più dibattuti, in tutti gli ambiti del pensiero occidentale, dalle scienze «dure», alla filosofia e alle scienze umane e sociali. Sebbene la sua definizione non sia stata mai pacifica, attualmente esso sembra aver bisogno di un ripensamento più radicale, dovuto anche alla sempre maggiore rilevanza di ambiti di ricerca che impongono una sua revisione. Proprio tale revisione è lo scopo che questo fascicolo di «Teoria» si prefigge, insieme a quello di far emergere una serie di spunti di riflessione per correggere, modificare ov-

vero anche sostituire le definizioni e le concezioni correnti di natura con altre più adeguate a costituire un riferimento efficace per i problemi del presente.

I saggi contenuti in questo fascicolo sono il risultato di un Call for Papers internazionale, che ha avuto un'importante risposta in termini di numero e di qualità degli abstract proposti, a riprova del fatto che ripensare la natura è di per sé una delle questioni aperte del nostro tempo. E proprio in virtù del numero, della qualità e dell'interesse dei contributi proposti, si è deciso di dedicare a «Ripensare la 'natura'» entrambi i fascicoli di «Teoria 2014». Di conseguenza, a questo primo fascicolo sulle «Questioni aperte» ne seguirà un secondo incentrato su «Figure e problemi».

Flavia Monceri

T

Get Real! Nature without Scare-Quotes

Ted Benton

Introduction: the complexity of "nature"

Nature, Raymond Williams once remarked (Williams 1989: 219), is the most complex word in the English language. I suspect this applies to other languages, too. If we consider the many different ways in which we interact with non-human beings, both living and non-living, the ways in which our lives are dependent upon and tangled up with forces and processes that lie outside our control (even our understanding), and the ways in which we ourselves may be thought to be part of a wider system of forces and relations – any concept doing service to grasp all of this would have to be complex.

We might begin to explore some of this complexity by considering the contrasts that are made, in different contexts, by using the term "nature". Perhaps the most general and inclusive distinction marked by the concept is that between the natural and the supernatural. As I write from a secular perspective, nature in the sense indicated here means "all that exists": the sum total of the matter and energy, in their various forms and modalities, that constitute the universe, and the laws governing their behaviour and transformations. Nature in this sense includes sub-regions of more-or-less structurally complex combinations with associated emergent properties: for example living organisms, their biotic communities and the ecosystems formed out of their combinations with physical and chemical elements and processes.

In this all-inclusive sense, nature encompasses humans, their populations, societies, cultural creations and so on. However, there are contexts in which humans, and especially their social, cultural and psychological processes and relations, are contrasted with nature as it is, or was, independently of all human agency: nature versus "culture", or "nurture". Taken

strictly this must involve taking out of the denotation of "nature", all domesticated animals and cultivated crop plants, and horticultural, agricultural and urban landscapes since all of these are shaped by human social practices of one sort or another. But what of other features of the non-human world that have been affected by human activity, although unintentionally or accidentally, and, perhaps, unknowingly? What of atmospheric pollutants such as CFCs, CO2 and other greenhouse gases, waste effluents in the marine environment, ecosystems variously degraded or transformed by human activity? The tendency is to include these still within nature, as opposed to culture, but to regard them as nature modified, degraded or damaged.

Yet again, relatively undeveloped or "green" open spaces are often designated as natural. Such spaces may harbour a relatively high diversity of plants and animals, few or no buildings or busy roads, and have "fresh", unpolluted air. In Britain "nature" in this sense is roughly equivalent to the "countryside", but some urban environments include informal green spaces. Some of these have some significance in planning policy as, like access to the countryside, they are believed to provide benefits in the form of health and well-being to local residents. Some sociologists of a "constructionist" persuasion have tended to present it as a great insight of the social sciences to point out that such spaces are no longer natural, but bear the imprint of past – often many centuries of past – human transformative activity. There is, they argue, no longer any such thing as "nature" (for example, Ulrich Beck: «Nature is not nature, but rather a norm, memory, utopia, counter-image. Today, more than ever, now that it no longer exists, nature is being discovered, pampered». See Giddens 1994: 206). They correctly point out that more-or-less the whole of the earth's surface, including the oceans, as well as the atmosphere, has been modified to a less or greater degree by human activity.

Of course, planners, public health specialists, environmentalists, and lay publics in general did not need sociologists to explain this to them. Most of us recognise how pervasive human impacts on non-human nature have been. However, it is still important to be able to make distinctions between the qualitatively and quantitatively different sorts of impacts those activities have had. There is a difference, for example, between living in a dense, high-rise housing estate, with unceasing air and noise pollution from heavy traffic, and living in a small village, or suburban settlement, with large gardens, quiet lanes and footpaths through flowery downland, or with access to upland fells and mountains. The latter sorts of living-environment all show signs of past and present human activity – open

spaces may be grazed by domesticated animals, grassland may be managed for hay or silage, woodlands may be coppiced or pollarded for timber products, and arable fields may be separated by hedgerows or stone walls. Even so, that human activity will itself bear the signs of necessary adaptations and limits imposed by conditions not humanly produced: climate, altitude, aspect, soil properties, populations of wild species that have become adapted to these humanly modified habitats, and, ultimately, the original gene pools of the wild ancestors of domesticated animals and crop plants. True, technological innovation in agriculture, especially, progressively overrides its naturally given limiting conditions – but it does not do so without a corresponding response from what is naturally given. This may take the form of deteriorating soil properties, pollution of water-sources by nutrient and pesticide run-off, excessive generation of greenhouse gases, decline of "ecosystem services" and so on.

Finally, we refer to the "nature" of something as a specific sub-set of its characteristics. In this usage, the term nature may be serving at least three distinct purposes, and these are quite often confused with one another. First, the properties that are singled out may be ones that distinguish this type of being from other, perhaps superficially similar, ones. So, for example, the shape of the antennae or details spotting on the wings of a butterfly might serve to allocate it to one species rather than another. Second, the term may be used to characterise an individual's persistent or enduring character or disposition, despite occasional departures or lapses: he's a good-natured dog, despite the fact that on this occasion he bit you because he was alarmed, confused etc. The third use refers to fundamental properties (often unobservable ones) that can be used to explain the empirically observable flow of behaviours and dispositions of the being whose "nature" is under consideration. So, for example, the chemical composition of a drug will be used to explain its effects in combating pathogens, interacting with other drugs, producing a range of "side-effects" and so on.

1. *Nature and human nature: realism versus reductionism*

Confusions among these different uses of the expression "the nature of" have been important in shaping rival traditions in the human social sciences. Two of these are of special significance:

1. a confusion between nature as distinguishing characteristics and nature as fundamental (explanatory) properties, and,

2. misleading ways of thinking about the relation between fundamental properties and the observable flow of events or behaviours.

The first confusion has led one pervasive tradition in the human sciences to treat human capacities that distinguish us from our nearest non-human relatives as, at the same time, fundamental properties. So, human capacities for rational thought, for aesthetic creation, conventional/ normative regulation of behaviour, sociability, tool-use, or, especially, complex, grammatical language are taken to be not only *distinctive* but also *fundamental* to understanding what we are. Some traditions of sociology, anthropology and psychology have accordingly developed theoretical approaches that give priority to symbolic practices, meaning-systems, cultural forms and patterns of social relationship in abstraction from their basis in either bodily processes or bio-physical external conditions.

These hermeneutic-humanist traditions have, of course, provided great insights and sustained valuable research traditions. However, they are particularly challenged by evidence, often brought into the public domain by social movements, that ecological, physiological, anatomical and developmental conditions and processes are deeply implicated in the shaping of mental life, cultural forms and human well-being in general. Once this is recognised, the sociology of inequalities, for example, is able to investigate the effects of poverty via its impact on developmental processes, on slowed or defective mental functioning, resistance to disease and reduced self-regard (Benton 1991; Dickens 2004, 2009). Inequality is more than disparity of income and wealth, and also more than its socio-cultural dimensions, its "hidden injuries" (Sennett and Cobb 2008). It is also experienced as differences of housing quality, of exposure to environmental risk and hazard, of access to spiritually rewarding engagements with the natural world, and of opportunities for full mental and physical health (Martinez-Alier 2002). Now, more than ever, we are confronted by the high probability that current patterns of socio-economic development are taking us towards ecological catastrophe on a global scale. Hermeneutic approaches to culture have an indispensable part to play in understanding the various forms of denial and resistance to this dire predicament. They may also have much to offer in meeting the challenge of developing the necessary cultural shifts and policy orientations to address the ecological crisis. However, they have much less to offer to the equally necessary tasks of analysing the scale and dynamics of the socio-ecological metabolism itself, and evaluating the viability of rival perspectives on the

possible alternative ways of living in relation to the rest of nature that are urgently needed.

The second area of confusion is at work in the formation of an alternative tradition of thinking about "human nature", fundamentally opposed to the hermeneutic. Scientific endeavour often progresses by revealing that a hitherto puzzling field of phenomena can be explained in terms of a hypothetical mechanism. In some cases the explanatory mechanism may operate at the same level as the phenomena it is used to explain. A good example is the evolutionary mechanism of natural selection. Differential survival and reproductive rates of organisms with varying heritable attributes explains long term shifts in the character of the populations to which they belong. Everything is, so to speak, "on the surface", and the explanatory strategy works, even though we may not know anything about how variations are actually produced and why some, but not all, are heritable. Indeed, neither Darwin nor Wallace did know the answer to these questions, and at the time accepted a theory that was incompatible with their own accounts of natural selection (Benton 2013).

However, following Weismann's demonstration of the separation of germ and somatoplasm, the recovery of Mendel's experiments, and the development of modern genetics the mode of operation of natural selection was itself explicable in terms of more fundamental processes underlying reproduction and development. But in this case not everything is visible, and "on the surface". Appeals are made to what at first are theoretically invented hypothetical entities and processes. Only later are these identified empirically, and then, still later, themselves further analysed as sequences of the highly complex molecule DNA.

Now the question emerges as to how to interpret the relationships between the successive "layers" of nature that are exposed by scientific investigation. If entities and processes at the "deeper" levels explain, or are understood to be more fundamental than, those of "higher" levels then it might be thought that descriptions and explanations that operate at higher levels no longer have any work to do – they served a provisional purpose and have now become superseded. This "reductionist" philosophical move has been widely used by evolutionary biologists not only in making ambitious claims to explain human psychology and social behaviour, but also in effectively shifting the research agenda of the life-sciences to the molecular level. One powerful critique of this version of reductionism is given by Steven Rose (1997):

Different scientific disciplines, from the social to the subatomic sciences, deal with different levels of organisation of matter […]. Thus atoms are less complex than molecules, molecules than cells, cells than organisms, and organisms than populations and ecosystems. So at each level different organizing relations appear, and different types of description and explanation are required. Hence each level appears as a *holon* – integrating levels below it, but merely a subset of the levels above. In this sense, levels are fundamentally irreducible; ecology cannot be reduced to genetics, nor biochemistry to chemistry (*ibid.*: 304).

2. *Society and "external" nature*

The above exploration of different usages of the concept of "nature" yields two very broad areas of enquiry, both of which are of great relevance to sociology and other social sciences. The first we might call "internal nature". How we think of human nature, as to varying degrees defined by genetic constitution, by psychological or behavioural dispositions, or by interaction with social, cultural and biophysical environments through life, and so on will shape our commitment to one or other of the rival approaches to explanation. My concern in the rest of this chapter will be, rather, with nature as "external" nature: that is, with the complex structural and dynamic interactions between human socio-economic forms and their biological, chemical and physical conditions, contexts and effects. Of the different uses of the term "nature" that I distinguished at the beginning of this chapter, the first three are of most direct relevance. These are:

1. "nature" as all that exists, including humans and their activities;
2. "nature" as what exists, or has existed, independently of, or unaffected by, human agency;
3. "nature" as those aspects or regions of the physical world that are *relatively* unmodified by human activity. This includes those urban, suburban, and rural landscapes, and niches within them, that continue to provide conditions of existence for communities of non-human species of animals and plants.

Darwin, Wallace, humans and nature

Darwin's *Descent of Man* (1871) is a useful touchstone for the first way of thinking about humans in relation to (the rest of) nature. Darwin does not hesitate to assert human distinctiveness: our highly evolved sociability,

intelligence and capacity for moral progress. However, these distinctive traits can all be understood as having evolved by degrees from abilities shared with primate ancestors, and as having evolved by the operation of causal mechanisms also at work in the evolution of all other species. Darwin's thesis is buttressed by his sympathetic recognition of intelligence, sociability, emotional complexity and even rudimentary morality in other species. Moreover, Darwin's recognition of the intertwining of the conditions of existence of species through relations of predation, parasitism, mutualism, pollination and so on doubly binds humans to the rest of nature: through both evolutionary kinship and ecological interdependence. In Darwin's thought humans are radically deposed from their hubristic status as a kind of being set over and above the rest of nature. We are part of nature and governed by its laws, just as are all others.

However, Darwin's friend, and the independent founder of the theory attributed to them both, Alfred Russel Wallace, drew back from this thorough-going naturalism. Although he never retreated from the view of humans as descended from ape-like ancestors, Wallace became sceptical of his own earlier claim that natural selection could have been the sole mechanism of this transition. From the late 1860s Wallace became convinced that certain "higher" human faculties could not be explained in terms of natural selection. These included aesthetic and moral attributes such as love of nature, artistic creativity, mutual respect and self-sacrifice for moral principle. Curiosity about ultimate truths and the meaning of life, too, Wallace takes to be a distinctively human trait, inexplicable as an outcome of natural selection acting alone.

Wallace offered a scientific case for his (limited) anti-naturalist view of human evolution and nature, but added an appeal to spiritual guides as his complement to the inadequacies of natural selection. Not surprisingly, this departure from their shared naturalism alarmed Darwin and others in their circle. However, divested of its spiritualist aspects, Wallace's position has significant merits. Wallace could and did maintain his commitment to the centrality of access to land and material resources as indispensable conditions for human wellbeing. He used his scientific credentials to campaign against economic and environmental injustice, and advocate land nationalisation, de-colonisation, women's rights and socialism over more than a half century. Against more familiar versions of "social Darwinism", Wallace's sensitivity to human distinctiveness held open a conceptual space for non-reductive approaches to economics, sociology and anthropology.

Wallace's view that humans are, in some respects, a "new order of being"

has important implications for the ways we can think about the relation between human socio-economic forms and the rest of nature. For Wallace, even in his earlier, more naturalistic phase, the combination of inventiveness and high capacities for social coordination would have produced a transformation in the relationship between hominids and their material conditions of existence. Advances in domestication of other species and in agriculture have lead to a progressive displacement of natural selection in favour of "human selection". To this extent, Wallace shared the widespread "prometheanism", or technological optimism, of his century, but he also railed against the over-crowding and unsanitary living conditions of workers, and, towards the end of the 19th century, launched a powerful environmental critique of the over-exploitation of mineral resources and of deforestation in the tropics (Wallace 1898; Benton 2013).

Three aspects of Wallace's thinking are directly relevant to any adequate approach to integrating social and ecological insights:

1. there is no single "human ecology", but numerous qualitatively different ways in which human societies combine social labour to acquire or produce the material means of meeting their needs;
2. these different ways of applying human activity to naturally given conditions have consequences both for the quality of the human life that they sustain (including patterns of inequality) and for the continuing viability of the (external) naturally given conditions of that activity;
3. beyond the capacity of a given mode of interaction between society and nature to meet its material needs, human wellbeing requires opportunities to take spiritual and aesthetic nourishment from our various connections to external nature.

Sociology and ecology

The founders of sociology and anthropology as distinct and autonomous disciplines have bequeathed to their successors a fundamental conceptual division between the natural and the social. While this has provided a powerful resource for resisting various forms of biological, even genetic, reductionism, it has tended to obstruct or marginalise full recognition of the significance of human social interaction with, and ultimate dependence upon, external nature. Human social and cultural life has often been understood as if it were reproduced in a physical and ecological vacuum. Pioneers in overcoming this dualistic approach were American sociologists Riley Dunlap and William E. Catton, with their critique of the «human

exemptionalist» paradigm of sociology and advocacy of an alternative «New Ecological Paradigm» (Dunlap and Catton 1979; Dunlap 2002). There have been other sustained attempts to break down the inherited categorical opposition between nature and society, most notably the Actor Network approach associated with Latour and others, and versions of "modernisation" theory such as "ecological" and "reflexive" modernisation.

3. *An ecological historical materialism?*

The classics

These are all welcome developments, as serious attempts to meet the challenges of environmental degradation and the rise of environmental politics. However, the approach I will try to present here derives from an intellectual tradition that was, from the beginning, not burdened by nature/society dualism. This is the tradition of historical materialism, founded by Marx and Engels, but substantially developed and reworked by subsequent thinkers – most notably, in this context, by environmentalists and life-scientists. The work of Marx and Engels themselves incorporates all three of the insights I derived from Wallace's thought, above, together with a more developed account of the political economy of capitalism. Marx's early philosophical notebook, the *Paris Manuscripts* of 1844 includes some deep but inconsistent thoughts on the place of humans in nature (see Benton 1988, 1993). This paragraph gives a useful insight into Marx's thinking at that time:

> Nature is man's *inorganic body* – nature, that is in so far as it is not itself human body. Man *lives* on nature – means that nature is his *body*, with which he must remain in continuous interchange if he is not to die. That man's physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature (Marx and Engels 1975 vol. 3: 276).

Key ideas here are Marx's insistence that humans are part of nature – not set over and above it, that continuous interchange, or "metabolism" with the rest of nature is essential to human life, and that human "spiritual life" is lived in relation to the rest of nature. In other parts of the *Manuscripts* Marx develops his account of the aesthetic and scientific ways in which nature is apprehended, and especially of the ways in which sociohistorical development enhances human sensory encounters with the nonhuman world:

Only through the objectively unfolded richness of man's essential being is the richness of subjective *human* sensibility (a musical ear, an eye for beauty of form – in short, *senses* capable of human gratification, senses affirming themselves as essential powers of *man*) either cultivated or brought into being. The *forming* of the five senses is a labour of the entire history of the World down to the present (*ibid.*: 310-312).

However, this early concern with the sensory, cultural, aesthetic appropriation of non-human nature is rather displaced in Marx's later theoretical work in favour of analysis of the structures and dynamics of the material, need-meeting "metabolism" between human socio-economic forms and the rest of nature. The key concept, here, is that of the «mode of production». This is Marx's term for the whole structure of relations and practices through which the labour of a society is deployed and coordinated to work upon nature and distribute the product of that work to meet subsistence needs and wants. A mode of production in this sense is formed of the combination of «forces of production» (tools, instruments, machinery, "raw" materials, energy, domesticated species, divisions of labour/ specialist skills, etc) with «social relations of production» (essentially relations of power, domination or ownership over the combined workers and/ or the materials, instruments and products of their work).

Variations in the relations and forces of production and in the character of their combination serve to distinguish, in this tradition, the different forms of human social life – feudal, capitalist, ancient, "primitive" communist, etc. – partly in terms of their internal social structures, but also in terms of the way those social structures intertwine with material resources, artefacts, other species and so on through which the necessary metabolism with nature is conducted. This dual character of modes of production – as social systems in which power is deployed in the creation and distribution of wealth as well as modes of application of human labour to nature to meet human requirements – places human social interaction with nature at the core of social life whilst simultaneously providing analyses of the historically specific social relations and divisions involved in that interaction.

This approach differs from ones that rely on systems theory, or on the concept of modernisation, in that it postulates that at least some modes of production are characterised by internal contradictions. A single system of coordination of labour in relation to nature may generate tendencies and counter-tendencies whose conflict may lead to destabilisation of the system as a whole. In "classic" versions of the approach, as applied to capitalism, the contradictory character of the system generates social and

political divisions between working and capitalist classes, while the play of tendencies and counter-tendencies renders the system vulnerable to recurrent crises. Depending on the available strategic options and the prevailing balance of forces among structurally opposed groups, these crises may be temporarily resolved by restructuring (as, e.g., in western Europe in the period following the Second World War), or they may give rise to prolonged periods of instability and disintegration. At the limit they may give rise to transition to a qualitatively different pattern of socio-natural relations.

A significant limitation of the classic version of the theory was its tendency to give exclusive attention to the patterned conflict between social classes as defined by their relations to the means of production: ownership, on the one side, alienated and exploited labour on the other. These conflicts are, of course, of great significance, including struggles over wages, the length of the working day, conditions of work, job security, the introduction of new technologies and working practices, the right to organise and so on. However, the approach risks marginalising (at least!) two other structural sources of social inequality and division. The first of these we might call the "social relations of reproduction". Under capitalism the reproductive unit is the household, or family, living as an independent unit, and deploying various kinds of labour that are not directly paid for in monetary terms. The domestic, nurturing and reproductive work carried out in the household is indispensable to the availability of wage-workers on a day-by-day and generation-by-generation basis, but the resources that sustain it do not figure directly in the calculations of the key economic agents (owners or managers of capital). The shifting and often contradictory relations between household and formal economy may give rise to conflicts around the gendered division of labour, as well as overdetermining and modifying in various ways the character of class conflicts as narrowly defined.

The second relatively neglected structural source of inequality and division is best understood on the basis of the mode of production considered as a socially coordinated material appropriation of nature. Again, in the specific case of capitalism, monetary calculations shape patterns of investment, and price fluctuations in markets determine the patterns of distribution and circulation of goods and services as "commodities". The employment and price of labour (power) is governed by the same forms of monetary calculation. However, these patters of distribution and flow, as well as the practices that produce the goods and services, can be described in non-monetary terms – as quantities of goods of various sorts, appropriate to the meeting of needs and wants of various kinds, drawn from sources in

nature of various kinds and altered in various ways by means of the application of differently skilled human labour using instruments of various kinds. The repeated use of the word "various", here, draws attention to the fact that, as understood in this way, the production, distribution and consumption of goods and services necessarily involves innumerable decisions of a qualitative kind. Needs are many and various, and one sort of need will be met by only a specific range of goods or services, having the appropriate properties. In the tradition, the cluster of properties that make a commodity a means of satisfying a need or want is called its "use-value" (as distinct from its "exchange-value", its value as something that has a monetary value, can be exchanged for something else in the market, and is thus a purely quantitative measure). Similarly, the process whereby workers use energy, skills, knowledges and powers of cooperation of specific types and in specific proportions to produce specific products with qualitatively distinct use-values, is termed the "labour-process", as distinct from the "social process of production". This latter refers to the same activity, but under its character as the deployment by capital of a set of monetary costs with the purpose of gaining a financial profit.

This much is already theorised in the classics of the historical materialist tradition. My argument here is that these concepts and distinctions have enormous potential for understanding the relations between specifically capitalist socio-economic formations and their naturally given conditions. Some recent commentators emphasise the extent to which Marx and Engels themselves recognised and at least partially realised this potential (Burkett 1999, Foster 2000). It is certainly true that Engels, especially in works such as *The Condition of the Working Class in England* and *The Family, Private Property and the State* did provide a pioneering study of the class dimensions of environmental degradation associated with urban industrial capitalism, as well as developing a distinctive account of the household and the state in relation to the formal economy. Marx, too, later in his life, developed an environmental critique of the "metabolic rift" caused by the separation of town and country, resulting in urban pollution and the loss of soil nutrients (Foster, Clark and York 2010).

However, it is at least arguable that both theorists shared the widespread 19th century view of technological progress. They were certainly immensely impressed by the transformative power of technology as unleashed by the dynamic capitalism of their day:

> The bourgeoisie, during its rule of scarce one hundred years, has created more

massive and more colossal productive forces than have all preceding generations together. Subjection of nature's forces to man, machinery, application of chemistry to industry and agriculture, steam navigation, railways, electric telegraphs, clearing of whole continents for cultivation, canalization of rivers, whole populations conjured out of the ground – what earlier century had even a presentiment that such productive forces slumbered in the lap of social labour? (Marx and Engels 1969: 85).

According to some sympathetic readers (e.g. Eckersley 1992), the core of their objection to capitalism was the qualitative and quantitative impoverishment of the great mass of industrial workers in the face of the massive increase in social wealth produced by their labour. In more abstract statements of the approach, social relations of production are "progressive" while they foster the continuing expansion of human productive powers, but, at a certain point in their process of development they become "fetters", limiting the further growth of productive power, or "mastery" over the forces of nature. In this frame, the future socialist or communist society will have overthrown these fetters, not only allowing the results of scientific and technical advance to be shared by all, but also enabling the further expansion of social wealth: a realm of abundance.

Admittedly this is something of an oversimplification, and the works of both thinkers are littered with remarks which significantly depart from or qualify it. My main point is that there is no fully developed grasp of the intrinsic tensions between capitalism as a socio-economic system and the rest of nature (Burkett 1999 and Foster 2000 argue strongly against this). This is understandable in that the politics of inequality and poverty, including their environmental dimensions, were the key mobilizers of social and political conflict in their day. The character of capitalism as a globalising and restlessly innovating socio-economic system, with the potential to destroy as well as appropriate the rest of nature, was still in its infancy.

Polanyi, O'Connor: capitalism and nature

A major step towards a theory that could grasp both the socially and ecologically destructive tendencies of capitalism came in the work of Karl Polanyi, an economic thinker outside the historical materialist tradition. His identification of land, labour and money as «fictitious commodities» provided a powerful argument against what he viewed as a utopian belief in the feasibility of a fully self-sufficient market economy. A real commodity, in his account, is some good or service produced for exchange on the market. This is not true of money, whose quantity and value has to be

determined by political decision-making, nor is it true of land and labour. Although human labour is treated by employers as though it were a commodity, it is not produced as a commodity, but under quite different normative relations in households, schools, colleges and so on, and its employment is subject to high levels of public regulation in terms of workplace health and safety, working time, wage levels, sickness and unemployment compensation and so on. Land (and here Polanyi was thinking primarily of farming and food production) is likewise protected from the vagaries of full market freedom so as to sustain farm livelihoods and provide food security.

Of course, Polanyi was fully aware that attempts can be made to withdraw state regulation in these areas to expand the realm of free market exchanges. His argument is that the attempt to do this will prove to be self-destructive, as producing negative consequences and associated forms of resistance. Renewed state intervention, perhaps of a more extensive form, will be the political outcome. Indeed, the whole project would prove self-contradictory as extended state intervention would be required in order to enforce the withdrawal of the state! As he put it:

> Our thesis is that the idea of a self-adjusting market implied a stark utopia. Such an institution could not exist for any length of time without annihilating the human and natural substance of society; it would have physically destroyed man and transformed his surroundings into a wilderness (Polanyi 2001 [1944]: 3).

The US ecological Marxist, James O'Connor has developed a very similar critical understanding of the limits of markets as a way of grasping the inherent tendency of capitalism to degrade its own conditions of existence (O'Connor 1998). Again, the key idea is that of goods and services that are useful, even necessary, but which are not true commodities. These are treated under capitalism *as if they were* commodities, but are not, and could not be, *produced* as commodities. In developing his argument, O'Connor makes a clear distinction (which Marx and Engels did not do consistently) between the *process* of production, with its various means, raw materials, human agents, forms of cooperation, etc., and the *conditions* of production: that is, those things, relations and so on that are necessary for production, while not directly entering into it.

Three categories of conditions of production are directly relevant to our theme here. These are, first, those material and social practices through which the health, motivation, skills and bodily existence of the labour force is maintained and reproduced. As we saw above, many of the activities that

secure this essential condition for the capitalist economy are carried out primarily by women, and within institutional orders that do not operate as capitalist firms: in households, hospitals, schools, colleges and so on.

Second, the functioning of a complex economy requires coordinated provision of a great range of infrastructures: a transport system, a reliable network for energy supply, waste disposal systems, flood defences, emergency services, media of communication and so on. Again, provision of infrastructures may take the *form of* production of commodities for the market, but is never entirely left to the market, whatever the prevailing ideology. The third category of the conditions of production brings us more directly to the theme of this paper: naturally given conditions, such as geological formations, landscapes, climate, soil nutrients, diversity of life-forms, chemical composition of the atmosphere, ecosystems and "ecosystem services" such as nutrient, carbon and nitrogen cycles, pollination, decomposition and so on. These renewable and non-renewable "resources" are also not produced as commodities. In any ordinary sense of the word, they are not produced at all, although they may be both intentionally and unintentionally modified by human activity. Since these "gifts of nature" are generally available as "free goods" and so do not count as costs in the calculations of key economic actors, there is no restraint on their exploitation. The resultant tendency is over-exploitation and degradation.

For all three categories of conditions of production, for somewhat different reasons in each case, the dynamic tendency of capitalist accumulation is to degrade and undermine the very conditions upon which it depends: wages are reduced to a competitive minimum, with resulting degradation of the quality of family life and its reproductive role, residential districts tend to be over-crowded, polluted and squalid, infrastructures are badly maintained, waterways are polluted, biodiversity is reduced, ecosystems and natural cycles are disrupted and so on.

The analysis of these as inherent tendencies associated with capital accumulation justifies O'Connor in claiming them as a «second contradiction» of capitalism (the first being that between forces and social relations of production, yielding the class conflict between capital and labour). This second contradiction, between capital accumulation and its diverse social and ecological conditions provides O'Connor with an explanation of the basis for oppositional social movements, notably the womens' and environmental movements. In this framework these movements emerge as forms of resistance provoked by the tendency of capital accumulation to impact negatively on the life-experience of whole categories of the population. As

it degrades its own conditions, capital tends also to degrade the quality of life of its subjects.

Like Polanyi, O'Connor recognises that the destructive consequences of "leaving everything to the market" are never fully realised. In O'Connor's argument, the social and environmental movements complement the labour movement in prompting the state to intervene to ameliorate and set limits to the exploitation of labour, compensate for "market failures" in the provision of infrastructures and establish regulatory regimes to address environmental degradation. In his view, the implicit recognition is that capital accumulation must be set within powerfully enforced social parameters if it is not to put at risk its own existence as well as threaten the wider public interest. A broad red-green alliance brings the possibility and desirability of a transition to a sustainable socialist future into focus.

A sustainable capitalism?

Of course, to recognise environmental degradation as "market failure" is not necessarily to give up on the idea that markets can be fixed by markets. There is now a well-established discipline of "environmental economics", sometimes developed by, and even more often relied upon by, well-meaning environmentalists (this is to be distinguished from "ecological economics" – see Özkaynak, Adaman and Devine 2012). The non-marketed goods and services that are provided by nature risk being over-exploited because they do not figure as monetary costs. This is a market-failure, but there are two options for repair that seem consistent with the market ideology: one is to assign property rights to environmental goods so that owners have the right to charge for their use. Since many of these goods and services cannot be disaggregated, this option is of limited value (and highly vulnerable to ideological resistance where a valued public good is privatised). The other approach is to assign a notional monetary value to each environmental good and find ways (green taxes, tradable permits, etc.) of ensuring that economic calculations "internalise" the costs of using them.

Despite their seeming consistency with the free-market ideology of neoliberalism, these strategies necessarily involve significant political intervention into the way markets operate and are, in effect, covert versions of the "command and control" approach they claim to have replaced. At least, this *would be* the case if they actually worked. The relative power of business lobbies is generally sufficient to ensure that levels of green taxa-

tion or prices of tradable permits are well within their comfort zone. A stark example is the recent collusion between the cartel of energy suppliers and centre right parties in the UK. Public protests about profiteering by the energy companies and rising household energy costs were deflected onto the "green" contribution to retail prices, which were then withdrawn by government.

Apart from the purely practical obstacles to effective regulation by this route, there are also deeper objections. Basing itself on the assumption that non-marketed naturally-given goods and services can be assigned a monetary value, the concept of "natural capital" has been introduced to stand for the total contribution of nature to economic life (for example, Porritt 2005). Interestingly, this stands in contradiction to the most fundamental argument of the advocates of free markets. This is that only through the actual process of market exchange can the value of any good be determined. Any attempt to assign values objectively will necessarily fail to access the tacit knowledge and subjective wants of individual consumers (Hayek 1937, 1944). While this argument has only limited force in relation to consumer needs and desires, its parallel in relation to the (economic) value of nature is very powerful. Scientific knowledge is always limited and provisional. Until the discovery of the effects of CFCs in depleting ozone, and knowledge of the importance of ozone in shielding the skin from the toxic effects of high frequency radiation, these chemicals were considered inert and safe to use. Economic valuation of CFC emissions into the atmosphere would have had to be revised radically overnight in response to scientific discovery. More seriously, what if long-term accumulating sources of damage remain undetected until too late for them to be halted or subjected to market-based restraint? So much uncertainty surrounds the potential scale and distribution of the economic impact of such processes as depletion of biological diversity or anthropogenic climate change that any attempt to assign an economic value to units of biodiversity or greenhouse gas emissions must remain in the realm of inspired guesswork.

But there is a further strand to the argument. To assign an economic value to some good or service provided by nature, to treat nature as "capital", is to notionally commodify it. That is, to recognise it as something open for buying or selling, as if it were, like any other commodity, something that could be subject to adjustment of supply in relation to demand. If "the price is right", living species may be extinguished, beautiful landscapes obliterated, natural resources exhausted and so on. This is the risk that well-meaning environmentalists take when they adopt the discourses

of the powerful. To insist that some elements or aspects of nature are uniquely valuable, should not be irreversibly damaged, and so on, requires practices of valuation which eschew and transcend the language of prices and markets.

Building from O'Connor

While I find O'Connor's framework very illuminating indeed, I will suggest a few further considerations and elaborations. This takes me to a further revision, or elaboration, of the analysis I have taken from O'Connor. He, like Polanyi, seems to suppose that the forms of destruction and degradation that stem from the attempt to commodify things and beings which are not, and cannot become, true commodities will spontaneously engender social and political resistance. This, in turn, it is supposed, will result in a political intervention to limit or compensate for market failure. In some respects this is a justifiable assumption. If rising sea levels resulting from climate change combine with coastal storm surges and overwhelm sea defences with high costs to farming, export industries, households and insurance companies, then powerful extra-parliamentary coalitions are likely to press for state action to enhance flood defences, or, as occurred recently in the UK, insurance companies may seek financial guarantees from government as a condition of offering affordable insurance to those at risk.

However, the formation of grass-roots social-environmental movements, with more radical or transformative projects, cannot be assumed to arise spontaneously in the face of environmental degradation. Social constructionist approaches to "nature" have their place at this point in the argument (see, for example, Hannigan 1995: 2). Existing cultural traditions and practices of engaging with and valuing aspects of non-human nature are a necessary condition for the formation of activist movements in defence of wildlife habitats, local landscapes, footpaths and open spaces, picnic sites, and, on the larger scale, species-diversity, rainforests, arctic and marine habitats and so on. Without some emotional response at the level of individual subjectivity, able to articulate itself in terms of moral or metaphysical frameworks of thought and feeling that are available in the surrounding culture, no coherent activism could take root. Further, the formation and flourishing of such activist movements relies on the availability means of communication and mobilization, and, in turn, on a relatively open and diverse civil society with well entrenched civil liberties and at least some purchase on formal political institutions. The role of communi-

cations media – especially visual media – in representing the beauty and diversity of non-human nature, but also in the ways they report environmental threats and disasters, may be highly significant.

A further elaboration of the "two contradictions" framework takes more fully into account the significance of the vast increase in international trade and investment that has occurred in recent decades. The "core" model is one in which capital is to some degree saved from itself by social and political movements that respond by placing demands for restorative or mitigating action on the state. However, with the key institutions for regulating international trade and investment promulgating the neo-liberal project of global deregulation, the economic power of large and highly mobile transnational corporations and of financial capital has escalated accordingly. These transnational actors now provide the key parameters within which national states define their social and economic policies. Even if national governments were disposed to address problems of economic inequality and ecological degradation in radical (i.e. effective) ways, they would be (and have been) destabilised by international speculative activity, and withdrawal of investment, if not worse.

Just as economic globalisation severely limits the capacity of nation states to form autonomous strategies to address environmental degradation, the very same process intensifies the problem. Both the scale and geographical distribution of ecological and social degradation and fragmentation are being augmented by global deregulation and enhanced mobility of capital. Local and regional ecological problems remain, but are also intensified by the emergence of a truly global anthropogenic socio-ecological crisis. The most widely recognised dimension of this is, of course, climate change, but there are independent drivers, such as biodiversity loss, and crises in access to fresh water for drinking and sanitation, and affordable food, each of which interacts in potentially disastrous ways with the others. Limited as the nation state has been in relation to environmental degradation at local and national levels, the near-complete absence of authoritative and effective institutional forms at the global level dedicated to defence of social and ecological values bodes ill. The high point in attempts to create such a global regime was the "Earth Summit" held at Rio de Janeiro in 1992. The limited but still highly significant achievements at Rio were already under threat from the Uruguay round of GATT negotiations, conducted separately, which unleashed still deeper challenges to the global environment. Since then, each of the Rio agreements has been diluted and eroded by advancing corporate domination of follow-up conferences.

Concluding thoughts

So, what implications does this discussion have for the conceptions of nature required by the social sciences? First, any serious understanding of the relation between human societies and the rest of nature must take as its "first premise" nature as the immensity of matter and energy together with the fundamental laws governing their actions and interactions in the universe. Despite the great history of achievement of the physical and life-sciences, we must suppose that our current state of knowledge of the natural world is both limited and provisional. Nevertheless, our work as social scientists must both understand human society as grounded in and dependent up on the rest of nature, and take, at least as its starting point, available natural scientific knowledge. This is an indispensable (though not infallible) resource for characterising natural beings, laws and processes as they bear upon social ones.

Second, the categorical division between the social and the natural must be transcended if a fully coherent grasp of social reality is to be achieved. The Actor Network approach is valuable in this respect. However, its key concept of "actant", while allowing for non-human causal agency to play its part in social and historical explanation, is at fault in "flattening out" the ontological diversity of sorts of causal agent and the different sorts of role they might play. Human intentional agency, impersonal economic forces, GM crop strains, disease vectors, relations of predators, prey and parasites and so on all have causal powers but operate and interact in very different ways.

The alternative way of dissolving the nature/society duality that is used in the above version of historical materialist analysis is to theorise human social relations and practices as indispensably *including* non-human entities, beings and processes. Labour processes, for example, are performed by human agents in relationship with other humans (relations of cooperation, division of labour, etc.) and with material objects, raw materials, instruments of labour, and so on. A labour process could not be described as such without characterisation of these non-human elements and their interaction with human activity. The nature of the process will necessarily be shaped by the combination of skills, ingenuity, inventiveness, etc. of the human agents involved, and the properties of the materials, and of the instruments in use, the resistances and affordances they offer to human intentionality, and so on.

So, human societies *include* as terms in social relations, and con-

stituents in social practice, non-human beings, objects, materials and so on. However, this inclusion is never complete absorption. The properties of these beings and objects relate in several different ways to human consciousness and practice. Some properties (powers and liabilities) are recognised and incorporated into the practice, either as features which are useful in achieving the purposes of the practice, or ones which tend to obstruct or resist human purposes. Elsewhere I have suggested a way of theorising this in terms of «intentional structures» (Benton 1989; 2000). Labour processes are commonly characterised in economic discourse as exemplifying a means/ends intentionality. Raw materials are transformed by human agents, employing tools or instruments, into products which serve some human purpose. This «transformative, instrumental» model of labouring activity fails to adequately grasp manufacturing or industrial labour processes, but it is still more lacking in relation to other sorts of work that are unavoidably present in any complex division of social labour.

Three other major categories of labour involving engagement with natural beings can be distinguished. First, "primary appropriation", the collection or extraction of some natural being or material from its naturally given context. This includes mining, fishing, hunting and gathering, original forestry, solar, wind or tidal energy generation and so on. In these practices labour is not transformative, but, rather, extractive, dissociating a resource from its pre-existing context to make it available for further processing. The metaphor of "mastery" is at its least plausible here, since the labour involved is entirely dependent on the pre-given distribution in space and/ or time of the required resource. Knowledge and skill is needed, not to transform, but to find and access the object. A second category is what I have called "ecoregulatory" practice. This refers to such practices as plantation forestry, horticulture, agriculture, animal "husbandry" and so on. In these practices, human labour is deployed primarily in preparing and maintaining optimal conditions for the development, flourishing and reproduction of crop plants, domesticated or "farmed" animals. The transformations undergone by the plants and animals are the outcome of their own autonomous life-processes, not directly of human labour. Human intentional activity is devoted to *facilitating*, rather than transforming. A third category, "reproductive" practice, includes, centrally, social practices surrounding the organic and social reproduction of human beings. Although these differ considerably from one society or historical period to another, certain features are universal. The fundamental dependence of human infants demands caring and nurturing work whose character

and temporality is dictated by the needs of the developing infant. Again, this is work that is difficult to assimilate plausibly to a means/ end transformative action schema.

However, the tendency of advancing capital accumulation is to capture and subordinate each of these diverse modes of integrating human intentional action with objects, beings, materials and conditions to its own overriding form of rationality: means/ends efficiency, cost/benefit analysis, monetary calculation of value. Quantitative calculation over-rides qualitative judgment of appropriateness of time, place and mode of activity. Two different sorts of loss are incurred. The first is the aesthetic, normative, affective dimensions of practice. Work loses its "charm" for the worker, it is no longer engaged in freely, but only under compulsion of economic necessity, it is not experienced as self-expression, but loss of self. These notions form part of Marx's denunciation of the alienation of labour under regimes of private property in his *Manuscripts* of 1844, but the sentiments were shared by other commentators on industrial capitalism, including Adam Smith, Robert Owen, and, later, William Morris. Morris and his circle in the arts and crafts movement responded by practicing and campaigning for work that was meaningful and creative. An essentially similar celebration of the emotional connection between the craft worker and his/her materials is beautifully expressed by the contemporary British potter, Grayson Perry:

> Craftsmanship is often equated with precision but I think there is more to it. I feel it is more important to have a long and sympathetic hands-on relationship with materials. A relaxed, humble, ever-curious love of stuff is central to my idea of being an artist (Perry 2011: 169).

The second sort of loss follows on from the way cost/benefit instrumentalism squeezes out "love of stuff", and over-rides the inherent limits and constraints that set bounds to material social practices. Objects, instruments, raw materials, etc. that are drawn into social practices and to a greater or lesser degree modified or transformed by them also have properties, and stand in relations to other beings, objects and so on, which are either dismissed as irrelevant to the purposes of the practice, or simply unknown. As social practices modify their objects and materials intentionally they incidentally set in motion causal processes which do not belong to the purposes of the practice. The unintentional or unknown causal chains that result from practical activities involving nature may, indeed, be inconsequential, but, as the natural world is increasingly drawn into and subordinated to capitalist forms of calculation, the unintended, unexpected, but

also known and denied consequences become more and more consequential. To be able to conceptualise them as "naturally mediated unintended consequences" is necessary if social scientific analysis is to rise to the challenge of grasping the ecological dynamics of social life. In the case of contemporary globalising capitalism, this is perhaps the most urgent challenge we face. And, perhaps, the spread of Grayson Perry's «humble, ever-curious love of stuff» to the full range of human engagements with nature might show the way to a feasible and liveable future.

References

Beck, U. (1992), *Risk Society: Towards a New Modernity*, Sage, London, *et. al.*

Benton, T. (1988), *Humanism = Speciesism?*, in «Radical Philosophy», vol. 50, pp. 4-18.

Benton, T. (1989), *Marxism and Natural Limits: An Ecological Critique and Reconstruction*, in «New Left Review», vol. 178, pp. 51-86.

Benton, T. (1991), *Biology and Social Science*, in «Sociology», vol. 25, n.1, pp. 1-29.

Benton, T. (1993), *Natural Relations: Ecology, Animal Rights and Social Justice*, Verso, London (ch. 2).

Benton, T. (2000), *An Ecological Historical Materialism*, in F.P. Gale and R.M. M'Gonigle (eds.), *Nature, Production, Power: Towards an Ecological Political Economy*, Edward Elgar, Cheltenham, 2000, pp. 83-104.

Benton, T. (2003), *Alfred Russel Wallace: Explorer, Evolutionist and Public Intellectual: A Thinker for Our Own Times?*, Siri Scientific, Manchester.

Burkett, P. (1999), *Marx and Nature: A Red and Green Perspective*, Macmillan, London.

Darwin, C. (1871), *The Descent of Man and Selection in Relation to Sex*, John Murray, London.

Dickens, P. (2004), *Society and Nature*, Polity, Cambridge.

Dickens, P. (2009), *Cognitive Capitalism and Species Being*, in S. Moog and R. Stones (eds.), *Nature, Human Needs and Social Relations: Essays in Honour of Ted Benton*, Palgrave Macmillan, Basingstoke.

Dunlap, R.E. (2002), *Paradigms, Theories and Environmental Sociology*, in R.E. Dunlap *et al.* (eds.), *Sociological Theory and the Environment*, Rowman & Littlefield, Lanham, Maryland and Oxford, 2002.

Dunlap, R.E. and Catton, W.R. (1979), *Environmental Sociology*, in «Annual Review of Sociology», vol. 5, pp. 243-273.

Eckersley, R. (1992), *Environmentalism and Political Theory: Toward an Ecocentric Approach*, University College of London, London.

Foster, J.B. (2000), *Marx's Ecology*, Monthly Review Press, New York.

Foster, J.B., Clark, B. and York, R. (2010), *The Ecological Rift: Capitalism's War on the Earth*, Monthly Review Press, New York.

Giddens, A. (1994), *Beyond Left and Right*, Polity, Cambridge.

Hannigan, J.A. (1995), *Environmental Sociology: A Social Constructionist Approach*, Routledge, London & New York.

Hayek, F.A. (1937), *Economics and knowledge*, in «Economica», vol. 13, n. 2, pp. 33-54.

Hayek, F.A. (1944), *The Road to Serfdom*, Routledge, London.

Martinez-Alier, J. (2002), *The Environmentalism of the Poor*, Edward Elgar, Cheltenham.

Marx, K. and Engels, F. (1969), *The Communist Manifesto*, Penguin, Harmondsworth.

Marx, K and Engels, F. (1975), *Collected Works*, vol. 3, Lawrence & Wishart, London.

O'Connor, J. (1998), *Natural Causes*, Guilford, New York & London.

Rose, S. (1997), *Lifelines: Biology, Freedom, Determinism*, Penguin/Allen Lane, Harmondsworth.

Özkaynak, B., Adaman, F. and Devine, P. (2012), *The Identity of Ecological Economics: Retrospects and Prospects*, in «Cambridge Journal of Economics», vol. 36, n. 5, pp. 1123-1142.

Perry, G. (2011), *The Tomb of the Unknown Craftsman*, British Museum, London.

Polanyi, K. (2001), *The Great Transformation*, Beacon, Boston (Mass.), or. ed. 1944.

Porritt, J. (2005), *Capitalism as if the World Matters*, Earthscan, London.

Sennett, R. and Cobb, J. (2008), *The Hidden Injuries of Class*, Yale University Press, New Haven.

Wallace, A.R. (1898), *The Wonderful Century: Its Successes and Failures*, Swan Sonnenschein, London.

Williams, R. (1989), *Keywords*, Collins Fontana, London.

Abstract

The chapter begins by noting and exploring some of the great complexity of the uses of the term "nature". Uses of the concept of nature to characterise "internal" human nature are briefly discussed before the focus turns to social scientific approaches to "external" nature, and to the relationships between human social life and its non-human conditions. The emergence to centre-stage of concern about environmental degradation has challenged tradition sociological dualisms of "nature" versus "culture". The materialist tradition stemming from the work of Marx and Engels is taken as one important resource for this effort. Some strengths and limitations of the work of Marx and Engels themselves are reviewed, and later work that develops the capacity of the tradition to analyse the relationship between capitalist development and the rest of nature is discussed. Concepts such as "second contradiction of capitalism", "intentional structure" and "naturally mediated unintended consequences" are outlined.

T

Towards the Consistent Construction of Nature

Alexander Riegler

Introduction

When social constructivists started to make claims such as «Nature is nothing if it is not social» (Smith 1984: 30) and «nature no longer exists» (Giddens 1994: 11), many feared that they

> fail to take seriously the physical reality of nature, which demands our respect, if not for its own sake then because it will impact us materially in ways we will never be able to understand or ameliorate so long as we regard it as a mere projection of social interests (Demeritt 2002: 767).

In subsequent debates, arguments were piled up on both sides, as well as by those who wanted to establish a third reconciliatory position that takes the idea of nature as a construction seriously but «does not rob us of our ability to speak some degree of truth about nature as a consequence» (Proctor 1998: 353).

In this paper I will argue that none of the three positions (social constructivist, realist, and reconciliatory) is reconcilable with the perspective of radical constructivism. More specifically, I will call into question notions used in the arguments of these positions, in particular the notion of "nature" itself. In doing so, it should become clear that radical constructivism, even though it shares the noun with social constructivism, is inherently different from the scope and goals of the latter. That is, if radical constructivists speak about "nature as a construction" (thus prioritizing individual constructing), this does not refer to the "social construction of nature" (which amounts to thinking that nature no longer exists as separate from human society as, for example, Anthony Giddens seems to claim).

1. *The notion of nature*

Raymond Williams (1983) described the word "nature" as perhaps the most complex in the language as it can refer to one of three meanings:

Nature$_1$: the essential *quality* of entities,
Nature$_2$: the inherent *cause* for the behavior of entities, i.e., the laws of nature, or
Nature$_3$: the *realm* these entities are supposed to populate, i.e., reality (see also Demerit 2002).

