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Metaphysics of Normativity

by

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A thesis submitted in partial fulfilment of the requirements for the
degree of
Doctor of Philosophy in Sociology

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Abstract

This work represents an interdisciplinary attempt at the development of a scientific theory of norms and normativity. Normativity, understood in its most general interpretation as value determinations and prescriptions, has traditionally been troublesome to account by science and difficult to “place” within a scientific worldview. Such an accomplishment is attempted by the joining in conversation of two bodies of literature. The first of these is Steve Fuller’s naturalist epistemology and the second corresponds to the situated study of cognition, along with the epistemologies that have resulted from their findings. These two bodies of literature constitute the most radically naturalist attempts at developing a viable frame of epistemological and/or normative reference within their respective fields.

Declaration

This thesis is submitted to the University of Warwick in support of my application for the degree of Doctor in Philosophy. It has been composed by myself and has not been submitted in any previous application for any degree.

Parts of this thesis have been published by the author:

SAEZ WILLIAMS, P. 2015: "Naturalism and Scientific Hierarchy". In: KRINGS, B.J., SCHLEISIEK, A. and H. RODRIGUEZ (eds.) *Scientific Knowledge and the Transgression of Boundaries*, Springer. Berlin, Germany.

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Abbreviations

SPSSK Strong Program in the Sociology of Knowledge

STS Science and Technology Studies

SCS Strict Cognitive Situatedness

OMD Ontological Mutual-Determination

TOC Traditional Ontological Claim

TCC Traditional Cognitive Claim

1. Introduction

Sociology is a *circular* endeavour. This means that sociology – not unlike other disciplines such as cognitive science or epistemology – finds itself within its own object of study. As will be thoroughly discussed, the consequences of sociology’s reflective encounter with itself are problematic: they challenge the prevailing (epistemological) assumptions that ground the conduct of science and claims to scientific validity (and thereby those of sociology as well). In the simplest terms, the central objective of this work consists of carefully delineating this problem and offering a viable solution.

The first thing to elaborate upon is how it is the case that sociology finds itself amongst its objects of study. In other words, why is sociology circular? The answer is simple: amongst its objects of study, sociology will invariably find norms, and yet sociology, and for that matter all science, is a normative endeavour.

That is, it is hardly controversial to claim that sociology studies “society” or “social phenomena”. What exactly counts as “society” or “social phenomena” depends on the perspective assumed by the sociologist. Amongst the most common interpretations of this object of study we find matters such as the origin, the development, the function and/or the transformation of social structures, organisations, cultures and/or networks. Nevertheless, independently of the precise manner in which sociology understands its occupation, it will invariably find it to be associated with the scrutiny of social and/or collective behaviour and as such, invariably associated with the (scientific) study of social norms or normativity. Sociology, in other words, invariably

deals with the set of established values, categorisations, imperatives, prescriptive attitudes and institutions that inform, guide and/or direct social conduct. In this regard, social theorist Göran Therborn suggests that the main contribution of sociology to the understanding of “society” or the “social” essentially consists “in the discovery and study of the ideological community [the community of values and norms] – in human aggregates of various types and sizes” (Therborn 1976: 224).

Sociology, however, like any other science or any other attempt at disciplined study, is very much a normative endeavour in itself. Not only does it proceed according to a distinct discipline or method, but it also values its own findings and its own claims as true, or as otherwise valid or useful. In other words, the value that is socially awarded to the knowledge produced as a result of scientific, or otherwise academic, pursuits counts as social normativity, as does the relationship between science/academia and the rest of society that is informed by these values. Because these matters count as social normativity, and because sociology counts as an instance of “science”, whatever sociology finds or claims in regards to social normativity, it also claims for itself. Again, sociology is a *circular* endeavour.

The second thing to expand upon, then, is why it is the case that this circular or reflective encounter is problematic for sociology, and for science in general.

In basic terms, this results because sociology (and science in general) operates under certain express or tacit (i.e. performative) assumptions that are incompatible with the results of *strict* sociological scrutiny. That is, sociology – and science – operates and is organised under the assumption that the knowledge it produces is objective, unbiased or at least valid or useful without being politically biased towards its context of production; in other words, without operating as an “ideology”. As will be thoroughly

explained, matters such as objectivity, truth and even non-political pragmatics, are beyond what is empirically accessible for sociology, and for science in general. This obtains because science and sociology are explanatory endeavours. As such, they account for the phenomena they study by providing reasons and/or causes. For sociology, these reasons or causes constitute social phenomena. Sociology, then, will invariably explain normative matters such as knowledge or values in relation to phenomena such as “function”, “structure”, “interest”, “class”, etc. If this is not the case, it must rely on *a priori* philosophical assumptions inaccessible to sociology, and at many times, challenged by its own evidence. In summary, the conduct and the organisation of science/academia (and therefore of sociology) is grounded and/or informed upon philosophical assumptions that find themselves challenged by the (empirical and theoretical) practice of sociology.

If sociology is strict, however, it will also find that, just as particular social categorisations result in determined outcomes, the value judgements and determinations that ultimately delineate such categorisations are also the result of determined and sociologically accessible causes or factors. That is, they both cause, or result, *and* are the cause or result, of other factors or circumstances. As is the case with all phenomena under the gaze of science, that which “causes” the phenomenon is also (ontologically) related to its consequences.

Now, it most certainly is the case that normative dispositions, and the social arrangements that obtain from their observance, favour some over others. For example, a “feudal” social arrangement favours those with noble privileges; a “free market economy” and a “liberal democracy”, in turn, result in circumstances that are most favourable to those with the greatest capacity to command private economic resources; “Western traditional values”, seem to favour “hetero-normative”

dispositions, and so on and so forth. It should not be a surprise, then, that sociology (as well as other social sciences) recurrently finds normative arrangements and institutions to be both cause and consequence of the power relations present in a particular context, and more specifically cause and consequence of the capacity of some (those favoured) to exert power over others.

Under the gaze of sociology then, value judgements and normative prescriptions previously or commonly understood as “Universal”, “objective” or “true” are rendered “particular”, “relative”, “constructed”, “contextual” or “ideological”; a circumstance that finds itself at odds with the “objectivist” assumptions that seem to guide the practice of science, the public understanding of scientific knowledge and the relationship between the scientific/academic establishment with the rest of society.

Examples of work that socializes the outcomes, or the normative dimension of science, are commonly found throughout the history of sociology and the social sciences. These include Durkheim’s *Primitive Classification* (1963 [with Marcel Mauss]) and *The Elementary Forms of Religious Life* (1964). Marx (1977) and Marxists (i.e. Lukács [1923] 1971; Gramsci 1978; Althusser 1971), of course, hold the normative (i.e. cultural, legal, political and scientific [see Marx 1969: 81]) supra-structure of society to be determined by the “base”: by the forces and relations of economic production. On the other hand, Marxism seems to exclude (or “save”) the validity of its own account and its own claims and prescriptions from such “politicisation” and/or “contextualisation”. This is a position (i.e. standpoint epistemology) comprehensively articulated by Lukács ([1923] 1971) and shared with (standpoint) feminism (see Harding and Merrill 2004; Abbott, Tyler and Wallace 2006).

Unlike Marxism, Feminism and the bulk of “pre- Kuhnian” sociology of knowledge (i.e. Manheim 1929; Parsons and Platt 1973; Merton 1970), other approaches, such as post-structuralism (i.e. Foucault 2002, 1977; Derrida 2016), the strong program in the sociology of knowledge (i.e. Barnes, Bloor and Henry 1996; Barnes and Bloor 1996) and Science and Technology Studies (Latour and Woolgar 1986; Latour 1983, 1987, 1988; Knorr-Cetina 1983, 1999; Pickering 1984) do not resort to any philosophical assumptions to “save” their own position, their own normative (i.e. epistemological or political) assumptions, or any aspect of the normative dimension of science or knowledge (i.e. “reason”, “scientific truth”, “scientific validity”) from the scrutiny of the social sciences. This is what I call *strict*, and the result is exactly as expected. All normative notions, including those that support the objectivity or the positivity of scientific knowledge are politicised, contextualised or deconstructed. All forms of knowledge are rendered contingent to the social, economic and political circumstances of their context, and as such, all social relations are – to different extents – rendered relations of power. In consequence, however, science, rationality and, thereby, the social sciences are neutered. If all norms, including scientific norms are rendered contextual or political, then all values and all prescriptions, including scientific values and prescriptions turn (to an extent) ideological.

In this regard, and unlike Marx, Foucault seems to offer little in the way of a positive program. For the latter, for example, there is no necessary end point in the struggle or the resistance against domination. As all relations are power-relations, and all knowledge and prescription are politically laden, it may very well be the case that perceived “progress” or “revolution” (social or scientific) results in outcomes undesirable to more people than the preceding circumstances. “One has to recognize

the indefiniteness of the struggle – though this is not to say it won't some day have an end" (Foucault 1980: 57).

Finally, as identified and insisted upon by their most prominent detractors (e.g. Habermas 2015; Laudan 1990, 1977) by deconstructing the assumptions that ground the normative implications of science and knowledge without offering anything to replace them, these approaches turn hopelessly self-referential and/or self-defeating. That is, as they claim that all claims are political or contextual, their own claims become political or contextual in their eyes.

So far, however, all solutions to the problem of circularity (e.g. Habermas 1984; Longino 2002; Bhaksar 1989; Fuller 2002; Kitcher 2003) involve returning to, or producing new, *a priori* philosophical assumptions that are as challenged, and at many times as easily deconstructed, by strict sociology as the ones they purport to replace.