Similarly, Robin Attfield (2006) argues that in most (European) languages, "nature" has three senses: (i) referring to the quality of something, (ii) being in contrast with the supernatural, (iii) being in contrast with the man-made, artificial.

I will argue that radical constructivism looks at what we consider real in an entirely different way. It entails that (1) the quality an observing cognitive subject sees in another entity is merely constructed and attributed to that entity by the subject, (2) causality, whether natural or artificial, is the description of an observer, and (3) making statements about "mind-independent nature" is mere metaphysical speculation.

Attentive readers may have noticed that I avoided saying "nature *is* constructed." This is a deliberate choice because the verb "to be" conveys the (unfortunately, often implicit and unnoticed) idea of ontological existence, i.e., that the product of the construct was material. As an epistemology, radical constructivism refrains from statements about the ontological existence of singular and all-encompassing entities (such as nature): «constructivism deals with knowing not with being» (Glasersfeld 1991). Consequently, in contrast to characterizing nature as a *noun* (placing "nature" in contrast to humans, artifacts, the supernatural, or technology, see meanings 2 and 3 above) or as an *adjective* ("nature of"), nature is best portrayed as (the process or the result of) an *activity*, that is, the cognitive subject's constructing and enacting. So what do I mean when I talk about "constructing"? Let us review the idea of constructing with regard to the three senses mentioned above, i.e., constructing (1) quality/nature of, (2) causality, and, finally, (3) nature/reality.

2. *Constructing quality (nature$_1$)*

Long before radical constructivism was introduced in Glasersfeld (1974), other authors already referred to experience out of which a cognitive subject constructs knowledge about objects. An early example is physicist Ernst Mach. Referring to Mach as a constructivist may appear curious for we would expect physicists to be the last people to embrace the idea that nature is constructed. He, however, emphasized that whatever is known in the sciences such as chemistry and physics (he was a leading expert in the last part of the 19th century) is the result of repeated experience:

> A chemist is able to recognize a chunk of sodium by merely looking at it. However, he takes for granted that he has a number of tests in mind, which would provide him with the expected result. To be certain he can apply the label "sodium" to a given sample only if he finds it as soft as wax, easy to cut, silvery on the cut surface, easily changing color, floating on water, quickly dissolving the latter, having a specific gravity of 0.972, burning with a yellow flame, etc. Thus there are a number of sensory features that appear due to certain manual, instrumental, and technical operations (some of them being rather complicated) and that constitute the notion "sodium" (Mach 1900: 417, my translation).

In other words, the "nature of sodium" cannot be characterized independently of the mind of the chemist whose education and repeated dealing with the substance made him acquainted with its nature.

Mach's claims were corroborated by the work of Ernst von Glasersfeld, who, basing it on Jean Piaget's work, described in greater detail the cognitive processes by which entities are constructed based on the «regularities which we are able to impose on the flux of experience.» Any cognitive subject «must segment its experience, compare chunks, and institute lasting individual identities» (Glasersfeld 2000). Glasersfeld (1982) suggested that the construction process takes place in four steps (see also Riegler 2011):

1. The construction of sensorimotor entities: Based on repeated experiences, the cognitive subject constructs schemata, which consist of the sensory context C in which an experience took place, the action A the subject carried out, and the observed new sensory context E. The latter characterizes the expectations of the subject, i.e., forming a production rule $C \,\&\, A \rightarrow E$. The construction of such schemata already takes place in the earliest days of childhood when the infant repeats an action A (say, banging the head) in context C (being under a table) over and over again just to ensure E (sensation of pain) will reliably follow. The

subject retains those schemata that prevail, even in the face of perturbations. Later on, retained contexts are externalized as objects (in the example: the "existence" of the object "table").
2. The construction of multi-modal entities: By including sensory material from various modalities, perceptual compounds become multi-modal and the externalized objects "more real" as their existence is corroborated in various dimensions. For example, the infant's tactile sensation is confirmation of her visual sensation (see Foerster 1984).
3. The construction of abstract entities: At the next level, schemata can be used in the construction of further, nested schemata making the cognitive subject capable of reflective abstraction. This allows the abstraction from purely sensorimotor schemata. Also, schemata can be reused in different and integrative contexts, such as the concept of "nature."
4. The construction of social entities: The final, social level of reality construction is reached as soon as the subject constructs herself as an experiencer among others. The social level greatly adds to the ways of validating schemata as the subject finds herself in agreement and disagreement with others.

However, the more recent constructions on the level of social agreement/disagreement cannot eradicate much older constructions the cognitive subject made in an early stage. This explains the differences in the concepts people have about "wilderness," i.e., «nature in its fullest […] free of human imprint» (Proctor 1998). A city dweller who has not experienced wilderness first-hand romanticizes it, while a person from the countryside may have constructed entirely different conceptions about it. Thus, under the assumption that nature is constructed, this construction is the product of the cognitive efforts of the individual rather than of society.

3. *Constructing causality and laws of nature (nature$_2$)*

In general understanding, the laws of nature describe the behavior of entities «by reasons of their immanent causality alone» (Hepburn 2006: 517). This is the idea of a mind-independent "*machina mundi*" that governs the behavior of entities in the world. For Aristotle, behavior rested on four different causes, which could not be mathematically described, in particular because in antiquity changes such as acceleration could not be formalized. However, with the increasing sophistication of mathematical tools, in particular infinitesimal calculus, natural phenomena became

accountable for in purely mechanistic deterministic ways ("*natura non facit saltus*"). Nature, in other words, became the synonym of the scientific endeavor: «"Nature" means that which is open to scientific method» (Sheldon 1945: 263, as quoted in Keil 2008).

In particular, one of the original causes, *causa finalis*, expressing the goal or purpose being served by an event, has been replaced by the formal notion of "negative feedback" (Rosenblueth, Wiener, and Bigelow 1943), which abolished the idea of teleology, i.e., that in analogy to the purposeful behavior of living being, all of nature *inherently* tends toward definite ends. By formalizing teleology, the distinction between living being and non-living objects was revoked for the benefit of a realist worldview that centers on a mind-independent nature in which the behavior of entities is causally interlinked.

David Hume, however, rejected the idea of causal necessity between observed events (i.e., between two elements in the experiential flux), irrespective of how often they have been observed to occur together. The doubt about the ontological nature of causality was picked up by early Ludwig Wittgenstein, whose «Superstition is the belief in the causal nexus» (Wittgenstein 1922: 5.1361) expresses his claim that only in the realm of logic is there necessity and «outside logic everything is accidental» (ibid: 6.3). Hume referred to psychological certainty, Wittgenstein to "compulsion" whenever the (chronological) order of experiential elements in the memory of the cognitive subject provides the incentive to establish a causal relationship among them: $event_1$ causes $event_2$, etc. That is, causality emerges if the observational pattern is an invariant pattern of time. However, as pointed out by Olaf Diettrich (2001), this condition is not sufficient. He argued that we need a time metric defined by a mental metric-generator which allows us to distinguish between shorter and longer intervals of time:

> If our time metric generator were of the kind that it would be accelerated after a flash of light and retarded after an acoustic event, we might well come to the conclusion that thunder is the cause of lightning rather than the other way around (Diettrich 2001: 304).

It is due to the mental time-metric-generator that causal order between experiential elements can be established such that the subject can form anticipations and make predictions. And since the mental metric-generator is mind-dependent, the causality is necessarily mind-dependent as well, and so are the laws of nature.

In his paper on *The Nature of the Laws of Nature*, Humberto Maturana arrives at a similar conclusion:

> Nature and the laws of nature are notions concerned with the explanation of experience, not with the explanation of reality as a domain of independent entities (Maturana 2000: 467).

For him, "experience" is that which a cognitive subject distinguishes as happening to her, with her or in her, as the subject attends or reflects upon what she does (cf. Step 3 in reality construction). The laws of nature are, then, «abstractions of the regularities (coherences) of our operation as living systems that we distinguish as we explain our experiences with the coherences of our experiences» (ibid: 468). Or as Ronald Hepburn expressed it: «Our knowledge of nature's powers and laws is itself derived from our experience» (Hepburn 2006: 518).

4. *Constructing reality (nature$_3$)*

Radical constructivism certainly does not stop short at the "deconstructivist attitude," which refutes particular beliefs that have become taken for granted in the mainstream realist worldview while leaving the "whole picture" untouched. For reasons detailed below, it is simply inconsistent to claim that concepts such as "table" are the result of constructions while, for example, "nature," "others," and "society" are not because they are considered absolute in terms of reality conceived as mind-independent. However, the epistemological trivial position of those who accept the idea of knowledge construction *only* as long as it serves the goal of gradually approaching mind-independent reality, is unattainable for two reasons.

Logically, as pointed out by von Glasersfeld, we cannot verify whether or not such gradual progression takes place since all the means at the subject's disposal to verify her knowledge are the very senses through which she gathered the sensory experience for this knowledge in the first place. In the sense of Putnam's «God's eye view» (Putnam 1981), the subject would need to stand outside and transcend herself to compare her current knowledge with the state of reality. There is no (logical) necessity to assume, though, that because as cognitive subjects we cannot access that reality it does not exist. (For how radical constructivists deal with the, at first glance, unsettling idea that we should forgo the idea of being able to relate to a firm, objective reality see the next chapter). For the radical construc-

tivist, ontology and metaphysics coincide as both become (in the sense of Occam's razor) superfluous components in any explanation.

Empirically, the position is unattainable due to the undifferentiated signal encoding in the nervous system of a cognitive subject (Foerster 1984). That is, nervous signals only encode the degree of their excitement but they do not reveal what caused a sensory signal nor how big the stimulus was that caused the signal. Maturana pointed out that in living beings and other structure-determined systems, it is the structure of the system that determines the degree to which it can be perturbed by some event external to it and not the event itself, which, therefore, may also go completely unnoticed for the system. How does this square with the impression that we recognize external entities? If the identity of these entities is not directly revealed by our sensory experience, it can only be inferred from the cognitive construction processes as described above.

In the light of the logical and empirical objections to the idea that eventually our constructions will hit rock bottom and reveal the truth of the mind-independent reality, any constructivist perspective must necessarily be thorough, or "radical" as von Glasersfeld put it. That is, the process of constructing must be assumed to cover all aspects of cognition without ever being able to verify them against reality. This implies that that which we refer to as the totality of entities, i.e., nature_3, must be considered a construction.

The requirement of being consistently constructivist on all levels makes any aspiration to establish the third "reconciliatory position" between realism and constructivism (as suggested by Proctor) impossible because ultimately such a position conflates with the realists' position.

5. *Inaccessible nature?*

In the spirit of Robin Collingwood, our arguments so far have led to the conclusion that the mind-independent nature about which we cannot say anything with certainty may or may not exist because:

> Objects to which no predicate other than existence is ascribed, are unknown since we cannot say anything about them other than that they are (D'Oro and Connelly 2010).

From the many reactions the radical constructivist position provoked it becomes clear that, psychologically, it is an uneasy perspective as it seems to take away any firm ground. So does the radical constructivist perspec-

tive imply that we could be mere brains in a vat? Not only, again, would we need to have a "God's Eye view" to verify or falsify such a scenario, the argument also builds on the implicit but misleading assumption that knowledge construction is a material process, and its product, experiential reality, is an ontological realm. As Maturana pointed out, the observer (who is supposed to make the comparison) «is not a physical entity, and observing is not a physical process» but rather a relational process taking place «in the realization of the living of the kind of living beings that we human beings are – that is, living beings which exist in languaging» (Maturana 2000: 460). For a cognitive subject to talk about the existence of an object, that object needs to be part of the subject's experiential reality, hence constructed: «The question of whether this table exists or not is an assertion that neither adds to, nor subtracts from, existence» (Schmidt, quoted in Poerksen 2004: 134). We live our daily (and scientific) lives without being able to ground our concepts and actions in a mind-independent reality: «We living systems do not need the supposition of an external independent reality to live» (Maturana 2006: 94).

In Riegler (2007) I argued that the fact that for a cognitive subject the experiential reality is stable does not necessarily imply the existence of stable structures in any metaphysical material reality. What may sound like the old Aristotelian idea of *causa formalis*, i.e., that there are formal causes to phenomena, was found in the behavior of formal network models. Stuart Kauffman (1993) showed that in complex networks of interdependencies, order arises "for free" without selection by external forces. Working with simulations of binary networks, i.e., networks whose nodes have only two states, Kauffman noticed that networks of a vast number of binary nodes display the tendency to move into a few recurrent cycles of activity. The dynamics of these circles can even be so stable that external forces cannot seriously perturb these systems. Already in a very simple setting of networks of n nodes where each node has 2 inputs and outputs from and to other nodes, the number of states that can be occupied by the network is as big as $2n$ while the number of cycles of activity these n nodes eventually arrive in is only $\sqrt{n}$. This means that there is a high degree of stability in such networks (which could be interpreted as metabolic networks or as networks of cognitive processes), even in the absence of force from outside the network (such as entities in the world that allegedly are the object of cognitive processes). The general formal character of this result suggests that the emergence of stability is *formally inherent* in systems and no *causa materalis* (material causality) need be assumed.

6. *Social construction?*

There is yet another implication of von Glasersfeld's claim that in order to avoid inconsistency any constructivism must be thorough. Since construction permeates all of a subject's cognition and hence all her knowledge is the result of an ongoing construction process, in her experiential reality not only are non-living entities constructions but also living beings including other human subjects (Glasersfeld 2008). If, however, other humans are constructions, how can an assumed totality of humans, i.e., a social group or society, be held responsible for constructing nature? In this vein, what are "projections of social interests" (cf. quote in the beginning) other than a concept attributed to the externalization of repeated observation of the experiential elements a subject refers to as her peers?

In this sense, radical constructivism subscribes to a *perspectivist* view, in which a subject's own experiences are the only source of her knowledge construction. This relieves constructivism from the inherent threat that an idea such as the "projection of social interests" may pose for realists, and which could be easily associated with the unpredictable force of a mob having no regard for individual interests, those of nature included. Ever since Stanley Miligram's experiments, the effect of feeling embedded in social groups and subordinated to authority, both of which seemingly relieve the individual of any responsibility, have been a subject of scientific research.

In contrast to that, in a radical constructivist understanding, neither a mind-independent reality nor an individual-transcending society can be held responsible for constructing that which a subject refers to as nature; only that subject herself can do so. This means that ethical issues linked with the concept of nature, such as environmental protection, are the individual's responsibility and cannot be delegated to an entity, living or non-living. This is because any such entity has an existential quality only in the experiential reality of the subject. Delegating to society proper would mean trusting to a metaphysical authority to which we have no access.

Conclusion

In the course of this paper, I characterized the three different meanings of "nature" from a constructivist position. For logical (and empirical) reasons, this position must necessarily be consistent, which leads to the rejection of (a) the idea of social construction of nature (for society is already

the product of constructing) as well as (b) the possibility of a third position between realism and constructivism (for it is tantamount to realism). The remaining constructivist position, radical constructivism, has a strong ethical component when it comes to discussing concepts such as environmental protection. In any theocratic society, God was the original mover; in enlightened societies the role was taken over by Nature, referred to as "*machina mundi*". In postmodern societies, society itself became the ultimate reason. In the radical constructivist view, however, the baton of responsibility is handed over to the individual cognitive subject.

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References

Attfield, R. (2006), *Is the Concept of "Nature" Dispensable?*, in «Ludus Vitalis», vol. XIV, n. 25, pp. 105-116.

Demeritt, D. (2002), *What is the "Social Construction of Nature"? A Typology and Sympathetic Critique*, in «Progress in Human Geography», vol. 26, n. 6, pp. 766-789.

Diettrich, O. (2001), *A Physical Approach to the Construction of Cognition and to Cognitive Evolution*, in «Foundation of Science», vol. 6, pp. 273-341.

D'Oro, G. and Connelly, J. (2010), *Robin George Collingwood*, in E.N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*. Available at http://plato.stanford.edu/entries/collingwood/.

Foerster, H. von (1984), *On Constructing a Reality*, in P. Watzlawick (ed.), *The Invented Reality: How Do We Know What We Believe We Know? Contributions to Constructivism*, W.W. Norton, New York, pp. 41-61.

Giddens, A. (1994), *Beyond Left and Right*, Polity Press, Cambridge.

Glasersfeld, E. von (1974), *Piaget and the Radical Constructivist Epistemology*, in C. D. Smock and E. von Glasersfeld (eds.), *Epistemology and Education*, Follow Through Publications, Athens, GA, pp. 1-24. Reprinted in Glasersfeld, E. von (2007), *Key Works in Radical Constructivism* (edited by Marie Larochelle), Sense Publishers, Rotterdam, pp. 73-87. Available at http://www.vonglasersfeld.com/034.

Glasersfeld, E. von (1982), *An Interpretation of Piaget's Constructivism*, in «Revue Internationale de Philosophie», vol. 36, n. 4, pp. 612-635. Available at http://www.vonglasersfeld.com/077.

Glasersfeld, E. von (1991), *Knowing without Metaphysics: Aspects of the Radical Constructivist Position*, in F. Steier (ed.), *Research and Reflexivity*, Sage, London, pp. 12-29. Available at http://www.vonglasersfeld.com/132.

Glasersfeld, E. von (2000), *Problems of Constructivism*, in L.P. Steffe and P.W. Thompson (eds.), *Radical Constructivism in Action: Building on the Pioneering Work of Ernst von Glasersfeld*, Routledge, London, pp. 3-9. Available at http://www.vonglasersfeld.com/233.

Glasersfeld, E. von (2008), *Who Conceives of Society?* in «Constructivist Foundations», vol. 3, n. 2, pp. 59-64 and pp. 100-104. Available at http://www.univie.ac.at/constructivism/journal/3/2/059.glasersfeld.

Hepburn R.W. (2006), *Philosophical Ideas of Nature*, in D.M. Borchert (ed.), *Encyclopedia of Philosophy*, second edition, Thomson Gale Macmillan Reference, Detroit MI, pp. 517-522. Originally published in 1967.

Kauffman, S.A. (1993), *The Origins of Order*, Oxford University Press, New York.

Keil, G. (2008), *Naturalismus und menschliche Natur* [*Naturalism and human nature*], in W.-J. Cramm and G. Keil (eds.), *Der Ort der Vernunft in einer natürlichen Welt. Logische und anthropologische Ortsbestimmungen*, Velbrück Wissenschaft, Weilerswist, pp. 192-215.

Mach, E. (1900), *Prinzipien der Wärmelehre* [*Principles of the Theory of Heat*], Barth, Leipzig.

Maturana, H.R. (2000), *The Nature of the Laws of Nature*, in «Systems Research and Behavioral Science», vol. 17, n. 5, pp. 459-468.

Maturana, H.R. (2006), *Self-Consciousness: How? When? Where?* in «Constructivist Foundations», vol. 1, n. 3, pp. 91-101. Available at http://www.univie.ac.at/constructivism/journal/1/3/091.maturana.

Poerksen, B. (2004), *The Certainty of Uncertainty*, Imprint Academic, Exter. German original was published in 2001.

Proctor, J.D. (1998), *The Social Construction of Nature: Relativist Accusations, Pragmatist and Critical Realist Responses*, in «Annals of the Association of American Geographers», vol. 88, n. 3, pp. 352-376.

Putnam, H. (1981), *Reason, Truth and History*, Cambridge University Press, Cambridge.

Riegler, A. (2007), *The Goose, the Fly, and the Submarine Navigator: The Case for Interdisciplinarity in Artificial Cognition Research*, in A. Loula, R. Gudwin, and J. Queiroz (eds.), *Artificial Cognition Systems*, Idea Group Publishing, Hershey PA, pp. 1-26. Reprinted in V. Sugumaran (ed.) (2008), *Intelligent Information Technologies*, pp. 1636-1657.

Riegler, A. (2012), *Constructivism*, in L. L'Abate (ed.), *Paradigms in Theory Construction*, Springer, New York, 2012, pp. 235-256. Available at http://www.univie.ac.at/constructivism/riegler/69.

Rosenblueth, A., Wiener, N. and Bigelow, J. (1943), *Behavior, Purpose, and Teleology*, in «Journal of Philosophy of Science», vol. 10, pp. 18-24.

Sheldon, W.H. (1945), *Critique of Naturalism*, in «Journal of Philosophy», vol. 42, pp. 253-270.

Smith, N. (1984), *Uneven Development: Nature, Capital and the Production of Space*, Basil Blackwell, New York.

Williams, R. (1983), *Keywords: A Vocabulary of Culture and Society*, Flamingo, London. Originally published in 1976.

Wittgenstein, L. (1922), *Tractatus Logico-Philosophicus*, Kegan Paul, London. Available at http://www.gutenberg.org/ebooks/5740.

Abstract

For a realist, nature embodies the ultimate arbiter, while for social constructivists nature is the projection of social interests. In this paper, the highly ambiguous term "nature" is discussed from yet another position, i.e., radical constructivism. It is argued that this position is incompatible with realism and, for reasons of consistency, also with social constructivism. Furthermore, from an ethical perspective, the radical constructivist conception of nature shifts responsibility further away from God, nature, and society to the individual.

Rethinking "Nature"

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Perché e come ripensare oggi la natura

Andrea Aguti

Il tema della natura è uno di quelli che presenta per la riflessione filosofica un interesse perenne, non fosse altro perché il pensiero occidentale è iniziato proprio con esso. La perennità di un tema, tuttavia, non è garanzia né della sua attualità né della sua reale significatività in un certo contesto storico-culturale. Nell'epoca moderna l'autonomizzazione del sapere scientifico dalla filosofia ha fatto sì, fra l'altro, che lo studio della natura – la fisica – sia divenuta a tutti gli effetti una disciplina scientifica, una disciplina che nel suo aspetto "teorico" è certamente ancora suscettibile di sollevare domande filosofiche (come quelle sulla natura del tempo o dello spazio), ma che per il resto possiede un carattere schiettamente matematico-sperimentale. Di fronte a questo sviluppo quella parte della riflessione filosofica dedicata in modo sistematico alla natura, cioè la filosofia della natura o filosofia naturale, è apparsa sempre di più come una disciplina puramente speculativa e ciò ha comportato la sua profonda crisi, al punto che essa è quasi del tutto fuoriuscita dal curricolo degli insegnamenti accademici e oggi non è facile trovare trattazioni ad essa dedicate[1]. Esiste certamente una filosofia della fisica, così come una filosofia della biologia, ma esse rappresentano delle sotto-discipline della filosofia della scienza nelle quali, di solito, si tratta di singole questioni sollevate dalla ricerca scientifica e non della natura in generale.

Da alcuni anni, tuttavia, come dimostra in modo eloquente il presente fascicolo, si assiste ad un ritorno di interesse della riflessione filosofica per il tema della natura in quanto tale e questo fenomeno, per quanto ciò

[1] Tra le poche eccezioni cfr. Mutscher (2002). Per una ricognizione di tipo storico cfr. Grant (2007).

sia ancora lontano dal prefigurare una strategia di riconquista del tema da parte della filosofia, possiede un'oggettiva rilevanza. In questo breve saggio vorrei riflettere su quelli che mi sembrano i motivi principali che alimentano questo fenomeno, sulle sue caratteristiche più interessanti e su alcune delle questioni teoriche che solleva.

Mi sembra che vi siano due motivi preponderanti, uno di tipo etico, l'altro di tipo antropologico in senso lato, che spingono oggi a riprendere in mano il tema della natura, motivi che sono entrambi ben fondati e fra loro intimamente intrecciati. Essi emergono, però, da uno sfondo comune che è problematico e sul quale è quindi opportuno soffermarsi preliminarmente. Lo sfondo è quello dell'opposizione polare tra natura e cultura che è un elemento costitutivo e continuamente risorgente nella comprensione umana della realtà, tanto più ad uno stadio complesso di evoluzione culturale come quello presente nelle società occidentali post-moderne. Poiché la cultura è essenzialmente l'opera di mediazione riflessiva che l'uomo esercita su ciò che è naturale, e poiché questa mediazione comporta necessariamente, assieme a molti guadagni, la perdita dell'originaria immediatezza del naturale, tanto più si accresce la dimensione e si moltiplicano le modalità della mediazione riflessiva quanto più si accresce l'attrazione verso l'immediatezza del naturale. Ciò che è naturale, infatti, secondo l'etimologia greca e latina del termine, è ciò che sorge da sé, che è spontaneo, originario, autentico, ma anche ciò che possiede un ordine proprio che si sottrae all'arbitrio dell'uomo e che, almeno apparentemente, non muta in modo accidentale come invece mutano le vicende umane.

Talora si tenta di rendere innocua questa attrazione sostenendo la tesi radicale che la differenza fra natura e cultura è essa stessa una differenza indotta dalla cultura, ma mentre si può concedere che ad un certo livello tutte le interpretazioni della natura contengono dei costrutti umani (cfr. Habgood 2002: 51), a questa tesi si può obiettare che essa deve comunque ammettere l'esistenza della natura, intesa come un insieme di realtà aventi determinate proprietà e determinati processi causali, seppure soltanto per negarla (cfr. Soper 1995: 132-133). Infatti, l'affermazione che «tutto è cultura», come quella che «tutto è linguaggio», è palesemente assurda. Si può ovviamente rinunciare ad usare il termine "natura", ma se lo si impiega è difficile non attribuire ad esso un qualche significato realistico e quindi indicare con questo termine qualcosa che è quello che è, non quello che noi diciamo che sia. Lo conferma, del resto, il significato del termine "natura" in abituali espressioni del linguaggio quotidiano dove esso rimanda ad una fattualità di cui, in ultima analisi, si deve prendere atto (per esempio

in espressioni del tipo: «cosa vuoi farci, è nella sua natura» o simili).

È vero, invece, che questa attrazione nei confronti del naturale è destinata ad assumere forme culturali, e infatti di essa è ricolma la cultura contemporanea. Il primitivismo in ambito artistico e letterario, le varie declinazioni del pensiero ecologico, il tendenziale rifiuto dell'elaborazione intellettuale nell'esperienza religiosa, l'etica dell'autenticità, la diffidenza verso la mediazione concettuale mostrata in filosofia da molti autori moderni e post-moderni, l'impulso alla naturalizzazione degli esseri viventi in ambito scientifico sono tutte espressioni a volte potenti, altre meno, del desiderio di rimuovere o ridimensionare la barriera eretta dalla riflessione che separa l'uomo dalla natura e dal sé naturale per manifestarli nella loro dimensione autentica o basica.

Il fenomeno del ritorno all'immediatezza del naturale è tuttavia ambiguo, perché il concetto di "natura", com'è noto, è tutt'altro che univoco. Un significato rilevante che la modernità filosofica ha fatto valere è quello sintetizzato da una definizione di John Stuart Mill: «Natura significa la somma di tutti i fenomeni e insieme le cause che li producono; includendo non soltanto tutto ciò che accade, ma anche tutto ciò che è suscettibile di accadere» (Mill 1874; trad. it. 2006: 14). Questa definizione si scosta sensibilmente da quella classica, in particolare aristotelica, che considera la natura come ciò che sorge da sé in modo non casuale ma per lo più ordinato e intellegibile, e che si distingue dall'arte o dalla tecnica, ovvero da ciò che è realizzato dall'azione umana in vista di uno scopo. Una delle conseguenze rilevanti della definizione di Mill consiste proprio nel fatto che l'arte sia da considerare «altrettanto natura quanto qualsiasi altra cosa» (*ivi*: 15), cioè che la distinzione tra natura e artificio non abbia motivo di sussistere. Prima di Mill, anche Voltaire aveva revocato alla natura un qualche primato e una qualche distinzione dall'arte («on m'appelle *nature*, et je suis tout art» [Voltaire 1879: 116]) e quest'ultimo, a sua volta, non faceva altro che esprimere la peculiare concezione della natura avviata dalla scienza moderna, per la quale la natura è priva di un principio interiore che orienta il suo movimento e deve piuttosto essere compresa come una macchina governata da leggi fisico-matematiche. Così facendo, la scienza moderna ha capovolto il significato della massima classica «l'arte imita la natura», poiché nel contesto di una spiegazione meccanicistica della natura è piuttosto la natura che imita l'arte, in quanto è la macchina a funzionare da principio esplicativo della natura[2].

[2] Interessanti osservazioni a questo riguardo in Spaemann (2007).

Se torniamo alla definizione di natura data da Mill, si vede che egli giustifica la tesi della indistinzione tra natura e arte con il rifiuto di un concetto teleologico di natura che considera quest'ultima come una realtà ordinata da leggi finalizzate nella maggior parte dei casi al bene. Così inteso, infatti, il concetto di natura non ha soltanto un significato descrittivo bensì ne possiede uno normativo, poiché si ritiene che l'uomo trovi nei processi naturali ordinati ad un fine buono un riferimento oggettivo per orientare, sulla base della ragione, le proprie azioni. Tuttavia, dal momento che Mill non ritiene che la natura manifesti un tale ordine finalizzato al bene, poiché secondo lui in natura la quantità dei mali è altrettanto grande di quella dei beni e anzi l'esistenza dei beni sembra dipendere proprio da quella dei mali, un concetto normativo di natura è respinto per fare spazio a quello, per così dire, onnicomprensivo che abbiamo richiamato sopra, un concetto che ha soltanto un valore descrittivo ed è quindi inservibile per l'etica.

Se si assume quest'ultimo concetto di natura, in effetti, la contrapposizione tra natura e cultura e il desiderio di ritornare alla natura perdono qualsiasi significato, poiché la natura è intesa semplicemente come la totalità di ciò che esiste e può esistere. Perché sia possibile innescare un'effettiva dialettica tra natura e cultura, e giustificare così la sempre risorgente attrazione verso il primo polo, è necessario conferire al concetto di natura un qualche significato normativo, ovvero indicare per mezzo di esso non soltanto ciò che esiste, ma la figura originaria e autentica di ciò che esiste e che serve da modello per le azioni umane. Questo carattere normativo è espresso in modo esemplare nella concezione aristotelico-tomista della natura, ma in qualche modo è presente anche nelle concezioni moderne della natura *à la* Rousseau, perché anche in questi casi la vita secondo natura è considerata sinonimo di vita autentica e l'autenticità assunta ad ideale etico da perseguire. In assenza di un tale carattere, la natura, come mostrano le penetranti riflessioni di Arnold Gehlen, indica semplicemente la condizione ambientale e istintuale caotica da cui l'uomo è fuoriuscito grazie alla cultura e nella quale egli rischia di ricadere ogni volta che la cultura, divenendo troppo ricca e differenziata, perde la sua funzione essenziale di stabilizzazione della contingenza. Il ritorno alla natura, in questa prospettiva, è il momento in cui «tutto diviene possibile» (Gehlen 1961; trad. it. 2005: 91), un momento al quale ovviamente non si può che guardare con notevole preoccupazione.

Ebbene, e qui troviamo la prima motivazione di ordine etico del rinnovato interesse verso il concetto di natura, la tesi dell'indistinzione tra naturale e culturale o tra naturale e artificiale appare oggi non soltanto

discutibile dal punto di vista teorico, ma molto di più da quello pratico. Per esigenze di brevità mi concentro soltanto sulla questione del rapporto tra naturale ed artificiale.

I progressi scientifico-tecnologici realizzati in epoca moderna hanno già da molto tempo mostrato la loro ambiguità etica, cioè il fatto che essi per un verso servono a migliorare la condizione umana, ma per l'altro a deteriorarla (cfr. Fabris 2012: 33). Anche chi concorda con la tesi che il progresso scientifico-tecnologico non possa arrestarsi deve fare i conti con la necessità di elaborare criteri etici che assicurino un suo uso responsabile. La nozione di responsabilità implica, tuttavia, che esista qualcuno o qualcosa di fronte a cui si debba rispondere. Di solito ci si riferisce "ai nostri figli" o alla "generazioni future", ma è ovvio che la responsabilità verso queste realtà implica la responsabilità per tutto quello che ha influenza sulla vita di queste ultime e prima di tutto implica una responsabilità nei confronti di noi stessi.

L'etica moderna, nelle sue principali tendenze, ha sostenuto la capacità autonoma dell'uomo di essere soggetto morale, ma si è dovuta confrontare con la difficoltà di giustificare la normatività dei propri orientamenti e questa difficoltà spiega tanto la sopravvivenza di una morale fondata religiosamente nelle società secolarizzate dell'Occidente quanto la rinnovata attenzione verso l'impiego etico del concetto di natura[3]. Di questo impiego è chiara espressione, in primo luogo, la rinascita della dottrina del diritto naturale nella seconda metà del Novecento, una rinascita indotta dalle esperienze totalitarie della prima metà del Novecento e dalla crisi del positivismo giuridico, ma che poi ha trovato modo di esprimersi anche nell'epoca attuale con la finalità di ridurre la caotica complessità della pluralità etica contemporanea, inibire l'effetto anomico della estraneità morale fra individui che vivono in una medesima società e favorire la rinascita di un'etica delle virtù che offra una teoria morale alternativa a quelle largamente diffuse, ma non per questo meno problematiche, del conseguenzialismo o dell'emotivismo[4]. In secondo luogo, esso si esprime nella ripresa del concetto normativo di natura soprattutto nel dibattito attorno alle conseguenze antropologiche della cosiddetta "convergenza tecnologica", cioè della combinazione sinergica fra diversi settori scientifici quali le nanoscienze e le nanotecnologie, le biotecnologie e la biomedicina, la

[3] Cfr. per una panoramica su questo fenomeno Botturi-Mordacci (2009) e Pollo (2008).

[4] Sono molti gli autori che rappresentativi di questa tendenza. Fra essi cfr. George (ed.) (2003).

tecnologia informatica e le scienze cognitive, le genetica e la robotica. In questo dibattito, che vede molte voci in campo (da Hans Jonas a Jürgen Habermas, da Michael Sandel a Leon R. Kass), il concetto di natura, e in particolare di natura umana, seppur all'interno di contesti teorici sensibilmente diversi, è usato come nozione-chiave per indicare una datità indisponibile alla volontà di trasformazione da parte dell'uomo che esige di essere preservata per garantire, a seconda dei casi, la salvaguardia dell'ordine biologico, la capacità di autodeterminazione degli individui, una vita morale realmente significativa (cfr. Aguti 2010: 129 ss.).

Una delle questioni teoriche che tocca in modo più diretto questo rinnovato utilizzo del significato normativo di natura è ovviamente quella se, così facendo, non s'incorra in una fallacia naturalistica, cioè non si identifichino arbitrariamente i fatti con i valori. Secondo il noto *open question argument* di George E. Moore, la descrizione di una qualche proprietà naturale da sola non basta per prescrivere alcunché, perché una volta che la si è definita buona rimane sempre aperta la questione se sia veramente buona. Per quanto si continui a discutere sulla validità di questo argomento[5], molti oggi sono propensi a ritenere che esso non sia un argomento valido per il fatto che dipende da una teoria referenziale del significato, dove il significato di un termine è confuso con il suo riferimento (cfr. Stewart 2009: 230-231). Se si evita questa confusione, si può legittimamente ammettere che certi termini morali non significhino la stessa cosa delle proprietà naturali, pur ritenendo che si riferiscano a queste ultime. Più in generale, come hanno fatto rilevare altri, l'*open question argument* aprirebbe un divario incolmabile tra fatti e valori che permetterebbe l'attribuzione della proprietà della bontà a qualsiasi fatto naturale, il che appare implausibile, perché esiste evidentemente un limite nel classificare come buoni certi fatti naturali[6]. Se l'obiezione della fallacia naturalistica non coglie nel segno, è chiaro che la ripresa di un significativo normativo del concetto di natura risulta plausibile, anche se mi sembra che un tale uso sia pienamente giustificato soltanto all'interno di una concezione teleologica della natura.

Quest'ultima, che ha dominato per secoli la cultura occidentale, com'è noto, è stata fortemente messa in discussione dalla scienza moderna e in particolare dalla teoria dell'evoluzione darwiniana, ma esistono motivi per dubitare che tale critica l'abbia completamente destituita di validità. In

[5] Cfr. a questo riguardo i contributi di diverso orientamento presenti in Nuccetelli-Seay (2012).

[6] È la prospettiva che emerge dalla riflessione di autori come Philippa Foot. Cfr. Foot (2007).

primo luogo, perché la domanda sul perché certi eventi fisici abbiano luogo secondo certe leggi e non altre o certi processi biologici funzionino in un determinato modo anziché in un altro non è facilmente eliminabile e la stessa teoria dell'evoluzione fa ricorso ad un surrogato della teleologia (la cosiddetta teleonomia) per spiegare l'organizzazione interna, la capacità di autoregolazione e la tendenza all'ottimizzazione delle *performance* degli esseri viventi (Trigg 1999[2]: 184); in secondo luogo, perché la convinzione che esista uno sviluppo definito nelle realtà viventi (uomo compreso) che le porta, se non intervengono fattori accidentali, a conseguire la propria natura, cioè la propria "normalità", è una convinzione ancora molto diffusa nel senso comune. Tale convinzione rappresenta una "credenza propriamente basica", ovvero una credenza che *prima facie* ha buone motivazioni per essere sostenuta e che, per essere dismessa, attende di essere confutata da una credenza più convincente che ad oggi, però, non c'è ancora o almeno non c'è in una misura tale da essere conclusiva. Infatti, anche se si dovesse condividere la conclusione che il finalismo è il risultato di un'interpretazione ingenua della natura, uno dei tanti frutti della cosiddetta psicologia popolare, non si può certo sostenere che il "caso" sia una nozione che spiega meglio le regolarità della natura rispetto a quella di "fine" o di "progetto".

Ovviamente una concezione normativo-teleologica della natura è di tipo metafisico, poiché ricorre a concetti come quelli di "essenza" o "fine" per descrivere proprietà della natura che non si prestano in modo univoco all'osservazione e alla verifica empiriche e che, proprio per questo, sono suscettibili di essere ampiamente discusse sia dal punto di vista scientifico che filosofico.

Quest'ultima osservazione mi consente di introdurre il secondo motivo di centralità del concetto di natura nella riflessione odierna. Anche in questo caso è utile prendere le mosse da un significato di natura che spesso è fatto valere nel dibattito contemporaneo, soprattutto in ambito scientifico. Esso è restituito da una breve definizione di Alfred N. Whitehead: «La natura è ciò che noi osserviamo nella percezione per mezzo dei sensi» (cfr. Whitehead 1920; trad. it. 1948: 4). L'interesse di questa definizione consiste nel fatto che essa mira ad escludere il ricorso a interpretazioni della natura mediante concetti metafisici, come quelli di spirito, dal momento che, come ancora afferma Whitehead con un'immagine efficace, quando si studia la natura «ricorrere alla metafisica è come gettare un fiammifero in un deposito di polveri: si fa saltare in aria tutto quanto» (*ivi*: 27).

L'illegittimità di nozioni metafisiche nello studio della natura è una delle tesi qualificanti della scienza moderna che così motiva il suo naturalismo

metodologico, ovvero l'esclusione del ricorso esplicativo a entità che non cadono sotto il controllo del metodo scientifico. Spesso, tuttavia, essa viene oggi assunta come una tesi metafisica, nel senso che l'esclusione metodologica di entità soprannaturali è concepita come un'esclusione di fatto dell'esistenza di tali entità. È vero che una concezione naturalistica non è necessariamente identica al materialismo o al riduzionismo, ma è altrettanto vero che il tentativo di naturalizzare realtà come l'essere umano, oggi molto diffuso in diversi settori della ricerca scientifica, ha maggiori possibilità di riuscire se effettivamente si accompagna alla tesi, dichiarata o meno, dell'inesistenza di entità soprannaturali. Ciò che si ritiene non esista non interferirà di principio con ciò che esiste o almeno con il nostro studio di esso, mentre ciò che si ritiene possa esistere, anche se noi non lo prendiamo in considerazione, potrebbe sempre farlo e quindi manifestare la lacunosità dei nostri sforzi esplicativi di ciò che esiste. In altri termini, l'impresa di naturalizzare gli esseri viventi e in particolare l'uomo riesce meglio se prima si naturalizza il concetto stesso di natura, ovvero se lo si sfronda da tutto quello che non è oggetto di esperienza sensibile e non è indagabile per mezzo del metodo empirico. Nel caso dell'uomo, la natura diviene così sinonimo della costituzione biologica di un determinato essere vivente, e a partire da un siffatto concetto di natura umana è in effetti possibile avviare il tentativo di naturalizzare quelle dimensioni proprie dell'essere umano, come l'etica o la religione, che fino ad oggi hanno presentato ampi margini di inesplicabilità scientifica.

Questo tentativo presenta, però, almeno due inconvenienti: il primo è che esso tende ad assumere i tratti di un imperialismo scientifico, ovvero manifesta «la tendenza ad applicare un'idea scientifica di successo ben oltre il suo dominio originario, in genere con sempre minor successo man mano che la sua applicazione viene estesa» (Dupré 2001; trad. it. 2007: 19). L'idea che un certo metodo d'indagine, come quello adottato per lo studio della realtà fisica, che ha dato innegabili risultati, offra per questo una chiave d'accesso alla spiegazione di altre realtà che presentano una diversa costituzione (come la mente), è un'idea che certamente può motivare l'avvio di un progetto di ricerca scientifico, ma che non ne garantisce *a priori* il successo. Nella discussione attuale sulla natura dell'uomo l'attenzione è spesso polarizzata dagli sviluppi delle neuroscienze e delle scienze cognitive, poiché è da esse che ci si attendono rilevanti novità, ma dal punto di vista filosofico questa attenzione è discutibile. Nuove conoscenze sul funzionamento del cervello o dei meccanismi cognitivi sicuramente ampliano la mole delle nostre informazioni sull'essere umano, ma

rimane aperto il problema di capire se e come esse contribuiscano ad una comprensione dell'essere umano che sia in grado di rendere conto della totalità dei suoi aspetti e al tempo stesso della sua specificità nel confronto con le altre specie viventi. In ultima analisi l'obiettivo di una comprensione dei fenomeni che non si limiti ad un singolo aspetto, ma miri alla loro totalità e alla loro essenza, rimane la caratteristica distintiva della riflessione filosofica, ancorché si tratti di un obiettivo tutt'altro che facile a raggiungersi. Il problema rimane quindi quello della interpretazione di conoscenze scientifiche alla luce di assunti che non sono essi stessi soggetti al *test* della scientificità, se con quest'ultima s'intende, almeno in parte, la verificabilità o la falsificabilità delle conoscenze a nostra disposizione.

A tale proposito il dibattito sulla filosofia della mente nell'ultimo scorcio del Novecento è esemplificativo: quest'ultimo ha visto fin dal suo sorgere una netta prevalenza di impostazioni fisicalistiche e eliminativistiche che identificano la mente con il cervello o con alcune sue proprietà, ma queste impostazioni sono state fatte valere o a spese della evidente diversità fenomenologica degli eventi mentali da quelli fisici oppure per mezzo di una tesi, come quella epifenomenalistica, che non prevede per la vita mentale un ruolo causale da giocare negli eventi del mondo fisico ed è quindi difficilmente conciliabile con gli assunti della teoria che la promuove. Questo spiega perché in questo ambito la tesi del dualismo delle sostanze di tipo interazionistico, che è invisa ai sostenitori di una visione naturalistica del mondo, non soltanto non sia mai definitivamente tramontata, ma conosca attualmente perfino una significativa rinascita[7]. Si può respingere una soluzione del genere e ritenere, come per esempio fa John Searle, che il mistero della coscienza sarà presto illuminato da una spiegazione naturalistica della mente (cfr. Searle 2012: 177), ma in mancanza a tutt'oggi di essa è più plausibile ritenere che le conoscenze provenienti dalle neuroscienze e dalle scienze cognitive alimenteranno senz'altro in futuro un dibattito che ha già una storia secolare, mentre difficilmente lo porteranno a risoluzione. Ciò che muove a questo dibattito, infatti, è il conflitto tra visioni del mondo diverse sulle quali l'evidenza messa a disposizione dalla scienza ha un impatto significativo e probabilmente destinato ad accrescersi, ma pur sempre limitato.

Il secondo inconveniente che consiglia una presa di distanza dal tenta-

[7] Cfr. i testi contenuti in Lavazza (2008). Vi è da ricordare la tesi del dualismo non è sostenuta soltanto da una prospettiva filosofica, ma anche a partire da una scientifica, come dimostrano gli studi di John Eccles.

tivo di naturalizzazione dell'essere umano consiste in quello che sembra il suo esito auto-contraddittorio. La naturalizzazione è in fondo un'operazione conoscitiva che l'uomo è in grado di intraprendere grazie al possesso della ragione e dunque in base ad una libera scelta cognitiva orientata ad un fine che è quello della verità, cioè, almeno secondo la definizione di verità più comunemente accettata, della corrispondenza tra uno stato mentale e uno stato di cose esterno alla mente. La naturalizzazione, però, se realizzata sulla scorta di un naturalismo metafisico come quello richiamato in precedenza che ammette soltanto cause fisiche per i nostri processi cognitivi, comporta che proprio la struttura razionale dell'uomo che guida l'intero processo non sia contemplata come suo esito finale, anzi sia decisamente eliminata, poiché né la scelta libera, né l'azione orientata ad fine, né un concetto di verità come quello richiamato sopra trovano esplicazione in questo contesto. Ne consegue che o la naturalizzazione è un processo casuale e deterministico che, in quanto tale, non può rivendicare alcuna pretesa di verità razionale oppure essa deve fare un'eccezione per se stessa, ammettendo la propria natura razionale, ma con questo anche autocontraddicendosi. Questa obiezione nei confronti del naturalismo non è certamente una novità: essa si muove sulla falsariga dell'ironica osservazione schopenhaueriana per la quale il materialismo è una filosofia del soggetto che ha dimenticato se stessa e ha trovato una formulazione nel cosiddetto *argument from reason* sostenuto da molti autori contemporanei (cfr. Goetz-Taliaferro 2008: 117-122). Da ultimo Alvin Plantinga ne ha proposto una versione con l'obiettivo di dimostrare che la congiunzione della teoria evoluzionistica darwiniana con il naturalismo metafisico riduce in modo significativo le probabilità che l'apparato cognitivo dell'uomo sia affidabile, rendendo quindi non razionalmente credibile l'uso della nostra ragione e di conseguenza minando le basi stesse delle argomentazioni a favore del naturalismo[8].

La validità di quest'argomento può ovviamente essere discussa, ma al di là di questa discussione rimane la profonda impressione che il tentativo di naturalizzare l'essere umano comporti la rinuncia ad alcune sue dimensioni fondamentali e distintive come la ragione, intesa come facoltà spirituale che rende l'uomo consapevole di sé e al tempo stesso aperto al mondo, la libertà, intesa come la capacità di inaugurare nel mondo nuove catene causali, la responsabilità morale, intesa come capacità di rendere conto delle proprie azioni sulla base della distinzione categoriale tra bene/male,

[8] Cfr. Plantinga in Dennett-Plantinga (2012).

giusto/ingiusto. A meno di non voler considerare questo tentativo soltanto come una delle molteplici espressioni di quel "fascino del disincanto" che connota la cultura post-moderna, nella quale spesso esiste una fondamentale incongruenza tra ciò si afferma in teoria e come ci si regola in pratica, esso getta un'ombra inquietante sulle modalità future in cui l'uomo potrà auto-comprendersi e sul suo destino. Un ripensamento in prospettiva filosofica della natura non può prescindere, mi sembra, da un'adeguata considerazione di questo aspetto.

Bibliografia

Aguti, A. (2010), *Natura umana. Un'indagine storico-concettuale*, Meudon, Portogruaro (VE).

Botturi, F. e Mordacci, R. (a cura di) (2009), *Natura in etica*, Vita & Pensiero, Milano.

Dennett, D.C. e Plantinga, A. (2011), *Science and Religion. Are they Compatible?*, Oxford University Press, Oxford-New York; trad. it. (2012) di M. Di Stasio, *Scienza e religione. Sono compatibili?*, Edizioni ETS, Pisa.

Dupré, J. (2001), *Human Nature and the Limits of Science*, Oxford University Press, Oxford; trad. it. (2007) di B. Tortorella, *Natura umana. Perché la scienza non basta*, Laterza, Roma-Bari.

Fabris, A. (2012), *Etica delle nuove tecnologie*, La Scuola, Brescia.

Foot, Ph. (2001), *Natural Goodness*, Clarendon Press, Oxford; trad. it. (2007) di E. Lalumera, *La natura del bene*, Il Mulino, Bologna.

Gehlen, A. (1961), *Anthropologische Forschung. Zur Selbstbegegnung und Selbstentdeckung des Menschen*, Rowolth, Hamburg; trad. it. (2005) di V. Rasini, *Prospettive antropologiche*, Il Mulino, Bologna.

Goetz, S. e Taliaferro, Ch. (2008), *Naturalism*, Eerdmans, Grand Rapids, MI.

George, R.P. (ed.) (2003), *Natural Law*, Ashgate, Aldershot.

Grant, E. (2007), *A History of Natural Philosophy: From the Ancient World to the Nineteenth Century*, Cambridge University Press, New York.

Habgood, J. (2002), *The Concept of Nature*, Darton, Longmann and Todd, London.

Lavazza, A. (a cura di) (2008), *L'uomo a due dimensioni. Il dualismo mente-corpo oggi*, Mondadori, Milano.

Stuart Mill, J. (1874), *Three Essays on Religion*, Henry Holt and Company, New York; trad. it. (2006) di L. Geymonat, *Saggi sulla religione*, Feltrinelli, Milano.

Mutscher, H.-D. (2002), *Naturphilosophie*, Kohlhammer, Stuttgart.

Nuccetelli, S. e Seay, G. (a cura di) (2012), *Ethical Naturalism. Current Debates*, Cambridge University Press, New York.

Pollo, S. (2008), *La morale della natura*, Laterza, Roma-Bari.

Searle, J. (2012), *Prospettive per un nuovo realismo*, in M. De Caro e M. Ferraris (a cura di), *Bentornata realtà. Il nuovo realismo in discussione*, Einaudi, Torino 2012.

Soper, K. (1995), *What is Nature?*, Blackwell, Oxford.

Spaemann, R. (2007), *Was heißt: "Die Kunst ahmt die Natur nach"?*, in «Philosophisches Jahrbuch», CXIV, pp. 247-263.

Stewart, N. (2009), *Ethics: An Introduction to Moral Philosophy*, Polity Press, Cambridge.

Trigg, R. (1999[2]), *Ideas of Human Nature. An Historical Introduction*, Blackwell, Oxford.

Voltaire, (1879), *Oeuvres Complèts de Voltaire. Nouvelle Édition*, vol. XX, Paris.

Whitehead, A. N. (1920), *The Concept of Nature*, Cambridge University Press, Cambridge; trad. it. (1948) di M. Meyer, *Il Concetto della natura*, Einaudi, Torino.

Abstract

The essay aims to highlight the main reasons for which the theme of nature, usually left in the modern age to scientific investigation, today shows a renewed interest in philosophical reflection. Starting from some considerations in the dialectical relationship between nature and culture and taking into account the difficulty in establishing a clear meaning of the term "nature", the paper shows that the concept of nature continues to play a significant role especially in the context of ethics, philosophical anthropology and philosophy of the mind when is understood in a normative meaning, and not merely descriptive. To the normative meaning of nature is connected a finalistic interpretation of the latter that in modern times has been widely criticized, but that still seems significant in many areas of human experience.

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Galileo Debunked: A Neutral Foundation for Nature

Riccardo Manzotti

1. *Can we live without Galileo's ontology?*

To a great extent, the traditional picture of nature is derived from Galileo's insight about the separation between quantitative objective properties of matter and qualitative subjective properties of the mind. As a result, the ensuing dualism entrenched the gap between nature and mind. Eventually, the mind became an apparently intractable problem both for physics and neuroscience (which is rooted on physics). Yet, the conscious mind seems to have a set of properties that are not shared by any known physical phenomenon – i.e. quality, intentionality, unity, semantics, first-person perspective, duration, and so forth (Chalmers 1996; McGinn 1999; Miller 2005).

Given the recurrent difficulties in tackling with the mind (Chalmers 1996; Manzotti and Moderato 2010; Noë and Thompson 2004; Searle 1992; Tononi and Koch 2008; Uttal 2001), it is worth considering whether the real problem may consist in the received Galilean ontology. Maybe nature is different from what we surmise it to be, thus rethinking nature may lead to a simpler solution. Maybe our difficulties as to the mind-body problem stem from some misguiding assumptions about the "nature of nature".

Since contemporary physics is far from traditional Galilean science, I will refer to *objective science* in order to refer to the common core shared by physics from Galileo onward (Boi 2004; Feynman 1963; Gamow 1961). In this paper, I will outline the key assumptions of objective science. Of course, the great success of such an approach is not put into discussion. Science gives wonderful agreement with observation over a wide range of phenomena. Nonetheless, it leaves out a fact that cannot be discounted –

namely our consciousness. In the long run, no theory of nature that does not explain our mind is acceptable. Our mind must have a place in the order of natural phenomena.

To recap, instead of insisting to find a way to naturalize the mind keeping fixed physics, why do not we consider the radical possibility that there is something wrong in the way in which nature is conceived? Of course, any revision should be compatible with physics. A revision may not simply add new properties to the physical world – a conceptual move that would be akin either to traditional substance dualism or to naïve panpsychism. Rather, a successful ontological revision ought to simplify the current picture of nature.

At the onset, I put forward a declaration of principle. I am a physicalist in the sense that I do believe there must be a mind-world unified explanation. However, I am a very dissatisfied physicalist since my conscious mind do not seem to fit in the current physicalist framework. Thus, how can I be happy to belong to a club that does not accept my own conscious mind? In my above declaration of principle, the critical keyword is "unified". In fact, I think that physics is just a shortcut to refer to everything that exists and that fits under the same explanation. The notion of physical does not translate into an a priori definite set of properties (as Galileo suggested) but it expresses that reality – all reality – has to undergo a common explanatory framework. Thus, everything has to share the same fundamental principle that we may agree to call physical. So if something is left over, it means that the physical project has totally failed, at least insofar as physics ought to encompass everything (Strawson 2008).

Taking advantage of consciousness as a probe to peer into the deep structure of reality, here I will sketch an ontological revision that develops some intuitions partially shared both by some previous classical authors (Alexander 1909; Gibson 1979; Holt 1914; Mach 1897; Whitehead 1929) and by some contemporary scholars (Chemero 2009; Honderich 1998; O'Regan and Noë 2001; Rockwell 2005; Strawson 2004). Briefly, the suggested revision revolves around a few critical issues that are paramount to analyzing key properties of phenomenal experience – namely time and unity. I want to stress that the suggested ontological revision, elsewhere dubbed *Spread Mind*, does not determine any clash with traditional physics (Manzotti 2006, 2011a, 2011b). No emergent property is invoked and no additional feature is added. Ontological economy is preserved. The goal of the paper is to rethink nature with particular reference to the issue of time and that of unity.

2. *What are the limitation of the current view of physics?*

According to many scientists, everything is just made of atomes. Everything is identical to the atoms it is made of. For instance, the influential Nobel price Richard Feynman confidently writes that

> If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on, what statement would contain the most information in the fewest words? I believe it is that *all things are made of atoms* (Feynman 1963: 2).

Likewise, the current view of the physical world is the result of three powerful ontological intuitions that were much boosted by the Galileo's scientific revolution (Galilei 1623). Yet, at the onset, it is important to stress that such insights as to the nature of reality are not a necessary consequence of the scientific method. On the contrary, the widespread ontological premises that underpin most of scientific research are not based on empirical observation (Whitehead 1925). They are the result of an (admittedly very successful) ontological bet as to the nature of nature. Galileo suggested a kind of ontological framework that fits well with the experimental method but that is neither a mandatory premise nor a necessary consequence. In fact, the scientific method is neutral as to the ontological roots of reality.

In a nutshell, the three key intuitions[1] are:

1) Nature is made of individuals whose properties are autonomously and locally instantiated (smallism).
2) Such individuals have only quantitative properties and thus nature in itself is devoid of quality.
3) Change does not really exist insofar time is just another mathematical variable (that is individuals are eternal).

As of the XVI century, these intuitions were adopted by most scientists almost overnight. Their acceptance has set aside many troublesome features of nature (for instance, subjective experience). However, they became assumptions that nobody could discuss. Impressive progress was achieved in countless fields and thus their authority increased enormously. For presentation purpose, I will refer to this view as the Galilean view of nature. This terminology may give rise to various objections. Thus, I need

[1] Here, I avoid a detailed historical analysis of Galileo's work. I prefer to outline an alternative ontology. Besides, there are brilliant analysis of Galileo's historical impact (Freedberg 2002; MacLachlan 1997; Redondi 1983).

to put forward two caveats. First, there is no pretense for historical exactness here. There may be difference between the details of Galileo's work and the Galilean's view here outlined. This is of no concern here. Second, it may be argued that what I call the Galilean's view does not represent the current scientific view of reality. To a large extent, this objection hits the mark – all the more, since there are many conflicting views as to what the physical world is. As an example, it will suffice to quote the still unresolved conflict between Einstein's relativity and Quantum Mechanics. Currently, the state of the art of physics is more similar to a shop where everyone is free to pick up the tool that matches more closely with the phenomenon under scrutiny. However, this does not prevent most scholars from adopting a rough idea of what nature is. The resulting approximation fits quite acceptably with the sketchy view just outlined.

A few words about each of the three listed intuitions will clarify their paramount role in shaping the current view of nature. The first intuition is responsible for the tendency to locate phenomena inside the smallest parts. If reality is composed by autonomous entities, whenever something is divided, its parts must be autonomous. This suggests that the parts should drain all powers of the whole. This is the argument put forward by Kim as to the causal role of parts (Kim 1993). By and large, it should be possible to divide any phenomenon into smaller parts. If the properties are instantiated locally, given any phenomenon, its properties must reside in the parts. When it is not possible to divide any further, we have reached rock bottom and we ought to have found the ontological basis of everything. In fact, the assumption of the local autonomy leads seamlessly to atomism. In fact, many scholars concluded that there is nothing but atoms. So much the worse for chairs, buildings, faces, concerts, colors, smells, thoughts, and of course ourselves. Atoms are *really* real. Everything else is not. It goes on without saying that I consider such a view totally inconsistent with empirical evidence and thus to be rejected. Yet, most laymen and many brilliant scholars believe wholeheartedly in it as testified by the above Feynman's words. The resulting view is some stripe of smallism, according to which any natural phenomenon is nothing more than the composition of smaller phenomena. The commonsensical notion of physical object – transmogrified either in that of entity or in that of individual – is not supported by physics. This view has the amazing metaphysical consequence that there are no objects but only particles (Merricks 2001; van Inwagen 1990).

The second intuition is no less arbitrary – namely that all properties are

either functional or quantitative (in operational terms to be quantitative means to be in some kind of quantitative functional relations with other phenomena, thus the two terms are practically synonymous). Consider mass, for instance. Isn't it possible to divide a body into smaller masses? Is mass anything more than the functional role expressed by a quantity? The very idea that natural phenomena are expressed by numbers leads naturally to the idea that they can be divided. Composition by addition became quickly the natural way to conceive natural phenomena. Yet, it is surprising that it was so easy to dispatch all other aspects of reality we encounter everyday. Such an intuition runs afoul of most empirical evidence. Worse, in characteristic Galilean fashion, it suggests abusing your own senses – denying that what we perceive is real. Although I perceive a colored, tasteful, smelly world, Galileo claims that it is created inside the body of the subject. Outside the subject, colors are nothing but names. The world is devoid of qualities. The consequence of this intuition is that a natural explanation of the conscious mind is *ipso facto* impossible since we have just assumed that nothing like the mind is part of the world. Consider Prinz's definition of physicalism as «the conjecture that the fundamental laws and elementary parts that we find in things that lack mentality are the only fundamental laws and elementary parts in the universe» (Prinz 2012: 11). If the only way to define what is physical is to appeal to what utterly lack mentality, it should not come as a surprise the world is devoid of conscious experience.

Finally, the third intuition concerns change. It is important to remind that, since Plato's time, the deepest mystery of classic and medieval philosophy was the notion of change. How could anything change and still be retain some identity. Scholars have been endlessly puzzled by change. Plato simply denies it. Aristotle's metaphysics of act and potency is arguably an elaborate conceptual machinery designed to deal with change. Change is troublesome from a theoretical, empirical, and existential perspective. Galileo introduces the geometrical notion of time that gets rid of change. Time becomes objective and change is expunged from the mathematical description of nature. An atom does not change, after all. It remains the same notwithstanding the possibility to occupy different locations in different instants. At each instant, though, an atom is at a definite spatial and temporal location. Newton reinforces this view by introducing the calculus and the notion of absolute space-time. Eventually, orthodox physical models of time suggest that the *now* is a point with no width. More recent mathematical models of time – such as Einstein-Minkowsky's space-time – do not change the fundamental ontological assumptions. Time remains a

variable. This well-entrenched model combines with the idea that everything that exists at a certain time must fit (so to speak) inside a moment of present – another commonsensical notion running afoul both neuroscientific models of the mind (based on neural activity distributed in time) and phenomenal experience (based on a thick *specious* present characterized by duration). The atomistic view of matter and space has been glanced by an atomistic view of time. Time is a collection of instantaneous instants each self-sufficient and self-contained. Furthermore, as Einstein remaked, the now has no longer any role in physics.

At the end of Galileo's revolution and up to now, unity, quality, and change –three fundamental aspects of everybody's experience of the world – were exiled to the dubious domain of the mental world. The advantage of this ontological move is plain. Scientists are provided with a simplified version of nature that fits with the available experimental tools and conceptual models. Unfortunately, sooner or later, the chickens must come to roost. The mind does not fit inside the orthodox view of nature. The mind reminds us that the nature seems to have qualities, unities and change.

In order to cope with the challenge posed by the mind, scholars developed a few strategies that I will recap briefly. The first strategy suggests that the mind has to external to the natural order. The mind has to be located in a mental domain with rules and properties different from those of the physical world. Descartes' dualism is the classic example. Although dualism was the most popular view until Skinner, no scholar succeeded in showing how two ontologically separate domains may work together. The second strategy consists in denying that the mind exists – a view dubbed as eliminativism. Until recently, eliminativism has been the most popular view among scientists. The third strategy claims that the mind exists but we are not clever enough to figure out how. No need to comment on such a view. What then?

There are two options left. Either there is something wrong in our picture of nature or our picture of nature is correct and somehow the difficult properties arise out of nature. The latter option usually leads to some stripe of emergentism. I am personally very suspicious of any form of emergentism because of its proclivity to disguise some kind of miracle – any true emergence has to reach a point in which the crucial step is akin to an act of faith. Either the emergent phenomenon could not be predicted and thus is miraculous, or the emergent phenomenon is somehow predictable and thus it is not really new. Then we are left with the former option – our picture of nature may be incorrect. It may be that nature (the physical world) is different from what is usually assumed since Galileo. If

this were the case, it may also be that the mind fits in the natural order. In the next section, I will sketch a tentative ontological model that is alternative to the orthodox picture inherited from Galileo, Newton, and Einstein.

Before entering into the details of the presented model, let me stress that many critical features of empirical evidence are so closely tied with the mind that they come to be referred to as mental features – a move that may result into a gross mistake. For instance, consider intentionality. Brentano famously claimed that intentionality is the hallmark of the mental. I do not argue here whether it is true that all mental phenomena possess intentionality. Rather I wonder whether the fundamental structure of nature is such that it may produce processes or events that we may regard as intentional structure. My point is that since intentionality, quality, unity, duration, and many other features were often linked to the mind, it has been all too easy to confine them into the mental domain. However, why should they been regarded as mental? It is a fact that all these features plays a role in shaping the world as we know it. They are the core of empirical evidence. There would be no knowledge of nature if there were no intentionality. Why should we confine intentionality into the mind? Is Galileo's authority enough to convince us?

A further possible source of confusion that I would like to bring to the fore is panpsychism – or at least the dumb straw man often presented as panpsychism. Many scholars take for granted that either one accepts a mechanistic nature devoid of qualities, or one cannot but fall into the deadly sin of panpsychism. Naïve panpsychism is not a solution. I do agree. Naïve panpsychism is tantamount to relocate mental properties in nature after having them expunged and confined in the mind. Yet, there are more subtle versions of panpsychism. For one, the view defended in this paper follows a conceptual trajectory akin to views often categorized as variants of neutral monism (Coleman 2009; James 1904; Mach 1897; Manzotti 2011a; Skrbina 2003; Strawson 2003, 2006). The difference is that, instead of resurrecting the features exiled by Galileo and his followers, neutral monism considers whether the ontological roots are such that may be compatible both with the received physics and with those features that show up so conspicuously in our experience of the world.

The advanced solution will consider a process ontology in which the fundamental buildings blocks of reality are physical processes spread in space-time and singled out by causal conditions. In this way, one might rethink nature as a big mesh of processes interacting together. Processes offer a twofold advantage. First, they concoct wholes with an actual causal

role – thereby they avoid falling into the causal-drain trap. Secondly, since causal processes are spread in space-time, they solve the issue of the present. They do not take place in the abstract thinness of the Euclidean present. Could it be that our present if physically extended in time and space because nature itself is so?

3. *An alternative picture of nature*

In this section, I will outline here a picture of reality that ought to be compatible both with everything we know through traditional objective experimentation and with other features of empirical evidence that were traditionally exiled into the mind (quality, unity, duration, intentionality). At least, this is my bet. In order to clarify this picture, I will resort to systematic confrontation with the corresponding Galilean view.

The first issue to deal with regard to the basic constituent of reality. According to the Galilean view, the basic constituent is some kind of stuff 1) devoid of qualities and 2) autonomous. The latter feature is of paramount importance. The Galilean view considers a physical reality made of autonomous entities, whereas autonomous means that any entity X is what it is independently of its relations with other entities. Once, one opts for autonomy as one of the fundamental features of physical reality, smallism is practically unavoidable. In fact, if physical reality is made of autonomous entities, once one opts to split phenomena, the resulting parts have to be autonomous too. Consequently, their properties have to be locally instantiated. This kind of approach is expressed by most disciplines. Geologists study the crystals and the molecules that compose mountains. Neuroscientists struggle to decipher how neurons create the mind. Genetists have decoded the molecule of DNA. And so forth. This strategy is correct and fruitful for many phenomena, but the fact that it worked in so many cases does not guarantee that it will work for every future phenomenon. Many phenomena still resist to such an approach – the mind is the most prominent example.

In fact, the mind does not appear to be autonomous. The mind has to perceive the external world and thus the mind – whatever the mind is – is constituted by what it perceives. The structure of this constitutive relation is very mysterious and it is constantly at the core of the best part of philosophical discussion (Block 2005; Swiatczak 2010; Tye 2009). It is usually disguised as an outcome of more distinguished notions such as those of semantics, intentionality, representation, and so forth. The fact is that my

mind – if it is not a solipsist monad – has to be constituted by the outside world in some non-trivial sense. And since I am a physicalist, this means that nature is made of entities that are intrinsically relational.

Taking advantage of the best empirical evidence we have – namely our own experience – I propose to turn upside down Galileo's intuitions and derive a series of statements to be put to test. I claim that, contrary to what is usually supposed, experimental procedures will not falsify such statements. It must also be stressed that the aforementioned Galilean's ontology has never been verified by any experimental procedures. Rather experiments were carried on inside the framework defined by such an ontology. It was no surprise thus that science never falsified the ontological premises. In fact, it may be argued that all empirical evidence that did not fit (such as our everyday experience of the world) was systematically set aside and discarded. Anyway, the alternative ontological claims are the following:

- the fundamental units of reality are causal processes which are intrinsically spread in time and space;
- each of these processes is one and the same with what one has an experience of when it happens that she is identical with that process;
- the fundamental structure of such processes is change. They do happen because each of them is a change.

The above proposal clearly resembles some previous proposals such as those put forward by Ernst Mach (Mach 1897), Alfred N. Whitehead (Whitehead 1929), William James (James 1904), however it is different insofar as it tries to outline a framework that may be used empirically to bridge the gap between subjective experience and objective data. There is also some shared conceptual space with various versions of externalism and enactivism (Noë 2009; O'Regan and Noë 2001; Rockwell 2005). Various versions of this proposal – dubbed *Spread Mind* – were presented elsewhere (Manzotti 2011a, 2011b, 2011c). The main idea is that the unities we experience are real. Chairs, tables, buildings and such are real. But also percepts, feelings, and thoughts. They are not a collective illusion. And, since we must accept to be part of nature, the fact that our experience is so structured shows an undeniable fact: there is a part of nature which is structured in those unities. Furthermore, consider the following elementary issues.

World and quality. We experience each of those unities as if it had a definite quality. There is no fact of the world which does not present itself without a given quality. Colors have quality. Thoughts have quality. But also objects have their own quality. Even numbers, ratios, movements, to the

extent that they are part of my own experience, have their own definite quality. I've never experienced anything in a purely objective and quantitative fashion. No one has. Thus, why should I believe that the world is devoid of quality if whenever I perceive x, for any x, x has its own quality. This is rather curious if you ponder about it for a while. We have an overwhelming evidence of a colored, tasteful, smelly world. Yet the Galilean view presses us to accept that it is just an illusion concocted by brains.

We cannot step back from the world. Suppose that we accept the Galilean view. The world would be a dull place devoid of qualities. Yet, our brains are a part of the world. We cannot step back from the world. We are in the world. We are the world. If the world is devoid of quality, the brain is devoid of quality too. On the other hand, if quality emerges out of neural activity, it may as well emerge out of other physical processes. Or, more simply, it may have always been there. Why do scientists find more acceptable that the functional friction between neurons heats up as phenomenal experience than considering the hypothesis that the quality of experience is the quality of the world we have an experience of? The only reason I may envisage is that Galileo thought us that the world is devoid of qualities and thus that such uninvited aspects are not to be found where everyone perceive them: in the outside world.

Everything is in relation with something. Another common aspect of every experience is that they are always in relation with something else. This is the aspect that Brentano identified with the exotic property of intentionality and that he claimed is the hallmark of the mental (Brentano 1874). I do agree with him that all experiences are always experience of something else and thus that they are intrinsically relational. There has been some discussion as to whether it is true that *all* mental experiences are always experience of something. The discussion is still ongoing and thus I am allowed to take my side: all mental experiences have intentionality (Manzotti 2012b). However, I disagree with Brentano's thesis on two different fronts. First, I do not see any basis to restrict intentionality to mental acts only. Since I am a physicalist in the sense outlined above, since any mental act has to be a fact of nature, the very occurrence of mental acts with intentionality entails that there are physical facts with intentionality. Historically, Brentano's dualism is justified since he was fighting against the positivist oversimplification of nature. If nature is made of locally instantiated autonomous individuals locally instantiated, he needs to add a special ingredient – intentionality – to match the mind. Yet, this is exactly what I am arguing against. My point is quite straightforward. I take the mind to be a

piece of nature. Thus, any properties that we acknowledge in our (mental) experience are properties of nature, too. Once, we have accepted that, it is tempting to ask ourselves whether there is any empirical reason to deny that all facts of nature have intentionality. After all, all our contacts with nature are possible because of intentionality. If there were no intentionality, we would have no contact whatsoever with anything but ourselves. If only by a prudent use of induction, we may consider the apparently astonishing hypothesis that everything has intentionality. Finally, after clearing the way from the exotic relation with the mind, intentionality is likely to be the expression of something simpler – namely causation.

Everything has duration. Everything we experience takes place in time. Our experience is necessarily a moment of change. Each experience is a new experience because it makes a change. In fact there is a strong link between having an experience and the underpinning information as it has been emphasized in different ways by many scholars (Bateson 1979; Chalmers 1996; Tononi 2004). Yet, the notion of information has its roots either from computer theory or from the abstract models of probability theory (Shannon 1948; Von Neumann 1958; Wiener 1961). More often than not, information is conceived in purely functional terms capable of endorsing a powerful case with computer technology but a very poor case with our experience of the world (Bowers 2009; Manzotti 2012a; Searle 1990; Tallis 2004). Even when we observe a static stimulus, our experience is a flow that runs seamlessy from one moment to the next. There is nothing like a mental *state* – pace a widespread terminology borrowed from computers where states are the norm. Once again, the argument is the same. We have no experience of static entities. Everything we experience is a change. Observe how perverse is the language that even when one wants to refer to change, suggests an expression such as "a state of change" – so powerful is the urge to get away from change. If there were no change, there could be no mind. The relation between change and mind couldn't be stronger.

To recap this section. Our experience shows that everything we step into has the properties that Galileo demanded to expunge from the physical world. I do not see any reasons why we should think that the remaining part of the physical world ought to be the opposite of what we have an experience of. Experience is not a step back from nature. Experience is the part of nature we are directly acquainted with. Thus, I suggest considering a physical framework in which the fundamental constituents are intrinsically relational (intentionality), have unity, have quality, and are moments of change (in lack of a better expression).

4. *A different foundation*

While Galileo suggested a timeless localistic quantitive atomistic ontology, I think there is sufficient evidence to consider a distributed process-oriented ontology. This is neither particularly original nor unsupported by empirical evidence. In fact, process-oriented ontologies have been proposed again and again (Dowe 1992; Manzotti 2008; Seibt 2003; Whitehead 1929). In quantum mechanics transational/relational process-oriented interpretations raised some interest (Cramer 1986; Rovelli 1996; Stapp 1993, 2007). However, here I will embark on a more trivial kind of ontological revision.

The basic idea is that nature ought not to be split into separate autonomous timeless individuals or events. Consider causal processes as the fundamental units. Since Hume, causality has often been taken to be a cumbersome epistemic nuisance. Recent approaches to causality have tried to tackle with the issue of normativity, inductions, and prediction (Lewis 1973; Pearl 2000; Woodward 2003). But, since Hume, scholars have envisaged causality as the main relation between separate and otherwise autonomous events. In brief, Hume's view of causality is based on Galileo's ideal ontology. He applied to the world of impressions the same basic structure that Galileo applied to nature. Impressions were conceived like just as many autonomous and self-sufficient moments of subjective experience. Once you start with a domain made of autonomous and separate individuals (either they be facts, events, objects, impressions, thoughts), causality is just an external relation linking sequences of events.

In brief, Galileo's ontology first detached existence from experience and then existence from change. In doing so, the obvious target was causation. Causation has always been the key to understand change. Causing something entails bringing a change into existence. In turn, causation and change are two different perspectives on becoming. By detaching existence from causation, Galileo stepped into a timeless world of eternal individuals. Eventually it was possible to study nature oblivious of the causal connection between phenomena. Each phenomenon was thus isolated and made autonomous. Therefore, ontologically, particles (eternal atoms) came first and their causal relation only afterwards.

I suggest turning upside down this picture of nature. Clearly, I cannot provide a formal description here. Nevertheless, I may try to present a series of examples that, although surely not convincing, may suggest some reflection.

First, consider a traditional physical entity such as a good old electron. How could we know whether an electron does exist if the electron were not involved in some kind of causal relation with something else? In turn, this means that the existence of an electron is known only because such existence is involved in some change elsewhere and elsewhen. So we may ask whether there is any empirical evidence of the existence of an isolated electron. It is a fact that we cannot answer to such a question since – to provide an answer – we would need to set up an experiment in which the electron is allowed to provoke some change. All available empirical data show that electrons are the alleged cause of countless observations. This is the critical point. Any observation is a causal relation. It is a change. The existence of the isolated and autonomous electron is always a construction, a useful abstraction out of the real empirical unit: a process of change. The observation is a causal process in itself. Traditional science concoct abstract causes such as the alleged autonomous electron. Yet, are these entities ever been spotted without being part of a causal process? Of course not. How could we know whether an electron exists between two separate interactions? As a matter of fact, we do not have a clue as to how satisfy our traditional and parochial Galilean insights about the existence of platonic eternal individuals.

Let's move from the domain of the very small to that of everyday life. Consider a face. Does the face exists between two different observations? Why should it exist? There is no reason to suggest its existence if not to fulfill our belief in the existence of perduring timeless[2] individuals. The face is a whole that comes into existence when the corresponding causal processes occur. There is no face outside causation and there would be no face-causation if there were no faces. Likewise to the case of the electron, we may start from an elementary observation: there is nothing outside causal relations that actually produces a change. If existence is always connected with causation (and with change), we may be tempted to adopt the so-called Alexander's dictum according to which existence and causation are two-sides of the same structure (Cargile 2003).

The crucial idea for this proposal of ontological revision is to consider

[2] I use the term "timeless" to refer to the fact that Galilean individuals are conceived in such a way that, if time were set aside, they would suffer no alteration. A triangle may move in time – yet, if time were set aside – it would continue to exist. A movement, on the other hand, could not survive the elimination of time. A movement is a kind of change, and thus it is intrinsically a temporal entity. A triangle is not.

causation as an original moment of reality rather than as an external relation between otherwise timeless and separate individuals. Here, causation/change/becoming is proposed as the ontological root of everything. Galileo's model did his best to expunge change out of the ontological roots of nature. Here, I suggest doing the opposite. Change is key.

Why is this model dubbed Spread Mind? and what happened to those aforementioned aspects of reality that fit so badly with Galileo's ontology? The two questions have the same answer. Not only every moment of reality is perceived through a causal process and a change, but also every moment of reality is perceived with its own quality and duration. We have to accept the way in which nature presents itself.

If I assume that my experience is not the colossal delusion of a solipsistic mind, I cannot deny that my experience is the experience of a world. The proposed ontological revision suggests that the physical underpinnings of the mind do not need to be confined to the brain. The subject is spread beyond the limits of its nervous system. Consider the simplest case: veridical perception. I look at my son's face. There is a causal relation between his visual features and my brain. Traditional ontology considers the two moments as autonomous events that, by contingent factors, happened in sequence because of some kind of causal entanglement. However, the two events may happen without any connecting causal reason. My son's face may be there oblivious that someone is watching it, and the same neural activity may take place in my brain without being caused by a face (for instance by an electrode). This is the classical view that sinks irremediably because of the fatal embrace with the issues of representation, intentionality, quality, and so forth. The ontological revision I outline suggests a different picture. Certain causal processes (or a proper subset of them[3]) are natural unities and single out pieces of nature. During perception, the piece of nature, which is identical with one's experience, singles out that part of the environment one has an experience of. Thus, experience is not a representation but a moment of identity with a part of nature. Conscious experience is not an a posteriori representation of nature. Conscious experience, not very surprisingly, is a piece of the world and it offers a unique opportunity. Consciousness allows us to be directly acquainted with the fundamental aspects of nature: quality, unity, duration, and change.

[3] For reasons of space, I cannot enter into the details of the kind of causal structure that expresses the key process unity. It suffices to say that certain causal processes have a peculiar structure that is shared by all conscious perception.

The framework presented here is a rough sketch of an alternative view of nature. However, it aims to endorse the available empirical data and to offer a different foundation. For what concerns objective evidence, my bet is that it does not fare any worse than the traditional Galilean ontology. It offers four main advantages: 1) it sets aside the old spatial/temporal/material atomism; 2) it offers a place for the mind inside nature; 3) it accepts change as the root of reality; 4) it outlines a mind-body process-oriented realist ontology.

References

Alexander, S. (1909), *On Sensations and Images*, in «Proceedings of the Aristotelian Society», vol. 10, pp. 1-35.

Bateson, G. (1979), *Mind and Nature: A Necessary Unity*, Hampton Press, Cresskill (NJ).

Block, N. (2005), *Review of Alva Noë's "Action in Perception"*, in «The Journal of Philosophy», vol. 102, n. 5, pp. 259-272.

Boi, L. (2004), *Theories of Space-Time in Modern Physics*, in «Synthese», vol. 139, n. 3, pp. 429-489.

Bowers, J. S. (2009), *On the biological plausibility of grandmother cells, implications for neural network theories in psychology and neuroscience*, in «Psychological Review», vol. 116, n. 1, pp. 220-51.

Brentano, F. (1874), *La psicologia dal punto di vista empirico*, Laterza, Bari.

Cargile, T. (2003), *On "Alexander's" Dictum*, in «Topoi», vol. 22, pp. 143-149.

Chalmers, D.J. (1996), *The Conscious Mind. In Search of a Fundamental Theory*, Oxford University Press, New York.

Chemero, A. (2009), *Radical Embodied Cognitive Science*, MIT Press, Cambridge (Mass).

Coleman, S. (2009), *Mind under matter*, in D. Skrbina (ed.), *Mind that Abides. Panpsychism in the new millenium*, John Benjamins Pub, Amsterdam 2009, pp. 83-107.

Cramer, J.G. (1986), *The Transactional Interpretation of Quantum Mechanics*, in «Review of Modern Physics», vol. 58, pp. 647-688.

Dowe, P. (1992), *Process Causality and Asymmetry*, in «*Erkenntnis*», vol. 37, pp. 179-196.

Feynman, R.P. (1963), *The Feynman Lectures on Physics*, Addison-Wesley, London.

Freedberg, D. (2002), *The Eye of the Lynx. Galileo, His Friends, and the Beginnings of Modern Natural History*, University of Chicago Press, Chicago.

Galilei, G. (1623), *Il saggiatore*, Roma (English Translation in S. Drake [1957], *Discoveries and Opinions of Galileo*, Doubleday, New York).

Gamow, G. (1961), *The Great Physicists, from Galileo to Einstein*, Dover, New York.

Gibson, J.J. (1979), *The Ecological Approach to Visual Perception*, Houghton Mifflin, Boston.

Holt, E.B. (1914), *The concept of consciousness*, MacMillan, New York.

Honderich, T. (1998), *Consciousness as existence*, in A. O'Hear (ed.), *Current issues in philosophy of mind*, Cambridge University Press, Cambridge 1998, pp. 137-156.

James, W. (1904), *A World of Pure Experience*, in «The Journal of Philosophy», vol. 1, n. 20, pp. 533-543.

Kim, J. (1993), *Supervenience and Mind*, Cambridge University Press, Cambridge.

Lewis, D. (1973), *Causation*, in «The Journal of Philosophy», vol. 70, n. 17, pp. 556-567.

Mach, E. (1897), *The Analysis of Sensations*, Dover Publications, New York.

MacLachlan, J. (1997), *Galileo Galilei. First Physicist*, Oxford University Press, New York.

Manzotti, R. (2006), *A Process Oriented View of Conscious Perception*, in «Journal of Consciousness Studies», vol. 13, n. 6, pp. 7-41.

Manzotti, R. (2008), *A Process-Oriented View of Qualia*, in E. Wright (ed.), *The Case for Qualia*, MIT Press, Cambridge (Mass.), pp. 175-190.

Manzotti, R. (2011a), *The Spread Mind. Seven Steps to Situated Consciousness*, in «Journal of Cosmology», vol. 14, n. 4, pp. 4526-4541.

Manzotti, R. (2011b), *The Spread Mind. Is Consciousness Situated?*, in «Teorema», vol. 30, n. 2, pp. 55-78.

Manzotti, R. (2011c), *The Spread Mind, Phenomenal Process-Oriented Vehicle Externalism*, in M. Blamauer (ed.), *The Mental as Fundamental. New Perspectives on Panpsychism*, Ontos-Verlag, Frankfurt 2011, pp. 79-98.

Manzotti, R. (2012a), *The Computational Stance is Unfit for Consciousness*, in «International Journal of Machine Consciousness», vol. 4, n. 2, pp. 401-420.

Manzotti, R. (2012b), *An Externalist Approach to Existential Feelings: Different Feelings or Different Objects?*, in J. Fingerhut and S. Marienberg (eds.), *Feelings of Being Alive*, De Gruyter, Berlin 2012, pp. 79-100.

Manzotti, R. and Moderato, P. (2010), *Is Neuroscience the Forthcoming "Mind-science"?*, in «Behaviour and Philosophy», vol. 38, pp. 1-29.

McGinn, C. (1999), *The Mysterious Flame. Conscious Minds in a Material World*, Basic Books, New York.

Merricks, T. (2001), *Objects and Persons*, Clarendon Press, Oxford.

Miller, G. (2005), *What is the Biological Basis of Consciousness?*, in «Science», vol. 309, p. 79.

Noë, A. (2009), *Out of Our Heads. Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*, Hill and Wang, New York.

Noë, A. and Thompson, E. (2004), *Are there Neural Correlates of Consciousness?*, in «Journal of Consciousness Studies», vol. 11, n. 1, pp. 3-28.

O'Regan, K.J. and Noë, A. (2001), *A sensorimotor account of vision and visual consciousness*, in «Behavioral and Brain Sciences», vol. 24, n. 5, pp. 939-73;

Pearl, J. (2000), *Causality. Models, Reasoning, and Inference*, Cambridge University Press, Cambridge.

Prinz, J. (2012), *The Conscious Brain. How Attention Engenders Experience*, Oxford University Press, Oxford.

Redondi, P. (1983), *Galileo* eretico, Einaudi, Torino.

Rockwell, T. (2005), *Neither Ghost nor Brain*, MIT Press, Cambridge (Mass).

Rovelli, C. (1996), *Relational Quantum Mechanics*, in «International Journal of Theoretical Physics», vol. 35, n. 8, pp. 1637-1678.

Searle, J.R. (1990), *Is the Brain a Digital Computer?*, in «Proceedings of the American Philosophical Society», vol. 64, n. 3, pp. 21-37.

Searle, J.R. (1992), *The rediscovery of the mind*, MIT Press, Cambridge (Mass).

Seibt, J. (2003), *Process theories*, Kluwer Academic Press, Dordrecht.

Shannon, C.E. (1948), *A Mathematical Theory of Communication*, in «Bell System Technical Journal», vol. 27, pp. 623-656.

Skrbina, D. (2003), *Panpsychism as an Underlying Theme in Western Philosophy*, in «Journal of Consciousness Studies», vol. 10, n. 3, pp. 4-46.

Stapp, H.P. (1993), *Mind, Matter and Quantum Mechanics*, Springer, Dordrecht.

Stapp, H.P. (2007), *Mindful Universe. Quantum Mechanics and the Participating Observer*, Springer, Dordrecht.

Strawson, G. (2003), *What is the relation Between an Experience, the Subject of the Experience, and the Content of the Experience?*, in «Philosophical Issues», vol. 13, pp. 279-315.

Strawson, G. (2004), *Real intentionality*, in «Phenomenology and the Cognitive Sciences», vol. 3, pp. 287-313.

Strawson, G. (2006), *Does physicalism entail panpsychism?*, in «Journal of Consciousness Studies», vol. 13, n. 10-11, pp. 3-31.

Strawson, G. (2008). *Real Materialism and other essays*, Oxford Clarendon Press, Oxford.

Swiatczak, B. (2010), *Conscious Representations, an Intractable Problem for the Computational Theory of Mind*, in «Minds and Machines», vol. 21, n. 1, pp. 19-32.

Tallis, R. (2004), *Why the Mind is Not a Computer. A Pocket Dictionary on Neuromythology*, Imprint Academic, Exeter.

Tononi, G. (2004), *An Information Integration Theory of Consciousness*, in «BMC Neuroscience», vol. 5, n. 4, pp. 1-22.

Tononi, G. and Koch, C. (2008), *The Neural Correlates of Consciousness, an Update*, in «Annals of the New York Academy of Sciences», vol. 1124, pp. 239-261.

Tye, M. (2009), *Representational Theories of Consciousness*, in B.P. McLaughlin, A. Beckermann and S. Walter (eds.), *The Oxford Handbook of Philosophy of Mind*, Oxford University Press, New York 2009, pp. 253-268.

Uttal, W.R. (2001), *The New Phrenology. The Limits of Localizing Cognitive Processes in the Brain*, MIT Press, Boston.

Van Inwagen, P. (1990), *Material Beings. Philosophy and Phenomenological Research*, Cornell University Press, New York.

Von Neumann, J. (1958), *The Computer and the Brain*, Yale University Press, Yale.

Whitehead, A.N. (1925), *Science and the Modern World*, Free Press, New York.

Whitehead, A.N. (1929), *Process and Reality*, Free Press, London.

Wiener, N. (1961), *Cybernetic, or Control and Communication in the Animal and the Machine*, John Wiley & Sons, Cambridge (Mass).

Woodward, J. (2003), *Making Things Happen. A Theory of Causal Explanation*, Oxford University Press, Oxford.

Abstract

Since Galileo's time, according to a widespread ontological framework, nature is conceptually split into absolute and point-like unities of time, space, and matter. In this paper, the empirical adequacy of this view is criticized. By and large, three fundamental features of nature do not seem to fit in it – namely change, unity, and quality. To overcome these shortcomings, an alternative framework based on causal processes, which are intrinsically spread in time and space, is fleshed out. Conscious experience is exploited as a probe into the deep structure of nature rather than as an additional phenomenon to be explained by neuroscience. In the spirit of Whitehead and the late James, a process-ontology – dubbed the spread mind – is outlined to carve nature at its joints in a way compatible both with empirical objective data and with phenomenological adequacy.

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Why It Proves so Difficult to Pin Down a Definition of Nature

Marta Bertolaso

Introduction

The main goal of this paper is to clarify why it proves so difficult to pin down a precise definition of *nature*, one of the central concepts to understand living systems in biological sciences. The meaning of nature depends dramatically on its opposite term: natural/artificial, nature/society, natural/conventional, nature/history, etc. and also nature/nurture. In this paper, I will deal with the last pair and instead of performing a conceptual analysis of the term, I will analyse the explanatory import of the *nature* notion, and of its counterpart *nurture*, when a circular causality characterizes the regulatory features of a biological behaviour and the context dependency argument is in the explanatory picture of a biological process.

I will proceed in four steps. In Section 2 and 3, I will frame the philosophical perspective I move from. Interestingly, in fact, the debate on the concept of *nature* in scientific and philosophical fields has been mainly driven by the explanatory role of interactions between *nature* and *nurture* in regulating the system-environment dynamics. However, what still remains elusive is the kind of such interactions and, therefore, the specific explanatory status of the relationship between what is considered intrinsic to the system (*nature*) and to its context (*nurture*). In Section 4 and 5, I will highlight how the context dependency of biological explanations is relevant from an epistemological point of view that is, from the point of view of the identification and definition of the explanatory elements. To clarify this point, I introduce a case study from cancer biology. It is actually well known that an essential (causal) definition of this disease is far from being at hand because of its intrinsic causal complexity, i.e. the relative

autonomous behaviour of tumour cells with respect to their microenvironment. My working hypothesis is that, as often happens in science, part of the answer is already in the question: why is it (the tumour cell, in our case) behav-ing like this? Any adequate answer should expand our understanding of what the "-ing" form implies.

The thesis, I finally defend in Section 6 and 7, is that the difficulty to pin down a definition of *nature* is related with the peculiarity of biological emergent properties and their phenomenology. As we will see, any definition of what is natural shall be understood in terms of *mode of action*, hold by organizing principles that follow causal categories, relational in nature. Moreover, such phenomenology has implications for the structure of the biological questions and explanations, in which the emphasis is not on the system or on the environment, on the parts or on the whole, but on their dynamic interaction that is: on their inter-relationships or, in causal terms, "what is naturally-occurring". What follows is the impossibility to overcome the nature-nurture tension, and a step towards a better understanding of how science works in practice.

1. *The dichotomy*

Definitions of terms have important intellectual and practical consequences and concepts shape heavily scientific practice and philosophical concerns and reflections. In science, the definition of terms is a necessary step in formulating the content of a theory and in making it more determinate, and clear definitions of such terms may also be necessary to understand such theories as well (Hesslow 1993). However some concepts in biological sciences do not fit this process of conceptualization. There are concepts for which no operational definitions are made explicit although they structure the object of inquiry of such sciences and therefore influence the explanatory accounts. There is no biological theory in which *nature* appears as a theoretical entity, although there are different *rules* – with scientific and ethical relevance – logically tied to concepts of *nature* and of *nurture*. Conceptual analysis is necessary for determining this system of rules, but the epistemological status of such determination has its peculiarity reflected in our way of inquiring the biological world. In this sense, a different kind of reason for caring about definitions is the value that some concepts have in organizing intellectually a certain body of knowledge (*ibidem*). In our case, it would be the question about biological

systems, through the concept of *nature*. Framing the issue in these terms requires, more than a direct conceptual analysis of the term itself, a reflection about its role in explanatory processes.

Coming to scientific literature, it is clear that the *nature* issue is strictly related with the evaluation of how behavioural properties in living systems arise, develop and are maintained (both in loose, i.e. dynamics of a functional integrated system, and strong sense, i.e. the behavioural phenotype). On one hand, the nature-nurture dichotomy was, and to some extent is still related to the fact that DNA is both inherited and environmentally responsive (Robinson 2004). On the other hand, analysis on genotype-environment interactions naturally encourages scientists to consider broader implications for research on phenotypic plasticity so that, at the end of a technical book on these issues, Pigliucci says: «What originally motivated me to tackle this field was the fascinating relationships it has with the age-old philosophical question of nature versus nurture» (Pigliucci 2001: 253). Therefore, in science, «[w]hen it comes to behavior, the nature-nurture controversy has not disappeared» (Robinson 2004: 397)[1]. The issue at stake is the *determinant* of biological behaviours, i.e. of the constitutive and regulatory features of biological dynamics. Variations and variability of phenotypes are the phenomenological evidences that arise concerning the question about the nature-nurture interactions in the process of structuring biological behaviours, while the dynamics of inter-level regulatory processes can be considered the basic experimental characterization of such phenomenology.

Also the philosophical analysis of these scientific research programs highlights that the notion *of nature* in the biological field has been always put in relation with the notion of *nurture* and that the nature-nurture debate has been mainly about «sorting out the contributions of nature form those of nurture, and trying to estimate their relative importance» (Keller 2010b: 25). Such relationship informs the discussion in the Philosophy of Biology on genes and species, what should be considered inborn or acquired in the formation of individual traits as well (Griffiths 2009; Sober

[1] Note that this statement can be applied to different dynamics in biological sciences, at different levels: from genes to cells' behavior within the organism or to animals' behavior. Therefore, the notion of nurture acquires a wider meaning in science as well. It refers to "educational" factors in a loose sense. It is, in fact, acknowledged that the context (or biological (micro)-environment) has a role in the processes of formation, growth and in the dynamic behaviours of biological systems at different levels. This is why the paradigm of cancer will be particularly interesting.

2001). However, as Evelin Fox Keller clearly shows (Keller 2010b), the scientific perspective is heavily shaped by the assumption about how the question should be answered: when talking about *nature* and *nurture* the question, in fact, regards *comparison of contribution*. In this way what exactly means *nature* and *nurture* remains an irrelevant issue conceptually speaking, while the relationship between these two concepts is at the centre of scientific interest and of philosophical debate.

Moreover, the evidence that the nature-nurture interactions have been driving the shift in science from the analysis of traits to the analysis of traits' differences and from individuals to population also asked for a philosophical reflection. The incapacity to overcome the nature-nurture dichotomy dates back to the attempt – paradigmatically exemplified in the work of Galton (1871) – to either substantialize or consider as causal elements at the same level and in the same sense *nature* and *nurture*. Such dualistic attempts were doomed because inadequate to account for the kind of variability we see in nature. As Keller concludes, the valuable question seems to be on the *relative contribution* to variation (not to the process that makes us as we are), i.e. on the contribution to phenotypic difference or variability (Keller 2010b).

But: contribution to what? On this point opinions and discussions both in the scientific and philosophical field have been changing[2] and a general answer in terms of behaviours shows its pitfalls, given the heterogeneity of meaning that the term itself has in different fields from biology, to psychology, sociology, philosophy of mind and regarding moral issues (Keller 2010b; Goldhaber 2012). Given this multiplicity of behavioural references, the emerging and central issue became causation of phenotypic variability (or trait-differences) and explanation of the quasi-independent inheritance of such traits.

[2] As reviewed by Keller 2010b, such relative contribution has been discussed in terms of a) contribution in the formation of individual traits and in the formation of human personality so that nature and nurture could be considered separable causal elements or two different substances; b) contribution to individual development (opening the whole research field on epigenetics); c) contribution to the variation within a population (e.g. for population genetists; d) and in terms of contribution to differences between individuals.

2. *Nature-nurture interactions*

At the crossroads of the debates mentioned in the above Section, there is the question on the origin of variation in nature and on the varieties of responses of living systems to external inputs. The hard core of the explanatory challenge regards in "what" does the explaining, i.e. the cause of variation, while the conceptual challenge regards the question about behavioural responses or reactions and in which sense they rely upon *nature* (a question which is exemplified in expressions as: it is behaving like this by nature). More recently a discussion on some explanatory issues related with the debate on the nature-nurture interaction has been, therefore, engaged.

To tackle the problem of understanding the relative contribution of *nature* and *nurture* to variation (the thing to be explained, or *explanandum*), Tabery has recently developed an analysis of how two different scientific perspectives faced this issue (Tabery 2014): the variation-partitioning approach (that deals with statistical, biometric notion of biological interactions and answer "how much" questions) and the mechanism-elucidation approach (that deals with developmental issues and answers "how" questions). He also discusses how such explanatory models of variance could be understood in a more unified framework. With this analysis Tabery is setting a new threshold in understanding the debate on the nature-nurture issue, through an «integrated concept of interaction» that is understood as the «interdependence of actual difference makers in the causal mechanisms responsible for a phenomenon» (Tabery 2014: 253). The language clearly recalls Water's concept of an actual difference maker[3] and the philosophy of mechanisms on which Tabery's population idea about mechanisms is based on. Scientists who elucidated mechanisms give great importance to the developmental nature of interaction, while the scientists who partitioned variation reply that interaction was a statistical concept that had nothing to do with development. In Tabery's account instead interaction is developmental in nature, but it does not encompass all forms of developmental interaction. Answering Longino's criticisms to his account (Longino 2013), he also further expands the notion of interaction saying:

[3] In Water's account one gene, for example, can be considered the *actual* difference maker for a phenotype. «In order for there to be a difference maker there must be a difference. And in order for there to be an *actual* difference maker, there must be an *actual* difference» (reported in Tabery 2014). If the actual effect in question is caused by a single actual difference, then we may speak of *the* actual difference maker. The causal relationship between $X \rightarrow Y$ is understood in the sense of Woodward's manipulability theory.

interdependent actual difference makers are not the only type of developmental interactions that occur in the causal mechanisms responsible for a phenomenon. Many developmental interactions involve the interdependence of just potential difference makers; these difference makers are crucial parts of the causal mechanisms, but they generate no actual variation. Likewise, many developmental interactions involve a combination of interdependent actual and potential difference makers (Tabery 2014: 141).