The objective of the present work consists precisely in developing a solution to the problem of circularity in a way that does not rely upon *a priori* philosophical assumptions. In other words, the positive component of the present dissertation consists of producing a viable normative support for science (and thereby for sociology) that does not rely on an appeal for *a priori* philosophical assumptions or determinations. The strategy is simple, unlike all previous attempts that have resorted to philosophy in order to provide science with a normative dimension, I will resort to another empirical science: cognitive science. The result is a trans-disciplinary theory of normativity, whose premises are drawn *entirely* from empirical science. As a trans-disciplinary approach at both sociology and cognitive science, the outcome of this work functions as a theory of both society *and* cognition, or in other words, challenges

the disciplinary boundary established between the study of these two. Finally, as it provides a theory of norms and normativity (including but not limited to epistemology and politics), completely devoid of *a priori* assumptions or methodological dispositions that may “save” certain matters from scrutiny, the resulting theory constitutes a successful naturalist epistemology or in other words, a successful and “strict” naturalism. That is to say that – supported on the results of this dissertation – I am able to claim that the study of truth versus falsity, justice, validity and, ultimately, good versus evil, can be perfectly addressed by science without the need to resort to philosophy in anyway whatsoever.

In fact, because sociology’s object of study has always included norms and normativity, including epistemic norms and normativity, sociology has always constituted an empirical or a scientific epistemology – a “successful” sociology, then, one that did not require the support of philosophy for grounding nor explanatory purposes, was always destined to be naturalist epistemology. As will be thoroughly elucidated, the same goes for cognitive science.

In many ways, then, this work does not correspond to an example of “standard sociology” (nor to an example of “standard philosophy” or “standard cognitive science” for that matter). Unlike most of the work that is conducted in sociology departments, this dissertation does not answer a sociological question. This is to say that it does not seek to use the tools – either empirical or theoretical – of “sociology” to respond to a question whose answer might be available to such tools. It is concerned, rather, with addressing a question *about* sociology, about one of the most (if not the most) pressing problems that result from the manner in which sociology is understood, including the placement that it is afforded in regards to disciplinary boundaries.

If you, then, have chosen to read or study this text for the purposes of familiarising yourself with the structure and content of a standard PhD dissertation in sociology, I would prompt you to choose something else. If, on the other hand, you are interested in familiarising yourself with the contradictions that afflict the philosophical footing of sociology (and of the social sciences in general), and whose solution leads to an empirically supported and philosophically precise understanding of society that subtly but powerfully challenges current orthodoxy, keep reading.

1.1 Social Epistemology

In the literature one will find three attempts to develop a *strictly* “scientific” or “naturalist” theory of normativity. That is, a theory of normativity that may be compatible with the results of empirical scrutiny (e.g. the results of sociology). All of them constitute attempts at developing a normative dimension for science (or knowledge production) that does not rely in the *a priori*. All of these, in this regard, are instances of “naturalist epistemology”.

The first of these is W.O. Quine’s “epistemology naturalised” (1969b, 1981, 1990, 1995a, 1995c). Quine’s project takes off in response to the constant query of Western philosophy, which is that the disciplined use of our senses and/or our powers of reason apparently leads to philosophically inconsistent outcomes: realism and scepticism, universalism and particularism, objectivity and relativity/subjectivity. In the case of Quine (1969b), his naturalism, that is, his suggestion that “epistemology, or something like it, simply falls into place as [...] a chapter of natural science” (1969b: 81-2), results from the “insurmountable” philosophical support for certain brands of “scepticism” – particularly Hume’s ([1748] 1999) “problem of induction” – and the obvious positivity of natural science. In so many words, because Quine finds that philosophy is unable to hurdle challenges such as Hume’s, he also finds it unable to

explain the “positivity” of science. Because science is clearly positive, however, he therefore concludes that can only science can explain (the reasons behind the positivity of) science.

The other two attempts follow or subscribe to the philosophical framework and commitments set out by Quine. These are social epistemology, or rather the most naturalistically committed version of social epistemology (Fuller 2007, 2006, 2002, 2000, 1997, 1993; Rouse 1996, 1987), and radical constructivism (Von Foester 2003, 1981, 1974; Von Glasersfeld 1995; Luhmann 1995; Maturana and Varela 1992, 1980, 1979; Maturana 1988a, 1988b, 1980). Both of these respond to a problematic circularity similar to that described above. Social epistemology responds to the normative “vacuum” left by the strict sociological scrutiny of science by the Strong Program of the Sociology of Scientific Knowledge (SPSSK) and science and technology studies (STS). Radical constructivism, in turn, attempts to make sense of the epistemologically self-referential circumstances resulting from the most scientifically strict and radical versions of embodied cognition.

These three attempts will be comprehensively explored in the present work. Indeed, the final outcome of this work is obtained by addressing certain identified flaws of naturalist social epistemology, with insight from radical constructivism and embodied cognition. Doing so, in turn, results in a position that also amends certain identified problems of the radical constructivist approach. As such, and because both of these approaches constitute variants of the program originally proposed by Quine, the outcome of this dissertation can be adequately described as a synthesis of all three approaches.

Given that the starting point for this work is the discussion that concerns the circular problems of sociology, and in particular, the discussion surrounding naturalist social epistemology, the most adequate manner to locate this dissertation within contemporary disciplinary boundaries is as contribution to the sociology of science, and more specifically as a contribution to science and technology studies and social epistemology.

In this regard, the research outcomes of SPSSK and particularly those of STS constitute perhaps the most impactful and controversial academic work that challenges the prevailing assumptions upon which the normative dimension of science (and thereby modernity) is established and informed. The claims and affirmations of both these approaches correspond to the most strongly supported challenge to the scientific status quo, a circumstance that makes both SPSSK, and especially STS, very hard to dismiss (e.g. this ultimately led to the “science wars” [see Labinger and Collins 2010; Ashman and Barringer 2005]).

Despite their methodological differences, the understanding of scientific knowledge and practices that results from these two endeavours is not dissimilar. For example, Barry Barnes, David Bloor and John Henry (1996) explain that once the production of scientific knowledge is subject to causal explanation, “the sociologically interesting causes of scientific action are the goals and interests which are furthered by the action being performed in the way it is, rather than in some other way” (1996: 114). On the other hand, Latour and Woolgar’s (1986) claim that according to their evidence objects only have meaning within a particular network. As this network (whose extent is defined by the amount of agents familiarised with such meaning) grows, most members of the network lose touch or contact with the contingent circumstances of production of such meanings and, as a result, they become “facts” (1986: 148). The

point is that, again, once matters that were previously explained by pure philosophical reasoning – such as knowledge and scientific normativity – are empirically scrutinised and explained in relation to empirically accessible phenomena, reasons and causes, they are invariably rendered as contextual, constructed, relative or political.

The objections that critics and detractors of SPSSK and STS put forward are not dissimilar to Habermas' (2015) challenge to post-structuralism (e.g. Laudan 1977, 1990; Latour 1988, 1992; Bloor 1991 [it is interesting to note that STS is critical of SPSSK and vice versa]). Again, not unlike the above-reference argument, the gist of this challenge is that the contextualising and/or the politicisation of scientific/academic knowledge that these efforts arrive at is "self-defeating". They deconstruct the assumptions that guide the practice of science and justify its authority *vis a vis* the rest of society, but they do not offer an understanding of knowledge or of scientific normativity that is able to replace the notions they challenge. As such, they are left as normatively orphaned as their object of study, for they *are* their object of study.

Social epistemology, at least the naturalist "brand" of social epistemology that is advocated by Steve Fuller (Fuller 2002, 2007a, 2009; Fuller and Collier 2004) takes-off precisely as an attempt to fill this void. That is, naturalist social epistemology consists in an attempt to provide science with a new normative domain that is consistent with the findings of all the above-referenced empirical work.

Fuller's main contribution resides in unearthing that the sociological evidence of matters concerning science's normative aspects suggests that the reasons why certain scientific claims are valued or accepted in the context of their production (or the context that motivates and seeks their reception) may vary from the reasons why they

are received or accepted in the context of reception (the context of benefit or use) (Fuller 2002, chapter 1.2).

Fuller's prescriptions (2002, 2000, 2001, 1997; Fuller and Collier 2004) intuitively follow from the above. On the one hand, Fuller contends that standards for the conduct of science and knowledge production must be obtained from research. After all, there seems to be no evidence for an *a priori* normativity that may provide guidance for these matters in certain terms. On the other hand, however, we find the issue of scientific authority (including the authority of Fuller's epistemological researcher). In this regard, and in accordance to the insight that the normative validity of scientific claims may very well be found in the context of reception (e.g. society at large) in ways that do not fully conform to the interests of the context of production (e.g. the scientific establishment), Fuller contends that circumstances closest to those of objectivity (or in his words "epistemic justice") would be such that the parties most affected by production of knowledge (and therefore most potentially benefited) should be those who hold greatest sway over the normative dimension of its production. Under these circumstances, Fuller contends, knowledge albeit contextual, could no longer be political or ideological. In Fuller's words, "an epistemically just regime would be one in the perpetual project of preventing *any* form of knowledge from becoming a vehicle of power" (Fuller 2002: xviii). In practical terms, this amounts to elaborating a "constitution of science" in order to establish what Fuller calls "republic of science" (Fuller 2000).

As will be extensively elaborated upon in the third chapter, however, Fuller's programme falls short of its objective. Apart from the political difficulties that such a project would involve, and independently of the practical problems Fuller's prescriptions would have upon the efficient conduct of scientific practice and

knowledge production, the project also fails philosophically. This “republic of science” inevitably assumes *a priori* political values very much in line with those assumed by liberal or representative democracy. In consequence, however, Fuller’s solution turns problematic in regards to its own standards. In short, Fuller (i.e. 1997, 2000, 2002, Fuller and Collier 2004) as a replacement for a scientific normativity grounded in *a priori* epistemological assumptions, offers a scientific normativity that is ultimately grounded in *a priori* political assumptions. As such, his account is prone to be challenged and ultimately deconstructed by any and all endeavours with similar methodological commitments to STS and SPKKS. Whilst Fuller’s proposals are able to hurdle the standards set by these research programs, they only do so because neither STS nor SPKKS specifically target political assumptions such as those that underlie Fuller’s suggestions. The same, however, cannot be claimed in regards to the challenge set by post-structuralism in general, nor for other more traditional analyses of these values, such as Marxism.

In order for social epistemology to successfully hurdle circularity it must be able to do provide an account of normativity that:

- i) Avoids all and any assumptions – values and prescriptions – that are not sourced empirically and are not revisable according to its methodological standards;
- ii) Is able to provide normative value (i.e. normative purchase and/or normative import) beyond its context of source and/or beyond its context of production.

As described, all appeals to philosophy and/or the *a priori* would, lead to an account that finds itself at odds with the above. Also as described, and as will be extensively

elaborated upon, sociology is unable to hurdle the problem of negative circularity on its own. This is, then, where an appeal to an epistemology sourced from the most empirically committed versions of cognitive science comes in.

1.2 Embodied Cognition and the Unity of all Knowledge

As will be clearly illustrated, once cognitive science is brought into this discussion, it becomes much easier to understand how it is that *all* knowledge is continuous, consistent and/or compatible, and therefore how the knowledge that results from science, can also be used to explain it, predict it, and prescribe upon it.

As will be shown, by bringing cognitive science (and the [philosophical] discussions surrounding cognitive science) into the discussion referenced above, it becomes clear that the reason why we reach accounts that seem to be incompatible or inconsistent with each other (such as “realism” and scepticism”) is because the strict and disciplined use of our capacities of scrutiny (our capacities of sense and reason), results in conceptual outcomes that suggest that all phenomena are situated in space and time, which is to say that all phenomena are contextual or physical. Basically, if this consistently resulting and consistently reaffirmed “situationism”, “contextualism”, “relationism” and/or “physicalism” is not given theoretical primacy, conflicting philosophical accounts result.

What commonly occurs is that the disciplined use of our capacities of scrutiny upon “objects” results in elucidating the plausible ontological relationships that these have with the rest of the environment. Under the guise of the disciplined use of our powers of scrutiny there are no “first causes”. Everything is the result of something or, better yet, of a collection of preceding circumstances. Likewise, under the guise of disciplined scrutiny, everything is also the cause of something else. Under science, all

form comes to be on account of certain circumstances and then ceases to be on a similar account. This is also to say that all matters are transient, limited, particular and located: under the guise of science everything is “situated” in space and time.

Knowledge of these “discovered” ontological (i.e. causal) relationships, further, constitutes the base of our interaction with the environment. They allow us to navigate and negotiate our pursuits, and ultimately to command and transform our surroundings. As our “knowledge” of the environment becomes increasingly successful at predicting and providing the means for greater “command” of our circumstances we find ourselves holding it to be true, objective or universally valid. These assumptions, however, does not correspond to what results when we direct the disciplined use of our capacities of scrutiny to the study of subjects: our own norms, our own knowledge, our points of reference, and our powers of cognition or thought. When our powers of scrutiny are directed towards such matters these will also be found to result from preceding circumstances, caused by something else and the cause of other things. They will be transient, limited, particular and located; unlike normative dispositions suggested by notions such as truth, or universality. This, of course, destroys the epistemological firmness that seems to be suggested by the possibilities that such knowledge offers, and gives then the impression that the use of our powers of scrutiny leads to conflicting outcomes.

To illustrate the above, consider, for example, an encounter between our knowledge of aerodynamics and the “problem of induction”:

The most common explanation of why aeroplanes fly corresponds to “Bernoulli’s equation”(Sprigings and Koehler 1990). The gist of this explanation is that air moves faster on top of the aircraft’s wings, than it does below. As air moves faster, its

pressure decreases, the difference between the pressure that air exerts on the wings/aircraft below from that above creates a force that lifts the contraption.

This is, of course, a very simple understanding of how “aeroplanes fly” that does not go into the extensive detail of aerodynamics introductory texts (e.g. McCormick 1995). Its premises, however, seem straightforward. It suggests that experts have a clear grasp of the ontological intricacies (i.e. mechanics) of air and, thereby, of the different outcomes caused by the manipulation of air’s properties. Our relationship with flight seems to strongly suggest that the use of our powers of scrutiny (both sensorial and cognitive) has led towards “true knowledge” of these matters, or at the very least an adequate approximation of “reality”.

On the other hand, however, the very same strict and disciplined use of our powers of scrutiny also leads to positions such as “the problem of induction”.

The gist of Hume’s “problem of induction” ([1749] 1999) consists in the affirmation that a limited number of accounted cases cannot logically translate into general claims that affirm to describe all possible scenarios. In other words, it is impossible to ascertain that future manifestations of accounted phenomena will behave as expected. In strict logical terms, it is only possible to affirm statements in regards to the actually observed instances. That is, induction from a few cases onto general claims is not logically warranted. Another, very useful, way to understand the problem of induction is in terms of the inscrutability of the future: new knowledge is by definition unknown and, therefore, something not yet “known” once “known” may shed light into past “inaccuracies”.

As can be inferred from the above, the problem of induction appears to be as reasonable as the claim aerodynamic science is able to “grasp” the ontological

intricacies that surround flight in such a way that allows them to “command” pertinent causal forces. If what is suggested by the problem of induction is taken seriously however, there is no way to determine if the presently accounted for causal forces correspond to reality or even to what will constitute aerodynamic knowledge in the future. In fact, the current state of aerodynamics is a clear example of this situation, as not only is the “common” explanation of flight not shared by most experts on the matter, but actually the precise causal circumstances behind “lift” and “flight” are a matter of debate (see Hoffren 2001; Craig 1997).

At a first glance, it would seem to be the case that the above suggests that the disciplined use of our powers of sense, observation and reason may result in conflicting outcomes.

As will be demonstrated in what follows, however, – and throughout this work – bringing cognitive science, and the philosophical discussion that surround this discipline into the fray, illustrates how, in fact, our knowledge of aerodynamics, the relationship between ourselves and the environment that it suggests, and challenges to realism, objectivity, positivism and universalism such as the problem of induction and even scepticism, are entirely compatible, consistent and/or continuous.

For example, as will be clearly illustrated in chapter 4, the bulk of empirical evidence on matters pertaining to human and animal cognition suggest that all cognitive phenomena are “mutually-constituted”, which is to say that an agent’s cognitive structure can only be understood as constituted by the specific relationship said agent holds with its environment. This implies that cognition is ontologically contingent to its specific location or site: according to the pertinent evidence “everything” is “subjective” and cognitive “form” changes from agent to agent and from time to time.

Again it is “located” or “situated” in space and time. Most of the evidence in this regard concerns perception, and particularly vision. Applicable evidence on thought, such as language and abstraction, however, also leads to similar results.

As will be covered in chapter 5, all positions that hold to a different view – positions that assume “cognitive realism” for example (which include most of what is considered the “received view” in cognitive science) – require certain *a priori* methodological assumptions in order to reach these results. As will be shown, when the bulk of evidence pertaining the constitutive form of cognition is taken into account in the absence of assumptions that may save certain established notions from scrutiny, what results is an understanding of cognition consistent with what follows:

- Cognition or cognitive form – and therefore framework of reference – is a function of the agent’s need to interact with, and change, its environment in order to sustain itself. In this regard, the particular characteristics of cognitive form and the precise and particular way in which the agent interacts with its environment, are mutually determined by each other, and in turn, determined by the sustainment requirements of the agent. There is, then, a specific reason for every single aspect and characteristic of an agent’s cognitive form (or cognitive structure). There is a specific *cause* for every single aspect and characteristic of an agent’s cognitive form.
- Cognitive form is affected by every single interaction with the environment. This is to say that cognitive form changes by means of the agent’s interaction with the environment. These changes are not arbitrary, they take place in a manner constrained and/or determined by the circumstances that precede them. Every single change is *caused* by specific and particular circumstances that allow it. On this account, all afforded change “contains” the preceding

circumstances, and on this account, each change is then, from the perspective of the affected agent, *positive*.

- Because cognitive form and the particular way in which the agent engages with the environment determine each other, as cognitive form changes by means of such interactions, the particular manner of environmental engagement of the agent changes as well. In other words, every single change alters the phenomenological structure of the agent, which is to say that every single change alters the worldview of the agent to a determined extent. Cognition or cognitive form – and therefore framework of reference – is a result of a history of change, and it is also the departure point for further changes.

It begins to become clear how it is the case that our knowledge of aerodynamics and the problem of induction are consistent with each other. In this regard, like all knowledge of aerodynamics, the evidence that supports “embodied cognition” suggests that, if interpretation is strict, all aspects of cognition will be found to be caused and situated. Both aerodynamics and embodied cognition locate their objects of study in space-time and account for these in terms of causality. Finding cognition to be physical, situated or contextual corresponds to the precise manner in which natural science finds all of its objects of study.

The conclusions of radical embodied cognition, or more specifically the consequences they have in regards to (epistemological and/or scientific) normativity are similar, if not identical, to those of the problem of induction. To wit, they present a strong challenge to realism, universalism and objectivism.