The focus on the nature-nurture interaction is particularly relevant for our analysis: it avoids the concern related with *nature* and *nurture* as separate concepts or theoretical entities while directly focusing on their *relative contribution* in terms of interaction, opening a reflection about the causal relevance of the nature-nurture relationship itself. For this purpose, however, which interactions are relevant in order to understand the nature-nurture contribution to development and variance in nature (heuristic level), in which sense potential difference makers are relevant parts of causal mechanisms (epistemological level), and how such interdependence of nature-nurture interaction should be understood (ontological level) still need to be clarified. With Tabery's contribution, if we return to the original question – what is causing variation? – the answer is: an actual difference maker is a cause of variation. But how an *actual* difference maker is identified and which causal categories hold its explanatory power when the effect is not an actual event or molecular product but constitutive relations between levels – which precisely specify the question about the variability of responsiveness of biological systems – should be explained. Such variability of responsiveness, in fact, is typical of regulatory processes in biology. It also paradigmatically triggers the question about behaviours and nature-nurture causal interaction, i.e. about their inter-relationships or – in causal terms – what is naturally-occurring (cfr. also Tabery 2014 on the causal aspect).

The challenge is thus to link up these different aspects related with the nature-nurture debate and the explanatory import of such notions. The question of Keller: "to what" *nature* and *nurture* contribute is reframed in terms of a question: "how" such contribution to inter-level regulatory dynamics (as I said above, the minimal phenomenology of biological dynamics) should be understood. The causal focus is now on the peculiar effects of biological dynamics, on the constitutive relations between levels of biological organization. In biological explanatory accounts, the notion of *nature* takes the form of the adverb "naturally" and is related with how causality operates in biological dynamics. This issue in my opinion is

founded on an ontological issue which becomes an epistemological one that lies at the very heart of biological science. Therefore, rethinking *nature* implies a shift in the focus.

3. *An inter-level regulatory process and its circular causality*

Cancer research seems to be currently overwhelmed by the questions raised by the clear inadequacy of explanatory models that look at cancer as to a mere genetic or environmental disease. Cancer appears like a disease with a high multiplicity of causal and contributing factors both genetic and environmental. Moreover, tumour heterogeneity characterizes the complexity of cancer at a molecular, clinical, and cellular level, highlighting the peculiar dynamics of its development. Finally, recent evidence is making it clear that any explanatory model of cancer has to account for a double level of tumour heterogeneity: the one that cancer cells show *within* the same tumour and the one that cancer cells show *throughout* the tumour's progression (Hanahan and Weinberg 2000, 2011; Sottoriva *et al.* 2010). There are a system-environment and temporal dimensions (in brief, systemic dimension) mixed and at work in the neoplastic process, i.e. the process of tumour formation.

The increasing recognition of these dynamic components of the neoplastic phenomenon has contributed to less traditional points of view that led scientists to rethink the basic assumptions of the current research and practice of oncology, and develop new and alternative approaches considering cancer as a process rather than as an event (Sporn 2006). Cancer, in fact, presents important features that overlap with other complex biological processes, such as morphogenesis and development, so that the question is on the behaviour of tumour cells and how it is related with the multi-level disruption of organizational features of biological systems (from the genome to the cells and the tissues).

Interestingly, the evolution of the explanatory models of cancer offers an example to support Tabery's analysis of the variation-partitioning and mechanism-elucidation approach. However this is beyond the aim of this paper. Here I wish to define some reasons of this evolution and how they can clarify the question about the causal relevance of the nature-nurture relationship. Moving from the clonal genetic model, which attributed the origin of cancer to a single somatic mutation in a cell, over the last decades the neoplastic progression has been described as a progression of stages

defined by mutations in oncogenes or tumour suppressor genes (Fearon and Volgestein 1990), which already highlights the relevance of regulatory dimensions of tumour cells behaviour. Later on, the genetic account was integrated into the epigenetic model of cancer considering that other non-genetic factors have been found to be equally involved in the process, like DNA methylation of the promoters of some genes or histone acetylation, with regulatory functions in gene expression during the process of cellular differentiation. In this way, the description of the relationship between different molecular components has been enriched with more and more details resulting in an integrated cell circuit whose dynamics should explain the specific behaviour of cancer cells (Hahn and Weinberg 2002). While its molecular components and their interactions remain virtually unchanged, their functional activity changes in response to internal and external factors while ultimately involving DNA damage at multiple levels (Vogelstein and Kinzler 2004; Jones and Baylin 2007). Multi-level mechanisms became therefore the target of the explanatory models of cancer.

However, despite this effort to recover a more integrated and dynamic view at the cellular level, this paradigm omits an important aspect of carcinogenesis: the instability of tumour cells' phenotype and its behavioural dependence on organismic factors like, in some cases, the spontaneous regression of some tumours (Baker and Kramer 2007). From an experimental point of view the challenge became understanding how the system behaviour changes depending on micro-environmental factors, i.e. understanding its stability or instability (Heng *et al.* 2009) and its context functional dependence. Studies have moved from genetic to genomic level. Other authors, who explain the neoplastic phenotype in terms of system-level dynamics, also share the interest for the dynamic properties of tumour cells (Huang and Ingber 2000; Ingber 2008). Their models seem to match well with the facts that the neoplastic phenotype can revert and that metastasis can actually be dormant for a long time. The analysis of regulatory networks of genes seems to be a useful tool to explain changes from the cellular phenotype to the neoplastic one. These changes might occur through dynamic transitions of networks that can be described in terms of attractors and epigenetic landscape.

The novelty of these approaches is that they overcome limits of mechanistic models by integrating the space-time dimension into a more systemic perspective. Such perspective explicitly appeals to the role of the cellular functional context, described either in terms of cellular shape or tissue architecture. Such notion of context is not an additive factor in

causal terms but plays another important role that I am interested in exploring further.

The need to explain the space and temporal properties of cancer is not only a problem of integrating all the available information to cope with functional contexts where non-linearity is the rule, not the exception, as in the case of biological processes and functions. Instead, such more comprehensive systemic account of the neoplastic phenomenon requires new ways to think about networks, where contextual conditions and their relationship with a specific phenotype asks for a different epistemological perspective that supposes the hierarchical organization of the living organism. Such hierarchical organization implies inter-level regulatory processes that cannot be reduced to mere feedback dynamisms and present constitutive dependence on a top-down causality often referred to in terms of circular causality as well.

This has been explicitly stated by the authors of the Tissue Organization Field Theory of cancer (Sonnenschein and Soto 1999) that shifts the emphasis from the dynamics at the cellular or sub-cellular levels, to the organization of tissues. According to this view, carcinogenesis disrupts the three-dimensional structure connecting the stroma and the parenchyma, mediated by cell-cell interactions. In this perspective carcinogens might not be directly responsible for neoplasia by inducing genetic mutations. Carcinogenesis and neoplasia would occur once the signals that maintain normal organization are disrupted: a developmental process gone astray (Soto, Maffini and Sonnenschein 2008). A chain of cellular miscommunication is responsible for such organizational disruption. The perspective of analysis on the relative contribution of nature and nurture factors is inverted. Their relevance is not identified in causal terms nor in terms of specific events (e.g. mutations) or products (e.g. molecular tumour markers), but in terms of organizing principles that are compromised. Consistently, the organizational and historical dimensions of the tumour, caught up in this developmental and systemic approach, have been described in terms of morphogenetic fields that are ultimately explanatory for the neoplastic phenomenon.

The relationship between the explanatory role of the biological context and the circular causality at work is further clarified by an increasing number of studies on the role that tissue-specific stem cells have in the carcinogenetic process. By definition stem cells conceptually depend on the micro-environment, so that the epistemological and explanatory relevance of such notion in biological processes (like cancer) is already an argument to take seriously the context dependency and the top-down causality that

structure the explanatory models (cfr. Bertolaso 2013a). However, further arguments can be derived from the consideration that the developmental limitations of stem cells and of tumour stem cells depends on the microenvironment and that host cells, under specific conditions such as tissue injury or infection, are able to provide specific signals that counteract these restrictions (Nelson and Bissell 2005). The nature-nurture interplay gives, in these cases, an interesting example. We can see this in a program of differentiation and organization of cells (known as Epithelial Mesenchymal Transition) mainly characterized by loss of cell adhesion, and increased cell mobility, which seems to account for tumour cell invasiveness in many cases (Kalluri and Weinberg 2009).

Even more interestingly, the Dynamic Reciprocating Model of cancer explains a specific feature of this miscommunication among levels and the tumorigenic context dependence, by studying the dynamic integration of tissue architecture and function at different levels of biological organization (e.g. cell membrane, cellular cytoskeleton, etc.) that ultimately drive or compromise tissue-specific gene expression. Such dynamics underlying carcinogenesis show an interesting *reciprocity* (Xu, Boudreau and Bissell 2009). Regulatory inter-level mechanisms are involved and new properties emerge at different scales that prove to be real and autonomous. We should therefore consider the architecture of the tissue is an emergent property in the proper sense and not a mere function of aggregative properties of the cells that constitute the tissue. In fact, in the tissue, cells move in relation to each other and acquire different functional identities depending on these new relationships: there is a new mutualistic way to interact that is essentially reciprocal and causally effective on cell behaviour and thus on their biological identity.

As stated by Kim and reported by systemic scientists in their papers (Kim 1999 quoted in Soto and Sonnenschein 2006: 372): «[A]part from any recondite metaphysical principle that might be involved, one cannot escape the uneasy feeling that there is something circular and incoherent about this variety of downward causation»[4]. The interactions between a cell and its context determine the pattern of its gene expression and its specific phenotype, in spite of the fact that its genome, its blueprint essentially, is

[4] Note that Kim is discussing logic circularity not an organismic one, so that it becomes an argument for an intrinsic incoherence of explanations. The composite meaning in this quote might be considered (cfr. Bertolaso 2012) but a much more detailed analysis is beyond the aims of this paper.

invariant. «In the end, the unit of functional differentiation is the organism itself» (Nelson and Bissell 2006: 288). The explanations are operational, and the biological aspect is incorporated in terms of forms and behaviours.

The discussed circular causality seems to be strictly related with a systemic or relational notion of causality that ultimately corresponds to a natural principle of the structural and functional organization of the living organism and its maintenance. When single components come together and form a biological system, they engage in novel behavior and produce novel phenomena by the system itself constraining the components. Understanding how causality operates at different levels of organization is one of the distinctive purposes of systems biology as well (O'Malley and Duprè 2005).

4. *Context dependencies*

By addressing biological system behaviour we are implicitly assuming that living beings respond to the same inputs at different levels, that molecules can enter into different pathways with different functions, and that pleiotropic responses in nature are the norm and not the exception. The relationships between biological factors at various levels are not independent of, nor indifferent to, each other. The behaviour of complex systems is dependent on the context in a very peculiar way, which is relational in the sense that the contextual inputs are taken over by the system when the system imposes some form of information in the context as well. Such kind of dynamic information grounds the possibility for the system to change over time while holding its organizational identity and its behavioural phenotype.

Organ structure and consequently organ function are determined by the dynamic and reciprocal interactions between the organ's constituent tissues, the structure and function of which are determined by the dynamic and reciprocal interactions between the cells and ECM comprising a given tissue. The epistemological counterpart of this aspect is that any functional definition of parts in biological systems is possible just moving from the constitutive unity of the system itself. There are good reasons for classifying the explanatory systems in functional terms, i.e. in terms of properties that have some considerable stability over time. This defines a first epistemological level of context dependency.

Moreover, views that consider cancer as a phenomenon related to the loosening of biological constraints, which usually guarantee the functional stability over time and at different levels of the biological organization of a

living system (Bertolaso 2013b), also account for the multi-level phenomenology of cancer and for the hierarchical control of the organisms. Such relationships of functional order established by the nature-nurture interaction, in fact, introduce the priority of one item over another, which can also be non-temporal, even though changes may be seen over time. For this reason, the circular causality of which we spoke above is apparent as a projection of the relational actual causality or systemic generation of living organisms. This is the perspective that can provide answers to questions about the activity of causality at different hierarchical levels of the organization. Then the balance between the nature-nurture relative contribution is crucial for the causal establishment and maintenance of a living organ/ism. It is, in fact, «understanding the nature of the networks of interaction, which are involved in the process and which a collection of cells becomes organized into an organ with a unitary character» (Waddington 1977: 21) that still remains the central question when addressing living beings. This level of analysis becomes an ontological one if we consider that plenty of data are now showing how compromised relational dynamics among cells are responsible of cell instability at a functional and genomic level.

Reframing our understanding of the nature-nurture interaction in relational causal terms and its link with the hierarchical organization of the organisms, resolves the apparent logic circular causality. As a consequence various interpretative models of the neoplastic process seem also crucial for a deeper understanding of biological dynamics in terms of the nature-nurture interaction. This implies moving towards a biological theory of action that uses relational causal categories. I think that the very issue at the core of the nature-nurture debate refers to the causal question as dominant in biology and to the possibility for the organism to maintain its functional state, phenotypic stability, by constraining its functional states by integrating processes that underlie organic organization. Neither determinism nor indeterminism but only self-determination of the organism appears as the last condition for the possibility of a phenotypic stability of the organism through the integration of its different functional and molecular possibilities (Buzzoni 2009).

5. *Back to biological interactions*

In the light of the analysis performed till now, an aspect of the debate between Keller and Duprè on the possibility of explaining biology in terms

of molecular interactions acquires particular interest. Both Keller and Duprè seem to converge on the fact that there is a «dependence of the identity of parts, and the interactions among them, on higher-order effects» (Duprè 2010: 37). However this has different meanings for the two authors. For Duprè this is a fatal objection to a reductionist view that follows the consideration that «properties of constituents cannot themselves be fully understood without a characterization of the larger system of which they are part» (Duprè 2010: 30). In Duprè's account (dispositional) properties are relational, i.e. they cannot be reduced to any information about the parts and the context is relevant. Appealing to the context means «to refer to features of an object's environment that are necessary to confer on the object a particular capacity […]. Interactions are simply the exercise of such capacities with relation to some other entity that will presumably constitute all or part of that context» (Duprè 2010: 45). On the contrary, Keller stresses interactions among parts, leaving aside the definition of the system and its properties. Coherently in her discussion the notion of function is minimalist, a simple feedback mechanism (Keller 2010a). Keller thinks that the context-interactions distinction is artificial in Duprè's account: «context is simply all those other factors/molecules whose interactions with the object or system in question have not been made explicit and, hence, have not been included in the description» (Keller 2010a: 30).

In explanatory terms, for Duprè, his point can be reframed denying that «the behavior of the whole is fully determined by the behavior of, and interactions between, the parts. And hence, the elements of behavior that are not so determined are what we don't know when we know everything about the parts and *the way they are assembled*» (Duprè 2010: 35, my emphasis). The functional definition and ontological determination of the elements that integrate any biological organization I have discussed clearly fit these concerns and open to some conclusions. The double component entailed in biological explanations and related with the question on the nature-nurture interactions is adequately captured by distinguishing issues related with the *relata* and 'in what way' a reductive (i.e. explanatory) relationship is construed (Silberstein in Machamer and Silberstein 2002).

Such distinction is made by Duprè himself when saying: «I would say that the project of characterizing the entity, which I have said requires reference to the context, and the project of describing what, on a particular occasion, it does, namely interact, are distinct activities» (Duprè 2010: 45). However, to say that «the capacities of an object of inquiry are not merely consequences of its molecular constitution, but are simul-

taneously determined by the systems of which the object is part», does not mean that the conceptualization of a part, as an object of inquiry and analysed in terms of discrete constituent parts, needs defining the context with which it interacts. This is a stronger claim. Where Duprè and Keller therefore would not agree is on the *certain way* in which parts are assembled, that is «the emergent features of a whole or complex are not completely independent of those of its parts since they "emerge from" those parts, the notion of emergence nonetheless implies that, in some significant way, they *go beyond* the features of those parts» (Silberstein 2002: 1404). This implies to explain 1) dependency of the identity of the part on higher order effects, 2) how these higher order effects shall be understood, and 3) what does the expression 'assembled in a certain way' implies.

By discussing the conceptual definition of the explanatory terms we are contributing to the question about the *relata* of the explanatory accounts and to the nature of such relationship for which, as we have seen, context dependencies and notions like causal circularity play an important role. On one hand, in fact, it is not possible to give a full explanatory story at the same level (epistemological level). On the other hand the identity of parts is dependent on the system (ontological level). Therefore, the context dependencies and the apparent circular causality are interestingly linked up looking at how the *relata* of the explanatory accounts are conceptually interconnected.

Conclusion: the -ing issue

«The horns of a dilemma are usually on the same bull». This Spanish proverb quoted at the beginning of the article from «Science» already mentioned above (Robinson 2004) gives me the opportunity to summarize some conclusions. The central goal of this paper was to clarify why it had proven so difficult in Philosophy of Biology to pin down a precise definition of nature. What emerges from this analysis is that such difficulty is related with the conceptualization of causality and with the impossibility, within a mechanistic epistemology of biological processes, to account for the context dependency and the apparent circular causality that seem to characterize the explanation of such processes.

Nature escapes a precise definition because of its epistemological status, being a relational concept. Such relational feature is captured, on one

hand, by the "-ing" form that characterizes biological dynamics, i.e. it describes a mode of action. On the other hand, its explanatory role is linked to nurture not in a dialectic way, but through a reciprocal notion of causality. Therefore the terms of a biological explanation conceptually imply each other as the relationship among the *relata* and the nature shows through the context dependency argument.

This approach overcomes the limits of genetic determinism (prevalence of nature) and of some ecological accounts (prevalence of nurture) offering a more comprehensive perspective from which we can understand nature-nurture interactions. It also emphasizes the inter-level balanced stability of biological functional states and, at the same time, the importance of identifying adequately the explanatory system. The entanglement of levels in any biological organization can never be totally spread out in one (lower) level of explanation, because in the ultimate through-and-through lower-level explanation one might never know what higher-level phenomenon it explained. Each level of the biological organization has unique features through which the structure and information of one level are re-interpreted at a superior level. To ignore this means to lose sight of the basic principles of hierarchic structure and to abandon the explanation of their natural origin, which is systemic and organic.

Acknowledging the epistemological role of the apparent circular causality in explaining processes involved in the maintenance of the organism allows us to work with biological entities and concepts like those related with the notion of stemness and morphogenetic fields, which can not be considered just an epiphenomenon, and to use modern mathematical tools in a more meaningful way. Rethinking nature means to start by rethinking the nature-nurture relationship that is explanatory, required by the intrinsic complexity of biological causality that is multi-level, reciprocal, context dependent in a very peculiar way. So this study might also open the way to a deeper reflection about the notion of nurture, e.g. in which terms it also reflects the peculiar dynamics of biological systems and to what extent it sheds light on the mode of action that characterizes living beings.

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References

Baker, S.G. and Kramer, B.S. (2007), *Paradoxes in Carcinogenesis: New opportunities for Research Directions*, in «BMC Cancer», vol. 7, pp. 151-157.

Bertolaso, M. (2013a), *How Science Works. Choosing Levels of Explanation in Biological Sciences*, Aracne s.r.l., Rome.

Bertolaso, M. (2013b), *Breaking Down Levels of Biological Organization*, in «Theoretical Biology Forum», vol. 106, pp. 49-72.

Bertolaso, M. (2012), *Il Cancro come questione*, Franco Angeli, Milano.

Buzzoni, M. (2009), *Psyco-physical Dualism, Causality and Human Freedom*, in «Epistemologia», vol. 32, n. 2, pp. 219-232.

Dupré, J. (2010), *It Is Not Possible to Reduce Biological Explanations to Explanations in Chemistry and/or Physics*, in J. Ayala and R. Arp (eds.), *Contemporary Debate in Philosophy of Biology*, Wiley-Blackwell, Oxford 2010, pp. 32-48.

Fearon, E.R. and Vogelstein, B. (1990), *Genetic Model for Colorectal Tumorigenesis*, in «Cell», vol. 61, n. 5, pp. 759-767.

Galton, F. (1871), *Pangenesis*, in «Nature», vol. 4, pp. 5-6.

Goldhaber, D. (2012), *The Nature-Nurture Debate: Bridging the gap*, Cambridge University Press, Cambridge.

Griffiths, P. (2009), *The Distinction Between Innate and Acquired Characteristics*, The Stanford Encyclopedia of Philosophy, Stanford.

Hahn, W.C. and Weinberg, R.A. (2002), *Modelling the Molecular Circuitry of Cancer*, in «Nature Reviews Cancer», vol. 2, n. 5, pp. 331-342.

Hanahan, D. and Weinberg, R.A. (2000), *The Hallmarks of Cancer*, in «Cell», vol. 100, n. 1, pp. 57-70.

Hanahan, D. and Weinberg, R.A. (2011), *Hallmarks of Cancer: the Next Generation*, in «Cell», vol. 144, n. 5, pp. 646-674.

Heng, H.H. *et al.* (2009), *Genetic and Epigenetic Heterogeneity in Cancer: a Genome-Centric Perspective*, in «Journal of Cellular Physiology», vol. 220, n. 3, pp. 538-547.

Hesslow, G. (1993), *Do We Need a Concept of Disease?*, in «Theoretical Medicine», vol. 14, n. 1, pp. 1-14.

Huang, S. and Ingber, D.E. (2000), *Shape-Dependent Control of Cell Growth, Differentiation, and Apoptosis: Switching between Attractors in Cell Regulatory Networks*, in «Experimental Cell Research», vol. 261, n. 1, pp. 91-103.

Ingber, D.E. (2008), *Can Cancer Be Reversed by Engineering the Tumor Microenvironment?*, in «Seminars in Cancer Biology», vol. 18, n. 5, pp. 356-64.

Jones, P.A. and Baylin, S.B. (2007), *The Epigenomics of Cancer*, in «Cell», vol. 128, n. 4, pp. 683-92.

Kalluri, R. and Weinberg, R.A. (2009), *The Basics of Epithelial-Mesenchimal Transition*, in «J. Clin Invest», vol. 119, n. 6, pp. 1420-8.

Keller, E.F. (2010a), *It Is Possible to Reduce Biological Explanations to Explanations in Chemistry and/or Physiscs?*, in J. Ayala and R. Arp (eds.), *Contemporary Debates in Philosophy of Biology*, Wiley-Blackwell, Oxford 2010, pp. 19-32.

Keller, E.F. (2010b), *The Mirage of a Space between Nature and Nurture*, Duke University Press, Durham.

Kim, J. (1999), *Making Sense of Emergence*, in «Philos. Stud.», vol. 95, n. 1-2, pp. 3-36.

Longino, H. (2013), *Studying Human Behavior: How Scientists Investigate Aggression and Sexuality*, University of Chicago Press, Chicago.

Nelson, C.M. and Bissell, M.J. (2005), *Modeling Dynamic Reciprocity: Engineering Three-Dimensional Culture Models of Breast Architecture, Function, and Neoplastic Transformation*, in «Semin. Cancer Biol.», vol. 15, n. 5, pp. 342-52.

Nelson, C.M. and Bissell, M.J. (2006), *Of Extracellular Matrix, Scaffolds, and Signaling: Tissue Architecture Regulates Development, Homeostasis, and Cancer*, in «Annu. Rev. Cell Dev. Biol.», vol. 22, pp. 287-309.

O'Malley, M.A. and Duprè, J. (2005), *Fundamental Issues in Systems Biology*, in «BioEssays», vol. 27, n. 12, pp. 1270-6.

Pigliucci, M. (2001), *Phenotypic Plasticity: Beyond Nature and Nurture*, Johns Hopkins University Press, Baltimore.

Robinson, G.E. (2004), *Beyond Nature and Nurture*, in «Science», vol. 304, n. 5669, pp. 397-399.

Silberstein, M. (2002), *Reduction, Emergence and Explanation*, in P. Machamer and M. Silberstein (eds), *Guide to the Philosphy of Science*, Blackwell, Malden, 2002, pp. 80-108.

Sober, E. (2001), *Separating Nature and Nurture*, in D. Wasserman and R. Wachbroit (eds.), *Genetics and Criminal Behavior*, Cambridge University Press, Cambridge 2001, pp. 47-78.

Sonnenschein, C. and Soto, A.M. (1999), *The Society of Cells: Cancer and Control of Cell Proliferation*, Springer Verlag Inc., New York.

Soto, A.M., Maffini, M.V. and Sonnenschein, C. (2008), *Neoplasia as Development Gone Awry: the Role of Endocrine Disruptors*, in «International Journal of Andrology», vol. 31, n. 2, pp. 288-93.

Soto, A.M. and Sonnenschein, C. (2006), *Emergentism by Default: A View from the Bench*, in «Synthese», vol. 151, pp. 361-376.

Sottoriva, A. *et al.* (2010), *Cancer Stem Cell Tumor Model Reveals Invasive Morphology and Increased Phenotypical Heterogeneity*, in «Cancer Research», vol. 70, n. 1, pp.46-56.

Sporn, M.B. (2006), *Dichotomies in Cancer Research: Some Suggestions for a New Synthesis*, in «National Clinical Practice Oncology», vol. 3, n. 7, pp. 364-373.

Tabery, J. (2014), *Beyond Versus: The Struggle to Understand the Interaction of Nature and Nurture*, MIT Press, Cambridge.

Vogelstein, B. and Kinzler, K.W. (2004), *Cancer Genes and the Pathways They Control*, in «Nature Medicine», vol. 10, n. 8, pp. 789-99.

Waddington, C.H. (1977), *Tools for Thought*, Jonathan Cape Thirty Bedford Square, London.

Xu, R., Boudreau, A. and Bissell, M.J. (2009), *Tissue Architecture and Function: Dynamic Reciprocity via Extra- and Intra-Cellular Matrices,* in «Cancer Metastasis Reviews», vol. 28, n. 1-2, pp. 167-176.

Abstract

In Philosophy of Biology a definition of what should be considered nature *– as opposed to* nurture *– has remained an elusive issue. In order to clarify some reasons of this, I adopt in this paper the following strategy. Instead of performing a conceptual analysis of the term of nature in biological sciences, I explore two related epistemological issues that pose the question about the explanatory import of the notions of* nature *and* nurture*: a) when a circular causality seems to characterize the regulatory features of a biological behaviour and b) how the context dependency argument comes into the explanatory picture of a biological process. My thesis is that the notion of* nature *(and its interdependence with the notion of* nurture*) has a peculiar epistemological status because it implies relational causal categories.*

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Rethinking Nature Through Synthetic Biology*

Joseph A. Raho

Introduction

The possibility of creating life from non-living parts has always been a matter of science-fiction – until recently. In 2010, the world's first self-replicating synthetic cell was created by 24 researchers at the J. Craig Venter Institute (USA). Their paper, published online in *Science*, describes the synthesis, assembly, cloning, and successful transplantation of the 1.08 million base pair synthetic *Mycoplasma mycoides* genome (Gibson *et al.* 2010). This synthetic genome, «[…] the largest chemically defined structure ever synthesized in the laboratory» (J. Craig Venter Institute 2010), provides «a proof of principle for producing cells based on computer-designed genome sequences» (Gibson *et al.* 2010: 55) that have not up until now naturally existed. In the provocative words of Venter, «[this cell line] is the first self-replicating species we've had on the planet whose parent is a computer» (quoted in Murray 2011: 34).

In addition to promises of advancing fundamental scientific knowledge, creating renewable biofuels, and developing medicines more efficiently, there are various ethical concerns – from risk and safety issues to worries about tampering with nature and playing God. Whereas traditional genetic engineering aims to modify *existing* organisms, synthetic biology looks to design and assemble organisms *de novo* – i.e., from scratch. This paper provides an overview to the ethics of synthetic biology by focusing particularly

* The background research for this article comes from an earlier publication in Italian on the topic of metaphor and synthetic biology (Raho 2012: 295-304). The author would like to thank Professor Sergio Bartolommei for helpful suggestions.

on how this emerging field causes us to "rethink nature", the topic under discussion in this thematic issue of *Teoria*.

Two principal groups of moral objections to synthetic biology will be explored in this article. The first is based on *physical harms* – i.e., the current and foreseeable risk scenarios that pertain to *biosafety* and *biosecurity*. As commonly happens with new advances in science, these issues have captured the most attention. Yet it is a second set of moral objections, various *intrinsic objections*, that will be the primary focus of our analysis[1]. For example, if synthetic biology aims to construct living systems *de novo* (instead of merely modifying them), does this amount to *playing God*? If the products of synthetic biology comprise organisms that not only function like machines, but also possess characteristics that we normally take to be definitive of life, would we not be blurring traditionally-held distinctions between *artifact* and *organism*, or between the *living* and *non-living*? What is the relationship between the products of synthetic biology, on the one hand, and human beings, non-human species, and the natural world, on the other? Finally, is there any reason to believe that leaving nature "alone" is morally significant?

Developments in science have always caused us to rethink our relationship to nature. In this article, we will see how this is especially so with respect to the intrinsic worries over synthetic biology. In the next sections, an overview to synthetic biology will be provided, followed by a summary of the ethics of the practice. A brief exposition of the biosafety and biosecurity risks will be presented, followed by a more in-depth analysis of the intrinsic objections to synthetic biology. I conclude that any technology brings with it potential risk for misuse. However, we ought to embrace synthetic biology – and with it, the complexities surrounding our new relationship to nature.

[1] Some authors (e.g., Parens, Johnston, and Moses 2009) use the language of *non-physical harms* instead of *intrinsic objections*. *Non-physical harms*, according to these authors, encompass two subgroups: the first pertains to questions about fairly distributing the benefits of synthetic biology; the second deals with concerns regarding our attitude toward ourselves and nature (*ivi*, p. 4). Since we will be analyzing the second subgroup of objections in this article, for our purposes the term *intrinsic objections* will be adopted. In general, intrinsic objections are non-consequentialist; they prohibit as well as oblige human conduct or actions on the basis of prefixed, absolute principles. Such objections could be theocentric, communitarian, biocentric, ecocentric, as well as based on a reinterpretation of the natural law. For discussion of the differences between broadly consequentialist and intrinsic objections as they pertain to the debate on genetically modified organisms, see Bartolommei (2003: 22-26).

1. *What is synthetic biology?*

Synthetic biology is an emerging field of interdisciplinary research that applies the techniques of engineering to biology. This field also comprises aspects of molecular biology (gene technology), chemistry, and computer science (Swiss Confederation 2010: 3). Synthetic biology aims to advance fundamental scientific knowledge – e.g., about the function of DNA, cells, organisms, and biological systems (Parens, Johnston, and Moses 2009: 14) – as well as design new biological systems with enhanced or specialized functions. Because synthetic biology encompasses a variety of practitioners and approaches, it is resilient to easy definition (cfr. *What's in a Name*? 2009). For the purposes of this article, synthetic biology is defined as «the design and construction of new biological systems not found in nature» (Schmidt *et al.* 2009: 3)[2]. As explained by the U.S. Presidential Commission for the Study of Bioethical Issues (henceforth, PCSBI), standard biology «treats the structure and chemistry of living things as natural phenomena to be understood and explained»; by contrast, synthetic biology «treats biochemical processes, molecules, and structures as *raw materials* and tools to be used in novel and potentially useful ways, often quite independent of their natural roles» (PCSBI 2010: 36; emphasis added). As such, synthetic biology represents a rather radical departure in our ability to manipulate nature.

Although most applications at this time remain at the phase of research and development (De Vriend 2006: 29), potential uses of synthetic biology comprise innovations across the medical, industrial, and environmental sectors – e.g., the development of new drugs, vaccines, and diagnostic technologies; the ability to engineer algae to stimulate advances in clean-burning fuel, agriculture, bioremediation, and medicine; the creation of DNA with highly unusual characteristics; and developing life-like "protocells" (Douglas and Savulescu 2010: 688). One very promising example is the production of the anti-malaria cure artemisinin in engineered yeast (Ro *et al.* 2006) and the cholesterol-lowering agent atorvastatin (Swiss Confederation 2010: 9). Other applications target the environment – for

[2] Subfields of this research include: (1) engineering DNA-based biological circuits; (2) defining a minimal genome/minimal life; (3) constructing protocells (i.e., living cells) from scratch; and (4) creating orthogonal biological systems based on a biochemistry not found in nature (e.g., non-ATGC DNA bases or non-DNA non-RNA nucleic acids, and so-called XNA (Xenonucleic acid)) (Schmidt *et al.* 2009: 3-4).

instance, by creating microbes that can detect environmental toxins and other pollutants (such as oil spills). Further applications include using bacteria for remotely-controlled therapeutic agents in tumors, and therapeutic viruses can also be engineered to interfere with an infection of harmful viruses (De Vriend 2006: 29-30).

How might the aspirations of synthetic biology be evaluated from an ethical perspective? Is the creation of synthetic organisms intrinsically wrong, based on the nature of the action? Or, alternatively, are the foreseeable and unforeseeable consequences of synthetic biology ethically problematic? In the next sections, we will analyze two broad areas of moral inquiry: *physical harms* and *intrinsic objections*. Whereas the former group has to do with empirical objections, which may be analyzed through consequentialist considerations of benefit and harm, the latter deals with non-empirical objections, which may be articulated in broadly deontological terms[3]. I argue that the intrinsic objections provide the clearest example of how synthetic biology challenges us to rethink our relationship to nature. In the next sections, we will sketch the arguments from the potential physical harms, and then focus our attention on the intrinsic objections to synthetic biology. An ethical analysis of this latter category will be presented, and concluding remarks will highlight some of the implications of our analysis.

2. *Physical harms*

This first set of ethical issues pertains to the current and foreseeable risk scenarios posed by synthetic biology. We may divide these various risk scenarios into *biosafety* and *biosecurity* concerns.

A. *Biosafety*

The ethical issue of biosafety relates to the potential physical harms associated with the release of organisms into a natural environment. Might synthetic biology adversely impact human health, ecosystems, and the environment? Will synthetic biology somehow "contaminate" the gene pool? Could the organisms that synthetic biology produces somehow self-replicate or mutate? There is some reason for concern here: because synthetic

[3] Synthetic biology has been assessed from both utilitarian and deontological perspectives (see Smith 2013 and Heavey 2013).

biologists work with living organisms, they may tinker with unknown quantities of them; these quantities may be «either *essentially* unknown or too complex to be grasped», thus creating a situation that has «significant potential to endanger humans and the environment» (Swiss Confederation 2010: 22). Release of organisms may occur either through accident or via human negligence[4].

These concerns are not entirely far-fetched. Throughout history, various animals and insects have been introduced into new geographic areas where they have the potential to create significant destruction. Ethicist Arthur Caplan has written that «[t]here is very little about the history of human activities involving living organisms that provides confidence that we can keep new life forms in their place. People have been introducing new life forms for hundreds of years into places where they create huge problems» (de S. Cameron and Caplan 2009: 1105). Examples include rabbits, kudzu, starlings, Japanese beetles, snakehead fish, smallpox, rabies and fruit flies (*ibidem*)[5]. As Caplan explains,

> [s]ometimes, those involved in creating new life forms have accidentally lost track of the animals, insects or plants they were working with, as happened with the introduction of "killer bees" into South, Central and North America. And in other cases inadequate attention to oversight allowed life forms to escape and wind up in places they were most certainly not wanted, such as the appearance in the food chain of genetically modified "Starlink" corn containing the insecticidal Cry9C protein unapproved for human consumption (de S. Cameron and Caplan 2009: 1105).

The unintended release of such organisms poses substantial threats to agriculture, natural environments, and public health, and the economic costs are not trivial[6]. More importantly, some applications of synthetic biology – e.g., environmental biosensors or bioremediation – require the *deliberate release* of novel organisms into the environment (Schmidt *et al.* 2008: 6).

[4] Parens and colleagues distinguish: (1) *known harms* (e.g., certain viruses that would be fatal to those exposed); (2) *unknown harms* (e.g., the potential mutations of a synthetically engineered virus or bacterium); and (3) *unknown unknowns* (e.g., unknowns that we cannot anticipate with regard to our current state of knowledge) (Parens, Johnston and Moses 2009: 15).

[5] To this list, we can also mention the introduction of cane toads from Hawaii to Queensland, Australia, in 1935 (Coady 2009: 164).

[6] Consider the following example. Nearly a century ago, fire ants (*Solenopsis invicta*) were introduced unintentionally into the United States in cargo that was shipped from their South American habitat; today these ants have been identified in no fewer than nine separate locations, including California, Asia, and Australia. The economic impact of such infestations in the U.S. alone (costs of control, medical treatment, and damage to property) has been assessed at more than $6 billion per year (Ascunce *et al.* 2011: 1066).

B. *Biosecurity*

The second ethical issue refers to potential biosecurity threats. Some life science research enables scientists to facilitate bioweapons development. This is a particular concern in our post-September 11, 2001 world. How might we respond, for example, if the knowledge of synthetic biology were to fall into the hands of a "rogue" state or malevolent non-state actor, for the creation of "designer" viruses or pathogens, acts of bio-terrorism, or warfare? Synthetic biology, we must remember, will enable us to produce, reproduce, and modify potentially dangerous viruses or bacteria. Within biosecurity, a particularly new area of research in applied ethics concerns the *dual-use dilemma*. Stated briefly, these dilemmas occur in biological research «as a consequence of the fact that one and the same piece of scientific research sometimes has the potential to be used for harm as well as for good» (Miller and Selgelid 2007: 524) and «it is unclear how to prevent misuse without foregoing beneficial applications» (Parliamentary Office of Science and Technology 2009: 1)[7].

To illustrate this tension, consider how scientific studies, on the whole, provide extremely valuable public benefits – yet these benefits must be balanced against the potential harms associated with the information generated. To provide one example: the mousepox virus was successfully recreated in 2001 by Australian researchers and published in the *Journal of Virology* (Jackson *et al.* 2001). During the study, scientists inadvertently «produced a superstrain of mousepox in the process» which meant that «[t]he resulting virus killed both mice that were naturally resistant to mousepox and mice that had been vaccinated against it» (Segelid 2007: 39). The publication of this study was controversial since «it might be possible to produce vaccine-resistant smallpox via the same methods used

[7] Admittedly, nearly any human-made invention has the potential to be used malevolently; even an everyday knife could be used for the purposes of (1) cutting food, as well as (2) attacking an innocent. Dual-use dilemmas, however, pose a unique ethical problem for the protection of human populations for the simple «fact that – with regard to the expertise, equipment, and materials required – the manufacture of biological weapons is relatively easy and inexpensive, especially when compared with nuclear weapons» (Selgelid 2007: 37). There is thus an inherent tension between the benefits of research, on the one hand, and the potential for unforeseen harm – on a *large* scale – by malevolent individuals and governments, on the other. The dual-use dilemma presents an ethical problem for individual scientists, as well as those who fund or enable the research – e.g., private and public institutions, universities, and governments (Miller and Segelid 2007: 527); it also comes into conflict with other goods, such as freedom of intellectual inquiry. More thorough analyses of the dual-use dilemma have been published elsewhere (Kuhlau *et al.* 2008, Kuhlau *et al.* 2011; see also Miller and Selgelid 2007; Selgelid 2007).

with mousepox, given that the two viruses are so closely related» (*ivi*: 38). If used on a human population, the result would be a widespread public health catastrophe – a conclusion that leads some critics to suggest that controversial research should be censored, or at least the "materials" and "methods" sections of the studies should be removed (*ivi*: 39)[8].

C. *Conclusion: physical harms*

We conclude this section on physical harms with several salient questions to direct future research. With regard to biosafety: First, are we certain in our ability to prevent unintentional exposure to pathogens, toxins, and other harmful biological materials (Schmidt *et al.* 2008: 4)? Second, how might we realistically predict the foreseeable risk scenarios? And third, what is a morally tolerable level of risk that society is willing to undertake for the benefits promised by synthetic biology (de S. Cameron and Caplan 2009: 1104)? With regard to biosecurity: First, how might society seek to prevent the risks posed by biosecurity and the dual-use dilemma? Second, is there a way to balance the intellectual freedom of the researchers with the need for security, so that human populations and public health will be protected? Finally, if the costs of synthetic genomics are decreasing rapidly (Carlson 2009) and there are various non-professionals in the do-it-yourself (DIY) biology community ("biohackers") who are able to access low-cost materials in the absence of strict regulatory oversight (Alper 2009; Schmidt 2008: 2-3), how might we respond to the following observations of Miller and Selgelid (2007: 525)?

> [I]n the not too distant future a would-be terrorist will no longer need to go to an inhospitable region to find a naturally occurring pathogen such as Ebola […]. Rather he or she could buy a bench-top DNA synthesiser and potentially use it to assemble a specified genomic sequence of a highly virulent and transmissible pathogen from readily available raw materials.

An important question is the following: How can we, as a society, balance the inherent tension between the benefits of research, on the one hand, and the potential for unforeseen harm – on a large scale – by malevolent individuals, on the other?

[8] Other studies – such as the reconstruction of the 1918 Spanish influenza pandemic virus (which killed an estimated 20 to 50 million people worldwide between 1918 and 1919) and the chemical synthesis of poliovirus cDNA – have engendered similar controversy over their publication.

3. *Intrinsic objections*

A second group of ethical objections focuses on the nature of the act – i.e., is synthetic biology right or wrong in itself? Intrinsic objections to synthetic biology comprise a variety of concerns, ranging from metaphysical views to worries about the products we create. These arguments may be articulated in several ways: synthetic biology "plays God", blurs traditionally-held distinctions, and is "against nature".

A. *"Playing God"*

Synthetic biology represents a radical shift in our ability to intervene in the natural world. Beyond merely tinkering or modifying DNA, synthetic biology will enable us to *design* and *create* (Douglas and Savulescu 2010: 688). Thus, in a very tangible way, synthetic biology surpasses the boundaries of genetic engineering. Boldt and Müller (2008: 387) explain the significance of this important passage:

> Whereas genetic engineering traditionally consists of the implantation of a genomic sequence taken from one organism into the otherwise unaltered genome of another organism and its expression in that context, synthetic biology promises to create organisms whose activity, beside[s] basic functions of growth and reproduction, completely follows the scientists' visions. In short, synthetic biology does not just attempt to alter some characteristics of an existing organism: it can create new life forms whose key traits have been largely engineered by humans.

These observations are echoed further by Douglas and Savulescu (2010: 688):

> Humans have long been able to exert some influence on the genetic make-up of future beings through selective breeding; however we were constrained to working within timescales and genetic possibilities dictated by evolution. Genetic engineering partially freed us from this constraint. Synthetic biology promises to free us from a further constraint: the need for a natural template on which future organisms must be based. It will allow us to design and create life, not merely to tinker with or modify it.

Thus, on a broadly deontological approach, the fundamental ethical question we must ask ourselves is whether it is intrinsically wrong or misguided to attempt to design and create life in this way.

Some opponents of synthetic biology respond to this question in the

affirmative: synthetic biology is intrinsically wrong because it represents our human attempt to *play God*. The phrase *playing God* «[…] conveys that man in general or specific individuals have transgressed allegedly fixed limits that establish a certain order» (Dabrock 2009: 47). Embedded in this claim is the implication of *reproach* – i.e., «[…] of humanity attempting to arise above its natural station, of transcending natural limits, […] of challenging God directly by taking on his role» (Heavey 2013: 446). The phrase also implies that we have failed to respect nature, or at least have failed to adopt the *correct attitude* toward nature. As Baertschi (2013: 437) explains, «[w]e have to respect life as something given; *if we attempt to create it, we don't adopt a correct attitude and we defy the limits of human agency* […]» (emphasis in original). In pursuing synthetic biology, are scientists guilty of playing God or the vice of excessive *hýbris*?

The playing God argument is not unique to synthetic biology, and has been used as an objection to genetic engineering and genetically-modified organisms (see Bartolommei 2003: 34-65), as well as anesthesia, organ transplantation, artificial contraception, and brain death (Dabrock 2009: 47). Perhaps with respect to synthetic biology, it is the prospect of "reinventing" the fundamental elements of life that raises the question as to whether synthetic biology is intrinsically right or wrong. For example, Boldt and Müller (2008: 387-388) argue that synthetic biology represents a potentially radical shift: «[…] from genetic engineering's "manipulatio" to synthetic biology's "creatio" […]». Is synthetic biology «[…] tantamount to adopting a demiurgic stance» (Baertschi 2013: 436)? After all, «[t]o create life *ex nihilo* is to build an organism from non-living elements» (*ibidem*). The objection that scientists are somehow playing God may be formulated in two distinct ways.

In the first instance, the objection stems from *metaphysical* or *theological* concerns: synthetic biology represents an intrusion into a sphere of creation traditionally reserved for a divine being. As Coady (2009: 155-156) has noted, «[…] the idea is that there are certain things that it is presumptuous for human beings to undertake because those matters are really in the care of God». «Not only did God make the world», Coady continues (*ivi*: 156), «but God conserves, shapes, and cares for what goes on in that world». Moreover, synthetic biology represents (according to some critics) an unnecessary "tampering" with "nature" by creating primitive life forms (a point to which we will return below). According to this first formulation of the argument, scientists are «inappropriately stepping outside their proper role in the cosmos – that is, they [are] making a mistake about the

category to which humans belong in the order of things, and in so doing making a moral mistake» (Kaebnick 2009a: 1106). Such a view amounts to «asserting that humans should not intervene in certain realms of the natural world regardless of what the likely consequences of such interventions will be» (Buchanan and Powell 2010: 4). Many, for instance, would view the extinction of a species or damage to the environment as morally undesirable – even if such consequences would not directly affect human beings (cfr. Coady 2009: 159).

According to the second formulation of the playing God argument, the *epistemic* version, there is a worry that «we might fail to admit the limitations of our knowledge in tinkering with complex systems» (Buchanan and Powell 2010: 4). Because «[…] human beings are eminently fallible, limited in power, and only partially benevolent» (Coady 2009: 163), the central notion is not so much that we are usurping the role of the divine but that we are playing recklessly. Accordingly, synthetic biologists may be considered excessively self-confident in their aim for complete "mastery" over nature. Yet, it is not just *hýbris* that gives some critics unease about manipulating the delicate balance of ecosystems; even if the goals of synthetic biology are entirely benevolent (such as furthering fundamental knowledge in microbiology), we may still question our ability to predict the possible consequences of our actions. Coady states the matter this way: «[t]he great achievements of science and the prospects they open up for us can lead us to an exaggerated sense of what we know, to misplaced confidence in our powers to change the world and blindness to our own moral deficiencies» (*ivi*: 164). For these reasons, the moral reproach of "playing God" connects with several of the ethical concerns we articulated previously with respect to *biosafety*.

B. *Synthetic biology: blurring traditionally-held distinctions*

As Douglas and Savulescu (2010: 688) have noted, «[a] unique ethical concern about synthetic biology is that it may result in the creation of entities which fall somewhere between living things and machines». Whereas *living organisms* «traditionally exist, reproduce and change following natural rules, independently of the will of human beings» (Deplazes and Huppenbauer 2009: 55), *machines* are artifacts constructed specifically and according to the human will. What might be the ethical significance of *living machines*? Two experts put the matter thus: «[i]nterestingly, the aim of novel types of living organisms in synthetic biology not only implies the

production of living from non-living matter, but also the idea of using living matter and turning it into machines, which are traditionally considered non-living» (*ivi*: 56). With synthetic biology, would we blur the traditionally recognized distinction between *artifact* and *organism*, or between the *living* and *non-living*?

Perhaps one way to answer this question is to consider the aims of the practice. An important objective of synthetic biology is to create bacterial "bio-factories". In their discussion, Douglas and Savulescu (2010: 688-689) note that

> [t]hese bio-factories might possess many of the characteristics that we ordinarily take to be definitive of life: for example, homeostatic physiological mechanisms, a nucleic acid genome and protein-based structure, and the ability to reproduce. But they would also possess many of the features characteristic of machines: for example, modular construction, based on rational design principles, and with specific applications in mind.

We might worry, they continue, because «[e]ntities such as these certainly test our intuitive dichotomy between the living and the non-living in ways that it has hitherto not been challenged» (*ivi*: 689). The real difficulty, they note, is «not that we will come to underestimate the moral status of existing living things, but that we will misjudge the moral status of some of the new entities that synthetic biologists may produce. We are, after all, often uncertain or mistaken in our assignments of moral status» (*ibidem*).

C. *"It's against nature"*

The concerns raised thus far tend to mirror previous debates in agricultural biotechnology and gene modification[9]. Whereas some point to the inevitable harms or consequences of a particular action, others worry about the relation between human beings and nature. But what is *nature*? Does it have a value independent of human considerations? Is it morally considerable in and of itself (cfr. Light 2003)? The objection can be articulated in either of two ways. First, some object to synthetic biology on the grounds that it is against "nature", thereby assuming a particular conception of what is "natural". Second, synthetic biology might be considered wrong because it has the possibility of changing the fundamental make-up of

[9] For a more comprehensive analysis of some of these debates, see Bartolommei (2003).

primitive organisms, thereby undermining "species integrity"[10]. On this view, "nature" is equated with some kind of trait that is intrinsic to the particular organism that would be violated. In both of these positions, the governing conviction is that leaving things as they normally exist, without modification, has *noninstrumental* – i.e., intrinsic – value.

Although such convictions about nature are deeply-held, they are frequently difficult to articulate. Within a purely secular framework, however, the "it's against nature" argument can be understood most plausibly as a religious claim without reference to special ontological status – i.e., it is an argument about the *sacred* or the *inviolable*[11]. As Kaebnick reminds us: «[s]omething that is sacred has a value that transcends human affairs in the straightforward sense that it is experienced as having value independent of human decisions and preferences» (Kaebnick 2000: 17; cfr. Dworkin 1994: 71-72)[12]. For instance, we often view human cultures, historical artifacts and crafts, primitive languages, human knowledge, and artistic masterpieces as possessing innate or intrinsic value; we also intervene to save a particular species or natural forest for its own sake. Attributing "sacredness" to a human culture, historical artifact, work of art, and even "nature" is a judgment that stems from an assessment of intrinsic value and can be coherent even within a purely secular morality (see Kaebnick 2000: 22; Light 2003). As Dworkin (1994: 70) remarks, «[t]he idea of intrinsic value is commonplace, and it has a central place in our shared scheme of values and opinions».