In this regard, it becomes increasingly probable that philosophical challenges to objectivity, such as the problem of induction, have been suggesting physicalism, contextualism and situationism all along.

For example, by challenging the possibility of claiming something beyond one's specific and particular experience and, thereby, challenging the possibility of claiming general statements (e.g. all swans are white), the problem of induction is also affirming that only statements of one's particular circumstances (e.g. every swan I have ever experienced or known about is white) are philosophically unproblematic. A determined agent, in other words, cannot claim matters that transcend her experiential history, her circumstances and/or her context, without falling into philosophical problems.

These circumstances are not particular to the problem of induction. In fact, as can readily be verified by anyone who wishes to do so, deflationist claims, deflationist language or any other mode of expression that does not purport to judge or claim the (epistemic, ethic or otherwise) normative validity of statements beyond the claimant's particular and situated circumstance is immune to philosophical challenges such as Rorty's (1979) and Wittgenstein's (1953) "particularism", Quine's (1969b) "inscrutability of reference and/or "under-determination of theory by data" (1975) and, of course, "scepticism" (Sextus Empiricus 1933).

Positions such as those referenced above, and others such as "relativism", do not, and in fact cannot, challenge the presence of an external reality or the notion of truth. In regards to these matters, these positions are necessarily agnostic. What they all challenge, rather, as all empirical evidence that concerns "reference" or "the subject" does, is that determinations of value or prescriptions hold validity or purchase beyond

their specific context. In other words, they suggest that subjects and matters related to subjects -- such as reference, and value -- are found in the very same circumstance in which scrutiny also finds matters pertaining to objects. That is that everything is located in space and time, including normative value. There is no such thing as transcendent truth, transcendent evil, transcendent good or transcendent justice; and the knowledge of the most celebrated physicist is, just as her brain is, located in a particular time and a particular place.

Because, as argued above, the results of empirical science and precise philosophy, when not committed to methodological principles designed to save certain matters from study seem to lead to a coherent and compatible worldview, throughout this work I use the term *strict and disciplined scrutiny* as a reference to the practice of both these endeavours.

1.3 Strict Naturalist Normativity as a Solution to the Problem of Circularity

It is upon findings such as these that philosophers, particularly those grouped under labels such as "liberal naturalism" (Putnam 2010, 2002; De Caro and MacArthur 2010, 2004) and "critical realism" (Sayer 2000; Bhaksar 1989; Archer 1995) contend that normativity is simply beyond the reach of (natural) science. They contend that norms pertain to a distinct ontology that can only be grasped by disciplinary endeavours committed to the *a priori* assumptions that save normativity from being unintelligible.

As will be argued throughout, positions such as these fail to observe that an account of normativity, perfectly consistent with the results of science has already been elucidated by work such as that referenced (e.g. post-structuralism, STS and radical embodied cognition). Historical renderings of normativity that have been produced in order to hurdle challenges such as these -- for example, pragmatism, instrumentalism,

and hypothetical or functional normativity – are just as consistent with the results of the cited work as are the also referenced challenges.

The defining characteristic of these sorts of norms – which I will collectively refer to as “contextual” – is that their “normative consequence”, their “purchase” or their source of validity, is not assumed to result from a universal, transcendent or otherwise objective standard. It is assumed, rather, that their validity results from a relation between a prediction and a generally specified condition, desired outcome or terminal parameter (Kelsen [1934] 1960; Quine [1986] 1991: 664-665; Maffie 1990).

If, for example, I possess the “knowledge” that digging in determined places will result in obtaining water, and if it is the case that I do not have “knowledge” of any other way to acquire such water, and finally, it is also the case that I require water in order to sustain myself, I will then be “constrained” to either dig or perish.

As can be readily observed, this allows for the explanation of such norms in causal terms, which thereby allows for their location in time and space. This is, the reason or the cause why I am constrained, or in other words, the cause of the normative purchase, is my need to procure water and my particular state of knowledge.

This holds, of course, as long as my capacity to predict said causal scenario corresponds to the “best” (according to my own standards) way to procure such outcome, or as long as the predicted outcome is still required. This is, if it is the case that I “learn” of an easier and more efficient way to procure water, I will no longer be constrained to the act of digging.

As has been suggested above, the point of reference of both agents (e.g. cognition) and societies (e.g. social normativity) is in constant change. In the case of cognitive agents, for example, this implies that cognitive circumstances change from agent to agent and

from time to time. The normative purchase or the normative constraint of a determined disposition, thereby, also changes according to time and agent. It is, again, situated in space and time.

It should become clear that these accounts of contextual normativity are almost identical to the above described, situated rendering of embodied cognition. All that seems to be required in order to match both accounts is to change the notions of “knowledge” or “framework” to those of “cognitive form” or “phenomenal structure” and exchange “desire, requirement and/or necessity” of outcome for “sustainment”.

Now, it may be not initially apparent, but such an understanding of normativity is also perfectly consistent with the results of the above-referenced social science. In order to illuminate this, however, the social implications of contextual normativity, as dissected above, must be disentangled. For example, if a “normative context” as defined above is determined by a causal link between a particular (conceptual) framework and a required outcome, then the social equivalent of said normative context must be constituted by the relationship between a “social” (or a collective) framework and a socially or a collectively pursued outcome. If we are strict in our interpretation of the above referenced evidence and the outcomes of our previous reasoning, these social equivalents must be unravelled, taking into account that each agent constitutes a cognitive/normative context.

Understanding the social or the collective equivalent of the individual pursuit of outcome is fairly straightforward. It is not unusual to find circumstances in which a particular outcome can only result from the collective, and/or collaborative engagement of a plurality of agents. It is also not unusual to find circumstances in which the obtainment of these “synergic” outcomes is necessary in order to sustain those collectively engaged in their pursuit. To wit, if a determined group of agents

needs to obtain an outcome that requires collective and/or cooperative engagement to achieve, it is reasonable to affirm, upon the operating premises of the position presently followed, that the members of said group will be “constrained” to organise themselves collectively for these purposes. Examples include behaviour observed in all social animals. One of the clearest is human culture and the sophisticated living that results from it.

Understanding the social or the collective framework is a little trickier, given that, in line with our present theoretical commitments, the presence of a meta-framework that transcends the particular cognitive history of each and one of the contributing individuals cannot be assumed: every single participating agent has a different notion of what is the best way to achieve the collective outcome, every single participating agent has a different notion of how the distributive aspects of said outcome will best be negotiated and every agent also has different interests and/or incentives regarding this negotiation. If the framework is assumed to be the result of an exhaustive process of inclusion (i.e. a “deliberation”) of the “knowledge” and the “interests” (i.e. the cognitive circumstances) of all participating agents, there would be no significant problem in identifying the causal link between said collective framework and its corresponding collectively pursued outcome. If, however, the social and collective framework does not result from an exhaustive process of inclusion of the cognitive circumstances of *every* single member participating in the collective pursuit of the outcome, then it is not possible for a causal link to exist to the cognitive circumstances (the “knowledge”, the “values” or value determinations, “incentives”, “interests” and “desires”) that were not exhaustively included with the collective pursuit of the outcome. In this case, the only way in which the normative framework of such collective, or of such “society”, can be causally accounted for corresponds to the

cognitive circumstances that *were* exhaustively included, plus the material circumstances that these “interests” afford to impinge on the rest of their peers (i.e. those not included) in order for the overall outcome to be desirable to them as well. In other words, the causally accounted normative dimension of said society will correspond to the value determinations, the prescriptions, the interests and incentives of the included parties and the power that allows them to impose these on their counterparts. Circumstances, that are, of course, consistent with the findings of STS, SPSSK and post-structuralism in general. In short, “strict” science is perfectly able to locate norms and provide causal explanations for them.

“Liberal naturalists” (i.e. Sayer 2000; Bhaksar 1989; Archer 1995) and “critical realists” (Putnam 2010, 2002; De Caro and McArthur 2010, 2004) respond that these descriptions do not conform to particular manner in which science, society and language are either understood or practiced. Language, for example, or at least every language I am familiar with, does not operate under deflationist assumptions. Common claims are not made upon perspective or circumscribed to the first person. Language, rather, operates under “realist” assumptions, and common claims are made as if they held value and purchase independent of context or situation. Scientific determinations, on the other hand, have or may have repercussions towards third parties, that is, towards agents or contexts beyond and even unrelated to their practice. Political value determinations and prescriptions as contained in the formal normative arrangements of modern states, whether these purport to be “democratic”, “socialist”, “capitalist” or “popular”, do not contain the exhaustive inclusion of the circumstances of every single affected agent.

Every single form of social organization assumes that normative dispositions are able to hold legitimate validity independently of exhaustive participation of inclusion of

the particular circumstances of every agent that may be affected by these. And then again, like all other detractors “critical realists” and “liberal naturalists” also accuse “strict naturalism” of being self-defeating (i.e. circularity).

What philosophical movements such as “liberal naturalism” and “critical realism” are looking for, then, is not normativity *per se*. They are, rather, searching for positivity.

As I will try to demonstrate, a strictly naturalist account of positivity has not been developed yet, because philosophy has historically insisted on accounting for positivity in “vertical” terms. That is, as described above, the scientific study of matters pertaining to “normativity” illustrates that norms and related notions (i.e. “reference”, “knowledge”, “value”, etc.) are constituted by two interdependent phenomena: constraint and change. Constraint, as already explained, results from or is constituted by a framework of reference that informs the pursuit of a determined outcome, and by the necessity to obtain said outcome. The pursuit of outcomes, that is, engagement with the environment, leads to changes to the framework of reference, which in turn dissolve certain “constraints” in exchange for forming new ones. In this regard, however, all frameworks of reference are a product of a history of change.

Traditional understandings of normativity have always developed accounts of positivity within the realm of constraint. Normative constraint implies circumstances of supra-subordination. This is, norms, by definition judge upon, determine or prescribe matters. They are, then, not arbitrary. In the case of contextual norms, the necessity or the requirement of the outcome “subordinates” affected agents to its obtainment or its maintenance. For these reasons I describe “constraint” as the “vertical” aspect of normativity.

In order to theorise the possibility of a norm to hold non-arbitrary purchase or constraint in a plurality of contexts, what traditional attempts require is a framework that is unaffected by change. In other words, they require positing a framework that does not change. What this amounts to is the positing of frameworks that are not contextual, not particular, non-situated and therefore un-caused. The advantage of such theories is that they allow for normative prescription independent of context; they justify meta-contextual prescription as non-arbitrary. As such, they allow for understandings of “universal” “justice”, or “rights” or “desirability”. They allow agents to claim to be “right”, or “virtuous” in opposition to others who are faithfully claimed to be “wrong” or “flawed”. The downside of these theories is that they are unsupported and are challenged by all attempts at strict and disciplined scrutiny. Their only support seems to be that all traditional understandings of society and science assume them in one form or another, and that up until now all alternatives have been labelled as “self-defeating”.

As will be argued in what follows, and elaborated throughout this work, a “vertical” theory of positivity is not required to account for science or for society or to hurdle the problem of circularity. All that is required in order to develop such an account is to expand on the other component of “scientific” or “naturalist” normativity. In other words, as will be shown, by accepting *change* as an intrinsic component of normativity, the problem becomes the solution, and change becomes identical to positivity: the horizontal aspect of normativity.

From the perspective of a determined agent or a determined context, *all change is positive*. This results precisely because of constraint. This is, norms entail subordination. Normative dispositions, in this regard, are beyond the volition of the agents subject to them. Because constraint is constituted by the relationship of the

referential framework to the desired/required outcome, in order for the normative purchase to obtain, the referential system cannot be optional. That is, just as the norm is not subject to the volition of the agent, neither is the referential framework from whence the norm is sourced. In analytic philosophy, this circumstance is called “doxastic voluntarism”, or the affirmation that “belief is not voluntary”.

This implies that, from the perspective of the agent concerned, neither her referential framework nor its changes are arbitrary. In this regard, although an “objective” or “universal” standpoint for the determination of “positive value” cannot be developed through a scientific perspective, a contextual standpoint can. Changes transpire relative the circumstances that preceded them. That is, in order for a cognitive change to obtain, it must have been afforded by the circumstances that preceded it, thus every change includes and/or contains the circumstances that preceded it. The cognitive/referential circumstances that obtain from every change are held as “superior” or “complementary”. In short, from the perspective of the agent, all cognitive changes, *all afforded changes to her conceptual and/or referential framework, are positive*. Unknown or unaccounted mistakes, for example, are only mistakes from the perspective of future circumstances. That is, from the current perspective of our most celebrated physicist, the knowledge of past and/or preceding physicists was inaccurate or wrong. If science is to “progress”, then from the perspective of her future self, or from the perspective of her successors, the referential framework of our most celebrated scientist is inaccurate.

This horizontal theory of positivity (i.e. positivity as change) is perfectly able to account for “science”, “progress”, “language” and “society” in perfectly intelligible terms; as it is also able to hurdle the problem of circularity.

This results because it allows for a “scientific” or a “naturalist” theory of authority. For example, changes result, of course, from interactions. Many, if not most of the most important of these, result from interactions with one’s peers, which is to say that they result from communication. Because changes to cognitive/referential circumstances are neither arbitrary nor voluntary if a determined agent has the capacity to change said circumstances in another, she could be said to hold “natural (cognitive) authority” over the latter. From the perspective of the receiving agent, all communication that alters her cognitive circumstances will be awarded the value of “knowledge”, even if she does not want “believe” or acknowledge such a change. Think, in this regard, of communication that challenges the fidelity and loyalty of a close friend or one’s partner. Or consider an academic paper whose results “inform” a particular scientist that her past 25 years of research may have been for naught. Whether the agents in question want or not to accept this information as valid, the reception of it affects them in ways that forces them to action.

In this regard, I can safely claim without fear of falling into circularity that if anything which I have expressed so far or anything that follows changes your cognitive circumstances in such a way that related matters seem to be more certain or more doubtful, then your own circumstances have already provided this work with “validity”, and regarding those aspects you have valued this communication as knowledge.

As you can see, this understanding of positivity is perfectly able to claim to hold non-arbitrary validity in a plurality of agents and contexts. It does so, however, by taking the full contextual circumstances of all involved parties into account.

Now, unlike a “vertical” theory of positivity, this position does not allow a particular claimant to decree that she is “right” and her intellectual equal (or otherwise) is

“wrong”, or that she is “just”, or “virtuous” or to claim that she is “certain” that “society should be a determined way”. All this position allows is for a normative or epistemological pacifism. This is, it allows the claimant to express her “constraint”, or in other words, the “certainty” of her constraint. It allows the claimant thereby to express that she is “constrained to find something in certain manner” or “constrained to believe that society should be one way or another”.

Nevertheless, if these matters are disentangled, it becomes clear that the capacity to claim one’s normative supremacy is futile as regards debate, dialogue or conversation. Positions which assume the transcendent certainty of their claims are not necessarily more persuasive than those which do not allow this move. Most, if not all, religions seem to do so, and they constitute some of the most (if the most) challenged forms of knowledge. Circumstances of dialogue and conversation seem to offer strong support for the above. In scenarios, such as these, in which there is no intention whatsoever for any of the parties to impose the material consequences of their view, the persuasiveness of the argument is hardly determined by the “standards” that the very same argument seems to hold as valid, but by the standards of the listener or receiver.

Positions that profess their own validity, or supposed possibility of authority (i.e. normative purchase) beyond and independent of context, seem to be more useful as a justification of circumstances than as a tool of deliberative persuasion.

This account is also able to perfectly explain both science and society. Simply, the time required for an exhaustive participation of all members of a collective (or synergic) pursuit of outcome in the determination of the pertinent normative framework is immensely greater than the time in which the pursuit needs to be completed. Likewise, the spatial circumstances also present barriers to the achievement of wide

participation in the determination of outcome. Society is hierarchical because of the temporal, spatial and material boundaries to communication.

For example, it may be possible that a collective pursuit of outcome that only involves two participants, if it is the case that such agents are alienated from all society (e.g. on a desert island) and therefore from all social forces external to their own circumstance, would allow for exhaustive participation in the determination of outcome. In these circumstances, which would particularly imply that the amount of time that it takes these two agents to achieve an exhaustive exchange is less than the time in which they are required to commence their engagement, the most economic way for each member to procure their peer's participation and their own interests is by means of (honest) dialogue. In other words, the use of force upon one another is uneconomical. Because the outcome is required, and because the outcome is synergic, these agents are constrained to work with one another and need both their own force and the force of their peer. The determination of how the outcome will be pursued, and ultimately, distributed, will involve the exhaustive participation of both members. Because, under these circumstances, there are no value determinations or prescriptions that may affect either of the two members, which do not involve their full participation, there is no need for either to justify themselves independently of the participation of the other. Neither agent would benefit from claiming to be "right" in spite of the other. For personal activities or pursuits that do not require collaboration, their peer's opinion on the matter is inconsequential, but for activities and or pursuits that do require collaboration, they are forced to persuade each other. Being "right" is meaningless, and therefore so are any claims to "vertical" positivity.

If new members joined these two in their collective pursuit, any new member would increase the time that is required for an exhaustive participation in the determination

of the pursuit. It would not take many to reach a point at which it becomes physically impossible for all to partake without affecting their need to engage in action. As this happens, the relative number of agents partaking exhaustively in the determination of the pursuit is reduced, and determinations and prescriptions that do not involve full participation of those affected will result. The normative structure of the society begins to be more akin to the values, interests and overall particular circumstances of those with the most capacity to partake in the determinations of pursuits. And these norms, which now do not include the particular circumstances of all affected members, begin to be held as “true” or “valid” independently of particular context.

If it is the case that the arrangement, and the material, spatial, temporal and/or political/imposed bounds to communication, afford wide participation in matters regarding general organisation of society, but not in the daily collective activities (e.g. industry), the hierarchical arrangement and inclusion in the determinations of outcome will follow a logic of “competition”. These sorts of arrangements include market economies, representative democracies and related political and economic systems. Normative dispositions will validate and justify such hierarchical arrangement and “social” logic in transcendental terms (i.e. liberalism, rights of citizens).

If it is the case that the arrangement and the material, spatial, temporal and/or political/imposed bounds to communication do not afford wide participation in any matter, and matters regarding the general organisation of society are negotiated by an established political hierarchy, inclusion in the determinations of outcome will follow a logic of “force”. These sorts of arrangements include feudal systems and authoritarian and totalitarian regimes. Normative dispositions will validate and justify this hierarchical arrangement and its corresponding logic in transcendental terms.

Technology that dissolves spatial, material and temporal boundaries of communication allows for greater “horizontality” in social configurations. For example, this thesis would predict that representative democracy could not have been established at a national scale before the advent and public use of the printing press. All similar configurations observed before this event must have taken place in social circumstances that allowed members to have direct or concrete communication with each other (such as cities) and that were able to maintain sovereignty from other powers.