[10] Consider the case of transgenic animals (this example is from Savulescu 2009: 211-212). The DNA of ANDi, a rhesus monkey, includes a gene taken from a jellyfish; the result is that ANDi now has a fluorescent green glow. By transferring and activating a foreign gene from the jellyfish into ANDi, have we somehow undermined ANDi's "species integrity"? Might something similar happen in the case of synthetic biology?

[11] For an extended discussion of the sacred, in the context of our debates about abortion and euthanasia, see Chapter Three of *Life's Dominion* (Dworkin 1994: esp. 68-81).

[12] Dworkin distinguishes *intrinsic* from *instrumental* or *subjective* value: «Something is *instrumentally* important if its value depends on its usefulness, its capacity to help people get something else they want. […] Something is *subjectively* valuable only to people who happen to desire it. […] Something is intrinsically valuable, on the contrary, if its value is *independent* of what people happen to enjoy or want or need or what is good for them» (Dworkin 1994: 71; emphasis in original).

4. *Ethical analysis: intrinsic objections*

Synthetic biology raises complicated philosophical and ethical issues. In order to frame the ethical debate, we first need to be clear about the facts of the science. When commentators claim that synthetic biology is *creating life* "from scratch", they often do not clarify what they mean. What kind of life is being created – human life, animal life, the life of insects, or that of microorganisms? The possibility of synthesizing genomes, for higher order or complex species, is not currently possible (PCSBI 2010: 139). For example, Venter's synthetic bacterial cell included just over 1 million base pairs, whereas a typical bacterial cell includes 5 to 10 million base pairs, a fruit fly contains 165 million, and the human genome contains more than 3 billion (*ivi*: 39). As a factual matter, Venter's team did not "create" life (*ivi*: 139); rather, they «had borrowed a naturally occurring cell and inserted into it a synthetic version of a naturally occurring genome» (Kaebnick 2010: 49). Furthermore, as the PCSBI notes, «[t]he genome that was synthesized was also a variant of the genome of an already existing species. The feat therefore does not constitute the creation of life, the likelihood of which still remains remote for the foreseeable future» (PCSBI 2010: 3). Given these preliminary remarks, we will expose weaknesses in each of the three intrinsic objections to synthetic biology.

In the metaphysical or theological formulation of the "playing God" argument, it is not immediately clear how we might distinguish between cases in which humans have intruded in creation from those in which we have not. We have been tampering with the natural world for centuries by way of breeding animals, creating dams, and clearing forests. Although we might try to respect "creation" in various ways, this consideration need not imply that we should neglect the basic aims of science – to rationally understand ourselves, our environment, and our world. Likewise, the epistemic version of the argument – the notion that scientists are *playing recklessly* – is largely disingenuous. The true intention of research scientists is to promote a responsible handling of the products of synthetic biology. Although there are problems with regard to *biosafety* – for instance, due to the possible accidental release of organisms into a natural environment – this is an empirical, not strictly intrinsic, objection to synthetic biology. I would argue that this challenge can be met in the same way that many of the concerns over genetically modified organisms have been minimized over the years. One problem with the epistemic version of the argument is that it does not seem to be reducible to a single moral or political principle so as

to sanction or forbid certain actions (cfr. Erde 1989: 596). Even if we acknowledge limitations in our human knowledge, power, and benevolence, this is not an objection that can dismiss synthetic biology outright: we might consider ways of tightening regulatory procedures and requirements, but should not restrict synthetic biology out of exaggerated fears. Ultimately, the fatal flaw of the "playing God" argument is that synthetic biology uses *existing* materials; by contrast, God or a divine being is often credited with creating things *ex nihilo*[13].

If exaggerated fears of playing God are unlikely to halt further research, should we be concerned that synthetic biology will blur traditionally-recognized distinctions – e.g., between organism and machine, and the living from the non-living? The motivation behind this argument is that we might create a new organism and then underestimate its *moral status*. If, for example, we accept that such organisms have intrinsic value, we must be prepared to consider the *direct obligations* we have toward them (Swiss Confederation 2010: 15)[14]. Is there any reason to hold that such organisms possess moral status? Moral status is typically conferred upon beings endowed with a rational nature (human beings) or beings that are sentient (human beings, animals). Microorganisms do not fit into either category. Moreover, microorganisms do not perceive harm or have interests of their own. Could microorganisms be wronged in some way? And if so, on what basis? The admittedly hasty conclusion to be drawn is that if microorganisms cannot be wronged, they have no interests in a moral sense. As such, they do not possess inherent value – only instrumental value.

Finally, arguments about tampering with "nature" face several difficulties. They assume that leaving nature *alone* is morally significant (Kaebnick 2009b: 24) or at least morally preferable. But instead of providing a reason as to why such a position is morally significant, we rather are left with a mere description of "how things are", without substantiated argument. Although it is true that «[b]iological systems have developed over billions of years, and their interactions with the environment are astoundingly complex» (PCSBI 2010: 22), one need not infer that we must always

[13] Cfr. Bedau (2011: 29): «When synthetic biologists do create fully synthetic cells – and they will, at some point – then we *should* describe it as creating life, for that would be true. Similarly, those who are trying to make fully synthetic cells should be forthright about the fact that they aim to create life. This will encourage us all to face squarely the resulting social and ethical issues».

[14] The dominant positions of moral status, with respect to synthetic biology, are explored by the Swiss Confederation (2010: 16-17). A fuller discussion, however, is beyond the scope of this essay.

leave nature to its own devices or be passive in the face of disease or natural disaster. Even those who are religiously-inclined tend to view human beings as "responsible stewards" or "co-creators" of God's creation[15]. If the aims or products of synthetic biology enable us to radically alter the fundamental units of, say, bacterial organisms, we might express moral disapprobation for the simple reason that we would be upsetting a delicate balance in the ecosystem. But are we? It is hard to say. As explored in a recent article, there may be a moral obligation to synthesize organisms so as to *increase* biodiversity (Boldt 2013).

In short: the argument that synthetic biology is against nature is limited. The sacred admits of *degrees*, as Dworkin (1994: 80) emphasizes:

> […] for most of us, there are degrees of the sacred […]. It would be sacrilegious for someone to destroy a work by a minor Renaissance artist but not as bad as destroying a Bellini. It is regrettable when a distinctive and beautiful species of exotic bird is destroyed, but it would be even worse if we stamped out the Siberian tiger.

Our beliefs about the sacred are also *selective*:

> […] we consider only some species of animals as sacred: few people care when even a benign species of insect comes to an end, and even for those who believe that viruses are animals, the eradication of the AIDS virus would be an occasion for celebration untinged by even a trace of regret (*ibidem*).

The upshot is that we should approach nature «with a certain humility or gratitude, even reverence» (Kaebnick 2009b: 25). But this attitude does not automatically rule out the goal of better understanding natural systems in their complexity – one of the major objectives of synthetic biology. Although «[i]t's better not to log forests indiscriminately», Kaebnick notes, «we may and sometimes should chop trees» (*ibidem*). The same should be said about constructing new organisms and intervening in "nature".

Concluding remarks

Developments in science often alter our relationship to the natural world. Synthetic biology in particular represents a potentially radical shift in our relationship to nature. Boldt and Müller (2008: 387-388) describe

[15] For discussion, see Coady (2009: 155-161). For a different perspective of responsible stewardship, in terms of setting public policy in pluralistic society, see Gutmann (2011: 18-19).

this change as a shift from *manipulatio* to *creatio*. Synthetic biology is currently in its infancy, and so we are still at the stage of manipulatio. The important question is how we might respond when scientists are able to create synthetic cells from scratch. I have argued that the intrinsic objections to synthetic biology are, by themselves, likely insufficient to halt further research, even though they challenge us to rethink our relationship to the natural world. For this reason, the hope is to enable the research to continue while remaining vigilant about potential physical harms. Only time will tell.

References

Alper, J. (2009), *Biotech in the Basement*, in «Nature Biotechnology», vol. 27, n. 12, pp. 1077-1078.

Ascunce, M.S. *et al.* (2011), *Global Invasion History of the Fire Ant Solenopsis invicta*, in «Science», vol. 331, n. 6020, pp. 1066-1068.

Baertschi, B. (2013), *Defeating the Argument from hubris*, in «Bioethics», vol. 27, n. 8, pp. 435-441.

Bartolommei, S. (2003), *Etica e biocoltura. La bioetica filosofica e l'agricoltura geneticamente modificata*, Edizioni ETS, Pisa.

Bedau, M.A. (2011), *The Intrinsic Scientific Value of Reprogramming Life*, in «Hastings Center Report», vol. 41, n. 4, pp. 29-31.

Boldt, J. (2013), *Do We Have a Moral Obligation to Synthesize Organisms to Increase Biodiversity? On Kinship, Awe, and the Value of Life's Diversity*, in «Bioethics», vol. 27, n. 8, pp. 411-418.

Boldt, J. and Müller, O. (2008), *Newtons of the Leaves of Grass*, in «Nature Biotechnology», vol. 26, n. 4, pp. 387-389.

Carlson, R. (2009), *The Changing Economics of DNA Synthesis*, in «Nature Biotechnology», vol. 27, n. 12, pp. 1091-1094.

Cho, M.K. *et al.* (1999), *Ethical Considerations in Synthesizing a Minimal Genome*, in «Science», vol. 10, n. 286, pp. 2087-2090.

Coady, C.A.J. (2009), *Playing God*, in J. Savulescu and N. Bostrom (eds.), *Human Enhancement*, Oxford University Press, New York 2009, pp. 155-180.

Dabrock, P. (2009), *Playing God? Synthetic Biology as a Theological and Ethical Challenge*, in «Systems Synthetic Biology», n. 3, pp. 47-54.

Deplazes, A. and Huppenbauer, M. (2009), *Synthetic Organisms and Living Machines. Positioning the Products of Synthetic Biology at the Borderline Between Living and Non-living Matter*, in «Systems Synthetic Biology», n. 3, pp. 55-63.

de S. Cameron, N.M. and Caplan, A. (2009), *Our Synthetic Future. Two Prominent Ethicists Provide Their Views on the Ethical Debates Surrounding Synthetic Biology*, in «Nature Biotechnology», vol. 27, n. 12, pp. 1103-1105.

Douglas, T. and Savulescu, J. (2010), *Synthetic Biology and the Ethics of Knowledge*, in «Journal of Medical Ethics», vol. 36, n. 11, pp. 687-693.

Dworkin, R. (1994), *Life's Dominion: An Argument About Abortion, Euthanasia, and Individual Freedom*, Vintage Books, New York.

Erde, E.L. (1989), *Studies in the Explanation of Issues in Biomedical Ethics: (II) On "On Play[ing] God", etc.*, in «Journal of Medicine and Philosophy», vol. 14, n. 6, pp. 593-615.

Gutmann, A. (2011), *The Ethics of Synthetic Biology: Guiding Principles for Emerging Technologies*, in «Hastings Center Report», vol. 41, n. 4, pp. 17-22.

Heavey, P. (2013), *Synthetic Biology Ethics: A Deontological Assessment*, in «Bioethics», vol. 27, n. 8, pp. 442-452.

Jackson, R.J. *et al.* (2001), *Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox*, in «Journal of Virology», vol. 75, n. 3, pp. 1205-1210.

Kaebnick, G.E. (2000), *On the Sanctity of Nature*, in «Hastings Center Report», vol. 30, n. 5, pp. 16-23.

Kaebnick, G.E. (2009a), *Should Moral Objections to Synthetic Biology Affect Public Policy*?, in «Nature Biotechnology», vol. 27, n. 12, pp. 1106-1108.

Kaebnick, G.E. (2009b), *"It's Against Nature"*, in «Hastings Center Report», vol. 39, n. 1, pp. 24-26.

Kaebnick, G.E. (2010), *Synthetic Biology, Analytic Ethics*, in «Hastings Center Report», vol. 40, n. 4, p. 49.

Kuhlau, F. *et al.* (2008), *Taking Due Care: Moral Obligations in Dual Use Research*, in «Bioethics», vol. 22, n. 9, pp. 477-487.

Kuhlau, F. *et al.* (2011), *A Precautionary Principle for Dual Use Research in the Life Sciences*, in «Bioethics», vol. 25, n. 1, pp. 1-8.

Light, A. (2003), *Environmental Ethics*, in R.G. Frey and C.H. Wellman (eds.), *A Companion to Applied Ethics*, Blackwell, Malden, MA 2003, pp. 633-649.

Miller, S. and Selgelid, M.J. (2007), *Ethical and Philosophical Consideration of the Dual-use Dilemma in the Biological Sciences*, in «Science and Engineering Ethics», vol. 13, n. 4, pp. 523-580.

Murray, T.H. (2011), *Interests, Identities, and Synthetic Biology*, in «Hastings Center Report», vol. 41, n. 4, pp. 31-36.

Raho, J.A. (2012), *La metafora morale e le questioni emergenti in bioetica. Il caso della biologia di sintesi* (tr. di Francesco Petruzzelli), in «Quaderni della ricerca» (a cura di Luca Bellotti), n. 2, pp. 287-308.

Ro, D.-K. *et al.* (2006), *Production of the Antimalarial Drug Precursor Artemisinic Acid in Engineered Yeast*, in «Nature», vol. 440, n. 7086, pp. 940-943.

Savulescu, J. (2009), *The Human Prejudice and the Moral Status of Enhanced Beings: What Do We Owe the Gods?*, in J. Savulescu and N. Bostrom (eds.), *Human Enhancement*, Oxford University Press, New York 2009, pp. 211-247.

Schmidt, M. (2008), *Diffusion of Synthetic Biology: A Challenge to Biosafety*, in «Systems Synthetic Biology», vol. 2, n. 1-2, pp. 1-6.

Schmidt, M. *et al.* (2009), *A Priority Paper for the Societal and Ethical Aspects of Synthetic Biology*, in «Systems Synthetic Biology», vol. 3, n. 1-4, pp. 3-7.

Selgelid, M.J. (2007), *A Tale of Two Studies: Ethics, Bioterrorism, and the Censorship of Science*, in «Hastings Center Report», vol. 37, n. 3, pp. 35-43.

Smith, K. (2013), *Synthetic Biology: A Utilitarian Perspective*, in «Bioethics», vol. 27, n. 8, pp. 453-463.

What's in a Name? (2009), in «Nature Biotechnology», vol. 27, n. 12, pp. 1071-1073.

Websites

Buchanan, A. and Powell, R. (2010), *The Ethics of Synthetic Biology: Suggestions for a Comprehensive Approach* (paper delivered to the Presidential Commission for the Study of Bioethical Issues at its First Meeting, Washington, D.C., on 08/07/2010), in *President's Commission for the Study of Bioethical Issues*: http://bioethics.gov/sites/default/files/The-Ethics-of-Synthetic-Biology-Suggestions-for-a-Comprehensive-Approach.pdf (accessed on 22/04/2014).

Caplan, A.L. (2010), *Testimony of Arthur L. Caplan to the Presidential Commission for the Study of Bioethical Issues* (paper delivered to the Presidential Commission for the Study of Bioethical Issues at its Second Meeting, Philadelphia, PA, on 13/09/2010), in *President's Commission for the Study of Bioethical Issues*: http://bioethics.gov/sites/default/files/Testimony-of-Arthur-L-Caplan.pdf (accessed on 22/04/2014).

De Vriend, H. (2006), *Constructing Life. Early Social Reflections on the Emerging Field of Synthetic Biology* (Working Document 97, The Hague, Rathenau Institute), in *Synbiosafe.eu*: http://www.synbiosafe.eu/uploads/pdf/Rathenau%20Constructing%20Life%202006.pdf (accessed on 22/04/2014).

Gibson, D.G. *et al.* (2010), *Creation of a Bacterial Cell Controlled by a Chemically Synthesized Genome*, in «Science», vol. 329, n. 5987, pp. 52-56: http://www.sciencemag.org/content/329/5987/52.full.pdf (accessed on 22/04/2014).

J. Craig Venter Institute (2010): http://www.jcvi.org/cms/research/projects/first-self-replicating-synthetic-bacterial-cell/overview/ (accessed on 22/04/2014).

Parens, E., Johnston, J. and Moses, J. (2009), *Ethical Issues in Synthetic Biology: An Overview of the Debates*, in *Synthetic Biology Project*, Woodrow Wilson International Center for Scholars: http://www.synbioproject.org/process/assets/files/6334/synbio3.pdf? (accessed on 22/04/2014).

Parliamentary Office of Science and Technology (2009), *The Dual-Use Dilemma*, (Postnote 340, pp. 1-4), in *Parliamentary Office of Science and Technology*: http://www.parliament.uk/documents/post/postpn340.pdf (accessed on 22/04/2014).

Presidential Commission for the Study of Bioethical Issues (2010), *New Directions - The Ethics of Synthetic Biology and Emerging Technologies* (Government Printing Office, Washington, D.C.), in *President's Commission for the Study of Bioethical Issues*: http://bioethics.gov/sites/default/files/PCSBI-Synthetic-Biology-Report-12.16.10_0.pdf (accessed on 22/04/2014).

Schmidt, M. *et al.* (2008), *Background document for the SYNBIOSAFE e-conference (May 2008)*, in *Synbiosafe.eu/forum*: http://www.synbiosafe.eu/uploads/pdf/SYNBIOSAFE-background_paper.pdf (accessed on 22/04/2014).

Swiss Confederation (2010), *Synthetic Biology - Ethical considerations*, in *Federal Ethics Committee on Non-Human Biotechnology ECNH*: http://www.ekah.admin.ch/fileadmin/ekah-dateien/dokumentation/publikationen/e-Synthetische_Bio_Broschuere.pdf (accessed on 22/04/2014).

Abstract

The world's first self-replicating synthetic cell was created in 2010. Beyond promises of advancing fundamental scientific knowledge, synthetic biology poses various ethical problems – from risk and safety concerns to worries about tampering with nature. Whereas traditional genetic engineering aims to modify existing organisms, synthetic biology looks to design and assemble organisms de novo – i.e., from scratch. Two principal groups of moral objections to synthetic biology will be explored and assessed. I argue that the second set of ethical quandaries, raised by intrinsic objections, provides the clearest example of how synthetic biology causes us to "rethink nature", the topic under discussion in this thematic issue of Teoria. Although with any technology there is increased risk of misuse, we ought to embrace synthetic biology – and with it, the complexities surrounding this new relationship.

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Robots on Spaceship Earth: A Theoretical Plea for Machine Metaphors

Koen B. Tanghe

> It is astonishing what a different result one gets by changing the metaphor!
> George Eliot (1860: 80)

Introduction: Nature and the human Umwelt

Jakob von Uexküll, a pioneer of biosemiotics and ethology, in the early twentieth century gave a new meaning to the nineteenth-century term *Umwelt* (Sutrop 2001): the world as experienced by a specific species. The frequency of citation of Uexküll's concept in semiotics is growing rapidly (Kull 1998). I believe that it can also be useful in philosophy and in particular in a philosophical reconsideration of nature. The *Umwelt* of a particular species must for starters be contrasted with the unknowable world as it is (the noumenon in the classic two-worlds interpretation of Kant's transcendental idealism). A distinction can furthermore be made between the perceptual (representation) and the cognitive (understanding) *Umwelt*[1]. Lastly, Uexküll was not a Darwinist, but an *Umwelt* normally fits an animal's particular ecological niche, i.e., its way of life in a specific habitat, as neatly as morphological features. Old World monkeys, for example, rely on their trichromatic color vision to detect fruit against a background of leaves. Flies are highly dependent on their capacity to process almost seven times more visual information per second than humans to evade predators (and newspapers and more traditional flyswatters). Serious mismatches between *Umwelten* and niches can therefore be as fatal as grave

[1] Plants have a primitive perceptual *Umwelt* (e.g., Blancaflor 2012), but not a cognitive *Umwelt*.

mismatches between morphological features and niches. Also, a change of niche will often be accompanied or facilitated by a change of *Umwelt*.

Nature is «perhaps the most complex word in the language» (Williams 1983: 219). One of the causes of the confusion may be that we normally don't make a clear distinction between nature as it is and our representation and understanding of nature. When we use the term to refer to "everything there is" ("universal nature", Castree 2001), we often mean to say "everything there is as perceived and understood by us" (i.e., our *Umwelt*). Our "nature" certainly differs profoundly from the "nature" of our medieval ancestors. The term "nature" can also refer to "wildlife or things and places on Earth which more or less persist in a natural state, undisturbed by man and his culture" ("external nature") or "an essential quality or inherent force of something, as in human nature versus nurture" ("intrinsic nature"). The false dichotomy between nature and nurture has been deconstructed, although it will probably never disappear (e.g., Pinker 2004). The same is the case for the dichotomy between nature and man/culture (Gray 2002 criticizes it; for a defense, see, e.g., Moriarty 2007). «Man is a part of Nature», Russell (1925: 1) wrote, «not something contrasted with Nature». James Lovelock called us mechanically advanced beavers. We are indeed a very "transformative" part of nature. Morton (2011) even compares human intelligence with plate tectonics or photosynthesis. The real question, in any case, is not whether we, including our culture, are a part of nature, but how we should conceptualize and interpret "nature". Whereas many believe that we should return to a more intuitive and organic conceptualization, I here argue the opposite.

My point of departure is the "natural" human *Umwelt* (section 1). The industrial-technological way of life of modern man has been facilitated by a transition to an *Umwelt* that is to some extent characterized by a mechanistic (as opposed to teleological and agential) understanding of nature and by the use of machine metaphors (section 2). This transition is far from complete and universal, though: modern, Western or westernized man lives in or with a complex and hybrid, semi-scientific *Umwelt*. It is in particular still permeated by powerful religious or quasi-religious concepts and metaphors, many of which are remnants of premodern *Umwelten*. They are one of the causes of a mismatch between our modern niche and our *Umwelt* (section 3). It is a purely theoretical and hopelessly utopian plea, but it will be argued that the replacement of these archaic concepts and metaphors with machine metaphors would result in a better match between our *Umwelt* and niche (conclusion).

1. *Two core features of "natural" human* Umwelten

The attempt to identify features that meaningfully distinguish man from other animals has been disappointingly futile. Famous, in this respect, is Diogenes' of Sinope anecdotal reaction to Plato's definition of man ("a bipedal living being without feathers"): he plucked all of the feathers from a rooster and delivered it to Plato, upon which Plato had to add yet another qualification – "with flat toenails". Many centuries later, Goethe was exhilarated by his discovery of the supposedly non-existing human *os intermaxillare* (he did not realize that he had been preceded by Félix Vick d'Azyr). It is, in this light, quite ironic that the application of the original *Umwelt* concept to man has proven to be somewhat controversial, since nothing distinguishes us from other animals more clearly than our "rich" and "deep" cognitive *Umwelt* (e.g., Landmann 1966: 163-174). I will here focus on only two correlated features of "natural" human *Umwelten*: language and religion.

Language is «a means for sorting and manipulating the plethora of information that deluges us throughout our waking life» (Bickerton 1990: 5). Our concepts indeed to some extent structure our perception and behavior (linguistic determinism). Most originate as metaphors: the nineteenth-century German writer Jean Paul aptly called language «a dictionary of bleached metaphors». Metaphors are ubiquitous and influential ingredients of languages and therefore, *ipso facto*, crucial constituents of human *Umwelten*. Not only do we use, on average, six metaphors per seventeen words, they also provide «the only ways to perceive and experience much of the world» (Lakoff and Johnson 1980: 239). They structure our perception, thought and behavior, often without us realizing it. Thibodeau and Boroditsky (2011), for example, have shown that people are most likely to call for strong law enforcement when a crime is presented as a beast and that they are more prone to accepting solutions such as rehabilitation when it is presented as a virus. The participants in this study were completely unaware that these two metaphors determined their decision. They believed instead that their choice was inspired by objective parameters.

George Eliot (1860: 80) wondered why «we can so seldom declare what a thing is, except by saying it is something else?». Even the practice of science and philosophy is a «war of metaphors» (Dennett 1991: 455). We are in particular inclined to try to understand new or more abstract domains through «our experiences with the physical world» (Kövecses 2010: 7). Or, as Brown (2003: 184) puts it: «Presented with new aspects of the world, we humans understand them in terms of deeply ingrained bodily and social

experiences that already form the framework for dealing with life on a day-to-day basis». A possible explanation for this striking cognitive inclination is that neural circuits that steer our motor, sensory and social functioning were given a new, linguistic task when we evolved to process abstract thoughts.

This brings us to a second important feature of human *Umwelten*: they are or tend to be highly agential, i.e., nature tends to be interpreted in terms of agential metaphors such as ancestors, gods, witches, devils, angels, and so forth. Boyer (1994) points out that a belief in non-physical beings is the defining feature of religions. Likewise, Mithen (1996: 175-176) states that, since the classic work of E.B. Tylor (1871), the idea of non-physical beings has «been taken for the very definition of religion itself». Even death was personified (Thanatos, Dullahan, Azrael, Michael, and so forth). Modern hunter-gatherers all think about the natural world as if it were imbued with will and purpose (e.g., Mithen 1996: 47-48). Nature was and to a certain extent remains identified or at least associated with these agential metaphors: religious people do not realize that they are using metaphors.

This agential or religious nature of our "natural" *Umwelt* seems, like the evolution of language itself, to be directly linked to the main factor behind the evolution of the brain, the organ that generates our *Umwelt*. According to the social brain hypothesis (Dunbar 1993, 2009; Dávid-Barrett and Dunbar 2013), our neocortex primarily evolved as an adaptation to a more complex social environment (Kapogiannis *et al*. 2009 found tentative evidence for the thesis that religions are productions of the social brain). The question is not whether this was an important factor behind the evolution of our brain and our cognitive *Umwelt*, but rather whether it was the main factor. Mithen (1996), for example, identifies three cognitive domains or intelligences: the social, the technical and the natural history domain, with each being constituted by a bundle of interacting mental modules. However, even in Mithen's theory, the social domain stands central.

We developed a sophisticated theory of mind: the automatic tendency to attribute mental states such as beliefs, intentions and goals to others and the ability to imagine these mental states and thus to understand, mimic and manipulate other people (e.g., Schlinger 2009). Three-year-old children already appear to understand that other people have goals and beliefs that determine their behavior (Wellman 1990). This kind of agential thinking is, from a very early age, extended to the biological and even the non-biological world. Deborah Kelemen (2004: 295) succinctly speaks of «promiscuous teleology». At a certain point in time, we apparently began to use our social brain or the social domain to think about non-human

nature, instead of only about other human beings. According to Mithen, this "overflowing" of the social domain into the natural world started when we began to use language as a means for communicating abstract thought. Thanks to modern language, knowledge that had previously been trapped in separate domains and of which we were hardly conscious at all (consciousness was largely limited to the social sphere) was pulled into the social domain and became the subject of conscious thought and creativity: cognition became fluid. The result was, 100,000 to 30,000 years ago, a cultural explosion, including the birth of religions.

Mithen was inspired by Dunbar (1996) who also associated the evolution of abstract language with complex symbolic culture, including rituals and religions. The original evolutionary function of language, however, was to allow social bonding between groups of hominids, once they became too large for bonding through grooming (Dunbar 1993, 1996; see also Dávid-Barrett and Dunbar 2013). Our modern linguistic behavior still betrays that social origin: gossip forms an important part of daily life (Dunbar 1996). Modern languages also betray their social origin in that they are permeated with agential metaphors and metaphorical expressions. Cognitive psychologists call the inclination to endow the inanimate with animate, emotional or expressive qualities the physiognomic perception (physiognomic projection is the property of addressing inanimate objects as if they were living beings). Linguists have also long observed that we tend to use the same concepts and structures whether talking about animate or inanimate entities: we talk about inanimate objects as if they were living things. The sentence "the book fell off the shelf", for example, is equivalent in structure to the sentence "the man fell off the ladder".

Even scientists can hardly avoid talking about animals, plants, cells or molecules without somehow assuming that they are beings with goals and intentions (e.g., selfish genes and chaperone molecules). Dennett (2011: 481) calls it the «power of the intentional stance». These agential metaphors have the potential not only to mislead the public but also the scientists themselves, even though they fully realize that such are only metaphors. In 1869, Darwin admitted in a letter to Wallace that he had been misled by his breeding analogy to assume that single variations would be preserved in a population. Likewise, Dawkins (2006: ix) has conceded that he has been misled by his selfish gene metaphor. Even the mere analogy with organisms can be misleading. Lovelock's Gaia metaphor is a good example. Biological processes influence abiotic processes but these biological feedbacks do not, in contrast to what Lovelock claims, «generally

enhance the self-regulation of the atmosphere-biosphere system […]» (Kirchner 2003: 22) in the same way that an organism regulates itself. Likewise, Darwin began his evolutionary theorizing (1837-1839) with an organism analogy (Hodge 1985): he compared extinctions with the death of an organism (species senescence) and the coming into being of new species with reproduction. The metaphor of society as an organism (MacLay 1990) was the source of the highly influential idea of historical decline: if societies are like organisms, they must eventually face decline and death (Herman 1997: 106). Ecologists are influenced unknowingly by the popular metaphor of the ecosystem as a community (Silver 2006: 219-221).

2. *The partial mechanization of our* Umwelt

The rise of the scientific method has in large measure depended on human thinkers «disciplining themselves to abjure transactional, sociomagical styles of reasoning» (Humphrey 1976: 315). Thinking in terms of beings and goals was increasingly replaced with mechanistic and ateleological thinking. «This anti-teleological line of thought reaches its climax in the Darwinian theory of the nineteenth century, which seeks to explain organic forms causally and mechanically, without any appeal to vital force or purpose of any kind in the things or outside of them» (Thilly 1965: 269, see also Dennett 1995 and Inkpen forthcoming). This disciplining, in my opinion, also marks the true birth of the modern dichotomy between nature and man (Collingwood 1945, Merchant 1980, Callicott 1992): it came into being when we stopped interpreting nature in human (social, agential and teleological) terms. Our resulting alienation from nature has been an important philosophical theme and challenge ever since. Countless thinkers, from Hegel to Teilhard de Chardin and Whitehead, have tried to rethink nature in more human, agential, teleological or ensouled terms.

The Greeks were among the first to coin a specific term for non-human phenomena (Macnaghten and Urry 1998), but even they still conceived this natural world as permeated by mind and *telos*. It was «a rational animal with a mind of its own» (Collingwood 1945: 3). By contrast, Francis Bacon compared final causes to the Vestal virgins who served at Roman temples. Like them, he said, they are dedicated to God and are barren. «If we trace the history of the progress of the human mind», Laplace wrote in his *Exposition* (1796), «and of its errors, we shall observe final causes perpetually receding, according as the boundaries of our knowledge are

extended» (quoted in Greene 1973: 37). Shanks (2004: 30) puts it thus:

> Surveying these events, it is fair to say that correlative with the rise of modern science is the dual phenomenon of nature being conceptualized with the aid of mechanical metaphors and nature being studied with the aid of machines (telescopes, microscopes, barometers, vacuum pumps, and so on).

Biology in particular, has, since the seventeenth century, been a working out of «Descarte's [sic] original metaphor of the organism as machine» (Lewontin 2001: 1263). This mechanization wasn't inspired by religious doubts, nor did it lead immediately to such doubts. On the contrary, the design argument for the existence of God was rather bolstered by the rise of modern science. Indeed, some modern scholars (e.g., Pigliucci and Boudry 2011) even argue against the use of machine metaphors because of their misuse by creationists. However, the ultimate Christian agent was, nevertheless, relegated to the role of original designer of nature. The "mechanick theists", as they were called,

> attempted to weld into a single philosophy of nature two not entirely compatible conceptions: one, the idea of nature as a law-bound system of matter and motion, and two, the idea of nature as a habitation created for the use and edification of intelligent beings by an omnipotent, omniscient, and benevolent God (Greene 1973: 12).

Newton opposed the autonomous clockwork universe (in his universe, God still intervened) and the eager use, by scholars, of his mechanical laws of motion to spin theories of the origin of the Earth and the solar system, but to no avail: the natural theologists ended «by eliminating God from His works and overthrowing the chief argument for His existence: namely, the wise adaptation of the present frame of nature to the need of living creatures, especially man» (*ibid.*: 13).

The scientific revolution «outshines everything since the rise of Christianity» (Butterfield 1949: vii) and «looms so large as the real origin both of the modern world and of the modern mentality that our customary periodization of European history has become an anachronism and an encumbrance» (*ibid.*: viii). I believe that modern science outshines everything since at least the Neolithic Revolution. It radically transformed and still is transforming our *Umwelt*[2]. In a couple of centuries, we made more

[2] It was the second major *cultural* (as opposed to biological or genetically facilitated) *Umwelt*-shift in our evolution (see note 3).

progress toward a better understanding of nature than during the 3.6 billion years that preceded this revolution. It facilitated, together with the associated belief in progress (Bury 1920), the transition to our modern industrial-technological niche, i.e., the industrial-technological exploitation and modification of Earth (Jacob 2006, Spadafora 1990), resulting in a budding anthropogenic biosphere (e.g., Ellis 2011a)[3]. It is well-known that our hunter-gatherer bodies are not very well adapted to that new niche, leading to what Lieberman (2013) calls "mismatch diseases". I believe that the same can be said of our hunter-gatherer brain and that this has resulted in a "mismatch *Umwelt*".

3. *The mismatch with our modern niche*

Animals often manipulate and alter their habitat or elements of their habitat in order to satisfy their needs and the needs of their offspring, a phenomenon that is still underestimated and underresearched (Odling-Smee, Laland and Feldman 2003). This niche alteration and construction introduces feedback into the evolutionary dynamic. It significantly modifies the selection pressures acting on both the species themselves and on other species. *Homo sapiens* can be defined as an omnivore, specialized in niche construction, i.e., in meeting his needs by altering and manipulating his habitat and thus also in steering his own evolution and that of other species. The transition from an existence as largely vegetarian tree dweller to one as scavenger, hunter and gatherer was already facilitated by the use of tools. This niche construction in turn steered human evolution. Throwing rocks and swinging clubs at adversaries, for example, led to extensive anatomical remodeling of the human hand: the two modern handgrips, the "precision grip" and "power grip", represent a throwing grip and a clubbing grip (Young 2003). Other examples of cultural inventions that steered human evolution are spears (Roach *et al*. 2013), cooking (Wrangham 2009) and, possibly, agriculture (Cochran and Harpending 2009).

The agricultural exploitation of our habitats certainly had a noticeable

[3] Cauvin (2000) argues that the first cultural wave or niche-shift (the Neolithic Revolution) was also facilitated by a "mental transformation", i.e., a cultural *Umwelt*-shift. Man could not transform his means of subsistence and his society «without showing at the same time a different conception of the world and of himself in that world» (Cauvin 2000: 220). Some interpret the site Göbekli tepe (12.000-10.000 BP) as a confirmation of Cauvin's theory (e.g., Schmidt 2010).

impact on the planet. Humans now «truly began to harness the earth. […] farmers utilize the landscape intensively and create a milieu that suits their needs» (Price and Bar-Yosef 2011: S171). Ruddiman (2005) calls farming the largest alteration of the Earth's surface from its natural state that humans have yet achieved. Even the New World, including the Amazonian rain forest, was, by 1492, largely anthropogenic (Mann 2005). The Neolithic Revolution also marks the start of man's alteration of the Earth's climate (e.g., Pongratz and Caldeira 2012). Our farming ancestors may thus have averted or helped avert the onset of a new ice age (Ruddiman 2005) or even a semi-permanent ice age (Crowley and Hyde 2008).

In the mean time, the human impact on the atmo-, bio-, hydro- (liquid water), cryo- (the ice sheets and glaciers) and geosphere has become so extensive that many scholars speak of a new age: the Anthropocene (Ellis 2011a, Zalasiewicz *et al*. 2011) (the Yupik-Inuit already referred to westerners as "the people who change nature"). Or, as Ellis (2011b) puts it: «Forget Mother Nature: This is a World of Our Making». We are slowly but steadily turning the entire planet into an anthropogenic habitat. We may, eventually, even remake ourselves (Silver 1998). This is, whether one likes it or not, our evolutionary destiny as the niche constructing species *par excellence*. However, «If humanity's role has expanded to the point that the entire Earth is our niche, the trend of the changes we have made lately indicates that we are doing a poor job of niche maintenance» (Brand 2010: 275). I am afraid that our *Umwelt* is unsuited for our new niche in more than one way. However, I will here focus on mainly one mismatch.

Environmental theorists like Merchant (1980) of course argue that we used to treat nature better back in the days when everybody exclusively thought of it in organismic and agential terms. Suggestions that we should return to such a conceptualization of nature (Callicott 1992, Goldsmith 1992) and "reenchant" our mechanized world (Berman 1981), originate in eighteenth-century Romanticism (Herman 1997). For the *Naturphilosophen*, for example, the world was, once again, an enchanted and ensouled being [*anima mundi*], not a machine (for a history of this idea, see Bonifazi 1978), one of which human beings were or should be a part (hence Goethe's joy in finding the human *os intermaxillare*). Likewise, McKibben, in his influential bestseller *The End of Nature* (1989), laments the disappearance of nature as a separate, undisturbed entity and abhors the idea of a managed, anthropogenic planet. It is clear that he worships nature as if it were some kind of sacred being or a creation by a sacred being. Rain, for instance, loses its special, sacred power once it bears the permanent stamp

of modern man. «Instead of being a category like God – something beyond our control – it is now a category like the defense budget or the minimum wage, a problem we must work out» (McKibben 1989: 229). He also speaks of the lack of "reverence" for genetically engineered rabbits (*ibid.*: 230), trout (*ibid.*: 232) and plants (*ibid.*: 175). The end of nature may, «for those of us who have tended to locate God in nature» (*ibid.*: 85), even have the same, faith-shattering effects as the Holocaust. However, the scientific evidence seems, as we saw, to contradict the Romantic idea of a pristine premodern world: the Anthropocene started 10,000 years ago.

We should indeed forget Mother Nature, that projection of our social brain, and accept the anthropogenic reality. Seen this way, it is precisely the ancient, agential way of thinking about nature that Merchant *et al.* defend that is problematic. It continues to exert a certain influence on modern societies and is holding us back at a time at which we should be making rapid progress. It in particular contributes to the impediment of progress in two important domains: biotechnology (especially genetic engineering) and geoengineering. Both are of crucial importance in the further construction of the anthropogenic habitat. In *Terraforming Earth: Geoengineering Megaplan Starts Now* (2013), Michael Marschal argues that we should immediately research various geoengineering techniques because we are running out of time. In reality, hardly any sizeable research at all has been done. Geoengineering was until very recently a taboo, even among scientists. The public is open to the idea of researching geoengineering, «while holding significant reservations about ever deploying it» (Corner *et al.* 2013: 941). The opposition against certain biotechnological developments and in particular genetically manipulated crops is also well-known (e.g., Silver 2006). There are several reasons for this resistance, but an important cause is that these technologies are deemed a "blasphemous" violation of nature. Williams (2002: 5) speaks of a «deeply rooted myth in the Western psyche and its culture that nature is a passive, harmonious, God-given backdrop against which the drama of human life is played out». Interfering with this God-given or God-like natural order is taboo and dangerous, as evidenced by countless science fiction stories and movies (Schelde 1993), ranging from Shelley's *Frankenstein* (1818) to *The Rise of the Planet of the Apes* (2011).

The aforementioned «two not entirely compatible conceptions» of nature, the agential and the mechanistic conception, are clearly still with us today. Many in the West fear that biotechnology will «violate an unseen entity […]» (Silver 2006: xi). For those on the right, it is the God of the Bible, those on the left «have transferred their allegiance to a vague Mother

Nature goddess here on earth – although they usually don't verbalize their feelings in such terms» (*ibid.*: xi). The reason why advocates of organic food accept breeding techniques but not directed genetic engineering is that they believe that «the methods of Mother Nature are sacred, and that human modification of genes violates her spiritual integrity» (*ibid.*: 269). Analyses of public discourses of, or ideas about, genetically modified food (Shaw 2002, Hansen 2006) and geoengineering (Corner *et al*. 2013) reveal the same fear: these technologies are, like nuclear energy (Weart 1988) or nanotechnology (Scheufele *et al*. 2008), seen as unnatural and therefore inappropriate and unethical. Nature is thereby often portrayed as a powerful Goddess who «will "hit back" at inappropriate human intervention» (Shaw 2002: 281) or who "knows" she has a problem and will "cleanse" herself of the human rash (Corner *et al*. 2013: 945).

Conclusion: a plea for machine metaphors

The "diagnosis" is clear: there is a clear mismatch between the *Umwelt* of modern society and its industrial-technological niche in that the *Umwelt* is replete with agential metaphors (or notions that can be interpreted as such) that, as we have just seen, constitute an impediment to the further construction of that niche. They prime people to oppose progress in important domains: a holy and stable, God-like or God-given natural order may not be interfered with. The "remedy" is, *theoretically*, very simple. These agential metaphors should be abolished and, in some cases, replaced with metaphors that better match the modern human niche, i.e., machine metaphors, as machine-like entities can and should be tuned and modified[4]. This radical replacement should start in childhood. Maynard Smith (1984) believed that we need both science and myths, but that they should be kept strictly apart. I beg to differ. Myths are one of the means whereby the unconscious foundations of an *Umwelt* are laid. They therefore ought to be inspired by, and based on, science and machine metaphors instead of being kept apart from science[5].

Let me, again, emphasize that this is a purely theoretical plea: our social

[4] The effectiveness of this "remedy" could be tentatively tested through an experiment, similar to that of Thibodeau and Boroditsky (2011).

[5] In traditional societies, myths are seen as true stories and opposed to false stories (Eliade 1963).

brain is, to a greater or lesser extent, addicted to an agential interpretation of nature. A radical eradication of such an interpretation is therefore all but impossible – much as we cannot improve the perceptual *Umwelt* of a particular species by enhancing one of its senses. Even scientists can, as we have seen, and as the dubious success of the selfish gene metaphor illustrates, fall under the spell of agential metaphors. However, I will, nevertheless, end this analysis with a few words about a twin root metaphor that should or would stand central in a fully "mechanized" human *Umwelt*: that we are self-conscious and highly sophisticated but far from perfect "robots", living on board a giant and wonderful but also potentially dangerous "spaceship".

The modern depiction of the ancient *machina mundi* as a spaceship dates from the nineteenth century. The metaphor became more prevalent, once we began, in the 1950s, to build and launch spaceships and after the first satellite photographs of Earth were released by NASA in the late 1960s. However, it remains somewhat marginal, certainly compared to the Gaia metaphor. The real stumbling block, though, is its "twin", the metaphor that should occupy the central position in the sciences that study man: de La Mettrie's *l'homme machine*. Few oppose the idea that our body resembles a machine; however, our conscious mind allegedly still belongs to a sphere of its own. This may be the ultimate source of agential thinking: the self-evident and deeply rooted assumption that "we" (our conscious "I"), are, as agents, in control of "ourselves" (the human organism)[6]. Alas, while we may be uniquely self-reflective animals, that does not mean that "we" are in so meaningful a way in control as we tend and like to believe. In that ambitious sense, free will is nothing but a classic, prescientific illusion (e.g., Flanagan 2002), right up there with the illusion that the Earth is flat, life and the universe static or time and space absolute. As has been the case with previous illusions of knowledge, its scientific shattering will or would have important repercussions (e.g., Verplaetse 2011).

The so-called agency illusion is undoubtedly, like the belief in supernatural agents, adaptive (e.g., Rakos 2004), i.e., it was adaptive in the niche in which it evolved. One may wonder though, whether it is still as adaptive now that we have acquired almost God-like powers, i.e., whether this belief does not constitute another mismatch between our *Umwelt* and our niche.

[6] It is of course highly ironic that it was one of the fathers of the modern, mechanistic interpretation of the world, Descartes, who, with his strict dualism between mind and matter, cemented this illusion in the modern mind. He thus also contributed to the modern separation between man and nature.

Brand (2010: 1) writes: «We are as gods and HAVE to get good at it» (see also Lynas 2011). Ironically, if we truly were as gods, instead of self-conscious animals, if our conscious, rational "I" truly were in full control, we would probably not have to get good at being like gods, i.e., we would not be confronted with potentially apocalyptic problems like overpopulation and climate change. In any case: we will indeed increasingly need to act as gods or face the consequences of not acting. We should proceed very cautiously in "taboo" domains such as genetic engineering and geoengineering, but proceed we should. In his latest book, Craig Venter (2013) writes that he is not concerned with complaints about man playing God. His greatest fear is not the abuse of technology but that we do not use it at all. In his vision, synthetic organisms will heal the planet and extend humanity's reach beyond Earth. This may smack of classic techno-hubris; however, it is indeed not exuberant techno-optimism that should be feared most, but pessimism and immobilism, inspired by anxiety and agential eco-worship.

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References

Berman, M. (1981), *The Reenchantment of the World*, Cornell University Press, Ithaca, NY.

Bickerton, D. (1990), *Language and Species*, The University of Chicago Press, Chicago.

Blancaflor, E.B. (2012), *Regulation of Plant Gravity Sensing and Signaling* [sic] *by the Actin Cytoskeleton*, in «American Journal of Botany», vol. 100, n. 1, pp. 143-152.

Bonifazi, C. (1978), *The Soul of the World: An Account of the Inwardness of Things*, University Press of America, Lanham.

Boyer, P. (1994), *The Naturalness of Religious Ideas: A Cognitive Theory of Religion*, University of California Press, Berkeley.

Brand, S. (2010), *Whole Earth Discipline: Why Dense Cities, Nuclear Power, Transgenic Crops, Restored Wildlands, Radical Science, and Geoengineering Are Necessary*, Atlantic Books, London.

Brown, T.L. (2003), *Making Truth: Metaphor in Science*, University of Illinois Press, Champaign.

Bury, B.J. (1920), *The Idea of Progress*, Macmillan, London.

Butterfield, H. (1949), *The Origins of Modern Science, 1300-1800*, G. Bell, London.

Callicott, J.B. (1992), *La Nature est morte, vive la nature!*, in «The Hastings Center Report», vol. 22, n. 5, pp. 16-23.

Castree, N. (2001), *Socialising Nature: Theory, Practice, and Politics*, in N. Castree and B. Braun (eds.), *Social Nature: Theory, Practice and Politics*, Blackwell, Oxford 2001, pp. 1-21.

Cauvin, J. (2000), *The Birth of the Gods and the Origins of Agriculture*, transl. by T. Watkins, Cambridge University Press, Cambridge.

Cochran, C. and Harpending, H. (2009), *The 10.000 Year Explosion: How Civilization Accelerated Human Evolution*, Basic Books, New York.

Collingwood, R.G. (1945), *The Idea of Nature*, Clarendon Press, Oxford

Corner, A. *et al*. (2013), *Messing with Nature? Exploring Public Perceptions of Geoengineering in the UK*, in «Global Environmental Change», vol. 23, n. 5, pp. 938-947.

Crowley, T.J. and Hyde, W.T. (2008), *Transient Nature of Late Pleistocene Climate Variability*, in «Nature», vol. 456, n. 7219, pp. 226-230.

Dávid-Barrett, T. and Dunbar, R.I.M. (2013), *Processing Power Limits Social Group Size: Computational Evidence for the Cognitive Costs of Sociality*, in «Proceedings of the Royal Society B», vol. 280, n. 1765, 20131151.

Dawkins, R. (2006), *The Selfish Gene*, third, 30th anniversary ed., Oxford University Press, Oxford and New York.

Dennett, D.C. (1991), *Consciousness Explained*, Back Bay Books, Boston.

Dennett, D.C. (1995), *Darwin's Dangerous Idea*: *Evolution and the Meanings of Life*, Simon & Schuster, New York.

Dennett, D.C. (2011), *Homunculi Rule: Reflections on Darwinian Populations and Natural Selection by Peter Godfrey Smith*, in «Biology and Philosophy», vol. 26, n. 4, pp. 475-488.

Dunbar, R.I.M. (1993), *Coevolution of Neocortex Size, Group size and Language in Humans*, in «Behavioral and Brain Sciences», vol. 16, n. 4, pp. 681-735.

Dunbar, R.I.M. (1996), *Grooming, Gossip, and the Evolution of Language*, Harvard University Press, Cambridge, Mass.

Dunbar, R.I.M. (2009), *The Social Brain Hypothesis and Its Implications for Social Evolution*, in «Annals of Human Biology», vol. 36, n. 5, pp. 562-572.

Eliade, M. (1963), *Myth and Reality*, transl. by W.R. Trask, Harper & Row, New York.

Eliot, G. (1860), *The Mill on the Floss*, William Blackwood, Edinburgh.

Ellis, E.C. (2011a), *Anthropogenic Transformation of the Terrestrial Biosphere*, in «Philosophical Transactions of the Royal Society A», vol. 369, n. 1938, pp. 1010-1035.

Ellis, E.C. (2011b), *Forget Mother Nature: This is a World of Our Making*, in «New Scientist», vol. 210, n. 2816, pp. 26-27.

Flanagan, O. (2002), *The Problem of the Soul: Two Visions of the Mind and How to Reconcile Them*, Basic Books, New York.

Goldsmith, E.R.D. (1992), *The Way: An Ecological World View*, Rider Books, London.

Gray, J. (2002), *Straw Dogs: Thoughts on Humans and Other Animals*, Granta, London.

Greene, J.C. (1973), *The Death of Adam: Evolution and Its Impact on Western Thought*, The Iowa State University Press, Ames.

Hansen, A. (2006), *Tampering with Nature: "Nature" and the "Natural" in Media Coverage of Genetics and Biotechnology*, in «Media Culture Society», vol. 28, n. 6, pp. 811-834.

Herman, A.L. (1997), *The Idea of Decline in Western History*, Free Press, New York.

Hodge, M.J.S. (1985), *Darwin as a Lifelong Generation Theorist*, in D. Kohn (ed.), *The Darwinian Heritage*, Princeton University Press, Princeton 1985, pp. 207-243.

Humphrey, N.K. (1976), *The Social Function of Intellect*, in P.P.G. Bateson and R.A. Hinde (eds.), *Growing Points in Ethology*, Cambridge University Press, Cambridge 1976, pp. 303-317.

Inkpen, S.A. (forthcoming), *Likening Nature to Artifice: Darwin and the Mechanical Philosophy*, in «Endeavour».

Jacob, M.C. (2006), *Scientific Culture and the Origins of the First Industrial Revolution*, in «Historia e Economia. Revista Interdisciplinar», vol. 2, n. 1/2, pp. 55-70.

Kapogiannis, D. *et al.* (2009), *Cognitive and Neural Foundations of Religious Belief*, in «Proceedings of the National Academy of Sciences», vol. 106, n. 12, pp. 4876-4881.

Kelemen, D. (2004), *Are Children "Intuitive Theists"? Reasoning about Purpose and Design in Nature*, in «Psychological Science», vol. 15, n. 5, pp. 295-301.

Kirchner, J.W. (2003), *The Gaia Hypothesis: Conjectures and Refutations*, in «Climatic Change», vol. 58, n. 1/2, pp. 21-45.

Kövecses, Z. (2010), *Metaphor*, Oxford University Press, Oxford and New York.

Kull, K. (1998), *On Semiosis, Umwelt, and Semiosphere*, in «Semiotica», vol. 120, n. 3/4, pp. 299-310.

Lakoff, G. and Johnson, M. (1980), *Metaphors We Live By*, University of Chicago Press, Chicago.

Landmann, M. (1966), *Filosofische Antropologie*, Het Spectrum, Utrecht.

Laplace, P.S. de (1796), *Exposition du Système du Monde*, Imprimerie du Cercle-Social, Paris.

Lewontin, R.C. (2001), *In the Beginning Was the Word*, in «Science», vol. 291, n. 5507, pp. 1263-1264.

Lieberman, D. (2013), *The Story of the Human Body, Evolution, Health, and Disease*, Allen Lane, London.

Lynas, M. (2011), *The God Species: Saving the Planet in the Age of Humans*, National Geographic Society, Washington.

MacLay, G.R. (1990), *The Social Organism: A Short History of the Idea That a Human Society May Be Regarded As a Gigantic Living Creature*, North River Press, Croton-on-Hudson, NY.

Macnaghten, P. and Urry, J. (1998), *Contested Natures*, Sage, London.

Mann, C.C. (2005), *1491: New Revelations of the Americas Before Columbus*, Knopf, New York.

Marschal, M. (2013), *Terraforming Earth: Geoengineering Megaplan Starts Now*, in «New Scientist», vol. 220, n. 2938, pp. 10-11.

Maynard Smith, J. (1984), *Science and Myth*, in «Natural History», vol. 93, n. 11, pp. 10-24.

McKibben, B. (1989), *The End of Nature: Humanity, Climate Change and the Natural World*, Random House, New York.

Merchant, C. (1980), *The Death of Nature: Women, Ecology, and the Scientific Revolution*, HarperCollins, San Francisco.

Mithen, S. (1996), *The Prehistory of the Mind: A Search for the Origins of Art, Religion and Science*, Phoenix, London.

Moriarty, P.V. (2007), *Nature Naturalized: A Darwinian Defense of the Nature/Culture Distinction*, in «Environmental Ethics», vol. 29, n. 3, pp. 227-246.

Morton, O. (2011), *The Anthropocene*: *A Man-made World*, in «The Economist», vol. 399, n. 8735, pp. 81-83.

Odling-Smee, F.J., Laland, K.N. and Feldman, M.W. (2003), *Niche Construction: The Neglected Process in Evolution (MPB-37)*, Princeton University Press, Princeton.

Pigliucci, M. and Boudry, M. (2011), *Why Machine-Information Metaphors are Bad for Science and Science Education*, in «Science & Education», vol. 20, n. 4/5, pp 453-471.

Pinker, S. (2004), *Why Nature & Nurture Won't Go Away*, in «Daedalus», vol. 133, n. 4, pp. 5-17.

Pongratz, J. and Caldeira, K. (2012), *Attribution of Atmospheric CO_2 and Temperature Increases to Regions: Importance of Preindustrial Land Use Change*, in «Environmental Research Letters», vol. 7, n. 3, 034001.

Price, T.D. and Bar-Yosef, O. (2011), *The Origins of Agriculture: New Data, New Ideas: An Introduction to Supplement 4*, in «Current Anthropology», vol. 52, n. S4, pp. S163-S174.

Rakos, R.F. (2004), *The Belief in Free Will as a Biological Adaptation: Thinking Inside and Outside the Behavior Analytic Box*, in «European Journal of Behavior Analysis», vol. 5, n. 2, pp. 95-103.

Roach, N.T. *et al*. (2013), *Elastic Energy Storage in the Shoulder and the Evolution of High-speed Throwing in Homo*, in «Nature», vol. 498, n. 7455, pp. 483-486.

Ruddiman, W. (2005), *Plows, Plagues and Petroleum: How Humans Took Control of Climate*, Princeton University Press, Princeton.

Russell, B. (1925), *What I Believe*, Kegan Paul, Trench Trubner & Co, London.

Schelde, P. (1993), *Androids, Humanoids and Other Science Fiction Monsters: Science and Soul in Science Fiction Films*, New York University Press, New York.

Scheufele, D.A. *et al*. (2008), *Religious Beliefs and Public Attitudes toward Nanotechnology in Europe and the United States*, in «Nature Nanotechnology», vol. 4, n. 2, pp. 91-94.

Schlinger, H.D. (2009), *Theory of Mind: An Overview and Behavioral Perspective*, in «The Psychological Record», vol. 59, n. 3, pp. 435-448.

Schmidt, K. (2010), *Göbekli Tepe – The Stone Age Sanctuaries: New Results of Ongoing Excavations with a Special Focus on Sculptures and High Reliefs*, in «Documenta praehistorica», vol. 37, n. 17, pp. 239-256.

Shanks, N. (2004), *God, the Devil, and Darwin: A Critique of Intelligent Design Theory*, Oxford University Press, Oxford and New York.

Shaw, A. (2002), *It Just Goes Against the Grain. Public Understandings of Genetically Modified (GM) Food in the UK*, in «Public Understanding of Science», vol. 11, n. 3, pp. 273-291.

Silver, L.M. (1998), *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family*, Harper Perennial, New York.

Silver, L.M. (2006), *Challenging Nature: The Clash Between Biotechnology and Spirituality*, Harper Perennial, New York.

Spadafora, D. (1990), *The Idea of Progress in Eighteenth Century Britain*, Yale University Press, New Haven and London.

Sutrop, U. (2001), *Umwelt - Word and Concept: Two Hundred Years of Semantic Change*, in «Semiotica», vol. 134, n. 1/4, pp. 447-462.

Thibodeau, P.H. and Boroditsky, L. (2011), *Metaphors We Think With: The Role of Metaphor in Reasoning*, in «PLoS ONE», vol. 6, n. 2, e16782.

Thilly, F. (1965), *A History of Philosophy*, third ed., revised by L. Wood, Holt, Rinehart and Winston, New York.

Tylor, E.B. (1871), *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art, and Custom*, Brentano's, New York.

Venter, C. (2013), *Life at the Speed of Light: From the Double Helix to the Dawn of Digital Life* (2013), Viking Adult, New York.

Verplaetse, J. (2011), *Zonder Vrije Wil: Een Filosofisch Essay over Verantwoordelijkheid*, Nieuwezijds, Amsterdam.

Weart, S.R. (1988), *Nuclear Fear: A History of Images*, Harvard University Press, Cambridge, Mass.

Wellman, H.M. (1990), *The Child's Theory of Mind*, MIT Press, Cambridge, Mass.

Williams, M. (2002), *Deforesting the Earth: From Prehistory to Global Crisis*, second, annotated ed., University of Chicago Press, Chicago.

Williams, R. (1983), *Keywords: A Vocabulary of Culture and Society*, Flamingo/Fontana, London.

Wrangham, R. (2009), *Catching Fire: How Cooking Made Us Human*, Basic Books, New York.

Young, R.W. (2003), *Evolution of the Human Hand: The Role of Throwing and Clubbing*, in «Journal of Anatomy», vol. 202, n.1, pp. 165-174.

Zalasiewicz, J. *et al*. (2011), *The Anthropocene: A New Epoch of Geological Time?*, in «Philosophical Transactions of the Royal Society A», vol. 369, n. 1938, pp. 835-841.

Abstract

Metaphors are inevitable core elements of the conceptual schemes that shape our thinking and behavior. Traditionally, nature is interpreted in terms of agential metaphors such as ghosts, gods, witches and angels. Science, in contrast, is characterized by contra-intuitive, mechanistic thinking and machine metaphors. Modern societies nevertheless remain, to a certain extent, in the grip of powerful agential tropes. It will be argued that they are one of the obstacles that stand in the way of both reaping the full benefits of modern science and of meeting two of the biggest challenges we have ever faced: overpopulation and climate change. Or, put differrently, they are one of the reasons why there is a problematic mismatch between our modern "Umwelt" *and "niche".*

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Biotechnology, Human Dignity and the Importance of Art

Robert Zwijnenberg

Contemporary biotechnological practices (such as genetic modification, cloning, tissue engineering) that involve manipulation of living beings present a challenge to traditional notions of nature and the human body. This is particularly true of synthetic biology, a form of bioengineering which includes both the design and construction of new biological parts, devices, and systems and the re-designing of existing natural biological systems. Using a combination of molecular science and engineering, synthetic biology designs and creates new biological components, functions and systems[1]. The question is not only who has the right to re-design life, which is ultimately a question of legal and moral ownership and the commodification of life and nature, but also do we think it is necessary, and if so, how do we want to re-design nature and the human body? What limits do we wish to impose on biotechnological innovation involving nature and the human body? And what notion of "being human" and of nature are these limits based on?

In this paper, I want to show how the concept of what it means to be human and the associated concept of human dignity are central to any reconsideration of our traditional notions of nature and the human body. The questions of "what does it mean to be human" and "what is human dignity" are particularly relevant in the debate on human enhancement. I will discuss the fact that, though human dignity almost defies definition, we need the concept for practical and legal issues connected with life science research on the human body and nature. New materialism, a recent strand

[1] See for definitions of synthetic biology: http://www.synbioproject.org/topics/synbio101/definition/.

of thinking, appears to be able to provide a more satisfactory answer to the question of what attitude we should take to biotechnological developments. However, as I shall show, new materialism cannot conclusively guide our decisions on urgent legal issues in life sciences research that often have major societal implications. My conclusion is that biotechnology is testing accepted ethical and aesthetic values concerning the human body and nature to such an extent that we also need art as another necessary perspective in our search for a theoretical and practical position on new biotechnological challenges and developments.

1. *Human enhancement and human dignity*

«The bad news is that there is no consensus on what it means to be human» (Agar 2010: 19). In his most recent book *Humanity's End. Why we should reject radical enhancement* Nicholas Agar reconsiders the arguments for and against human enhancement[2]. Human enhancement is the application of biomedical technology not to cure or prevent disease but to increase the physical or mental capacity of humans – allowing them to live longer, stronger and more healthily, for example, or making them happier or more intelligent. The entire repertoire of existing and future biotechnological methods can and will be deployed to achieve this, including gene therapy, stem cell therapy, smart drugs, cognitive prostheses and reprogenetics.

Biotechnology is without a doubt one of the most important technological resources we have, and must be developed further if we are to sustainably address all kinds of global challenges and problems: food security, public health, ecological problems like pollution and climate change, water management and the need for new energy sources. The impact of these technologies on our daily lives will be significant; developments in the life sciences and their application will therefore inevitably lead to all kinds of public concern and debate, as can already be seen in the controversy surrounding genetically modified food. Although human enhancement has not currently aroused much public concern as yet – there are still few high-

[2] Agar (2010: 1) distinguishes radical human enhancement from "normal" human enhancement (like spectacles and other types of prosthesis) as follows: «Radical enhancement involves improving significant human attributes and abilities to levels that greatly exceed what is currently possible for humans». In this paper I use human enhancement in the sense of Agar's radical enhancement.

profile results in this area – it should come as no surprise to learn that the issue is being debated fiercely at a theoretical and philosophical level. When it comes to improving humans physically and mentally, we soon find ourselves facing questions like: Is human enhancement playing God? Does human enhancement interfere too much with who we are? Will it lead to an undesirable shift in what we regard as beauty, or a worthwhile mental and bodily performance? Let alone the matter of safety and the social implications of human enhancement. Will human enhancement lead to social pressure to enhance ourselves? Will two groups emerge – the enhanced and the unenhanced? (cfr. *Making Perfect Life* 2012). Aside from all these questions, in the end neither supporters nor opponents will be able to avoid facing the fundamental question of what it means to be human. If Agar is correct in saying that there is no consensus about what it means to be human, the debate on human enhancement is bound to end in a philosophical aporia for, ultimately, all the arguments will be based on a concept that is almost impossible to define.

One of the best-known supporters of human enhancement is the transhumanist[3] Nick Bostrom who, in a number of papers and books, has argued that people must have the right to use biotechnology to enhance their body and mind. Bostrom partly bases his argument on the fact that it is not possible to give a fixed definition of what it means to be human or of human essence; human history shows that the meaning of being human is in constant flux, both at the genetic level and in terms of the products of humanity, such as artefacts and institutions (Bostrom 2004). In short, Bostrom's defence of the right to human enhancement boils down to the idea that, because we cannot define any boundaries for what it is to be human, we cannot transgress these boundaries and we cannot therefore cite human essence in support of a ban on human enhancement. And, he adds, there is no reason to assume that human enhancement would devalue the moral beings we are held to be: «The enhancement that transhumanists advocate – longer lifespan, better memory, more control over emotions, etc – would not deprive people of the capacity for moral agency. If anything, these enhancements would safeguard and expand the reach of moral agency» (Bostrom 2004). The British bioethicist John Harris goes a step further by representing human enhancement as a universal «moral imperative». Enhancement

[3] Transhumanism is a philosophical position that argues that humans should explore, break and rise above the boundaries of human existence imposed by nature, using biotechnology and other means, leading to a posthuman body and mind. Cfr. Wolfe 2009.

will lead to «better people». These people will be more intelligent and more beautiful, and also «longer-lived, stronger, happier, smarter, fairer (in the aesthetic and in the ethical sense of that term)» – in other words, «more of everything we want to be» (Harris 2007: 2, 5 and 8; cfr. Zylinska 2010).

Opponents of transhumanists like Bostrom and Harris include Francis Fukuyama, often referred to as a bioconservative, who bases his rejection of human enhancement on the concept of human essence:

> The first victim of transhumanism might be equality. […] Underlying [the] idea of the equality of rights is the belief that we all possess a human essence that dwarfs manifest differences in skin color, beauty, and even intelligence. This essence, and the view that individuals therefore have inherent value, is at the heart of political liberalism. But modifying that essence is the core of the transhumanist project. If we start transforming ourselves into something superior what rights will these enhanced creatures claim, and what rights will they possess when compared to those left behind? (Fukuyama 2004: 42).

Fukuyama therefore argues that human enhancement will ultimately lead to the destruction of human essence, and thus of the inherent value of the individual: «when we strip all of a person's contingent and accidental characteristics away, there remains some essential human quality underneath that is worthy of a certain minimal level of respect – call it Factor X» (Fukuyama 2002: 149). This Factor X defines for Fukuyama what human dignity is. «Denial of the concept of human dignity – that is, of the idea that there is something unique about the human race that entitles every member of the species to a higher moral status than the rest of the natural world – leads us down a very perilous path» (Fukuyama 2002: 160).

Bostrom, for his part, argues that human dignity and post-human dignity are not mutually exclusive, but complementary: «By defending post-human dignity we promote a more inclusive and humane ethics, one that will embrace future technologically modified people as well as humans of the contemporary kind» (Bostrom 2005: 214). He sees human dignity as «what we are and what we have the potential to become» (Bostrom 2005: 214). In their discourse on human enhancement, both these authors arrive at a vague notion of human dignity, with reference to a human essence that is either fixed (Fukuyama) or not (Bostrom). However, both positions appear to be based on a sense of what humans are, and what they must, can or wish to become.

In his book *Humanity's End. Why we should reject radical enhancement*, Agar attempts to avoid the philosophical aporia by not basing his

rejection of human enhancement on the concepts of human essence and human dignity. He attempts to understand what it means to be human on the basis of biology. What connects us to other people is the fact that we can interbreed with them; what distinguishes me from other biological species is the fact that I cannot reproduce with them. There is a reproductive barrier between me as a human being and other species. Human enhancement could create a reproductive barrier within the species Homo sapiens. Agar sees this reproductive barrier first and foremost in psychological terms (acknowledging that it already exists between people of different religions or from different countries), but assumes that eventually a new human species might emerge. «Radically enhanced beings [...] have taken a significant step away from our species» (Agar 2010: 34). Agar's argument, in crude terms, boils down to the following: I understand what it means to be human because I know that I am not a horse, because I perceive (and there exists) a reproductive barrier between myself and a horse. This actually brings Agar close to Fukuyama, who writes that our assumption of fundamental equality between humans means that «In effect, we have drawn a red line around the human being and said that it is sacrosanct» (Fukuyama 2004: 42). Nor does Agar save us from our inability to define the meaning of human essence and human dignity in any way that might help underpin our argument in an important debate like this.

As I have said, it comes as no surprise that the issue of human essence and dignity plays such a huge role in transhumanism (and reactions to it), the philosophical response to the biotechnological possibility of human enhancement. The question of who and what is a human being, and what we do or do not wish to become, is a question to which a great deal of profound religious and philosophical thought has been devoted throughout human history. Biotechnology, and in particular synthetic biology, with its promise of the creation of new life and radical intervention in the human mind and body and in nature, have made these questions more urgent, and given them a new twist. The problem with the views of Bostrom, Fukuyama and also of Agar lies in the fact that they almost seem to refuse to probe deeper into the question of what the meaning of human essence or human dignity implies for their argument. As if thinking deeply about the meaning of these concepts would undermine those arguments.

2. *Bioethics, human dignity and new materialism*

The issue of human dignity is not merely a philosophical matter that has no bearing on our day-to-day lives, as long as no radical results of human enhancement are apparent. The philosophical wranglings of people like Agar, Fukuyama and Bostrom concerning concepts like human essence and human dignity reflect a real social issue that does have an immediate impact on our daily lives. The concept of human dignity forms the basis of our ideas about human rights. The preamble to the Charter of the United Nations begins with the following words: «We the peoples of the United Nations determined […] to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations large and small» (http://www.un.org/en/documents/charter/preamble.shtml). And article 1 of the EU Charter of Fundamental Rights reads: «Human Dignity is inviolable. It must be respected and protected». The notes explaining this article state: «The dignity of the human person is not only a fundamental right in itself but constitutes the real basis of fundamental rights» (http://www.eucharter.org/home.php?page_id=8). The articles that follow describe actions that violate human dignity (torture, abject destitution, humiliating or degrading treatment; cruel and unusual punishment; egregious discrimination on the basis of sex, race, etc; and flagrant denials of fundamental rights; e.g. indefinite extra-judicial detention). In other words, the Charter provides a legal framework for judging whether something is a violation of human rights. This is less the case when it comes to bioethical issues such as the status of early human life (embryos, foetuses, newborns), human reproductive cloning and designer babies (cfr. Bailey 2005 and Agar 2004 and also Agar 2006), and also questions about the dignity of all living beings and the extent to which all people possess or may appeal to human dignity.

The absence of a fixed definition of human dignity is so problematic in this context because human dignity is a key concept in the legal (and social) assessment of academic and industrial research into areas such as early human life, for use in applications (commercial or otherwise) like medication and therapy. It is in our social and political interests to arrive at some legally workable concept of human dignity[4]. This explains why

[4] The biohacking and do-it-yourself-biology movements are particularly keen to participate in this important social debate, given their critical position in favour of the democratisation of science. Cfr. Friebe, Karberg and Charisius 2013 and Wohlsen 2012.

recent decades have seen a flood of literature on human dignity, bioethics and the boundaries of scientific research into life (cfr. President's Council on Bioethics 2008)[5]. To some extent this has led to a legally workable concept of human dignity for commercial activities involving life (cfr. Van Beers 2009 and Koepsell 2009). At the same time, we see bioethical boundaries being pushed under pressure from new scientific and social developments, changing moral attitudes and, last but not least, commercial interests[6]. To some, the malleability of the concept of human dignity is a reason to exclude it from bioethics. Witness the assertion in Ruth Macklin (2013: 1419): «Dignity is a useless concept. It means no more than respect for persons or their autonomy»[7]. Nevertheless, the dominant view is that the concept of human dignity underpins a large proportion of our legal system, and that we cannot therefore manage without it.

My very brief discussion of the debate on bioethics and human dignity is intended to show that this is ultimately mainly a legal and pragmatic debate, which must ultimately lead to a workable legal concept that can serve as a basis for assessing the acceptability of academic and industrial research on living beings and the possible application (commercial or otherwise) of the results. This does not make the debate any less important, but the debate on human enhancement in relation to human dignity has broader cultural relevance, in my view. This debate is less a legal debate; nor, as far as I am concerned, is it primarily a bioethical debate[8]. It is above all a philosophical debate about how we should determine our attitude in the face of all kinds of future biotechnological possibilities: who and what do we want to be as humans, and who and what do we want to become? As we have seen, political scientist Francis Fukuyama ultimately wants to see humans as beings who must learn to live with their limitations: physical and mental fragility define what it is to be human, and the

[5] The main conclusion of this report appears to be that we cannot manage without this concept, though it does not deny that it is highly problematic. See for example p. 99: «the concept of human dignity is inherently ambiguous and cannot be settled by appeals to religious authority, conceptual analysis, or philosophical argument; instead, the meaning of human dignity – and its specific consequences for today's biomedical controversies – must be worked out pragmatically, in a spirit of compromise». See also President's Council on Bioethics: 2003.

[6] One of Barack Obama's first acts as President was to lift the ban on stem cell research, undoubtedly prompted by the economic interests of America's biomedical industry.

[7] Dieter Birnbacher (2005: 53), another sceptic as to the usefulness of human dignity as a bioethical concept, acknowledges that there is a «nearly worldwide consensus that reproductive cloning is incompatible with human dignity and should be prohibited by law».

[8] These two debates cannot of course be understood in isolation from each other.

principle of equality defines how we should deal with that. Attempting to transcend our human limitations will lead to more inequality in the world. The transhumanist Bostrom sees humans as infinitely malleable creatures, with no fixed meaning and by their very essence predestined to improve and expand their capabilities. And Agar would prefer not to see Homo sapiens as a species become extinct; his is an almost melancholic view of humanity as the sometime pinnacle of creation. All these positions are characterised by vagueness and ambiguity as to the essence of what it means to be human. Another feature of all these positions is that they are highly anthropocentric. Humans lie at the centre of their deliberations as to what a human being is, as evidenced by the fact that human dignity remains the focal point of their arguments.

There is a field of related philosophical thought that does attempt to escape the anthropocentric perspective in response to the potential and challenges of biotechnology, and of synthetic biology in particular – a group of theories that can be referred to as "new materialism". In the words of Dolphijn and Van Tuin:

> The term proposes a cultural theory that radically rethinks the dualisms so central to our (post-)modern thinking and always starts its analysis from how these oppositions (between nature and culture, matter and mind, the human and the inhuman) are produced in action itself. It thus has a profound interest in the morphology of change and gives special attention to matter (materiality, processes of materialization) as it has been so much neglected by dualist thought (Dolphijn and Van der Tuin 2012: 93).

One important thinker in this field, Rosi Braidotti, argues that new biotechnologies will not only reconfigure our image of, for instance, the human body, but above all create a «mutual interdependence» between bodies and technologies that resembles «a new symbiotic relationship» (Braidotti 2006: 37). This means, according to Braidotti, that we are faced with the necessity to readdress the notion of matter as carrier of agency from a new, non-anthropocentric perspective, which would fully explore this new entanglement between human and non-human bodies. Scholars from various disciplines, such as cultural studies, gender studies and philosophy, claim that the prevailing discourse on the body presupposes the anthropocentric paradigm. This, they argue, contributes to contemporary ecological, social and economic problems such as hierarchization and inequalities (Grosz 1994: 6).

New materialism thus strives for a non-hierarchical relationship with

nature and other living beings (non-human) in which humans are not the focus, but which is centred instead on a non-hierarchical relationship between humans and non-humans (cfr. Latour 2008). Any concept of human dignity has no role in such an argument. Both anthropocentrism and humanism are at stake in debates concerning the propositions of new materialism. New materialism thus offers another – theoretical – perspective on human enhancement that is not focused on human dignity, but views the matter from a non-anthropocentric perspective on the entanglement between body and technology. New materialism prompts a reconsideration of the traditional hierarchical human/animal or non-human relationship, and attempts to define what the blurring or transgressing of the boundaries between human and non-human means, and why it is necessary.

3. *Art and biotechnology*

New materialism is first and foremost a critical analysis of thinking in terms of dichotomies. A number of thinkers, like Braidotti, perform this analysis in relation to biotechnological developments that test the traditional, hierarchical contrasts between human and animal, culture and nature. However, so far new materialism has shown little potential for use in daily life[9]. As Wołodźko (forthcoming) rightly claims: «While new materialism studies can theoretically overcome the hierarchy between beings that presuppose the priority of a human agent, any actual bodily encounter of matter from a non-anthropocentric perspective is comprehended in text only as a theoretical engagement». How can one actually live a non-anthropocentric and non-humanist life?

To me, this is not a sarcastic question born of scepticism about a new philosophical perspective. My question is based on a conviction that new materialism exposes the limitations of our current thinking on the possibilities afforded by biotechnology. However, new materialism cannot simply be translated unchallenged into moral action in relation to bioethical issues with legal implications, like the status of early human life (embryos, foetuses, newborns) and human reproductive cloning. Is not any moral

[9] This is certainly the aim of many thinkers. More and more is being written about new materialism, more often than not in relation to an ecological re-thinking of environmental and/or global changes and developments. The aim of any philosophical position is, in my view, ultimately to change attitudes to reality and nature, as reflected in the title of the book by Morton 2007.

statement on the matter essentially anthropocentric and humanist? Whereas the need to make a moral statement on these issues appears to lie at the basis of the philosophising on new materialism of someone like Braidotti.

The search for an answer to the question of what human dignity means does lead to practical action and moral advice, but does not provide a satisfactory solution at a philosophical level for the meaning of human dignity.

Bostrom, Fukuyama and new materialist thinkers are looking for a new attitude to a world that will increasingly be determined by biotechnology. They are not of course the only ones. Other philosophers like Sloterdijk (*Regeln für den Menschenpark. Ein Antwortschreiben zu Heideggers Brief über Den Humanismus*, 2008) and Nussbaum (*Frontiers of Justice. Disability, Nationality, Species Membership*, 2006) have also responded. The same quest is also reflected in sci-fi movies like *Gattaca* (1997) and *Blade Runner* (1982) and in Japanese manga and anime like *Ghost in the Shell* (1995 and 2008) and *Metropolis* (2001). It can also be seen in literature, as in Michel Houellebecq's *La possibilité d'une île* (2005) and Don DeLillo's *White Noise* (1985)[10]. Of course, film and literature reflect the fears and hopes, the dreams and hidden agendas of a society and culture. From their own artistic perspective and imagination they give critical meaning and cultural roots to those social concerns and cultural anxieties. I am convinced that any quest like that pursued by Bostrom and Fukuyama, and also the answer to the question of how one can live in a non-anthropocentric way, is impossible without artistic reflection. The questions at stake constitute such an assault on established ethical and aesthetic ideas about who and what we are as humans that we will need all the cultural forces at our disposal to address them.

Art is able to seek a more tangible encounter with the many issues concerning biotechnology. Within the field of possibilities opened up by the artistic register, including inconsistencies, paradoxes, ambiguities or uncertainties, an artist can try out different and sometimes opposing avenues to explore the implications of re-designing life, for instance. I would argue that art can confront us with these issues in an embodied way, and it can thus provide us with an experience of these issues that is marked by ambiguity, complexity, disturbance, unsettlement and imbalance. It is my contention that art – from its own artistic specificity – can add something to

[10] Cfr. President's Council on Bioethics 2008: 17: «In the novel *White Noise* by Don DeLillo, a drug is invented whose specific effect on the human brain is apparently to suppress the fear of death. Would it be compatible with human dignity for all of us to start taking such a drug?».

our understanding that cannot be found or experienced in books or articles (see for a more detailed argument of this position Zwijnenberg 2012). Art does not of course provide a definitive answer to questions that philosophers leave open, nor is it the intention of art to illustrate philosophical or scientific views. What makes art so important in this debate is above all the fact that it inextricably links ethics and aesthetics, as is so elegantly expressed by Joseph Brodsky: «On the whole, every new aesthetic reality makes man's ethical reality more precise» (Brodsky 1987). To render the importance of art in the debate on biotechnology more tangible, I shall now discuss a number of artists who are strongly engaged with biotechnological practice. As I will demonstrate it is in particular the performative nature of these artworks that enables them to actively experiment with new ways of being, behaving and constituting subjectivities in relation to biotechnological developments[11].

One artist in whose work the entanglement of ethics and aesthetics is immediately obvious is Australian sculptor Patricia Piccinini. Her work features, among other things, encounters between humans (as part of the work or as viewers) and a non-human, a monstrous living entity that nevertheless often elicits empathy or enters into a relationship with a human, as in *The Young Family* (2002) and *Still Life With Stem Cells* (2002) (for images see: http://www.patriciapiccinini.net/). These works appear to be above all about how to shape the relationship between humans and non-human entities produced using biotechnology. Their aim seems to be to evoke a charitable attitude and an ethic of responsibility towards the new living biotechnological entities that in aesthetic terms appear repulsive and monstrous to us (cfr. Latour 2012). Piccinini herself has stated that her work is about «how the conceptual or ethical issues are transformed by emotional realities» (Orgaz 2007). Piccinini's work explores the confusing boundary between the natural and the artificial. The sympathy evoked in those who see her "monsters" of 2002 is undoubtedly related to their anthrophomorphic features and recognisable human emotions. This is no longer the case in Piccinini's more recent work, like *Belly* (2011), *Twins* (2012), *Nectar* (2012) and *Vanitas* (2013) (for images see: http://www.patriciapiccinini.net/). These are diffuse organic forms, often with human or animal hair, and a strong suggestion that they are living entities. They could be teratological defects resulting from synthetic biology experiments.

[11] I thank Boo Chapple for these observations.

It is impossible for the viewer to enter into a relationship with these entities, driven by sympathy and a sense of responsibility, as in her previous work. Nevertheless, these flesh-like blobs of material with a strong haptic character invite us to seek an attitude towards entities that are beyond the anthropomorphic and are difficult to incorporate into that domain (as we are accustomed to doing with most animals). We are called upon to look and behave towards living beings and material in a way to which we are not accustomed. We have to find an ethical attitude compatible with an aesthetic that confronts us with tangible, living entities that are beyond the realm of the known.

A similar development can be seen in the work of Eduardo Kac. In 2000 he presented *GFP Bunny*, a work he described as: «a transgenic artwork that comprises the creation of a green fluorescent rabbit ("Alba"), the public dialogue generated by the project, and the social integration of the rabbit» (Kac 2013: «Employing molecular biology, Kac combined jellyfish and rabbit DNA to produce a bunny that glows green under blue light. Kac's art is based on the literal creation of new biological life»). In another article he discusses the responsibility we must show towards the transgenic animals we are now able to produce in the biotechnology lab (Kac 2013). By taking this transgenic rabbit home as a family pet, he shifted the responsibility for transgenic animals from the scientific domain to the social domain. Kac writes of *GFP Bunny*:

> [it] does not attempt to moderate, undermine, or arbitrate the public discussion. It seeks to offer a new perspective that offers ambiguity and subtlety where we usually only find affirmative ("in favor") and negative ("against") polarity. "GFP Bunny" highlights the fact that transgenic animals are regular creatures that are as much part of social life as any other life form, and thus are deserving of as much love and care as any other animal (Kac 2013).

Kac's choice of a rabbit (a traditional pet) and his emphasis of the fact that biotechnologically created creatures have a right to our love and care appear to be driven from an anthropogenic perspective. Nevertheless, *GFP Bunny* confronts us with the complexity and ambiguity of our responsibility for and relationship with animals produced using biotechnology.

He goes a step further in a 2009 work entitled *Natural History of the Enigma*: «The central work in the "Natural History of the Enigma" series is a plantimal, a new life form I created and that I call "Edunia", a genetically engineered flower that is a hybrid of myself and Petunia. The Edunia expresses my DNA exclusively in its red veins» (Kac 2013). *Edunia* is as

an artwork, according to Kac «a reflection on the contiguity of life between different species». The work rejects speciesism, the idea that beings have different values or rights depending on their species membership; speciesism is the source of the hierarchical relationship between humans and non-humans. *Edunia*, a hybrid entity of plant and human, highlights the blurring boundaries between humans and nature arising from biotechnology. *Edunia* raises the question of how we should deal with those blurring boundaries, and how we should relate to hybrid beings. A photograph of Kac watering his edunia using a common-or-garden watering can illustrates these complex questions in a disturbingly indifferent way (for the photograph see: Kac 2013).

A work that investigates the human-animal relationship in a quite extraordinary way, and also attempts to transgress the boundary that Agar calls the reproductive barrier is *"que le cheval vive en moi"* (*may the horse live in me*) by French group *art orienté objet*. Artist Marion Laval Jeantet had herself injected with horse immunoglobins for several months to build tolerance to foreign bodies, and then had herself injected with horse blood plasma containing the entire spectrum of foreign immunoglobins. After the transfusion, Laval-Jeantet gave a peculiarly poetic performance, on stilts, of a communication ritual with the horse (the performance can be seen at http://www.youtube.com/watch?v=yx_E4DUWXbE). The work seeks a relationship with a horse beyond species boundaries, through the medium of a blood relationship. Laval-Jeantet herself said of the experience: «I had the feeling of being extra-human, I was not in my usual body. I was hyper-powerful, hyper-sensitive, hyper-nervous and very diffident, the emotionalism of an herbivore. I could not sleep. I probably felt a bit like a horse». At the very least, the work evokes the experience of transgressing species boundaries in a tangible and embodied way. It appears to actually "live" a non-anthropocentric attitude to a non-human. This is an ambiguous and complex work in which the relationship between horse and artist in the performance evokes an image of quiet beauty. It at any rate leaves the viewer with many questions. For instance, we may for instance ask whether injection with horse blood plasma – which is potentially life-threatening – is not in fact a violation of human dignity in purely objective terms, just as "dwarf tossing" is seen as a violation of human dignity, even if the dwarf consents (cfr. Malby 2002: 120).

The final artist I wish to discuss is Adam Zaretsky (see for the following Zwijnenberg 2012 and Zwijnenberg 2009). Adam Zaretsky belongs to a growing number of artists, known as bio-artists, who use the opportunities

offered by the life sciences to work with new materials: living materials that traditionally do not belong to the artistic realm. The use of these living materials, or moist media, in artistic practice also implies the application of the tools of the life sciences in the arts. Much bioart literally comes out of the laboratory. The materials, tools, and technologies of the life sciences are hardly neutral, of course. They are rife with all sorts of cultural, political, social and ethical assumptions and implications that are part of this particular scientific practice. In other words, the accomplishments of the life sciences, both scientific and cultural, are directly linked with the materials, tools and technologies associated with them. Bio-art encompasses the concrete results of, say, DNA research, as well as the promises, expectations and fears it arouses. The use of these materials, tools, and technologies within an artistic context automatically means that artists have to deal with these promises, expectations and fears, including their cultural, political, social and ethical ramifications. In using biomaterials – tissue, blood, genes – in their work, artists have also taken on board the discourses and practices of the science lab. Bio-art is the artistic outcome of the ways in which artists deal with living materials and life science practices (see for a detailed overview and theoretical discussion of bio-artists: Reichle 2009 and also Mitchell 2010).

In his art projects, bio-artist Adam Zaretsky welcomes rather than rejects biotechnological innovation and the creation of new forms of life, as for example in his project *Initial Attempts at Embryonic Transplant Surgery*. The goal of this project was «to cut the head off of one growing zebrafish embryo and transplant (paste) that head onto another "whole" zebrafish embryo. Done correctly, this might develop into a two-headed, fleshy and fashionable, "Mosaic Brut" designer zebrafish» (Zaretsky 2013).

The transplant operation did not succeed but to Zaretsky the lesson learnt from his attempt is:

> By learning standard microsurgical skills as an art productive process, I am attempting to focus on the liminal relationships that are formed at the border between the creation and the destruction of living beings. This is an attempt at waking the sleeping dreams of personal beauty. Therefore, I am not shielded by the rhetoric of moral sanctity implicit in the public face of scientific rationalization. I also believe participatory observation is a prerequisite to the comprehension and recontextualisation of any practice. But this is self expression, first and foremost (Zaretsky 2013).

In relocating and performing a scientific or technological practice in the

artistic domain, Zaretsky offers a different approach to nature than science, in the sense that he cites aesthetic motives to explain his artistic research. I quote from his website: «the limits of the possible realms of bio-sensuality have not even been approached». Yet he undertakes his artistic quest into the aesthetic and therefore ethical unknown with the tools of the life sciences in a hands-on approach and fully covered by the ethical procedures that apply to science. Another quote from Zaretsky's website: «This is the infinite approach to the mutual unknown that scientists, artists and even most novelty seeking organisms entertain». By literally participating hands-on in biotechnological practice, subject to the same rules and procedures, and using the same materials and techniques, he is able to explore and expose the ethical and aesthetic limits of this practice, the hidden desires, the fears and expectations. It is his quest for a new ethics and aesthetics better suited to the opportunities and challenges offered by biotechnology. In this work he tries to overcome a moralistic, anthropocentric and humanist perspective on nature and life. He aspires for a radical diversity of species made possible by biotechnology. In another work like *Workhorse zoo* (2002) he also explores nature/culture issues and human-non human relations and, last but not least, how biotechnology treats laboratory animals. *Workhorse zoo* is an installation in which Zaretsky is locked into a small greenhouse along with the workhorses of biotechnology which, having been starved for a time, eat each other (Zaretsky 2013: bacteria, yeast, plants, worms, flies, fish, frogs, mice, humans). Zaretsky himself kills and eats the mice. *Workhorse zoo* can be seen as a search for an ethics and aesthetics compatible with a biotechnological attitude to nature. With his art Zaretsky thus confronts us very directly and tangibly with issues that in new materialism, for example, remain theoretical possibilities.

In the artworks that I have discussed the artists give open-ended scenarios of how biotechnology might revise the human experience and our understanding of what life and nature are. As such, they perform experiments that run in parallel, or in the same zone of enquiry, with those of the biotech laboratory.

4. *The need for art*

Neither art nor philosophy (transhumanism or new materialism) can give us a definitive answer as to how we should act in moral, legal and practical terms in everyday life in the face of the potential and the chal-

lenges that biotechnology already offers, and promises for the future. We can do little more than keep searching for an ethics and aesthetics that suit the new world that biotechnology promises to design, without any hope of finding the ultimate answers. Any existential quest of this kind is impossible without a deep understanding of the ambiguities and complexity we need to consider. The function of art is precisely to enact these ambiguities and this complexity[12].

References

Agar, N. (2004), *Liberal Eugenics: In Defence of Human Enhancement*, Wiley-Blackwell, Malden and Oxford.

Agar, N. (2010), *Humanity's End. Why we Should Reject Radical Enhancement*, MIT Press, Cambridge (Mass.) and London.

Bailey, R. (2005), *Liberation Biology: The Scientific and Moral Case for the Biotech Revolution*, Prometheus Books, New York.

Bostrom, N. (2005), *In Defence of Posthuman Dignity*, in «Bioethics», vol. 19, n. 3, pp. 202-214.

Braidotti, R. (2006), *Transpositions. On Nomadic Ethics*, Polity Press, Cambridge.

Dolphijn., R. and Van der Tuin, I. (2012), *New Materialism: Interviews & Cartographies*, University of Michigan Library, Ann Arbor.

Friebe, R., Karberg S. and Charisius, H. (2013), *Biohacking*, Hanser, München.

Fukuyama, F. (2002), *Our Posthuman Future: Consequences of the Biotechnology Revolution*, Farrar, Strauss and Giroux, New York.

Fukuyama, F. (2004), *Transhumanism*, in «Foreign Policy», n. 144, pp. 42-43.

Grosz, E. (1994), *Volatile Bodies. Towards Corporeal Feminism*, Indiana University Press, Bloomington.

Harris, J. (2007), *Enhancing Evolution: The Ethical Case for Making Better People*, Princeton University Press, Princeton and Oxford.

Koepssel, D. (2009), *Who Owns You: The Corporate Gold Rush to Patent Your Genes*, Wiley-Blackwell, Malden and Oxford.

Making Perfect Life. European Governance Challenges in 21st Century Bio-engineering. (2012), STOA, Brussels, European Union. (Final Report IP/A/STOA/FWC/2008-096/LOT6/C1/SC3).

[12] Impressive historical examples of this include Dante's *Divina Commedia*, the sixteenth-century Issenheim Altarpiece of Matthis Grunewald and, more recently, Steve Reich's *WTC 9/11*.

Malby, S. (2002), *Human Dignity and Human Reproductive Cloning*, in «Health and Human Rights», vol. 6, n. 1, pp. 102-135.

Mitchell, R. (2010), *Bioart and the Vitality of Media*, University of Washington Press, Seattle and London.

Morton, T. (2007), *Ecology without Nature. Rethinking Environmental Aesthetics*, Harvard University Press, Cambridge (Mass.) and London.

Reichle, I. (2009), *Art in the Age of Technoscience. Genetic Engineering, Robotics, and Artificial Life in Contemporary Art*, Springer, Vienna and New York.

Van Beers, B. (2009), *Persoon en lichaam in het recht. Menselijke waardigheid en zelfbeschikking in het tijdperk van de medische biotechnologie*, Boom, Amsterdam.

Wohlsen, M. (2012), *Biopunk: Solving Biotech's Biggest Problems in Kitchens and Garages*, Current Trade, New York.

Wolfe, C. (2009), *What Is Posthumanism?* University of Minnesota Press, Minneapolis.

Wołodźko, A.A. (forthcoming), *Materiality of Affect. How Art Can Reveal the More Subtle Realities of an Encounter*, in R. Braidotti and R. Dolphijn (eds.), *Faux Titre*, Rodopi Publisher, Amsterdam and New York.

Zwijnenberg, R. (2009), *Preface*, in I. Reichle, *Art in the Age of Technoscience. Genetic Engineering, Robotics, and Artificial Life in Contemporary Art*, Springer, Vienna and New York 2009, pp. xiii-xxix.

Zylinska, J. (2010), *Playing God, Playing Adam: The Politics and Ethics of Enhancement*, in «Journal of Bioethical Inquiry», vol. 7, n. 2. pp. 149-161.

Websites

Agar, N. (2006), *Designer Babies: Ethical Considerations*, Action Bio Science. American Institute of Biological Sciences: http://www.actionbioscience.org/biotech/agar.html (accessed on 26/10/2013).

Birnbacher, D. (2005), *Human cloning and human dignity*, in «Reproductive BioMedicine Online», vol. 10, Supplement 1, pp. 50-55: http://download.journals.elsevierhealth.com/pdfs/journals/1472-6483/PIIS1472648310622067.pdf (accessed on 26/10/2013).

Bostrom, N. (2004), *Is transhumanism the most dangerous idea?*: http://www.betterhumans.com/Print/index.aspx?ArticleID=2004-10-19-1 (accessed on 26/10/2013).

Brodsky, J (1987), *Nobel Lecture*: http://www.nobelprize.org/nobel_prizes/literature/laureates/1987/brodsky-lecture.html (accessed on 26-10/2013).

Kac, E. (2013), *Artist website*: http://www.ekac.org/transgenicindex.html (accessed on 26/10/2013).

Latour, B. (2008), *A Cautious Prometheus? A Few Steps Toward a Philosophy of Design (With Special Attention to Peter Sloterdijk)*, Keynote Lecture, History of Design Society, Falmouth, 3rd September 2008: http://www.bruno-latour.fr/article (accessed on 26/10/2013).

Latour, B. (2012), *Love Your Monsters. Why We Must Care for Our Technologies as We Do Our Children*: http://thebreakthrough.org/index.php/journal/past-issues/issue-2/love-your-monsters/ (accessed on 26/10/2013).

Macklin, R. (2003), *Dignity is a Useless Concept*, in «BMJ», vol. 327, pp. 1419-1420: www.bmj.com/cgi/content/full/327/7429/1419?etoc (accessed on 26/10/2013).

Orgaz, L.F. (2007), *The Naturally Artificial World. A conversation between Patricia Piccinini and Laura Fernandez Orgaz*: http://www.patriciapiccinini.net/essays/29 (accessed on 26/10/2013).

President's Council on Bioethics (2003), *Being Human: Readings from the President's Council on Bioethics*, Washington D.C.: http://bioethics.georgetown.edu/pcbe/bookshelf/index.html (accessed on 26/10/2013).

President's Council on Bioethics (2008), *Human Dignity and Bioethics*, Washington D.C.: http://bioethics.georgetown.edu/pcbe/reports/human_dignity/index.html (accessed on 26/10/2013).

Zaretsky, A. (2013), *Artist website*: http://emutagen.com/index.html (accessed on 26/10/2013).

Zwijnenberg, R. (2012), *A Two-headed Zebrafish*, in «Moebius Journal», vol. 1: http://moebiusjournal.org/pubs/14 (accessed on 26/10/2013).

Abstract

Biotechnology allows us to re-design and design anew both nature, living creatures, and also the human mind and body. This forces us to reconsider our traditional views of humans and nature. What limits do we wish to impose on biotechnological intervention in nature and the human body? What view of nature and of what it means to be human informs these limits? All debates on biotechnology seem to rely on the concept of human dignity. Any search for a different ethical and aesthetic approach to humans and nature has to begin with this concept. The meaning of human dignity is almost indefinable, however. I argue that art, too, should have a role in our reflections on the applications and implications of biotechnology.

The Artinatural and the Importance of Nature Studies

Theodore Grudin

> The greatest good for the human and nonhuman communities is in their mutual living interdependence.
>
> Carolyn Merchant

This essay will explore, among other things, the strange question of what it means to be simultaneously artificial and natural, or what I call "artinatural". These distinctions, beyond being fascinating discussion points, will play an increasingly central role in societies, as technologies like genetic engineering, geoengineering, virtual reality and artificial intelligence ask for greater moral understanding. In this quest for more accurate languages, as well as the more accurate worldviews these languages could provide, it is important to ask how and why languages developed in such a way as to obscure certain truths and realities. Through this philosophical remediation, one might find that the true resistance to more accurate languages lies not only in the utility and safety of languages that have so far been used, but also in a fear of leaving those safe understandings behind to peek into something more mysterious, even frightening. But the changing world will allow, indeed demand, changing languages.

The issue of language is already evident in the academy. In the spring of 2012, for example, the Townsend Center for the Humanities at U.C. Berkeley sponsored a seminar entitled "Nature/No Nature". Professors and graduate students from a broad array of fields gathered to explore the idea of nature, as well as to ask the question: is the term "nature" really necessary at all? What I took away from the experience was twofold: not only is nature a concept that is here to stay, but it is also a concept that deserves much more attention and scrutiny. The most difficult challenges in fostering greater attention to the idea of nature include developing ways in which one can go beyond dualistic thinking about nature and, instead,

uncover significant moral arguments that encourage the study and learning of more complex and integrative views of nature.

A thoughtful reconsideration of the meaning of "nature" – and by nature I mean the universe in its entirety, including humanity and human creations – could bear fruit in significant and diverse ways. In the past, ideas about nature have helped to shape the ways in which individuals – and societies at large – treat their bodies, identities, and environments. On the other hand, concern for ecological and socio-environmental issues is constrained by one's knowledge of complex systems like ecosystems and societies. In order to address socio-ecological problems through democratic processes, individuals' understandings of nature must progress.

1. *Modernity's "nature" of alienation & the idea of "environment"*

Environmentalism surely chose a strange word to rally around: "environs" – or surroundings (Berry 2000: 151) – are clearly something to care about, but they are also *other*. Because of the demarcation between self and the external world, environmentalism has been aligned, at least metaphorically, with the notion that ecosystems, forests, oceans, lakes and rivers are *external* resources for human use, consumption and admiration, rather than with the notion that these are, in fact, integral, even internal, parts of humanity's own life support system. In other words, the term "environment" lends itself to an instrumentalist conception of nature, rather than one that recognizes the complexities and «mutual living interdependencies», to borrow Carolyn Merchant's words, of life on earth (Merchant 2003: 223). The term "environment" thus suggests an essentially bifurcated cosmos in which problems like pollution and global warming are not central, personal or moral concerns. In both the dominating and nurturing conceptualizations of "the environment," humanity is seen as separate from the rest of the universe. But how did this notion of separation develop?