By providing a successful account of positivity consistent with the worldview that results from the practice of strict and disciplined scrutiny, the outcome of this work is able to hurdle circularity and to provide a stable normative and epistemological ground to all circular disciplines (sociology, cognitive science, epistemology) without the need to appeal to the *a priori*. By doing so, however, this theory also challenges the disciplinary boundaries of all circular disciplines.

The text, is divided into six further chapters.

In Chapter 2, I will elaborate on the worldview that results from the practice of science and other forms of disciplined scrutiny, and the relationship between this and normativity. The purpose of this chapter will be to clearly demonstrate two things: first, that a specific worldview results from all strict and disciplined scrutiny; second, that a “transcendent” rendering of positivity, or meta-contextual normativity, is not compatible with such a worldview.

The third chapter elaborates on different accounts of naturalist normativity that have been attempted in the past. The naturalised epistemology of W.V.O. Quine (1969b) and Steve Fuller’s social epistemology (2002) are particularly selected, because they

correspond to the two most important attempts at producing a viable normativity whilst maintaining their own standpoint within the bounds afforded by strict naturalism. I explain why both of these attempts fail the challenge of their own standards, and I then elaborate on some of the most vocal opponents of the possibility of a strictly scientific theory of normativity, or of a “strict naturalism”.

Chapter 4 consists of a diagnosis and a proposal. The first section is an ontological analysis of contextual norms, intended to illustrate why it is exactly that these sorts of norms are able to be accounted for by science and strict scrutiny. I also illustrate why previous attempts at “strict naturalism” have been unable to account for normativity successfully. Following Price (2011), I then offer a different naturalist ontology to that of previous accounts. The second section of the chapter offers a comprehensive account of evidence pertaining to the study of the human point of reference, which offers strong evidence for the naturalist ontology offered before. Because most work in this regard has focused in the study of colour perception, I concentrate on this field but also provide evidence on other aspects of human cognition such as abstraction and language.

The fifth chapter elaborates on the discussions in the field of cognitive science that have resulted in responses to the bulk of evidence expounded and the position it suggests. After explaining why it is the case that only by means of a priori assumptions is one able to hold a “realist” or “objectivist” position in cognitive science, I offer a comprehensive elaboration of the view that results when such assumptions are avoided: radical embodied cognition.

In the sixth chapter, I offer the naturalist account of the normative that results from combining insight from Fuller’s social epistemology with that of radical embodied cognition and radical constructivism. In this first part of the chapter I elaborate on the

theory of horizontal positivity that results from this conversation. In the second part of the chapter I then elucidate the implications that this theory has for the understanding of knowledge and society.

Finally, in the concluding chapter I recap and explain in a clear and comprehensive way the contributions made by the overall thesis in terms of its theoretical and philosophical implications for the current state of the social sciences and the humanities.

2. Nature and Norms

2.1 Introduction

In this chapter I will address the relationship between science and normativity. Its main purpose will be to illustrate two related circumstances. The first of these is a particular worldview that results from the practice of science (in particular) and of strict and disciplined scrutiny (in general). Everything that occupies a space within this worldview is situated in space and time and is causally, or ontologically, contingent on everything else. The second point I will try to make is that this worldview, or this ontology, finds itself at odds with assumptions about the nature of normativity that inform and justify important aspects of the conduct of science and the organisation of society.

I will then show how it is that that which we understand as normativity is related to such a worldview. I will show that not all understandings of normativity find themselves at odds with naturalism. Rather, this is the case only for those that cannot account for the “placement”, or the ontological location, of their frame of reference for normative constraint. I will then explain different understandings of normativity in regards to this problematic relationship, specifying that this problematic sort of normativity can be better understood as *positivity*.

I will then show how the strictest use of “logic” and “reasoning” does not warrant a “transcendent” understanding of positivity. In other words, strict reasoning challenges the possibility of normative determinations having consequence in different contexts. I will then argue, following Quine (1952) that the sceptical challenge leads to

epistemological naturalism. This is to say that scepticism leads also to contextualism, and thereby to self-reference.

Before I proceed to show how other scientific matters pertaining to reference lead to similar circumstances, I will name a few “logicians” who have also arrived at similar conclusions to Quine (1952) in their respective fields. I will then illustrate how science, when empirically observed, can also be found to have such characteristics. These are contextual purchase for its claimed normative consequence and for the source of its determinations.

I finally conclude that all strict and disciplined scrutiny leads to contextualism, which implies self-referentiality. I also argue that the phenomenon of post-modernity or reflective modernity is precisely the result of the challenge to the assumed positive normative consequence of modern institutions by their own practices.

2.2 Naturalism: The Worldview of Explanations

A particular worldview (a particular ontology) results from the practice of science (as well as from any other disciplined explanatory endeavour).¹ That is, a particular worldview results from abstaining from positing the presence or existence of phenomena and entities prior to the strict, systematic and/or disciplined scrutiny of reality or nature. Explanations do not account for entities and phenomena, or for their characteristics, in virtue of those same entities and phenomena (A because of A). Explanations, rather, require accounting for the nature of items, entities or phenomena, in virtue of their relationship to other items, entities or phenomena (A because of B). Rain, for example, is scientifically explained as caused by the precipitation of

¹ The particular worldview described results from all endeavors that might constitute an attempt at reaching explanations or understanding in order to determine the pursuit of viable outcomes. These include but are not limited to the practice of science, the use of disciplined deduction or logic (if not considered intrinsic to science), democratic (or otherwise) deliberation, bureaucracy, the market, etc.

condensed water vapour. Water vapour, in turn, is explained as the result of the behaviour of the molecules of water when observed under a certain physical context, and so on. A posited Creator of All-That-Is, on the other hand, cannot be caused by any other phenomena but itself. It is posited as being the First Cause, transcendent of both natural causality and explanation. The worldview that results from strict disciplined scrutiny (or science), then, is one consisting of relationships of cause and effect, an ontological domain in which everything *is the cause* of something else (it is ontologically contingent on something else) *as well as the cause* of something else.² In other words, a domain of ontological inter-dependence, in which *everything is ontologically contingent on everything else*.

Various continuous positions come from the above. If it is the case that all aspects or characteristics of entities or phenomena are ontologically dependent on their relation to other entities or phenomena (to their ontological situation), it is also the case, then, that all aspects and characteristics of entities and phenomena are transient, subject to change. Because all entities and phenomena are contingent on other entities and phenomena they are also subject to the transformations or behaviour that transpires in these. Change in any aspect of the system will result in change in other aspects; everything is affected by everything else. "Everything" in such a worldview, or in such a domain, is (ontologically) contingent on time and space. That is to say that ontological form is contingent on time and space, and thereby located in the realm of the physical, as opposed to the physically transcendent or the Metaphysical. In sum, the ontology that results from science is one of *immanence*, or Metaphysical monism, in which "All that Is" is located in a single domain (i.e. as opposed to a Platonic heaven).

² There are explanations that are not specifically causal, such as nomological or statistical. They are, however, ultimately related to cause. For example, a statistical correlation may not necessary claim cause between two phenomena. The sole reason why the correlation is interesting, however, is because it suggests an ontological relation at play.

In this regard, a clear historical tendency can be observed. It involves a historical ontological reduction of the transcendent to the immanent, of the unlimited to the limited, of the eternal to the transient, etc. As such, it would seem to be the case that “transcendental causes” (items, entities and phenomena), that were previously held to have causal effect in the world, while being located beyond it, have, upon stricter scrutiny, gradually been found to be as natural as that which they affect. Most of that which has been displaced, especially in earlier attempts, would count as “religion” or “religious”. The most notable examples of this are those related to the displacement of theistic causality and justification by accounts of natural causality or demands for worldly justification (i.e. Darwin’s ([1859] 1964) *The Origin of Species* and Locke’s ([1689] 1988) challenge upon the Divine Right of Kings). The most interesting displacements of transcendental accounts are not, however, related to religion or God. A case in point is the Marxist explanation of liberal ideology, particularly of the notion of individual liberties as an integral element of the legal and political superstructure that results from (and is therefore *causally* related to) a social arrangement based on capitalist modes of production, rather than being universal or self-evident.

Both the practice of science and the worldview that results from it, are recognised as naturalism. The practice of science (or “natural philosophy”), particularly when promoted as a replacement for or a displacement of other (non-scientific) means of explanation, is recognised as *methodological* naturalism (De Caro and MacArthur 2004: 3-9). The worldview that results, in turn, is commonly labelled *ontological* naturalism (De Caro and McArthur 2004: 3; Kornblith 1994: 40).

Historical uses of the term can be traced back to 17th century philosophy and American pragmatism. An early example of this is found in Baruch Spinoza’s “heretical” interpretation of the Bible, “which implied that God is one with material

reality, and that Creation is simply the realisation of this single unified substance” (Fuller 2007b: 106). American pragmatists such as John Dewey, Ernest Nagel, Sidney Hook and Roy Wood Sellars, on the other hand, understood naturalism in very similar terms as “the wholehearted acceptance of the scientific method as the only reliable way of reaching truths about the world of nature, society, and man” (Sidney Hook cited in Kim 2003: 87).

Now, although most philosophers would recognise naturalism in the terms offered above, such a strict rendering does not encapsulate or describe any position offered by a contemporary thinker. It is safe to say that all contemporary naturalist credentials are, in one way or another, contained within the methodological theme, or its ontological counterpart (De Caro and McArthur 2004: 3-4; Kornblith 1994). It is also safe to say, however, that no philosopher adheres to both, or at least not in such a strong or strict sense (see De Caro and McArthur 2010). That is, no contemporary philosopher (successfully) subscribes to the commitment that all of reality (all phenomena pertinent to the conduct of human life) is exhausted by that which falls under the purview of the natural sciences, namely that which is located in time and space.

Committing oneself to such strict rendering of naturalism is considered to provide no place for matters indispensable to the practice of science as well as to the conduct and understanding of human life and society. Naturalism, in such a strict rendering, challenges the possibility to claim or advance prescriptions or value determinations that transcend context. As a result, naturalism is held to leave no conceptual space for

the account of (meta-contextual) normativity, semantics and human freedom/agency.³

In this sense, philosopher Barry Stroud (2004) explains that:

‘Naturalism’ [is] like ‘World Peace’. Almost everyone swears allegiance to it, and is willing to march under its banner. But [...] like world peace, once you start specifying concretely exactly what it involves and how to achieve it, it becomes increasingly difficult to reach and to sustain a consistent and exclusive ‘naturalism’ (2004: 22).

2.3 Norms and Nature

The most common misconception of contemporary popular culture is the idea that science currently provides an explanation for the most common aspects of everyday life. This does not imply, as this scholarship will try to advance, that science is unable to provide such explanations. It does entail, however, that many items, or rather, many of the assumed causal forces that seem to be indispensable for the conduct of society (and science) suppose an ontological nature that is puzzling from the

³ Note on ontological determinism: At a first glance, it would seem from the above, that ontological naturalism leads into hard ontological determinism. That is, it holds that all ontological forms (all entities and phenomena) are an instance of a causal continuum or sequence: everything, all aspects and all characteristics, are determined by their causal antecedents and form part, in turn, of the determination of that which will follow. If one considers ontological naturalism, however, to be the ever-evolving worldview that results from disciplined scrutiny, there seem to be, however, certain phenomena that upon disciplined scrutiny are found to have a causal relationship to antecedent that is qualitatively different in the sense that similar circumstances lead to wide variety of outcomes. To wit, a) beneficial mutation (argued as being “random”) which leads to phenotypic variance; and b) human (or culture-capable animal) determination, which in turn, leads to cultural variance. Such matters concern one of the oldest philosophical debates of the Western tradition, and the issue is far from settled, with scientifically supported arguments for ontological determinism, ontological agency and compatibility between the two (Dennett 2014 chapter 8, 1995). As part of this work’s attempt to provide a strictly naturalist account of norms and normativity, a continuous account of *social* agency (i.e. the capacity of agents to have causal effect upon the social forces that constrain them) will also be provided. Such an account, however, supposes the possibility of *ontological* agency. In this sense, even though chapters 4, 5 and 6 will offer evidence and empirically supported arguments that suggest the presence of such a phenomenon within a strictly naturalist context, this work will not address the long standing debate at hand. Doing so would constitute a scholarly effort as elaborate, or more so, than this one. I am constrained in this regard to assume that living beings, understood in the terms laid out in the aforementioned chapters, have the capacity to interact and affect their environment in ways qualitatively different than other (i.e. “purely physical”) phenomena, to the effect that the outcomes of such interactions are of such relative variance that their results are practically impossible to predict. I also assume that further work will be able to produce such an account of agency in terms as strictly naturalist as those maintained in the present account of norms, more specifically in terms that allow or even suggest an ontological continuum between the subject matter of both physics and biology.

perspective of a scientific worldview. This collection of anomalies is identical to “normative factuality” or “positivity”.

At first glance it might seem puzzling to suggest that norms or normative facts find themselves at odds with a scientific worldview. The issue, which can be traced back to Hume’s ([1740] 1888) idea that there is an “unbridgeable gap” that separates facts from values, can be illustrated as a “placement problem” (Price 2011: 187), that is, as an issue concerning the ontological placement of norms within a naturalist ontology.

As stated above, a determined worldview results from the practice of science: natural entities are located in space-time, which is also to say that they are transient and part of a network of causality. For a naturalist ontology then, problematic phenomena would be constituted by entities and items held as “super” or “meta-natural”, in other words, as that which is being posited as “outside or ‘extra to’ space and time” (Armstrong 2010: 1-2; Melnyk 2003: 9), which would also include all that which plays no causal role in nature or is unaffected by causality (Armstrong 2010: 2; Oddie 1982). In this sense, problematic items would obviously include ghosts and goblins as well as deities and any number of phenomena whose characteristics cannot be accounted for by causal relations. These “obviously irrational” items, however, do not exhaust the list, as amongst the problematic posits one also finds constructs whose reality is considered perfectly rational to assume, such as numbers (in a universalist sense), “possible worlds” or “modal realms” as posited by modal logic. Finally, and most importantly, amongst these problematic items one also finds normative facts, which, unlike the previous examples, are always held as having causal effects on social circumstances.

As an aid to illustrate why this is so consider the following example:

In a gathering amongst friends two discussions are taking place. The first of these concerns the ethical evaluation of a comment, and the second one the truth or falsity of a mathematical equation. In the first discussion, agent (A1) contends that a determined intervention by member (B1) was inappropriate because it was subtly racist. Agent (B1), in turn, holds that his comments were appropriate considering the context, given that the admittedly racist aspect was an attempt at humour and not offense. In the second discussion (A2) contends that 4 is the only possible answer to $2 + 2$, whilst (B2) holds that $2 + 2$ may equal ∞ . With the exception of (B1) and (B2) all other members of the collective hold that (A1) and (A2)'s position is correct.

The position of all members is normative in the sense that it involves an evaluation of circumstances. This is, the majority of the group holds that (B1)'s comments were inappropriate independently of what (B1) may think; and claim the number 4 as the only result of $2 + 2$ is true independently of what (B2) may hold.

If you would ask any member of such collective to explain why it is that (A1)'s or (A2)'s position carries more value (either ethical or epistemic) than (B1)'s or (B2)'s she would probably respond "because racism *is always wrong*", and " $2 + 2$ *is simply true*". Both *wrong* and *true* in this case, are held to be so independent of context. The wrongness of racism is held as an ethical imperative that operates independently to the temporal or spatial dimensions of a determined event. The truthfulness of $2 + 2 = 4$, likewise, is held as "universal", "non-temporal"; in the sense that "it always was and will always be".

The asked member is, in other words, claiming that the *cause* of a determined event or circumstance that has worldly implications (i.e. [A] is right and [B] is wrong) is another circumstance (X), one that cannot be placed in time and space, and cannot be, thereby, accounted to specific causal forces.

This is, both (A) and (B) are located in different spatial and temporal circumstances: whilst it is the case that during the time of the conversation (A) and (B) are located in similar spatial-temporal circumstances (i.e. the room or environment where the conversation is taking place), their history as persons and the reasons why they hold different positions in regards to different matters, is very different. For the purposes at hand, the spatial and temporal location of both (A) and (B)'s position on the matter is constituted precisely by this causal history, as it is this causal history that which can explain the characteristics of the personal framework with which they value all aspects of their life. This is, the reasons or the causes behind (A) having their position are different from the reasons and the causes of why (B) hold to theirs. The determinations of agents (A) however, are held by the group to have normative value independently of the value determinations of (B), which implies that (A) is assumed to have normative value independently of the causal history of (B), and independently of the spatial and temporal situation of (B). Agents (A), however, cannot claim their own circumstances as the reason or the cause of their normative fortune, as this would imply circularity (i.e. A is right and B is wrong because of A). The attempt to do so constitutes the naturalistic fallacy (Moore 1903), or the is-ought fallacy (Hume ([1740] 1888), namely the attempt to elevate a set of observable circumstances to the level of normative standards for the valuation, evaluation and prescription of other observable circumstances (i.e. B should be like A because of A). The source of (A)'s normative fortune over (B) must then be accounted to something (X) that *transcends* the spatial, temporal and causal circumstances of both (A) and (B) (i.e. A is right and B is wrong because of X). If it transcends causal circumstances, it is then not located in time and space, and if it is not, this means that we are attributing causal force to an agent that occupies placement somewhere "beyond nature".

Not all normativity, however, finds itself in circumstances that are problematic for naturalism. It is only that which is considered to be a normative *truth* or a normative *fact*. Or, in more general terms, what, following the use of authors and scholarship as diverse as Hans Kelsen ([1934] 1960), Michel Foucault ([1969] 1972), and logical empiricism (i.e. Moritz, Carnap and Neurath 1996) could be appropriately termed *positivity*, and defined as the capacity (or the assumed capacity) of a determined prescription, value determination or categorisation to have *non-arbitrary* normative or semantic implications for a plurality of agents (or in a plurality of contexts).⁴

Positivity, in this sense, can be most easily comprehended as the circumstances described in the above example. These are a relationship between a determined agent or context (A) and another agent or context (B), where a normative determination (X) can be considered to be “positive” if it holds non-arbitrary consequence or validity in for both (A) and (B) independently of (A) and (B)’s consent or agreement. In political terms, positivity is equal to the legitimacy of an act of authority, and thereby to the legitimate political authority of its source. Regarding epistemological matters, it is equivalent to determinations of truth or other epistemic value, and thereby to the cognitive and/or epistemic authority of its exponent or source. In sum, positivity is that which is held to have non-arbitrary consequences beyond contextual contingency.

Normative facts and positivity, however, do not exhaust the category of normativity.