One avenue that is available to explore society's conceptualizations of nature is through examinations of culture, including literature, philosophy, and cinema, that highlight the changing ideas of nature and the natural in relation to the human, personal and artificial. These sources can help to uncover some of the vast fluctuations in the understandings of nature and illuminate the effects they have produced. With Aristotle, and even as early as the pre-Socratic philosophers, there is already a perception of nature and the natural being separate from the human and the artificial. Skip

forward a couple thousand years and George Perkins Marsh is asking his readers «whether man is of nature or above her?» (Marsh 2003: 465). For Marsh, humanity had already begun to shape earth's surface as powerfully as if through geological processes. More audaciously perhaps, wilderness promoters like Henry David Thoreau and John Muir had adopted the idea that humanity was, indeed, a part of nature. The moment of polarization or separation for Thoreau and Muir, however, was the dichotomy of civilization and wilderness. Human artifice, in other words, human changes to nature, were not considered part of the natural world. This binary is what carried on through the writings of later conservation writers like Aldo Leopold, Rachel Carson, and Bill McKibben. What made environmental thinkers grasp so tightly onto the notion of a hard line between wilderness and civilization? What broader social norms and practices are secured within the myth of this conceptual separation?

Despite the more subtle demarcations that the "environmental" thinkers mentioned above brought to the table, the broader human/nature binary had a rich history to which many different realms of society contributed. Francis Bacon, for example, was a key proponent of the view of nature as a separate entity, a tool and resource for human societies to dominate and exploit. With Robert Boyle's experimental method, moreover, the sciences took an increasingly instrumentalist approach to nature and its bounties; "nature" could be the source of great wealth and power. Perhaps there was more wealth to be gained from seeing nature as a separate object rather than seeing it as an integral part of who we are and how we survive. "Environmental" problems, so to speak, had not yet become so disturbingly destructive on a global level.

Arguably, the conceptual and material split between humanity and nature, advanced in large part by thinkers like Bacon, Newton and Boyle, was an instigator for the alienation and anomie we see in literature as early as Shakespeare, epitomized early on in Hamlet's words: «I have of late […] lost my mirth». «The earth», seems to Hamlet «a sterile promontory», and its sky, nothing but «a foul and pestilent congregation of vapours» (II.ii.295-303). Not only has Hamlet lost his delight in life, but his vision of the natural world around him, once «majestical», has become «sterile» and inert. The once beautiful night sky now reveals itself as simply a mundane scientific happening: the simple conveyance of light, as information reaching, and being processed by, the eyes. Being a contemporary of Bacon, Shakespeare was well aware that understandings of the world were becoming more scientific and mechanistic – that even the conception of

the human was undergoing tectonic shifts. Hamlet, as a character, is an example of the emerging scientific awareness of Shakespeare's era. Hamlet's solipsism, his constant empirical self-scrutiny, is in large part his greatest enemy; not only does it delimit his ability to be in touch with his feelings and emotions, but it shatters his sense of self, and results in a troubled fragmentation – indeed, bifurcation – of his identity. The uneasiness that Hamlet feels about his body and his experience as a human being became a strong theme in the arts, and remains so today.

Writing from the perspective of an industrialized society, Fyodor Dostoevsky, in his *Notes from Underground*, builds on themes already present in *Hamlet* as early as the fourth sentence: «I think that my liver hurts» (Dostoevsky 1992: 1). A statement like this shows the readers two things: firstly, that there is an odd kind of relationship between his internal body, his liver, and his mind. And secondly, it shows an awkwardness caused by his lifestyle, a discomfort with his strange embodiment – Dostoevsky's Underground Man has biological processes taking place inside him of which he is only partially aware: strange things are happening that he can vaguely imagine, but cannot know or control. But perhaps more crucially, the processes that are happening inside him may be perceived as nonhuman or alien. Maybe this is one reason why the character that Dostoevsky depicts is so full of alienation and anomie.

One of the most striking of all portrayals of this kind of alienation is Franz Kafka's Gregor Samsa in *Metamorphosis*. «As Gregor Samsa awoke one morning from uneasy dreams he found himself transformed in his bed into a gigantic insect» (Kafka 1995: 1). Gregor vividly represents the kind of transformations that modern scientific thought had performed on the definition of humanity. Charles Darwin and Ernst Haeckel's formulation of, and elaboration on, evolutionary theories had demonstrated to intellectuals like Kafka the alienating reality of humanity's arbitrary place in an objectified, uncaring, and mechanistic biological world. Furthermore, the unsympathetic norms of society demoted Gregor to social outcast, a freak of nature. The warped and denigrated identity assigned to Gregor by both his family and himself after his transformation into an insect, in the end, lead to his death. Gregor's story is an apt metaphor for the way the new scientific society treats its outsiders and those not elevated by its distinctions, binaries and hierarchies.

Almost eight decades after *Metamorphosis*, Tim Burton's film *Edward Scissorhands* explores related territory with its artificially fabricated main character, Edward, who must deal with the fact that he is an unfinished

product. His hands, which are in the form of scissors, were meant to be converted into more realistic looking prosthetics by his inventor, played by Vincent Price (Burton 1990). One of the film's most powerful scenes is one in which his inventor reaches out with the prosthetic hands that he intends to install on Edward as a gift to his pupil, but at this very moment, his life slips away and he falls to the floor in front of Edward's hopeful and innocent visage. And even more tragic, as this old inventor falls, Edward reaches into the prosthetic hands with his scissor-hands, tearing into, and destroying, not only what were to be his hands, but also what was to complete his humanization. Having destroyed these, Edward must now exist in a strange reality where he is unfinished, and not yet human. But, as the narrative suggests, Edward is, in fact, even more human for his lacking. His alienation from his own form, his own nature, reveals a psychological phenomenon that becomes more and more familiar as technologies – and scientific understandings of life – become increasingly intertwined with human life. Edward's incompleteness, his condition of becoming human, is precisely what makes him so human. Edward, like Kafka's Gregor, must creatively experiment with the boundaries between human, animal and artifice. Are we animals or are we separate from them? Are we products of nature or of culture? Are we biological organisms like insects or are we – through minds, artifice, and culture – something entirely different? Perhaps all the protagonists above share this in common: each is grappling with the personal and social repercussions of intellectual and ontological categories that have persistently bifurcated and alienated not only their "human" identity but also the conceptual status of the greater nature within which they exist.

If characters like the Underground Man and Gregor Samsa highlight the awkward acceptance of human beings as merely a part of the animal kingdom and the biological cosmos, then the character of Edward Scissorhands portrays the harsh, sometimes harrowing addition of the artificial into that biosphere, the human body. In each case the characters are responding to, and grappling with, the falsehoods and limitations of heretofore-accepted dualistic cosmologies. In Kafka's work, characters began to see the insect in the human, or the strange commonalities between the two beings: both bodies containing the same kind of mucousy, slimy biological processes. And with Tim Burton's scissor-hands, there is the notion that human technology gets implanted into the human body, transforming us into more mechanized, robotic beings. Both of these transitional paradigms are hard pills to swallow; human beings do not seem to relish thinking of themselves

as either insects or machines – but both paradigms have also emerged as (troubled) aspects of post-Darwin and post-DNA identities.

The conflicts that Kafka unveils in his 1915 work still loom large today. The old Cartesian paradigm that elevated the mind above the body – and thus humans above other animals – was challenged by Darwin's theory of evolution. But through the calculus of complexity (and the idea that humans are the most complex animal, a debatable premise of course), people held onto the Modernist conception of the human as the apotheosis of all beings. In the next sections of this paper I will explore the stubborn, binary hierarchies, as well as some attempts, including one of my own, to move away from bifurcated thinking, and towards a less uneasy acceptance of the sometimes jarring overlappings of the human and the natural.

2. *Some persistent dichotomies of nature*

Here are some of these persistent dichotomies, or binaries:

Culture || Nature
Human || Nature
Civilization || Wilderness
Artificial || Natural
Mind || Body
Reason || Emotion
Human || Animal
Subject || Object
Internal || External
Man || Woman
Familiar || Strange
Material || Spiritual

The binaries above form powerful metaphorical structures, hierarchies, and moral structures. There are multiple hierarchies implicit, for example, in the wilderness/civilization binary. In one, wilderness is held to be the pure place that represents cleanliness and beauty; in another, an exalted civilization is seen as conquering a dark and brooding, wild nature. Both of these conceptions, it can be argued, helped to form a metaphorical hierarchy that placed the European man over women, animals, nature and non-European peoples. This kind of metaphorical structure forms the centerpiece for justifying history's most atrocious events: slavery and the

broader history of European colonialism, the Holocaust, and other heinous acts committed against human populations deemed lower in the hierarchy. The poor treatment of women, nonhuman animals and ecosystems can also be attached to these dichotomous, hierarchical metaphors.

The "mind vs. body" dichotomy, made famous by Descartes and many subsequent interpretations of his work, operates along similar hierarchical lines. The Cartesian "mind" is perceived as more valuable than the body: all animals and wild things have bodies but only the civilized, adult, refined member of the human species has a mind. Reason is valued over emotion. Emotions are associated with the more automatic responses of a clock-like body. In this worldview, reason is the most prized human attribute. David Hume, however, fought back on this point – he declared that «reason is, and ought only to be the slave of the passions» (Hume 1973: 295). One thing this statement suggests is the difficulty of moving past a binary even when challenging its assumptions: by claiming that emotions held precedence over the intellect, Hume re-affirmed the erroneous split between reason and the emotions. Since Hume, there has been a growing movement towards the notion of an "embodied mind" wherein the mind and body have no disconnection, either categorically or functionally. Beyond Hume's work, there have also been attempts to address some of these other dichotomies. The binary I chose to tackle is that between the artificial and the natural.

Strange things hide behind categories like natural and artificial. Synonyms for artificial include fake, false, manufactured, synthetic, sham, manipulated and unnatural. There is a sense of contamination here. Artificial's antonym, natural, has synonyms like these: essential, pure and legitimate. Entire moral systems could be derived simply from the contrast between artificial and natural – a hierarchy of order, right and wrong. The artists and writers I mentioned earlier were at least implicitly aware of the awkwardness and untruthfulness of these kinds of binaries and hierarchies and, since then, there have been academic attempts to deal with them more directly, some of which I will explore in the next section.

3. *Integrative terminology and nature*

Growing awareness of global ecological crises has produced a number of intellectual initiatives that seek to work against alienating binary paradigms, and towards ideas of nature that are more integrative and inclusive of

humanity. Donna Haraway's "cyborgs" (Haraway 1991) and "naturecultures" (Haraway 2003), for example, blur the lines between organism and machine, culture and nature. Because humans have become so intertwined and dependent on machines, from eyeglasses to cars, they are cyborgs. Because there is never "nature" without culture, or vice-versa, then these should be called naturecultures. Bruno Latour offered the term "hybrid" to denote the intermixing of culture and nature (Latour 1993). I use the term "artinatural" – a word that was first developed in the 18th century in the field of landscape architecture (Curl 2007: 44) – to describe things that are simultaneously artificial and natural, such as radioactive forests and dog breeds.

Like other words that intend to integrate two opposing realms – hybrid, cyborg, and natureculture, "artinatural" combines the ideas of natural and artificial to suggest that things, institutions, and even ideas can be simultaneously artificial and natural. A wooden chair, for example, is both from nature (wood from trees) and artificial (made with human hands and/or technologies). The concept is also meant to ask whether the artificial is really outside the realm of the natural at all. It begs the question: «Do we even need a separate concept of artificial or does the term "natural" already have it covered?». Unlike the term cyborg, the artinatural does not refer primarily to individual subjects; rather, it refers to artifacts, landscapes and ideas. Bodies too can be understood as artinatural, but from a different perspective than that of the cyborg. Unlike the term "hybrid", artinatural is not so broad or vague: it specifically describes things that are simultaneously artificial and natural, rather the broader category of instances when "nature" mixes with "culture". Donna Haraway's concept of naturecultures reminds readers to not see nature or culture as either «polar opposites or universal categories» (Haraway 2003: 8) – something both Raymond Williams (Williams 1980) and William Cronon (Cronon (ed.) 1995) also argue about nature and wilderness. Here, the term artinatural exists in some ways under the umbrella of natureculture or hybrid, but as a more specific form referring to things constructed by humans – what is usually called "artifice" – rather than to culture as a whole. Nature and culture, it could be argued, are both artinatural in some important ways. To be sure, the term "artinatural" is very much in debt to these other integrative terms.

Bruno Latour's actor-network theory (Latour 2005), Jane Bennett's "vibrant matter" (Bennett 2010), Karen Barad's "agential realist" approach (Barad 2007), and Mel Chen's "animacies" (Chen 2012) help illuminate another aspect of what an integrative term like artinatural hopes to promote. Actor-network theory exposes the complex and counter-intuitive agencies of

"actants" that include inanimate objects. Animacies then draw attention to the animacy and vibrancies that even "inanimate" objects possess. These re-articulations and new understandings of material reality – some call them "new materialisms" (Coole and Frost (eds.) 2010) – challenge traditional, normative hierarchies present both in racial and sexual identities as well as in binaries like nature-human, animal-human, wild-civilized and subject-object. Combined with the self-reflexive eyes of Donna Haraway's "situated knowledges" (Haraway 1991) and Sandra Harding's "strong objectivity" (Harding 1991), the new materialisms above (including integrative terms like artinatural) hope to offer both better, more complete, and less biased understanding of the universe, as well as greater humility.

My dog, Sonny, provides an excellent example of what I call the "artinatural". His genes and breeds were taken from a once "natural" setting, be they wolves or other wild canines, and were then manipulated over centuries. Sonny is a mixture of Golden Retriever and Boxer breeds. In a photo of him that I cherish, he is wearing a hand-knit wool sweater, itself an artinatural item constructed with sheep's wool. Sonny also interacts with the artinatural world around him, namely myself and my artinatural possessions, and the landscaped hills (also artinatural) that surround us. In 2011, he chewed up the first few pages of James C. Scott's *Seeing like a State* as well as Donna Haraway's *When Species Meet* (the cover of which features a human hand reaching out toward a dog – perhaps my dog was trying to tell me how he feels about being left at home alone during my hours at work).

The desk my computer is resting on right now is clearly made out of wood, but it is also processed and constructed by human hands (or, even more bizarrely, by machines that may have been assembled by human hands and/or by other machines); the same is true of my computer. And even synthetic materials have original sources in what we call nature or the wild – all this is not to mention that the human species itself, as well as its civilization and artifacts, can be understood as both wild and natural.

The moon and the sun can provide a good way to denote just what can and cannot be described as artinatural. The sun and the moon, before they were named or perceived, both started as entirely natural things. The names and ideas humans have applied to the sun and moon are artinatural – they are both constructed and based in the nature of biological beings and brains. The moon itself has now been physically touched and altered by human constructs and has thus become artinatural to a small extent. The sun itself, however, remains practically unaltered by humanity and is

essentially natural. Galaxies that are both unnamed and unknown are still entirely natural besides the artinatural radio emissions or probes that may reach them. Artinatural entities are things that both have a natural basis and have been altered by human action; all artificial things fall into the category of artinatural. Human ideas are artinatural, but unaltered objects themselves, like distant unknown stars, are still natural. These more subtle complexities and distinctions are difficult to navigate, but in this difficulty is potential for progress.

The term artinatural might lend itself to reflection on ethical and moral matters that established categories have tended to signify or promote. If things are artinatural, rather than simply "natural" or "artificial," then perhaps there is something other than these two simplistic categories that should go into evaluating an object, practice, or individual. Authenticity, genuineness, and sustainability could be good places to start – or even functionality. A well-made wooden chair may not be entirely "natural," but it can certainly perform a useful function for many years, if not decades or even centuries. Furthermore, if the production process of this chair, and its source materials, have been chosen carefully, the chair could have benefits absent in, for example, a similar plastic or metal chair. By the same token, if you analyze the prospects of human genetic engineering, the debate would quickly move past the natural/artificial distinction, toward more critical issues like the authenticity or genuineness of what might be a rather de-stabilizing and jarring development in society (think of Edward Scissorhands). Simplistic and fallacious dichotomies hide the complexities of serious issues, while integrative terms (and the concepts they evoke) may deepen and expand the moral queries that rest at the heart of these issues.

To see the interconnectedness of spheres means that one can no longer imagine an entirely contained "artificial" place or object. For example, some have learned the hard way, through recent events like the BP/Gulf oil spill and the Fukushima nuclear disaster, that although crude oil and radioactive materials may temporarily be contained in human-made structures, they are still structures that exist in the natural world, and furthermore, they are *by no means* permanently or completely sealed from that broader natural world. These toxic spills clearly crossed the theoretical boundary between "artificial" and "natural" and demonstrate that they had always been, in fact, artinatural. Such understanding would counsel that similar projects would entail risky and dangerous practices that can only be *temporarily* safe and contained. Even if the oil spill had not taken place, the oil would still eventually have been distributed through everyday

processes into world's skies and landscapes, contributing (if more slowly than a spill or explosion) to increases in greenhouse gas emissions and other pollutants. Global climate destabilization itself is an example of the artinatural: it is not just human societies emitting billions of tons of chemicals into the atmosphere, but also the interconnected processes that create the warming, the storms, and the rising sea levels. Not to see these artinatural complexities, and not to respond to them, would be disastrous.

Equally important, recognizing the artinatural can also help us move toward positive, transformative goals. Because we no longer imagine the city as merely artificial, we can start to imagine more urban farms, edible gardens, rooftop gardens, green/ecological corridors, and decentralized renewable energy production throughout and within our cities and neighborhoods. There are already cars and trucks and high-tech equipment in our wildernesses, but now we can also imagine wilderness within the city – more plants, animals and even ecological corridors integrated into spaces once strictly imagined as artificial. If negative artinatural overlappings have already occurred, at least many positive artinatural overlappings can be offered to heal them.

While integrative terms like hybrid and cyborg have proven to be useful, the term nature itself might prove to realize or encompass the same meaning. As Shakespeare wrote:

> Yet nature is made better by no mean
> But nature makes that mean: so, over that art
> Which you say adds to nature, is an art
> That nature makes. You see, sweet maid, we marry
> A gentler scion to the wildest stock,
> And make conceive a bark of baser kind
> By bud of nobler race: this is an art
> Which does mend nature, change it rather, but
> The art itself is nature.
> (*The Winter's Tale*, IV.iv.89-97)

If the «art itself» is nature, then the artificial manipulation of nature can simply be understood as nature manipulating nature. Nature itself seems to be an integrative term, but only if the writer or speaker chooses to define it so expansively. Indeed, the broadest definition of "nature" that I've seen is "the universe in its entirety." There may be substantial benefits to a more focused pursuit of these interpretations and understandings of nature, and the rich literary, philosophical and religious histories that pertain to them.

But how can society categorically improve its citizens' understanding and knowledge of the interconnectedness of the socio-ecological world? To start, a K-12 curriculum that emphasizes problem-based learning and interdisciplinary thinking would lend itself to greater awareness of the systemic processes that link pollution, politics, biology, culture, economics, and climate change. Moreover, curricula that involve outdoor education, a focus on farming, ecology, and geology would allow students to experience firsthand some of these complex processes and interactions. In higher education, fields of study, such as Nature Studies, that refuse to disconnect the human/cultural realms from the ecosystems/natural realms, and that also focus on interdisciplinary, problem-based learning would be suitable. It is remarkable that a concept as rich, historic and potentially enlightening as "nature" does not already have its own field of study.

The complex understandings of nature to be found in integrative terminologies can enrich, and meaningfully alter, one's perspective. But integrative and complex cosmologies of nature are things that need to be learned. The idea of an "ecological crisis" is also a product of knowledge and learning. One is not born with these ideas, and yet their widespread adoption, or lack thereof, can have significant impacts in sociopolitical landscapes, especially in a democracy (Lakoff 2009). It could be argued, moreover, that these kinds of knowledge are matters of justice. There is a "knowledge justice" in being able to understand the importance, and interconnectedness, of ecosystems to human health. If citizens are not aware of the damages from various pollutants, then how can they behave in such ways as to try to improve or avoid them? The development of the field of Nature Studies could help to address these significant gaps in educational systems. It can be argued that the field of Nature Studies has been taking place for decades or even centuries already. But, to give these kinds of studies a name, and a more extensive home, would allow for a more structured and expansive approach to these vital questions.

Conclusion

Raymond Williams reminds us that «ideas of nature» are really «ideas of men» – the ideas are not only made by human beings (in Europe, largely by the few men in power), but, perhaps even more importantly, they shape human identities and norms. Williams goes on to say that «nothing much can be done», or even *said*, «until we are able to see the causes of

this alienation of nature, this separation of nature from human activity» (Williams 1980: 82). Because they formulate a template for understanding humanity, conceptualizations of nature have significant moral implications. Creative minds, however, have been grappling with the alienation and dissolution of the human/nature binary to various degrees. Indeed, ontologies of nature may have more fundamental repercussions than ethical theories themselves. It is clear that bifurcated visions of nature lead to unhealthy, undesirable results both in the area of "environmental" policies and with respect to social justice and equity: the term "environment" itself exemplifies this destructive alienation, a kind of estrangement that is metaphorically embodied in artinatural characters like Gregor Samsa and Edward Scissorhands. Though it is difficult to reconcile and overcome deceptive binaries and their implied hierarchies, as well as the mechanisms that employ their destructiveness, it is essential that we do so.

More developed cosmologies of nature, along with knowledge of the interdependencies of societies and ecosystems, could limit the kinds of alienation, oppression, and damaging policies that have accompanied the dualistic conceptions of nature that have thus far persisted. As Kate Soper notes, «the societies that have most abused nature have also perennially applauded its ways over those of "artifice"» (Soper 1995: 150). The continued conceptual separation of ideas like nature and artifice, and the hierarchies that are embedded within these demarcations, need to be addressed and ameliorated. Stronger, more situated ontologies of nature – including terms like artinatural and other new materialisms – can establish more realistic and integrative understandings of nature's complexities. But to achieve these substantial shifts in understanding requires formidable educational support. The development of the field of Nature Studies could become a central part of developing and nurturing these crucial understandings.

At this stage of global ecological crises, the most serious problems are not only socio-environmental, they are also *cognitive*-environmental. The amelioration of these crises depends, in part, on the quality and dynamism of individuals' understanding and knowledge. Complex cosmologies of nature that better allow one to grasp socio-ecosystems' mutual living interdependencies, if they become more common, could have positive, even transformative, effects on ecological policies, and, in turn, both ecosystem and individual well-being.

References

Barad, K. (2007), *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Duke University Press, Durham.

Bennett, J. (2010), *Vibrant Matter: A Political Ecology of Things*, Duke University Press, Durham.

Berry, W. (2000), *Life is a Miracle: An Essay Against Modern Superstition*, Counterpoint, Berkeley.

Burton, T., dir. (1990), *Edward Scissorhands*, perf. Johnny Depp, Winona Ryder, Vincent Price, Twentieth Century Fox.

Carson, R. (1962), *Silent Spring*, Houghton Mifflin, Boston.

Chen, M. (2012), *Animacies: Biopolitics, Racial Mattering, and Queer Affect*, Duke University Press, Durham.

Coole, D. and Frost, S. (eds.) (2010), *New Materialisms: Ontology, Agency and Politics*, Duke University Press, Durham.

Dostoevsky, F. (1992), *Notes From Underground*, trans. by M. Ginsburg, Bantam, New York 1992 (or. ed. *Записки из подполья* (*Zapiski iz podpol'ya*), Epoch, St. Petersburg 1864).

Haraway, D. (1991), *Simians, Cyborgs and Women: The Reinvention of Nature*, Routledge, New York.

Haraway, D. (2003), *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, Prickly Paradigm Press, Chicago.

Haraway, D. (2008), *When Species Meet*, University of Minnesota Press, Minneapolis.

Harding, S. (1991), *Whose Science? Whose Knowledge? Thinking from Women's Lives*, Cornell University Press, Ithaca, NY.

Kafka, F. (1995), *The Metamorphosis*, *In the Penal Colony, and Other Stories,* trans. by E. and W. Muir, Schocken Books, New York (or. ed. *Die Verwandlung*, Kurt Wolff Verlag, Leipzig, Germany 1915).

Latour, B. (2005), *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford University Press, Oxford.

Latour, B. (1993), *We Have Never Been Modern*, trans. by Catherine Porter, Harvard University Press, Cambridge (or. ed. *Nous n'avons jamais été modernes: Essai d'anthropologie symétrique*, La Découverte, Paris 1991).

Leopold, A. (1949), *A Sand County Almanac*, Oxford University Press, Oxford.

Marsh, G. (2003), *Man and Nature,* University of Washington Press, Seattle.

Merchant, C. (2003), *Reinventing Eden: The Fate of Nature in Western Culture*, Routledge, New York.

McKibben, B. (1989), *The End of Nature*, Random House, New York.

Scott, J. (1998), *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, Yale University Press, New Haven.

Shakespeare, W. (1999), *Hamlet*, Cambridge University Press, Cambridge.

Shakespeare, W. (2008), *The Winter's Tale*, Oxford University Press, Oxford.

Soper, K. (1995), *What is Nature? Culture, Politics and the non-Human*, Blackwell Publishers Inc., Oxford.

Williams, R. (1980), *Problems in Materialism and Culture*, Verso Editions, London.

Websites

Lakoff, G. (2009), *Why Environmental Understanding, or "Framing," Matters: An Evaluation of the EcoAmerica Summary Report*, in «The Huffington Post»: http://www.huffingtonpost.com/george-lakoff/why-environmental-underst_b_205477.html (accessed on 17/02/2014).

Abstract

The conceptual separation between the natural and the artificial in environmental discourse limits the potential for progress in the spheres of social justice and sustainability. Overcoming the conceptual binaries that are implied in the term "environment" may enable progress in these areas. Several key moments in cultural history – in philosophy, science, literature and film – provide perspective on how these binaries function. If terminology has been a constraint, terminology may also allow new ways of seeing and understanding. Integrative terminology allows thinking that moves beyond bifurcating cosmologies that perceive objects as natural or artificial and, instead, the two realms can be seen as interwoven, as "artinatural". The field of Nature Studies can help students explore these more accurate languages and approaches to understanding nature's complexities.

Public Reason Renaturalized

Lars Tønder

> …to seek a philosophy which explains the upsurge of reason in a world not of its making and to prepare the substructure of living experience without which reason and liberty are emptied of their content and wither away.
>
> Merleau-Ponty (1962: 56)

> Reason without its networks is like an electric wire without its cable, gas without a pipeline, a telephone conversation without a connection to a telephone company, a hiker without a trail system, a plaintiff without legal means.
>
> Latour (2013: 66)

1. *Introduction*

An explosion onto the scene of new claims about "reason" and "reason-giving" mark contemporary democratic politics. Sometimes they appear as moderating forces that turn a confrontation of interests into something other than a paralyzing antagonism. At other times, the claims are used in a repressive manner to discipline the foreigner or newcomer who is not already familiar with the norms of appropriate behavior. This divergence in the effects of reason is largely due to globalization and the acceleration of speed, which has expanded the range of conceptions of reason, revealing the limits and finitude of all claims to reasonableness. A key task of contemporary democratic theory is to factor-in this newfound finitude before it defines the scope, practice, and authority of reason-giving in public life. This implies reexamining age-old questions about reason itself. How does reason work in a context of conflict and disagreement? Under what conditions are the demands of reason binding for those affected by them? What practices of reason-giving can motivate the parties of a given conflict to relax their own position and develop new ways of living together?

Answers to these questions have for the most part been the domain of theories of political liberalism and deliberative democracy. Driven by a neo-Kantian orientation to politics that seeks to free Kant's philosophy from its metaphysical assumptions, these theories depict reason as a disembodied faculty of self-legislation that may be limited in scope but nonetheless holds supreme power with regard to human knowledge, including morality and politics[1]. The main argument for this conception is that reason itself should be seen as a mode of abstraction that brackets claims based on affects, perceptions, and other so-called particularistic experiences, and instead looks to universalize another set of claims that all humans can accept once they realize that the only way to ensure a just and stable society is to subject all arguments and discourses to a test defined by standards of generality and reciprocity. These standards do not tell citizens "what" to do in a situation of conflict and disagreement but rather "how" to determine whether an argument or action is right or wrong, reasonable or unreasonable. Moreover, as evidenced by the contemporary debate, the standards have occasioned a new framework for democratic politics, one that foregrounds insights concerning the right to justification (Forst 2011), epistemic proceduralism (Estlund 2009), collective intelligence (Landemore 2012), and discursive political culture (Chambers 1996).

This is not the place to review these important contributions to contemporary democratic theory. Rather, I wish to take a step back in order to discuss how the neo-Kantian dismissal of what Merleau-Ponty calls the «substructure of living experience» has limited the terms of the discussion, precluding a proper view of the circumstances in which claims to reasonableness are made and contested. In a vein similar to Latour's observation cited in this article's second epigraph, the concern is that the importance of neo-Kantianism in contemporary democratic theory has produced a disconnect between the account we give of reason and the way reason itself is experienced and used as a tool for claim-making in theoretical as well as in practical discourses. Such disconnect has important implications for how we approach questions of public reason in deeply divided societies. This is the case, not only because the disconnect precludes a proper appreciation of the finitude of reason but also because it disavows the types of experiences that motivate citizens to follow the demands of

[1] Associated with the works of Rawls and Habermas respectively, this view of reason has become a mainstay of contemporary democratic theory. For Rawls' and Habermas' contributions, see Rawls (1985) and Habermas (1992).

reason in the first place. Once we overlook how reason is situated within a network of affects and other nonconscious registers of lived experiences, issues about how the same claim – the same "reason"– can mean something different in a given society no longer arise as a meaningful possibility. Once reason's sensorially inflected circumstances have been relegated to the unexamined background – once we no longer examine the way reason "feels" and "sees"– it may no longer be possible to examine how practices of reason-giving resonate with divergent lived experiences, and thus how they can not only demand but also inspire citizens to relax their own position in order to find new ways of living together.

In this article, I wish to further develop this argument in a manner that does not reject the role of reason-giving in public life but rather infuses it with new meaning, bringing the reasonable back to its sensorially inflected circumstances, exploring how an alternative perspective – what I call a sensorial orientation to politics – can renaturalize reason itself. The article develops this argument in two steps. First, I outline the basic tenets of a sensorial orientation of politics in order to show how it reframes the poststructuralist critique of the neo-Kantian conception of reason as a disembodied faculty of self-legislation (section 2). Second, I turn to a discussion of how the same tenets that reframe the critique of neo-Kantianism also include an alternative conception that allows us to overcome the disconnect between the account we give of reason and the way it is mobilized in deeply divided societies (section 3). I conclude with a discussion of how a sensorially inflected conception of public reason changes our conception of how contemporary democratic theory should position itself vis-à-vis the struggle for empowerment and pluralization in an age of neo-liberalism and state-surveillance (section 4).

2. *A sensorial orientation to politics?*

Let us begin by noticing that speaking of a sensorial orientation to politics may seem paradoxical, if not self-contradictory, especially when we consider how political theorists associated with such an orientation rely on reason and reason-giving, something that may give the impression that their arguments merely reproduce the blind spots and double binds that the sensorial orientation attributes to its neo-Kantian counterpart. One response to this impression is to recognize that a sensorial orientation to politics indeed is born out of conversations with proponents of neo-Kantianism, and it

therefore is likely to carry various traces of the neo-Kantian tradition. Another response is to note that rather than refuting reason – and, by extension, language and interpretation – a sensorial orientation to politics aims to proffer new resources that show how reason and reason-giving, too, are ways of experiencing the world as a place of conflict and disagreement. How a sensorial orientation to politics develops this conception of reason – and thus how it reframes our approach to the politics of reason-giving in public life – is best understood, first, by examining how a sensorial orientation to politics engages various developments in twentieth-century phenomenology and poststructural critical theory, and second, by explicating how this engagement reorients the existing critique of neo-Kantianism, setting the terms for a new conception of how to be reasonable in deeply divided societies.

2a. *Steps toward a sensorial orientation to politics*[2]

With regard to its place as a new contribution to contemporary democratic theory, we might say that a sensorial orientation to politics stands on the shoulders of a long tradition in the history of Western thought that culminates with various efforts in twentieth-century Continental philosophy, especially those inspired by Husserl's phenomenological investigations and further developed in discussions of embodiment, sexuality, desire, psychology, new media, and techniques of the self[3]. Drawing on these efforts, a sensorial orientation to politics implies first and foremost an interest in sentient beings (in particular human bodies) as generative forces that both are structured by and exceed their place within social institutions and political regimes. Whether described as an ontological lack or as a sign of vitality and abundance, sentient beings can be said to embody this excess because they are not only the object of sociopolitical pressures but also the source of these pressures. That is, if sociopolitical pressures arise, it is because sentient beings project and live out their own assumptions regarding material needs, psychological well-being, and cultural recognition. Contemporary feminists and critical theorists have long been interested in foregrounding this dynamic chiasm in order both to denaturalize the human body and highlight the possibility of political resistance granted by embodied differences (whether marked in terms of class, gender,

[2] This section draws on my discussion in Tønder (2013a: 13-16).

[3] For an overview of the "sensorial turn" in contemporary theory, see Howes (ed.) (2005).

or race). The differences themselves are an important reason sentient beings move and resist the weight of their own past, creating the possibility of a new future. As Elizabeth Grosz notes, «Bodies are not inert; they function interactively and productively. They act and react. They generate what is new, surprising, unpredictable» (Grosz 1994: xi).

This account stands in sharp contrast to the mind-body dualism that neo-Kantianism uses to privilege disembodied reason as the proper authority in cases of conflict and disagreement. To emphasize the sensorium as the enabling force behind reason is to undermine the hierarchy that delimits the conceptualization of this authority. And to move beyond this delimitation is to generate a more nuanced conception of how sentient beings participate in the production of regimes of discourse and sensation, as well as how these regimes "frame" the way sentient beings reason with each other. Some of these insights follow from the strategy of denaturalization that we have come to associate with contemporary poststructural theory. In Michel Foucault's discussion of late-modern governmentality, for example, the denaturalization of the body implies an interest in how political disciplining can be both limiting and enabling, instituting a field of normalcy that on the one hand restricts and constitutes the span of acceptable differences in society and on the other hand enables resistance and subversion (see especially Foucault 1991). Along similar lines, Judith Butler has pointed out how a society's ability to recognize bodies as bodies – what she calls "recognizability"– depends on an ontological framing that contains the seen and sensed without holding «anything together in one place, but itself becomes a kind of perceptual breakage, subject to a temporal logic by which it moves from place to place» (Butler 2009: 10). To Butler, this breakage assumes the denaturalization of the human body and, by extension, sentient beings: rather than conceptualizing sentient beings as given entities, controlled by the demands of disembodied reason, we must see them as cumulative and accomplished entities that actively participate in the structuring of meaning and recognition, and thus in the various definitions of reason and reason-giving.

A sensorial orientation to politics goes further than this, however. Inspired by Butler's own concern for the unsettling feeling of vulnerability that often follows from the experience of being framed and/or defined as unintelligible, a sensorial orientation shows how the strategy of denaturalization, though valuable in one sense, has had the adverse effect of bypassing how bodily existence is more than just a way of generating a subject recognized by others. Another way of saying this is that a sensorial

orientation to politics is motivated by the insight that bodily existence, in addition to generating individualized subjects of desire, evolves around relations of power and difference that exceed the sentient beings they enable, something that requires a return to Nature as the very source of power and difference. Crucial to a sensorial orientation to politics is thus the more radical argument that sentient beings are generative, not only because their bodies are socially constructed but also because their senses communicate with a natural world always-already open to intervention and change. Sentient beings are in that sense neither the most interesting nor the most fundamental element of analysis; they stand out as assemblages of bodily material in and through which affective intensities and perceptual shifts wire the body's senses in ways unique to both place and time.

These comments highlight an important difference between a sensorial orientation to politics and ongoing debates among neo-Kantians and poststructuralists in contemporary democratic theory. Insofar as the latter two camps have left the conceptualization of the senses to the natural sciences, particularly the discourses of physiology and medicine, the sensorial wiring of lived experience has come to be associated with a turn to nature as a fundamentally organic and precultural category immune to change, incompletion, and difference across its various instantiations. In accepting this view, contemporary democratic theory broadly understood has more or less tacitly embraced another division of labor between the natural sciences and the humanities, one that erects a new culture-nature dualism on the ruins left by the neo-Kantian mind-body dualism. This may seem obvious given the interests that situate contemporary democratic theory vis-à-vis the natural sciences, and yet the temptation to replace one dualism with another is what a sensorial orientation to politics seeks to resist. From its perspective, the challenge is to rethink political practices from within the world in which they appear, and therefore to problematize any pregiven separation of both mind and body *and* culture and nature. A sensorial orientation to politics thus shows how focusing on registers of embodied experience implies major epistemological upheavals, not only for the neo-Kantianism of contemporary democratic theory, which has tended toward a separation of mind and body, ceding the latter to the natural sciences, but equally (and perhaps more importantly) for poststructuralists who have privileged culture over nature and in that sense may have emasculated their own commitment to nondualist theory.

2b. *Renaturalizing the critique of neo-Kantian reason*

To appreciate the consequences of this reproach, we may go back to the neo-Kantian conception of reason and clarify how a sensorial orientation to politics reframes the poststructuralist critique of this conception. As I have already suggested, poststructuralists have for the most part highlighted the failed universality of neo-Kantianism – how the neo-Kantian mind-body dualism is a product of cultural and historical developments in early modern European Enlightenment philosophy[4] – and, in more recent years, how this failed universality points to the autonomy of affect and other nonconscious registers of lived experience[5]. Both insights strike a chord with a sensorial orientation to politics, which nonetheless insists that the poststructuralist way of placing reason within the exclusive domain of one of the two sides of a new culture-nature dualism has created a one-sided critique of the circumstances in which claims to reasonableness are made and contested. From the perspective of a sensorial orientation to politics, the challenge is not only to acknowledge the power of a nonconscious netherworld that undermines the neo-Kantian conception of reason as disembodied but also to appreciate how this subversion introduces a chiasmatic relationship between the reasonable and the sensorial, allowing reason to play a role on both sides of the historically defined and contextually situated division between "culture" and "nature". Without acknowledging this complexity, the argument goes, our conceptual framework may not be able to appreciate how reason can be mobilized for purposes that are more or less pluralizing, more or less democratic.

To bring the complexity back into view, a sensorial orientation to politics therefore reframes the poststructuralist critique of neo-Kantian reason by shifting the emphasis from "denaturalization" to "renaturalization"[6].

[4] A classical and still important version of this critique is Spivak (1999: Chapter 1).

[5] Emphasis on the autonomy of affect and other registers of nonconscious experience may be why contemporary poststructuralist discussions are witnessing a rather unhelpful divide between a position that affirms the sensorial turn because of the independent power embedded in these registers, and a position that rejects the sensorial turn because of this claim, insisting on the importance of psychoanalysis and its account of the unconscious (and the related questions of intentionality, meaning, and subjectivity). For an account of each position, see respectively Massumi (2003: Chapter 1) and Leys (2011). For an account that modifies the tension between these two positions, replying especially to Leys' arguments, see Connolly (2011).

[6] Borrowing the term from the recent work of Elizabeth Grosz, Hasana Sharp describes "renaturalization" in the following way: «Renaturalization is a strategy to attenuate the antipathy that plagues our psyches and our life in common […] It founds a new appreciation of ourselves as parts of nature, operating according to the same rules as anything else, invariably dependent upon many other things, human and nonhuman» (Sharp 2011: 5).

For our purposes, this shift in emphasis is interesting because it draws us closer to what Merleau-Ponty calls «the substructure of living experience» (Merleau-Ponty 1962: 56), by which he means the bodily material (the flesh) from which reason draws sustenance and on which it relies in order to become something more than an empty shell of abstract thinking. Moreover, a renaturalization of reason tracks Latour's insights into what "passes" as reasonable in any given context. According to Latour, this issue is important because reason, like science or culture, is a historical practice that has no innate definition but instead is situated within a network of actors (human and nonhuman) that orient themselves toward «conditions of felicity» that not only decide what count as reasonable in this or that context but also imbue reason with its status as an «immutable mobile» – an oxymoron Latour introduces to describe how reason continues to seem like an autonomous faculty even though it is always-already in the process of being transformed across time and space (Latour 2013: 77). As part of a renaturalization strategy, this insight is particularly helpful to clarify the disconnect between the "official" neo-Kantian conception of reason and the way it is used in various theoretical as well as practical discourses. If we follow Latour, we might say that the disconnect occurs because neo-Kantian reason itself is a network that invokes certain conditions of felicity in order to draw *a* line between the reasonable and the unreasonable. This line-drawing does not happen in isolation from other networks but it is nonetheless autonomous enough to allow for a disconnect between the network's account of reason and the way it is used and experienced by the actors within that network. As Latour puts it, neo-Kantian reason «is a network that traces its own particular trajectory, alongside other, differently qualified trajectories, which it never ceases to crisscross» (Latour 2013: 85).

In the next section of this paper, I shall return to how these insights by Merleau-Ponty and Latour point to an alternative, more affirmative conception of reason and reason-giving in deeply divided societies. But first I want to clarify how the disconnect that characterizes the neo-Kantian conception of reason, although possible in the sense suggested by Latour, engenders a set of problems that undermines one of the most important goals of reason-giving in deeply divided societies – to moderate tensions among opposing constituents and to turn a confrontation of interests into something other than a paralyzing antagonism. One way in which neo-Kantianism undermines its own commitment to this goal relates to the conception of reason as a disembodied faculty of self-legislation. As already noted, such a conception is steeped in a philosophical tradition that disavows the

sensorium, creating a discourse in which the power of affects and other nonconscious registers of lived experience is noticed and then displaced to the background as an unwelcome fact of reality. Still, given the enduring power of the nonconscious, the disavowed material is likely to return to the surface of public discourse, and when this happens, it is often with a vengeance due to the now apparent tension between the ideal of self-legislation and the heteronomy of sensorially inflected registers of lived experience that once disclosed are depicted as both subversive and unavoidable. In the tension between these two moments, the neo-Kantian conception of reason is not "above the fray" (as it would like to be) but rather a reluctant party that either turns against the practice of politics because it is too removed from the world of ideals, or, in a more militant manner, puts the burden of accommodation on those who have not yet understood and accepted the neo-Kantian conception of reason as disembodied and detached from the particularities of history and culture. In both cases, the outcome is something other than a moderation of wills. What matters, you might say, is not how to engender new modes of coexistence attractive to both sides of a given conflict but rather how to avoid such a change through a strategy of either retreat or accommodation (or both).

Another way of grasping this problem is to approach it from a more positive point of view – namely, from the perspective of how to motivate constituents to act in accordance with the demands of reason (whatever they may be). Here, too, the neo-Kantian conception of reason faces an important challenge as its emphasis on disembodiment diminishes our appreciation of how nonconscious registers of lived experience empower concrete action, and thus how these registers must be mobilized before reason can have any impact on how constituents interact with each other in a given conflict. From the perspective of a sensorial orientation to politics, this is the main reason for a shift away from the culture-nature dualism that defines much of the current debate between neo-Kantianism and poststructuralism in contemporary democratic theory. Although the two approaches could not disagree more on the effects of reason and reason-giving, they share a tendency to locate their disagreement exclusively on one side of the divide between culture and nature, overlooking how reason often crosses this divide, making claims to reasonableness both more mobile and less disembodied than assumed by the current terms of the debate.

3. *Public reason in a sensorial world*

With this insight in mind, we can now turn to the second objective of this article: to discuss how a sensorial orientation to politics envisions an alternative, more affirmative conception of reason and reason-giving in public life. Given what we have seen so far, it should be clear that the motivation for unearthing this alternative is how the existing neo-Kantian framework has become inattentive to the role that affects and other nonconscious registers of lived experience play in mobilizing opposing constituents, inspiring them to either intensify the appearance of conflict or change their position in order to experiment with new modes of coexistence. What is less clear, however, is whether the strategy of renaturalization on which a sensorial orientation to politics bases its view of this possibility is strong enough to offer an alternative that will resonate with the goals of public reason, including moderation and respect for differences. To answer this question, we must first consider how a sensorial orientation to politics conceptualizes public reason in a world defined just as much by deliberation and choice as by the work of affects and other nonconscious registers of lived experience.

A good way to get some traction on this issue is to return one more time to Merleau-Ponty's comment that we «see rationalism in a historical perspective» and that the motivation for this is to «[explain] the upsurge of reason in a world not of its making» (Merleau-Ponty 1962: 56)[7]. Apart from its critique of neo-Kantianism, this comment deserves our attention because it makes two points that are important for how a sensorial orientation to politics can conceptualize public reason as oscillating between thinking and feeling, culture and nature. To begin with, the comment adds to this conceptualization by reminding us that a sensorial orientation to politics need not oppose reason and that it instead should reposition practices of reason-giving by bringing the substructure of living experience back into view, renaturalizing the circumstances in which claims to reasonableness are made and contested. Once we embark on this project, Merleau-Ponty's comment suggests, the issue is no longer whether the reasonable and the sensorial belong to each other but rather how to theorize the ways in which each side of the divide augments elements in the other.

[7] Another example to consider would be Spinoza's doctrine of parallelism developed most interestingly by Stuart Hampshire in his discussion of Spinoza's doctrine of parallelism. See Hampshire (1971).

More about this in a moment. But first we should also note that Merleau-Ponty's comment is important because it points us to an account of the finitude of reason that is different from one suggested to us by the neo-Kantian tradition. That is, rather than defining the finitude of reason as an issue of delimitation, one that limits reason to one or more domain(s) in which claims to reasonableness hold supreme power, Merleau-Ponty's comment encourages us to see the finitude of reason as the outcome of a broader, more heteronomous process, one in which reason is *one* participant among many others. This shift from delimitation to interdependence – from autonomy to heteronomy – has the advantage of placing the finitude of reason at the very heart of everyday politics, however messy and imperfect this kind of politics may be. Moreover, it gives us the impetus needed to avoid seeing reason as an abstract mode of thinking and instead to acknowledge it as deeply immersed in the particularities of lived experience, including those that we normally associate with historically contingent and contextually situated conceptions of culture and nature.

If we follow this impetus, we may be able to connect Merleau-Ponty's insights about the substructure of living experience with Latour's observations about reason as an «immutable mobile», something that would lead us to see that what a sensorial orientation to politics defines as reason must be something that evokes a heteronomously defined lived experience – one that mixes deliberative reflection with context-dependent modes of feeling and seeing in order to judge sensory input according to varying epistemological and normative standards of truth and justice. Another way of saying this is that although a sensorial orientation to politics agrees that an important task of reason is to judge the world such as it is, evaluating the appropriateness of various feelings, images, and desires, a sensorial orientation to politics does not limit the discussion of this issue to a question of whether or not reason can position itself above the power of these registers of lived experience; in addition, and more importantly, on the view suggested here reason also stands forth as a sensorially inflected mode of reflection, one that empowers sentient beings to reason with one another, enabling them to judge the world in manner that resonates with the context from which the need for reason arises in the first place. An important corollary of this insight is that discussions of reason-giving in public life no longer can link the finitude of reason to a set of standards based on a dualism of some kind – be it the mind-body dualism that neo-Kantian tradition privileges, or the culture-nature dualism that has emerged in the wake of the poststructuralist critique of this tradition. Rather, a sensorial

orientation to politics situates the finitude of reason alongside the discussion of feelings, images, and desires, and suggests that reason too can be considered in a plurality of ways, imbuing not only the sensorial but also the reasonable with an abundance of possibilities. The result is a more agonistic political outlook compared to the neo-Kantian one that defines most discussions in contemporary democratic theory: that is, rather than interpreting the finitude of reason as the motivation for an overlapping consensus across reasonable comprehensive doctrines (à la Rawls), a sensorial orientation to politics sees it as the motivation for a political outlook that embraces the finitude of reason by letting the unseen and not-yet-recognized shine forth more powerfully than if no one sought to become reasonable in a manner that can resonate with the context in which one or more claim(s) to reasonableness are made and contested.

Elsewhere I have suggested that this kind of "sensorial reasoning" should be organized around three demands that link reason and reason-giving to a new politics of empowerment and pluralization (Tønder 2013a: 129). In their most succinct form, these demands are:

(1) Acknowledge the plurality of all lived experiences.
(2) Avoid non-contextual standards of judgment.
(3) Affirm creative instability and sensorial richness.

I use the term "demand", not in the neo-Kantian sense of a transcendental injunction that reason must fulfill in order to be valid at all times and in all contexts but rather in the sense suggested to us by Latour, i.e., as expressing the conditions of felicity that a sensorial orientation to politics stipulates as part of what "passes" as reasonable within a given context. Since these conditions themselves are a moving target, the demands too are circumscribed by a self-reflexivity that we do not find in the neo-Kantian tradition, and that enable the demands to draw sustenance from a variety of resources, some of which may inspire opposing constituents to test out new ways of living together. Some times it may thus be reasonable for citizens to comport themselves according to standards of generality and reciprocity. At other times, however, the reasonable is closer to militant contestation and active agitation aimed at changing the exposure to an expression or utterance that some but not other citizens find particularly objectionable.

It is not difficult to imagine the neo-Kantian rebuttal to this sensorially inflected conception of public reason. Two objections stand out as particularly important: first, that the conception is morally uncritical because it offers no definitive way of discriminating between a "right" and a "wrong" way

of being reasonable; and second, that the conception has no normatively binding force because its demands are context-dependent and therefore too particularistic to have any meaning for constituents who do not already share the underlying assumptions about the sensorium and its role in defining how humans and other sentient beings think and act[8]. Both of these objections raise serious doubts about whether a sensorial orientation to politics can do what it needs to do in order to inspire opposing constituents to relax their interests and to move outside their own point of view. In short, if the proposed alternative to the neo-Kantian conception of public reason is both uncritical and normatively vague, then why listen to it in the first place?

The answers that a sensorial orientation to politics offers in response to this question go to the heart of what a renaturalization of public reason might mean for discussions about empowerment and pluralization in contemporary democratic theory. To begin with, we should note that although a sensorial orientation to politics does not invoke morality to draw a line between right and wrong reason, this does not mean that a sensorial orientation to politics has nothing critical to say about what should pass as reason in a given context. What makes it seem like this is the case stems from a basic disagreement about whether the issue of critique and normativity should be settled immanently, that is, from within the context itself, or whether it should follow the neo-Kantian tradition and proceed from a transcendental viewpoint that remains untouched by the lived experiences for which the transcendental itself is a condition of possibility. According to a sensorial orientation to politics, there are good reasons for taking the former route rather than the latter. This is the case, not only because the neo-Kantian transcendental rarely is as pure and ahistorical as it pretends to be but also because a sensorial orientation to politics sees the context as a resource for empowerment and pluralization. As both Merleau-Ponty and Latour remind us, each in his own way, any given context consists of a plurality of both conscious and nonconscious registers of lived experience, none of which line up in a pregiven or strictly closed manner. Although this discrepancy imbues our judgments with an element of unpredictability,

[8] I highlight these two objections, not because they are the only ones that the neo-Kantian tradition can advance against a sensorially inflected conception of public reason but because they for present purposes are the most relevant ones. Another neo-Kantian objection might be that the sensorial alternative pays insufficient attention to the equality of all humans and that it therefore is without a proper sense of the dignity of everyone's right to live their lives as they wish to as long as they don't transgress the limits of reason. For an account of how a sensorial orientation to politics can respond to this objection, see my discussion in Tønder (2013b: 700ff).

it is also what allows us to see the context as a dynamic phenomenon subject to ongoing contestation and transformation. The latter is a priority for how a sensorial orientation to politics envisions reason and reason-giving in deeply divided societies. From its perspective, reason is "wrong" when it disavows contextual plurality; moreover, reason is "right" when it orients itself toward this plurality and, as stated by the last of the three demands listed above, affirms the instability and richness inherent in it.

Whether or not this is normatively binding for all constituents living in deeply divided societies is an open question. But what neo-Kantianism identifies as a weakness may in fact be a strength. This is especially the case if we recall how the neo-Kantian conception of reason as disembodied is limited in its ability to empower new modes of coexistence, creating a situation in which the disavowal of affects and other nonconscious registers of lived experience leads to a strategy of either political retreat or accommodation for constituents who do not already share the neo-Kantian view of politics. The way in which a sensorial orientation to politics seeks to renaturalize public reason is particularly valuable in this regard as it proffers the resources needed to both overcome a strict divide between reason and sensorium, *and* identify ways in which some practices of reason-giving both are dependent on and further augment a subset of feelings and perceptions that can inspire constituents to empower and pluralize the range of acceptable differences in society. According to a sensorial orientation to politics, these practices of reason-giving are associated with an affirmation of instability and richness, which in turn have their sensorial counterpart in expressions of joy and *hilaritas* that too are characterized by an active desire to perpetuate a society's attention to (and interest in) the unseen and not-yet-recognized[9]. The idea, in other words, is to cultivate a virtuous circle between reason and the sensorium: as constituents expand their capacity for feeling and seeing, experiencing the joy of a being part of a context that continues to express itself in new ways, the same constituents may also begin to think that there are good reasons to affirm the instability and richness inherent in this context, setting off a process that augments the initial joy, engendering the desires and motivations needed to change one's own viewpoint and seek new ways of living together in a world of deep pluralism.

[9] In making this argument, a sensorial orientation draws not only on Merleau-Ponty and Latour but also on canonical thinkers such as Spinoza and Nietzsche. For an early and a particularly influential version of this connection, see Deleuze (1983: Chapter 2).

To be sure, this confluence of the reasonable and the sensorial may not be normative in the manner demanded by the neo-Kantian tradition. But it does offer a "norm" for public reason – one that allows us to make contextually situated judgments about the degree to which an expression or a policy contributes to moderation and respect for differences. A sensorial orientation to politics sees this as a justification for bringing the strategy of renaturalization to the forefront of contemporary democratic theory, reconnecting the account we give of public reason with the way it is used in theory as well as practice.

4. *Concluding remarks*

We are now in a position to see how contemporary democratic theory can respond to the disagreements about public reason, which have emerged in recent years as a consequence of globalization and the acceleration of speed. As I have suggested in this article, one response to these disagreements is to bring a sensorial orientation to politics back into view in order to formulate a broader, more appropriate view of the circumstances in which claims to reasonableness are made and contested. A sensorial orientation to politics contributes to this project in two ways. On the one hand, the orientation identifies a disconnect between the neo-Kantian conception of reason as disembodied and the way reason is used in theoretical as well as in practical discourses, suggesting that this disconnect can help to explain why so many of our existing responses to the disagreements about public reason have ended up contradicting rather than enhancing the goal of moderation and respect for differences. On the other hand, however, a sensorial orientation does not reject public reason as such but instead sets forth an alternative "renaturalized" conception, one that straddles the divide between thinking and feeling, unearthing new resources for democratic engagement by combining the reflexivity of reason with the empowering potential of affects and other nonconscious registers of lived experience. Together, these two insights do not guarantee that current disagreements about public reason will produce the desired outcome, but they do suggest that there are ways for us to become more cognizant about the conditions and circumstances in which this could be the case.

Another way of making this point relates to the power associated with neo-liberalism and state-surveillance. There is no doubt that the current conjunction of these two phenomena represents a major obstacle to the

way contemporary democratic theory might link practices of public reason to a politics of empowerment and pluralization. But based on what we have seen in this article, we might also say that a sensorial orientation to politics is uniquely posited to offer an effective counter-response to this state of affairs – one that interrupts the tendency to see the conjunction of neo-liberalism and state-surveillance as either a normative abomination or as a totalizing force that gradually saturates all aspects of political and social life. Let me suggest three reasons for how and why a sensorial orientation to politics resists both of these views. First, a sensorial orientation to politics foregrounds the affective and perceptual sides of neo-liberalism and state-surveillance, suggesting that we approach these phenomena, not as a enclosed totality but rather as part of a dynamic network in which opportunities for contestation and transformation remain embedded within the very same lived experiences that agents of neo-liberalism and state-surveillance seek to govern. Second, a sensorial orientation to politics amplifies these opportunities for contestation and transformation by directing the public gaze toward the unseen and not-yet-recognized, finding sustenance for democratic engagement in practices such as comedy and satire where the lived experiences of joy and *hilaritas* are front and center. And third, a sensorial orientation to politics connects these practices of democratic engagement with an active mode of reasoning, one that this article has suggested can be seen as affirming the instability and richness of a given context in order to mobilize an agonistic politics of empowerment and pluralization.

Whether or not this way of responding to neo-liberalism and state-surveillance resonates with other efforts in contemporary democratic theory will in large part depend on the appeal of bringing nature and the sensorium back into view. In this article, I have suggested that there are good reasons for doing this, not only because the existing terms of the debate seem limited compared to the challenges posed by globalization and the acceleration of speed but also because renewed attention to nature and the sensorium can vitalize our conceptions of citizenship, democratic engagement, and public reason. As Merleau-Ponty and Latour have suggested, the time has come for a renaturalization of our existing categories of investigation, allowing for philosophical experimentation, setting forth new modes of inquiry that can straddle the age-old divide between culture and nature.

References

Butler, J. (2009), *Frames of War: When Is Life Grievable?*, Verso, London.

Chambers, S. (1996), *Reasonable Democracy: Jürgen Habermas and the Politics of Discourse*, Cornell University Press, Ithaca, NY.

Connolly, W.E. (2011), *The Complexity of Intention*, in «Critical Inquiry», vol. 37, n. 4, pp. 791-798.

Deleuze, G. (1983), *Nietzsche and Philosophy*, transl. by Hugh Tomlinson, Columbia University Press, New York.

Estlund, D. (2009), *Democratic Authority: A Philosophical Framework*, Princeton University Press, Princeton.

Forst, R. (2011), *The Right to Justification: Elements of a Constructivist Theory of Justice*, Columbia University Press, New York.

Foucault, M. (1991), *Governmentality*, in G. Burchell *et al.*, *The Foucault Effect*, University of Chicago Press, Chicago 1991.

Grosz, E. (1994), *Volatile Bodies: Toward a Corporeal Feminism*, Indiana University Press, Bloomington.

Habermas, J. (1992), *The Unity of Reason in the Diversity of Its Voices*, reprinted in *Postmetaphysical Thinking: Philosophical Essays*, transl. by W.M. Hogengarten, MIT Press, Cambridge, MA.

Hampshire, S. (1971), *A Kind of Materialism*, reprinted in *Freedom of Mind, and Other Essays*, Princeton University Press, Princeton.

Howes, D. (ed.) (2005), *Empire of the Senses: The Sensual Culture Reader*, Berg, New York.

Landemore, H. (2012), *Democratic Reason: Politics, Collective Intelligence, and Rule of the Many*, Princeton University Press, Princeton.

Latour, B. (2013), *An Inquiry into Modes of Existence: An Anthropology of the Moderns*, transl. by Catherine Porter, Harvard University Press, Cambridge, MA.

Leys, R. (2011), *The Turn to Affect: A Critique*, in «Critical Inquiry», vol. 37, n. 3, pp. 434-472.

Massumi, B. (2003), *Parables for the Virtual: Movement, Affect, Sensation*, Duke University Press, Durham, NC.

Merleau-Ponty, M. (1962), *Phenomenology of Perception*, transl. by Colin Smith, Routledge, London and New York.

Rawls, J. (1985), *Justice as Fairness: Political Not Metaphysical*, in «Philosophy and Public Affairs», vol. 14, n. 3, pp. 223-251.

Sharp, H. (2011), *Spinoza and the Politics of Renaturalization*, University of Chicago Press, Chicago.

Spivak, G.C. (1999), *A Critique of Postcolonial Reason: Towards a History of the Vanishing Present*, Harvard University Press, Cambridge, MA.

Tønder, L. (2013a), *Tolerance: A Sensorial Orientation to Politics*, Oxford University Press, Oxford.

Tønder, L. (2013b), *Spinoza and the Theory of Active Tolerance*, in «Political Theory», vol. 41, n. 5, pp. 689-707.

Abstract

This article takes up recent discussions of nature and the sensorium in order to rethink public reason in deeply divided societies. The aim is not to reject the role of reason-giving but rather to infuse it with new meaning, bringing the reasonable back to its sensorially inflected circumstances. The article develops this argument via a sensorial orientation to politics that not only reframes existing critiques of neo-Kantianism but also includes an alternative, renaturalized conception of public reason, one that allows us to overcome the disconnect between the account we give of reason and the way it is mobilized in a world of deep pluralism. The article concludes with a discussion of how a renaturalized conception of public reason might change the positioning of contemporary democratic theory vis-à-vis the struggle for empowerment and pluralization in an age of neo-liberalism and state-surveillance.

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The Nature of the "Ruling Body": Embodiment, Ableism and Normalcy*

Flavia Monceri

1. *The body as a social institution*

The attempt to define "human nature" seems to be at the core of the never-ending debate about nature. Indeed, since the only relevant definitions of nature for human beings are those elaborated by human beings themselves, the question concerning their relationship with such nature seems to be crucial both in terms of their collocation within a given environment and their sharing some more or less substantial features with the rest of "beings". And this remains true, at least in Western thinking, despite all successful arguments to show the illusory character of the very idea of a "human nature" (Sahlins 2008), all evidence that at the end of the day nature is but a cultural construct (see, among others, Hazelrigg 1995), and all warnings on behalf of major scholars engaging in the study of the body, such as Brian S. Turner, who sums up the problem from the sociological viewpoint as follows: «Although modern sociology has been prone to dismiss "nature" as merely a construct or has treated it as a cultural system, the tension between the body as a living organism and as a cultural product continues to underpin the sociological understanding of, and debate about, the body and embodiment» (Turner 2008: 1).

This is mainly because «whether we are part of nature or not depends, of course on how the idea of nature is itself constructed», although «unfortunately, precision and stability of meaning have not been very common in discussion of this topic» (Olafson 2001: 1). However, it is not my goal in

* Note to the reader: This paper employs gender-neutral pronouns. These are *sie* (he, she), *hir* (him, her; his, her), and *hirself* (himself, herself).

this article to jump into the debate, trying to rethink "human nature" by means of historically and theoretically reconstructing paradigms and positions (for a general introduction see Grunwald, Gutmann and Neumann-Held (eds.) 2002; Hacker 2007), or highlighting the various implications of the theoretical state of the art for very concrete and burning issues in different fields (see, e.g., Ellison and Goodman (eds.) 2006; Düwell, Rehmann-Sutter and Mieth (eds.) 2008; Sharon 2014). My aim here is to show that the assumptions we rely upon when constructing notions of human nature strongly affect the concrete human individuals by building up the correct, adequate, human body as the norm to which anyone of us must conform in order to be declared fully human. In short, the construction of the "ruling body" moving from a particular definition of human nature is the topic of this article, as well as its implications for those human bodies that are not able, or willing, to conform.

This implies considering the concrete individual bodies, rather than theorizing "the body" in the singular, which «is often abstracted from everyday contexts and people's everyday concerns and esperiences» (Petersen 2007: 4), by relying on a notion of nature that can become dangerous, because «if it is believed that humans are defined by their biology and that human differences are "hard-wired" (e.g. in genetic make-up or brain functioning), and implicitly unalterable, then this has substantial implications for how people are likely to view and relate to others, for what are seen to be the prospects for individual and social change, and for what are believed to be the most desirable social arrangements» (Petersen 2007: 23). In other terms, there is an immediate correlation between defining a concrete body as natural in the sense of fitting the model established according to a certain definition of nature and its evaluation as a "normal human body" to which full membership in the social, cultural and political group can be granted. On the contrary, a concrete human body that cannot be defined as "natural" for various reasons cannot be granted full membership in the group, on the basis of an evaluation judgment concerning the adequacy of the concrete body under examination to the general model accepted as a rule or norm.

Before addressing this more specific topic, let us briefly come back to the notion of human nature. Though taking into account all the complexity of the issue (at least in a Western-centric perspective), it can be surely stated with Gernot Böhme that «*nature* has a double meaning both in everyday language and in philosophical terminology»:

When, for instance, one speaks of the *nature of the matter*, one means that which makes the matter in question into what it is, its essence. On the other hand, if one says that animals, plants, mountains are a part of nature, then one classes them with a realm of being that is there of its own doing, not made by humans (2002: 3).

This same "double meaning" of nature can be and, in fact, *is* deployed in reference to human beings, so that, as Böhme goes on:

The "nature of the human being" can refer to his or her essence, that which makes him or her a human being. But one can also speak of the nature of the human being in the sense that, by reason of his or her corporeality or embodiment [*Leiblichkeit*], he or she is a part of the realm of being to which animals, plants, and mountains are also assigned (2002: 3).

Now, I find that the two meanings are interdependent, in that the latter determines the former, because corporeality and embodiment undergo a process of normalization at the end of which a notion of the human body emerges as the most correct configuration according to an allegedly neutral (i.e. "objective") definition of nature. Put differently, if it is true that corporeality and embodiment manifest themselves in many different forms in the realm of nature (as mountains, plants and animals do), they must be regulated moving from a single idea of the "nature of the human being", in order for its *essence* to be there. Let me briefly elaborate on this central point. No idea of a human essence might emerge if only the concrete corporealities and embodiments of human individuals were relevant, for the very notion of the human essence cannot be separated from the concrete human body which is the bearer of such an essence. Therefore, the idea of an human essence entails also a definition of the substantial features that any human body must hold just in order to be human. This means that the concrete configuration of the body – its concrete embodiment and corporeality – plays a relevant role in the process of defining what is properly human.

Beyond that, the definition of the human essence built up by selecting some of the features occurring in natural embodiments and corporealities (the proper "natural bodies") and reconfiguring them according to a model of the adequate human body (in the singular), ends up by becoming the norm to which those natural embodiments and corporealities must correspond. As a result, at the end of the process it is possible to state which ones of them can be evaluated to be *essentially* human by using the constructed norm as a measuring device, so to speak. However, if things are so, it can be stated that the human body is not simply an object occurring

in nature, as it would be the case if we hold to the above-mentioned second sense of nature, but a *social institution*, since it has undergone a whole process through which its concrete embodiments and corporealities have been literally re-built according to the normative idea of the human essence. Conceiving of the human body as a social institution allows us to remain aware of the process of exclusion that the concrete body of anyone of us must undergo, in order to be *assigned* to the category of the fully-human-beings as well as to be *recognized* as such and hence *entitled* to all the benefits attached to full membership.

Seen from this perspective, the costructed notion of nature is, in any given spacetime, a very powerful tool to establish the borders of the (fully) human, thus establishing also a binary inclusion/exclusion to be applied to single concrete human bodies in order to police and secure those same borders. This is the main reason why rethinking nature as a notion deployed to establish a difference between normal and not-normal human bodies is an enduring goal of philosophical and political reflection, at least to the extent to which to be assigned to one or the other of the two categories has huge implications also as to the opportunities, benefits, rights, and level of participation foreseen for a single individual. Rethinking nature should imply, first of all, to put the very possibility in question to define it in a neutral, not-ideological, objective, way in order to uncover the roots of exclusion among human bodies.

In order to do this, I find it very appropriate to listen to what the excluded bodies themselves have to say about the possibility to define a "natural body" as the "ruling body". This is the reason why, moving from the assumption that the body is a social institution, I have chosen to show the basically totalitarian character of the present (and still mainstream) notion of the "human nature" by means of referring to the case of the so-called "disabled bodies". My aim is to advocate a different notion of nature, according to which there is no possibility to build stable categories of the "human body" and the "human being" (in the singular), due just to the fact that every possible notion of nature is unavoidably constructed by (some) human beings for the sake of themselves, and therefore it always entails an exercise of power. In fact, I agree with the idea that holding the power to define implies holding the power to discriminate, much in the sense already pointed out by Michel Foucault (see, e.g., 1998).

2. *Body, embodiment and "disability"*

The notion of embodiment, which is becoming increasingly relevant for social sciences and philosophy, can be useful to definitely overcome the traditional, and still well alive, mind/body binary only if we acknowledge the fact that even the idea of em-bodi-ment presupposes a definition of the body that can lead to exclusion and must therefore be problematized. It can be stated with Cregan (2006: 3) that «embodiment – the physical and mental experience of existence – is the condition of possibility for our relating to other people and to the world», but the most consistent consequence of this statement is that there is no way to construct a general theory of embodiment independent of such an experience, which is *individual* by definition. This should lead to the conclusion that only the single individual is entitled to speak about hir own embodiment, that is to say hir own «physical and mental experience of existence», as well as to claim that it be recognized exactly in the terms in which sie understands it. As a result, we should be ready to acknowledge that theory reaches here its limits, and should remain silent, refusing to enter a realm that is precluded to it.

But this is not the case. We usually talk about embodiment as it were something we can more or less understand in shared terms, as if that «physical and mental experience of existence» were something we perceive more or less in the same way, for at the end of the day we are all "human beings". This happens just because the notion of embodiment presupposes a notion of the body, and ultimately of human being, that we are used to understanding as definable in universal terms, despite all individual differences, and particularly despite the fact that there is no possibility to make two individual embodiments overlap, given the uniqueness of the individual body. This is the reason why I find that the only legitimate task that theory – abstract by definition – can perform in this case is that of problematizing its own assumptions, showing just its inability to trespass its borders to enter the realm of concreteness. Therefore, I will try to problematize the notion of embodiment by means of considering the case of the so-called "disabled" bodies, using them as a kind of trojan-horse to show the biased presuppositions of the usual discourse about body and embodiment, which is rooted in an implicit, but clear-cut, understanding of nature. My theoretical position is close to those suggested by *Critical Disability Studies* (Meekosha and Shuttleworth 2009; Shildrick 2012; Goodley 2013), *Crip theory* (McRuer 2006), and *Studies in Ableism* (Campbell 2009).

As it is well-known, Disability Studies (DS) uncovered the constructed character of what is usually defined "disability" just highlighting the fact that the body is a social institution. As Garland-Thomson (2005: 524) stresses, «Disability Studies points out that ability and disability are not so much a matter of the capacities and limitations of bodies but more about what we expect from a body at a particular moment and place». In the terms I am using here, this amounts to say that each concrete body is intersubjectively evaluated on the basis of the social, cultural and political expectations concerning the "normal" or the "ruling body" that is, however, a social construction for which those «capacities and limitations» defining the concrete and unique body under scrutiny are not relevant at all, if they are not consistent with those envisaged by the model. What DS as a whole have succeeded in showing is that the label "disability" is a social construction whose condition of possibility lies in the existence of a clear-cut definition of the normal body. And of course this implies also a catalogue of normal embodiments, that is to say of the «physical and mental experience(s) of existence» that ought to be considered as fully human.

However, there is a second relevant aspect that DS are able to highlight by means of investigating the social constructed character of "disability", as again Garland-Thomson rightly points out:

> Disability studies reminds us that all bodies are shaped by their environments from the moment of conception. We transform constantly in response to our surroundings and register history on our bodies. The changes that occur when body encounters world are what we call disability. The human body varies tremendously in its forms and functions. Our bodies need care; we all need assistance to live. Every life evolves into disability, making it perhaps the essential characteristic of being human (2005: 524).

Put differently, bodies cannot be conceived if not referring to embodiment, which is bounded, in its turn, to environment and time. The lived experience of each and every human body unfolds as an unceasing and ongoing series of practices, that is to say interactions both with the not-human and the human "outside", without forgetting the ones occurring at the level of the single body itself. Therefore, the idea that «embodied social relations exist both as the context (the prior circumstances) and as an outcome (a consequence) of given social formations, given systems through which we create and gain social meaning» (Cregan 2006: 3) can be surely extended to all types of human relations with the environment, without limiting it to the ones taking place among human beings as if they lived in

a vacuum. As a consequence, granted that a newborn body has been evaluated as perfectly corresponding to the ruling one within a society – that is to say the one considered as "corresponding to nature" and therefore "normal" – this is not sufficient to state that this condition will be maintained during the entire life-course just because of embodiment, that is to say just because life unfolds as a number of practices that are very heavily dependent on environmental conditions and the passage of time.

So, it might well be that a particular body is able to live within a given environment without suffering any damage due to its infinite interactions with it, although this is not highly probable in an interdependent and complex context. But still, any human body has a limited time at its disposal, during which its initial features develop in the direction of deterioration, decay and dissolution, culminating in the moment of death: in this sense, we are all machines composed by "parts" to which a variable, but yet given, functioning-time is assigned. And it might well be that before the "natural" process of decay is completed some unpredictable and uncontrollable dis-abling conditions eventually occur. This is the ultimate reason why «our society emphatically denies vulnerability, contingency, and mortality» (Garland-Thomson 2005: 524), preferring to displace them in a particular category of bodies – the not-fully functional or "disabled" ones – that always overlap with "others". In this sense, the invention of the label "disability" has provided contemporary societies with the possibility to find a separate category of (not-fully) human beings in order to neutralize the threat they would represent if they were recognized as simply different human beings *by nature*.

However, for all their merits, it is my opinion that until recently DS have not been able to really empower "disabled" bodies and their embodiments, because of the clear distinction they draw between "impairment" and "disability", so establishing a binary very similar to that established by second-wave feminism between sex and gender (see originally Rubin 1975). And just like the discomfort with the sexual binary has given rise to the body of knowledge today known as queer (e.g. Hall 2003; Sullivan 2003) and transgender theories (e.g. Stryker and Whittle (eds.) 2006) the impairment/disability dichotomy has given birth to new fields such as Crip theory and Critical Disability Studies (CDS), aimed at overcoming that binary, which adumbrates the traditional nature/culture one, so running once more the risk to leave aside concrete bodies and their embodiment. The first and most important critique moved by CDS to previous and still meainstream DS consists in the fact that «the social model of disability

argued for a conceptual distinction between "impairment" as a functional limitation and "disability" as a socially generated system of discrimination» (Meekosha and Shuttleworth 2009: 50), considering the impaired bodies as something "natural" or "pre-social", which gain recognizable relevance only after they are labelled as "disabled". Anyway, this position can be questioned, adopting a Foucauldian stance, for instance by stating that even «impairments are medical fabrications that constitute disability as a "natural" subject position» (Hughes 2005: 83), just like biological sex, far from being something "natural", is itself a social construction.

The shift to CDS occurred during the 1990s, mainly because «the influx of humanities and cultural studies scholars with their postmodern leaning and decentring of subjectivity during the 1990s, especially in the US, enabled a more self-conscious focus on critical theorising to take hold» (Meekosha and Shuttleworth 2009: 50). And it cannot be denied that the US reception of post-structuralist thinking, especially of Michel Foucault's work, which contributed also to the shift from second-wave to third-wave feminism, and from Gay and Lesbian Studies to queer and transgender theories, had a great impact also for a re-interpretation of the presupposition of previous DS (see Tremain (ed.) 2005), whose most well-known strand is the "social model of disability". In my opinion one of the most important changes occurred in the last two decades of theorizing about the body was especially the stress upon the deconstruction of the notion of modern subjectivity and the frontal attack to the idea that identity might still be rooted in a neutral, obiective notion of nature, independent of the gaze of the human beings – be it by means of referring to biological sex or impairment.

Finally, DS were not able to fully escape their own normalization, so dissolving their original critical potential, if it is true that in the recent past there has been a «cooption of the language of disability studies by the institutions of government, along with the professional areas of rehabilitation and special education taught within higher educational institutions» (Meekosha and Shuttleworth 2009: 50). Moreover, as Tobin Siebers writes:

> Disability scholars have begun to insist that strong constructionism either fails to account for the difficult physical realities faced by people with disabilities or presents their body in ways that are conventional, conformist, and unrecognizable to them. These include the habits of privileging performativity over corporeality, favoring pleasure to pain, and describing social success in terms of intellectual achievement, bodily adaptability, and active political participation. The disabled body seems difficult for the theory of social construction to absorb: disability is at once its best example and a significant counterexample (Siebers 2007: 57).

At a more general level, the shift to CDS entails a modification of the fundamental questions that theory is called to answer, to the extent that «in CDS the question has become how to conceptualize a diversity within a radical agenda to restructure cultural meanings, social processes and a carnally relevant politics» (Meekosha and Shuttleworth 2009: 56). But if this is true, it implies also a radical shift from identity to diversity and the direct reference to the infinite embodiments of individual bodies, without any possibility to consider them from the vantage point of a unified theory to be constructed *before* addressing those single experiences of existence. Moreover, the reference to diversity and embodiment definitely establishes the political relevance of the single bodies and their embodiments, which is adumbrated in the expression «a carnally relevant politics» in Meekosha and Shuttleworth's quotation above, showing a great potential to modify the current ideas about what should count as political action.

The attempt to overcome the impairment/disability binary by the part of CDS, for all their differences in presuppositions and results, can be interpreted also as a shift from identity to diversity. To be sure, relegating impairment in the realm of "nature" can be also a means to find a proper place to those differences, which "the social" is not able to take into account. If "disability" is a social *construction* it cannot include by definition all possible differences in individual bodies, but only insert some of them in a (counter-)discourse by means of building up discrete categories working as "minority identities". Impairment becomes the (biological) basis from which "disability" may or may not emerge depending on the "attention" the social group shows to one or more of its types by inserting it/them in the social discourse. In a sense, we could say that an impairment needs to be explicitly thematized and made "visible" in order to be recognized as, that is to say *to become*, a "disability". This mirrors the usual process through which diversity is changed into identity by means of multiple identification processes (Monceri 2012) occurring at the intersubjective level. In this sense, the rising of CDS might also be interpreted as a (counter-)discourse interested in individual diversity and the possibilities to think about legitimate forms of individual political action rooted in individual bodies and embodiments. To do this it was necessary to overcome the mainstream DS paradigms, for which concrete individual bodies, embodiments and corporealities remained more or less confined in the realm of a not-linguistically articulable "pre-social", so reproducing again and again the nature/culture or nature/nurture dichotomy.

3. *The normalcy of ableism*

To recap the previous discussion, it can be stated that taking individual diversity seriously means acknowledging to its radical consequences that "impairment" (just like "sex") cannot be defined as something natural. If it is true that human bodies manifest themselves "in nature" in very different forms, the definition of such forms as fitting or not-fitting the ideal-type of a human body do not derive directly from "nature" (for which all forms are legitimate for the simple fact of being there), but rather from an evaluation judgment by the part of human beings themselves on the basis of a model, or standard, of the human body, which is already culturally constructed. To say that «this body has no legs» is a plain and trivial statement that simply recognizes a difference between that body and other bodies for which it can be stated that «this body has two legs». But defining that same body as "impaired" implies the delivering of an evaluation judgment based on the alleged existence of a standard human body – equipped with two legs – to be conceived as the correct body working as the reference model to declare that any other concrete body is fully human (what I call the "ruling body").

So being things, the so called "disabled" bodies – to use a label that is thinkable only under the current regime of "ableism" (Campbell 2009) – put radically in question the notions of body and embodiment as they are usually understood, since they can be considered, by the part of the alleged "normal human beings" as having, being, displaying, representing and performing non-normative embodiments (e.g., Shildrick 2009; Inckle 2010). In fact, they clearly uncover the implicit reference of body and embodiment to normalcy (Davis 1995; 2002), that is to say to the supposed existence of a model of the human body working as the fundamental norm against which all individual bodies might and should be measured in order to be "correctly" positioned within the social group. It is through this process of normalization that the body becomes a social institution: its definition, limits and abilities are stated from the very beginning, before a concrete body comes to the world, that is to say even before its actual embodiment takes place.

In this sense, the body is a social institution because each one of us has been categorized at birth according to the ruling body in force at that moment, after "passing" all the necessary tests to declare its being fully human. And it goes without saying that the individual embodied experience – that is to say the *essential nature* of the involved individual – had no

relevance at all for this process, just like it happens for a number of other processes taking place in the life-course of each one of us, unless it is not found out that our body is in some ways "abnormal"– far from the ruling body. As a result, what taking "disabled" bodies seriously leads to is the need to problematize "ability" and "normality", instead of "disability" and "abnormality". As for today, the prevailing (social-)scientific discourse still seems to suggest that we should gain more knowledge about "disability" as a social process of disabling (some) people by labelling them as "abnormal". But this discourse, for all its merits, is not able to frontally attack the notions of ability and normality, rather concealing them – *making them invisible* and therefore all the more strong.

Constructing a notion of disability, one that I would like to erase from any dictionary just like that of abnormality, is possible only because it refers to a notion of ability taken for granted and very rarely made visible, let alone problematized. Such notion apparently seems to be rooted in an external *nature* independent of human beings and having its universal and unchanging laws and rules that can however be broken giving birth to abnormality – the abnormals as "nature's errors". The same notion of abnormality is possible only because of the presence of a prior notion of normality, which is almost never directly problematized. From a political viewpoint, the implicit acceptance of the notions of ability and normality means that the "disabled" and "abnormals" people can act only on the presuppositions of an identity politics for "minority groups", without the reference to which they could never claim to be treated in terms of mutual recognition as fully-human-beings. Therefore, I agree with those scholars, who from a critical or radical position try to address normality and ability as *the questions* we should make visible, problematize and investigate if we want to let bodies and embodiments still labelled as "abnormal" and "disabled" actually matter.

In his *Enforcing Normalcy*, disability scholar Lennard J. Davis interestingly highlights the terms of this situation with direct reference to bodies and embodiments:

> For most temporarily abled people, the issue of disability is a simple one. A person with a visible physical impairment (someone who has an injured, nonstandard or nonfunctioning body or body part) or with sensory or mental impairment (someone who has trouble hearing, seeing, or processing information) is considered disabled (Davis 1995: 1).

This is possible because those temporarily abled people do think them-

selves as "normal" and therefore alien to the experience of "disability", which can be put away somewhere, far from sight. But

> what does not occur to many people is that disability is not a minor issue that relates to a relatively small number of unfortunate people; it is part of a historically constructed discourse, an ideology of thinking about the body under certain historical circumstances. Disability is not an object – a woman with a cane – but a social process that intimately involves everyone who has a body and lives in the world of the senses (Davis 1995: 2).

Just as Garland-Thomson in an above-mentioned quotation, Davis stresses the fact that "disability" can be considered a characteristic trait of being human, of being and having a human body simply given as such in nature, with all of its peculiarities.

So, it is very surprising that "we" are not easily ready to acknowledge that "we" are all not-fully-able, or in the process of becoming disabled. In my opinion this is just because of the invisible notion of normality, which works as a stabilizer, so to say, not only in order to neutralize social fears about suffering, illness, and death as far as possible, but also to minimize and control the claims that would arise by the part of the individual bodies if the fact of temporarily able-bodiedness or of the potential dis-ability of all of us would be patently acknowledged at the intersubjective level. In this sense, normality performs also a political task, consisting in blocking individual demands, coming from an out-of-control grassroots level. Through the notion of "disability" a gap is constructed between the "normal/able body" and the "abnormal/disabled body", which helps to negate the existence of a continuum in the forms in which human bodies are given by nature. Therefore it can be stated that «the construction of disability is based on a deconstruction of a continuum» (Davis 1995: 11), just like the construction of the male/female binary is based on the deconstruction of the natural continuum of sex (see, e.g., Fausto-Sterling 2000).

In this sense, it is true that «the disabled body is not a discrete object but rather a set of social relations» (Davis 1995: 11) having nothing to do with "nature as it is", because just the refusal of a natural continuum of the forms of the human body is the presupposition of its construction. The binary normal/abnormal is just what lies beneath the idea that it should be possible to interrupt the natural continuum by means of a *human* choice to re-interpret nature according to cultural assumptions, to the extent that at the end of the process the normal body is no longer whatever body existing in the world, but only the one conforming to what is considered normal

according to the culturally constructed notion of the human nature. Lennard Davis suggests to distiguish between normality and normalcy stating that normality is «the alleged physical state of being normal», whereas normalcy is «the political-juridical-institutional state that relies on the control and normalization of the bodies, or what Foucault calls "biopower"», so that «like democracy, normalcy is a descriptor of a certain form of governmental rule, the former by the people, the latter over bodies» (Davis 2002: 107). I would like to add, however, that normalcy is not properly a form of governmental rule «over the bodies» (by the part of whom?), but just like democracy is a kind of governmental rule "by the (alleged majority of) the people" *through* the body as a social institution adopted as a tool to police and control the concrete bodies.

Anyway, I agree with the distinction between normality and normalcy, because it makes clear that while the former can be more easily deconstructed by considering the evaluation judgment in which it consists as a kind of matter-of-fact statement clearly contradicted by nature itself, the latter is much more difficult to recognize and argue against. In fact, it entails all of the power relations that crystallize, moving from individual interactions, in wider and wider structures that end up by forgetting their origins in plain statements about alleged facts negotiated and conventionally agreed upon by single individuals. So, it is properly normalcy that should be openly addressed in order to deconstruct the binary normal/abnormal with the final goal to overcome this dichotomy as a mere result of negotiated opinions about *the truth* of body and embodiment. Of course, in the case of disability, this process of exposing the binary normal/abnormal, which is common to all kind of differences (ethnic and racial, sexual and gender, and so on), must address the binary able/disabled.

As Fiona Kumari Campbell rightly points out, we can speak about an "ableistnormativity" (Campbell 2009: 4), just like we can speak about a heteronormativity in the field of sexual and gender differences (see Warner 1991). This is the reason why in the field of Disability theories «it is necessary to shift the gaze of contemporary scholarship away from the spotlight on disability to a more nuanced exploration of epistemologies and ontologies of ableism» (Campbell 2009: 1). Put differently, the point is to shift the focus from the investigation of the abnormal to the uncovering and problematization of the normal, since «disability, often quite unconsciously, continues to be examined and taught from the perspective of the Other», while the challenge «is to reverse, to invert this traditional approach, to shift our gaze and concentrate on what the study of disability

tells us about the production, operation and maintenance of ableism» (4). Disability theory should investigate the positive pole, so to say, of the able/disabled dichotomy, in order to expose and clarify the logic of *ableism*, instead of concentrating on *disablism*.

Ableism can be defined as «a network of beliefs, processes, and practices that produce a particular kind of self and body (the corporeal standard) that is projected as the perfect, as the species-typical, and, therefore, as essential and fully human» (Campbell 2005: 127n.2). What this investigation could contribute to has not only a scholarly relevance, but especially a political one:

> Inscribing certain bodies in terms of deficiency and essential inadequacy privileges a particular understanding of normalcy that is commensurate with the interests of dominant groups (and the assumed interests of subordinated groups). Indeed, the formation of ableist relations require the normate individual to depend upon the self of "disabled" bodies being rendered beyond the realm of civility, thus becoming an unthinkable object of apprehension. The unruly, uncivil, disabled body is necessary for the reiteration of the "truth" of the "real/essential" human self who is endowed with masculinist attributes of certainty, mastery and autonomy (Campbell 2009: 11).

Under the ableistnormative regime, the "disabled" bodies and embodiments are assigned a very important role in reiterating and making stronger the claim that an able-body and embodiment can really exist, by means of relegating difference in another place, which has no relationship with the "normal self". But the importance of such role must go unrecognized, and is rather negated by means of different strategies: normalization, pathologization, marginalization, discrimination and even elimination. So it is not surprising Campbell's conclusion that «two strong images of living with impairment emerge»: on the one hand, there are «disabled people as *survivors*. […] There is an ethical imperative for us to interrogate the impact of ableism and speak of the injuries it causes for disabled people» (2009: 28). But on the other hand there is also the «image of disabled people engaged in guerrilla activity – rejecting the promises of liberalism and looking elsewhere, daring to think in *alternative ways* about impairment» (29). On the theoretical level, this second image suggests that a still more radical shift might occur in DS, one that I would define the shift toward refusing the notion of disability altogether, just because it contributes, if unwillingly, to keep the notion of ability invisible and unproblematic as it were a neutral one.

I find that Campbell's proposal to shift the theoretical gaze to ability,

ableism and ableistnormativity can be a step towards this goal, and the same goes with some recent developments to be found in works such as A.J. Withers' *Disability Politics and Theory* (2012). Here, Withers suggests a new direction to be undertaken by DS under the name "radical disability model" that although taking into account previous work by scholars and activist, was «developed in organizing meetings and coffee shops in Toronto» and intends to be an original «proposal for how we should move disabled people's movement forward and how anyone concerned with social justice should conceptualize disability». Therefore, this proposal is at once a theoretical one and «a call to action, for disabled people and non-disabled people alike, to organize inclusively for social justice and radical access» (Withers 2012: 98). Just from the definition adopted by the model, the double character of a proposal linked to previous achievements of DS and an attempt to move forward also by partially overcoming them is very clear:

> The radical model defines disability as a social construction used as an oppressive tool to penalize and stigmatize those of us who deviate from the (arbitrary) norm. Disabled people are not problems; we are diverse and offer important understandings of the world that should be celebrated rather than marginalized (98).

According to this model, "disabled" people should not be ashamed of their different bodies and the experience they make in, with and through it, although this is not to deny that such bodies experience troubles, pain and difficulties: «Because many disabled people find pride in our disabled minds and bodies, this doesn't mean that we don't have difficulty with them. Sometimes, we do. But these difficulties are not because we are disabled, we experience them because we are human» (115). But according to the ableistnormative regime, the able-bodied people should think that there is a difference *in kind* between their bodies and the "disabled" ones, instead of a difference *by degree*, and this leads "normal" people to think that the disabled individual cannot have a satisfying «physical and mental experience of existence», that is to say a satisfying embodiment. This may result even in hate crimes (see Sherry 2010) – just like it was and is the case with "Blacks", Jews, women, homosexuals, queer and transgender people…– whose ultimate reason lies in my opinion not only in the fear of the monstruous and the menace of contamination, but primarily in the possibility to perceive and think of "disabled" bodies as not-human bodies.

Under the ableistnormative regime the only possibility left to "disabled" bodies is to work as hard as possible in order to "pass" as "able-bodied", trying to normalize, to gain or re-gain a certain degree of ableness

which might be sufficient to enter the number of the normal people, although in a lower ranking. Therefore, as Withers writes,

> disabled people are often celebrated for our accomplishments *in spite of our disabilities* (people like Franklin Roosevelt and Helen Keller). We are rarely recognized for the contributions we make *because of our disabilities*. For instance, when I am having a hard time walking, I walk very slowly and I notice a lot of what is around me. Because I experience the world differently than many of the people around me, I have a unique and useful perspective (Withers 2012: 117).

In order to achieve the goal of fully recognizing the difference up to now labelled as "disability", not only currently "disabled" people will have to literally fight (120), but it is also necessary that theory gives up «perpetuating unrealistic ideals for humans» (119). In concluding this article, I would like to add that this last, but extremely urgent, task surely implies rethinking the notion of nature both as the invisible, uncritical, and unproblematic, foundation of the construction of the body as a social institution, and as an ultimate source of cultural, social and political exclusion and discrimination.

References

Böhme, G. (2002), *On Human Nature*, in A. Grunwald, M. Gutmann and E.M. Neumann-Held (eds.), *On Human Nature: Anthropological, Biological, and Philosophical Foundations*, Springer, Berlin, Heidelberg and New York, 2002, pp. 3-14.

Campbell, F.K. (2005), *Legislating Disability: Negative Ontologies and the Government of Legal Identities*, in S. Tremain (ed.), *Foucault and the Government of Disability*, University of Michigan Press, Ann Arbor 2005, pp. 108-130.

Campbell, F.K. (2009), *Contours of Ableism: The Production of Disability and Abledness*, Palgrave Macmillan, Basingstoke and New York.

Cregan, K. (2006), *The Sociology of the Body: Mapping the Abstraction of Embodiment*, Sage, London-Thousand Oaks-New Dehli.

Davis, L.J. (1995), *Enforcing Normalcy: Disability, Deafness and the Body*, Verso, London and New York.

Davis, L.J. (2002), *Bending over Backwards: Disability, Dismodernism and Other Difficult Positions*, New York University Press, New York and London.

Düwell, M., Rehmann-Sutter, C. and Mieth, D. (eds.) (2008), *The Contingent Nature of Life: Bioethics and the Limits of Human Existence*, Springer, Berlin, Heidelberg and New York.

Ellison, G.T.H., and Goodman, A.H. (eds.) (2006), *The Nature of Difference: Science, Society and Human Biology*, Taylor and Francis, Boca Raton, London and New York.

Fausto-Sterling, A. (2000), *Sexing the Body. Gender Politics and the Construction of Sexuality*, Basic Books, New York.

Foucault, M. (1998), *The Will to Knowledge: The History of Sexuality: 1*, Penguin, London.

Garland-Thomson, R. (2005), *Disability and Representation*, in «PMLA», vol. 120, n. 2, pp. 522-527.

Goodley, D. (2013), *Dis/entangling Critical Disability Studies*, in «Disability & Society», vol. 28, n. 5, pp. 631-644.

Grunwald, A., Gutmann, M. and Neumann-Held, E.M. (eds.) (2002), *On Human Nature: Anthropological, Biological, and Philosophical Foundations*, Springer, Berlin, Heidelberg and New York.

Hacker, P.M.S. (2007), *Human Nature: The Categorial Framework*, Blackwell, Malden, Oxford and Victoria.

Hall, D.E. (2003), *Queer Theories*, Macmillan, Basingstoke.

Hazelrigg, L. (1995), *Cultures of Nature: An Essay on the Production of Nature*, University Press of Florida, Gainesville *et al.*

Hughes, B. (2005), *What Can a Foucauldian Analysis Contribute to Disability Theory?*, in S. Tremain (ed.), *Foucault and the Government of Disability*, University of Michigan Press, Ann Arbor 2005, pp. 78-92.

Inckle, K. (2010), *Bent: Non-Normative Embodiment as Lived Intersectionality*, in Y. Taylor, S. Hines and M.E. Casey, *Theorizing Intersectionality and Sexuality*, Palgrave, Basingstoke 2010, pp. 255-273.

McRuer, R. (2006), *Crip Theory: Cultural Signs of Queerness and Disability*, New York University Press, New York.

Meekosha, H., and R. Shuttleworth (2009), *What's so "critical" about critical disability studies?*, in «Australian Journal of Human Rights», vol. 15, n. 1, pp. 47-76.

Monceri, F. (2012), "*Just Tell Me Who You Are!*": *Do We Need Identity in Philosophy and the Social Sciences?*, in A. Martinengo (ed.), *Beyond Deconstrution: From Hermeneutics to Reconstruction*, De Gruyter, Berlin 2012, pp. 225-237.

Olafson, F.A. (2001), *Naturalism and the Human Condition: Against Scientism*, Routledge, London and New York.

Petersen, A. (2007), *The Body in Question: A Socio-Cultural Approach*, Routledge, Oxon and New York.

Rubin, G. (1975), *The Traffic of Women: Notes on the "Political Economy" of Sex*, in R.R. Reiter (ed.), *Toward an Anthropology of Women*, Basic Books, New York 1975, pp.157-210.

Sahlins, M. (2008), *The Western Illusion of Human Nature*, Prickly Paradigm Press, Chicago.

Sharon, T. (2014), *Human Nature in an Age of Biotechnology: The Case for Mediated Posthumanism*, Springer, Dordrecht *et al.*

Sherry, M. (2010), *Disability Hate Crimes: Does Anyone* Really *Hate Disabled People?*, Ashgate, Farnham and Burlington, VT.

Shildrick, M. (2009), *Dangerous Discourses of Disability, Subjectivity and Sexuality*, Palgrave Macmillan, London.

Shildrick, M. (2012), *Critical Disability Studies: Rethinking the Conventions for the Age of Postmodernity*, in N. Watson, A. Roulstone and C. Thomas (eds.), *Routledge Handbook of Disability Studies*, Routledge, London 2012, pp. 30-41.

Siebers, T. (2008), *Disability Theory*, The University of Michigan Press, Ann Arbor.

Stryker, S. and Whittle, S. (eds.) (2006), *The Transgender Studies Reader*, Routledge, New York and London.

Sullivan, N. (2003), *A Critical Introduction to Queer Theory*, Edinburgh University Press, Edinburgh.

Tremain, S. (ed.) (2005), *Foucault and the Government of Disability*, University of Michigan Press, Ann Arbor.

Turner, B.S. (2008), *The Body & Society*, 3rd edition, Sage, Los Angeles *et al.*

Warner, M. (1991), *Introduction: Fear of a Queer Planet*, in «Social Text», 9 (4 [29]), pp. 3-17.

Withers, A.J. (2012), *Disability Politics and Theory*, Fernwood Publishing, Halifax and Winnipeg.

Abstract

In this article I try to show that the assumptions we rely upon when constructing notions of human nature strongly affect the concrete human individuals by building up the correct, adequate, human body as the norm to which anyone of us must conform in order to be declared fully human. In short, the construction of the "ruling body" moving from a particular definition of human nature is the topic of this article, as well as its implications for those human bodies that are not able, or willing, to conform. I have chosen to show the basically totalitarian character of the present (and still mainstream) notion of the "human nature" by means of referring to the case of the so-called "disabled bodies". My aim is to advocate a different notion of nature, according to which there is no possibility to build stable categories of the human body and the human being (in the singular), due just to the fact that every possible notion of nature is unavoidably constructed by (some) human beings for the sake of themselves, therefore always implying the exercise of power.

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Omaggio a Emanuele Severino

Saggi

Vincenzo Vitiello, *Aporia - Contraddizione - Insignificanza*

Biagio de Giovanni, *Emanuele Severino e Giovanni Gentile. Linee di filosofia italiana*

Luigi Vero Tarca, *Negazione del non essere e verità dell'essere*

Valerio Rocco Lozano, *Severino lettore di Hegel: una lettura hegeliana di Severino*

Massimo Dona, *Identità e totalità. Il pensiero di Emanuele Severino e il folle sogno della 'verità'*

Massimo Adinolfi, *Segno e identità. Sul linguaggio, a partire da Emanuele Severino*

Andrea Tagliapietra, *Mutando Riposa. Italo Valent interprete di Emanuele Severino*

Francesco Valagussa, *L'aporia del nulla: astrazione e narrazione*

Adalberto Coltelluccio, *Doppia negazione e non-contraddizione. Sulla critica di Severino a Łukasiewicz*

Carmen Palomba, *Chora. Il pensiero e l'Altro*

Costanza Saglio, *Invocare il dio. Il problema del «tragico» in María Zambrano ed Emanuele Severino*

Letture

Felix Duque, *Lucente debolezza della Parola (Topologia di un sonetto di Petrarca)*

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