There are various sorts of norms whose normative consequence or implication is found to be completely determined by context and which therefore find

⁴ “Positive” and “positivity” (as in “positivism” both empirical and/or legal) are terms used to simply denote non-arbitrary and meta-consensual normative (or semantic) consequence once claims for essential, ontological or metaphysical legitimacy or validity are abandoned. For example, a normative determination within an ethical or an epistemological realist framework can be perfectly labelled as laden with positivity. The term, however, is redundant, as the ontological source of legitimation (realism in this case) is equipped with its own terms to designate such normative relations (“true” or “just”). If the specific philosophical frameworks for the determination of validity or legitimacy are abandoned, one is left with just general terms to designate such matters, namely “positive” and “positivity”.

unproblematic placement within a naturalist worldview. The prime example of this is *contextual norms*.

2.3.1 Positivity and Contextual Norms

Hypothetical norms (also “pragmatic”, “functional” and “instrumental”) can be described as imperatives, value determinations or prescriptions whose normative consequence results from a relation between a prediction and a generally specified condition, or in other words, between a prediction and a specifically desired outcome or terminal parameter (Kelsen [1934] 1960; Quine [1986] 1991: 664-665; Maffie 1990).

Alternatively a hypothetical norm can be easily understood as a rule of the form:

If it is held that X follows from Y, then if X is desired or required, pursue Y.

In this case, X serves the specified condition or terminal parameter and the pursuit of Y follows in consequence. For example, if a determined agent holds that, in order to achieve good grades, she must study, if the agent wishes “to achieve good grades” (X, condition) then “she must study” (Y, normative consequence).

A very useful way to illustrate the relationship between contextually contingent and contextually independent normativity lies in the careful dissection of the above-mentioned naturalistic fallacy or the is-ought problem (also known as the is-should problem).

As set out above, the worldview that results from science is one in which entities, phenomena and items are situated in space and time and are the product or result of antecedent causes, as well as the cause of future phenomena. The worldview that

results from science is the domain of that which “is”, “was” or “is predicted to be” in the future (i.e. that which will be); the domain of “realisation”.

Value determinations and prescriptions, on the other hand, require at least two domains or scenarios: one of these serves as a standard, or as a reference for prescription or evaluation; the other corresponds to the scenario that is evaluated or prescribed upon. For example, in the statement “Sue is a better student than William”, Sue and William’s capacities as students correspond to one scenario: the realised scenario. There is, however, another element operating in the example: the standards held by the evaluator as to what constitutes a “good” student. As explained above, this standard for evaluation cannot be sourced from the evaluated scenario, as this would then result in the circularity that characterises the naturalistic fallacy (i.e. Sue’s characteristics are better than William’s on account of Sue’s characteristics). The standard for evaluation, then, necessarily corresponds to a different domain or scenario. These standards or points of reference for the prescription or evaluation of other scenarios are norms. The realm of the normative, thereby, is necessarily alternate to the realm that is being prescribed or (e)valuated. It corresponds, then, to the domain of the “should” or the “ought”; the domain of a desirable or ideal realisation.

The fact that normativity requires two different domains or scenarios, and that the domain of the normative cannot derive its normative or prescriptive force from that which it values or prescribes upon, does not imply that both scenarios cannot be found within the domain of the realised; that is, within the domain of nature. Within the world of nature, norms correspond to the framework that serves as a point of reference for the pursuit of a determined outcome. That is, all beings or entities (i.e. humans, societies, animals, machines, computer programs) that engage with the environment do so in the pursuit of outcomes. The pursuit of outcomes can be said to

be composed of two situations: the point of departure and the point of arrival. The point of departure corresponds to a desired outcome, and in this sense it also corresponds to the domain of the norms (the domain of should or ought). Actual or realised circumstances are evaluated in regards to the desired outcome. If they conform to the desired outcome, the actual or realised circumstances will be considered positive and then no action is prescribed. If actual or realised circumstances, however, do not correspond to the desired outcome, then these will be considered negative and prescription will follow.

A norm that is not at odds with a naturalist framework, then, can be simply understood as the departure point for a determined pursuit of outcome. Normativity, then, is value determination and prescription, and is simply the difference between the desired state and the perceived or diagnosed actual circumstances. In this case, the frame of reference for prescription and value determination is perfectly located within the realm of time, space and causality.

This description includes, of course, the above-described hypothetical imperatives as well as pragmatic, functional, or instrumental normativity.

Set against the concept of hypothetical normativity it is usual to find the notion of categorical norms. Categorical norms hold normative consequence independently of any condition or circumstance (Kelsen and Hartney 1991; Kelsen [1934] 1960; Maffie 1990). Because they are not necessarily related to the pursuit of an outcome which is desired, required or determined by the all those affected by their consequences, it can also be said of this sort of normativity that its consequences hold independently of (without excluding the possibility of) the immediate agreement, consent, will or desire of the affected party.

Like their hypothetical counterpart, categorical norms need not be necessarily at odds with a naturalist worldview. As explained above normativity necessarily presupposes two distinct domains or scenarios: the reference for normative prescription or evaluation and the domain, which is to be evaluated or prescribed upon. If a determined norm holds consequence for a plurality of agents, but in order to do so it requires express and full consent of all those affected, the referential standpoint is easily located as the outcome of the agreement. Such a norm is not problematic for naturalism, but neither can it be considered categorical, as it requires consent of all affected parties. If a norm does not require the consent, desire or requirement of all affected parties, it could be then considered categorical. The standard of reference in this case, if located in nature, would have to be located in the framework that serves as a point of departure for the pursuit outcomes desired or required by those who *did* have a chance to partake in the determination of these pursuits. Normativity, in this case, is reduced to power, and is, therefore, arguably arbitrary.

If categorical norms are held to be non-arbitrary, and therefore not located in the pursuit of outcomes determined by a few at the expense of the rest of the affected parties, the norms would be pursuing an outcome that is positive for all those concerned independently of their consent or agreement. In other words, the referential standpoint for normative determination and prescription is held as objective, and therefore not located or situated in anyone's particular desires or requirements. In fact, the alternate scenario is nowhere to be located in nature. It corresponds to an unsituated point of reference, hypothesised to speak in the name of universality, or otherwise not contextually placed positive or ideal circumstances. This is the case of posited normative facts or positivity. It is also a direct ontological equivalent of what Thomas Nagel (1986) calls a "view from nowhere".

In this sense, the constitutional order of a liberal society can be held to be, depending on the perspective, positive, categorical and hypothetical or instrumental. That is, the legal and constitutional system of a nation-state of the above-described characteristics can be perfectly understood as the pursuit of a determined outcome, understood in its own terms possibly as the pursuit of a “democratic, liberal and just society”. The value determinations and prescriptions that are carried into effect by the government of such a society, are not subject to the immediate or direct agreement of all those affected by them. In this regard, the formal normative structure of the society at hand can be considered to be categorical. From the perspective of those who hold the values of liberal humanism to be universal, and/or desirable independent from context, then such a normative system is “positive”. However, from a naturalist perspective, this normative system must correspond to a pursuit of outcome that is located in space-time as well as the result of causal forces. In this regard, sociological scrutiny of such circumstances will most probably find the system at hand to be the referential standpoint for the pursuit of an outcome established by those who have the greatest capacity to determine such matters within said society. Most probably, it will be a framework that pursues the reproduction of the elements that allowed said agents to determine the outcome in the first place, as in capitalism (i.e. Marx 1977).

In this sense, it can be predicted with relative assurance that strict disciplined scrutiny will always find norms within the bounds of “nature”. Upon scrutiny, categorical norms, of whichever sort, will most probably find their assumed positivity reduced to power.

Claiming formal and cultural norms as being a reflection of power relations within a society is not very controversial. Indeed this is, to certain extent, the main concern of the discipline of sociology.

A far more provocative consequence of the above is that the normative dimension of science is problematic from a scientific perspective. In other words, the above-described relationship between norms and science, suggests an incongruent relationship between the widespread assumptions regarding the features of science's point of departure (its normative dimension) and its point of arrival (the worldview that results from strict disciplined scrutiny). It suggests that science's point of departure assumes characteristics that cannot be fully accounted for from a strictly naturalist perspective, and, further, that upon reflection science will find itself and its own value determinations to be as contextually contingent and as causally determined as any other entity or phenomena that occupies a place within the realm of nature. This would imply a serious issue of circularity for all the social and political consequences that obtain from the assumption that science – and for that matter any other sort of categorical authority – is able to produce non-arbitrary value determinations that might hold as legitimate, independently from both context and the consent of those affected by their consequences.

There seem to be no *a priori* reasons why an individual agent, science, or any other categorical authority would not be able to determine a way of proceeding in (and/or understanding) ways which could be beneficial for all independently of the contextual circumstances of those who might be affected. There are, however, strong objections to the possibility of these agents acting upon such determinations in ways that could be considered non-arbitrary. The possibility of an agent (A) to effect a non-arbitrary prescription or value determination upon agent (B) without the latter's express consent, seems not only difficult to locate in nature, but also to be directly challenged by strict disciplined scrutiny, particularly by the scrutiny of reason.

2.4 The Scrutiny of Philosophy, Logic or Deduction

Unless she does not offer any objection towards the positive account of an intellectual adversary, no thinker is free from scepticism. The position is commonly despised, denied or avoided (i.e. Putnam 2002: 131-2), but never completely diffused. In order to “make room” for their philosophical advance, thinkers scrutinise their opponents’ arguments in light of finding weaknesses or inconsistencies that may provide the means to nullify or weaken the positive consequences of these. For this, philosophers use a variety of negative arguments, which on closer inspection seem to repeat themselves over and over again throughout the history of human thought. In what follows, I will suggest that these arguments can be adequately grouped into two headings, which in turn comprehend the entirety of that which falls into the label of scepticism. These two categories, further, can then be used to illustrate that at the heart of scepticism (understood as the entirety of negative philosophy) one finds a continuity with immanence which Rorty (1979) identifies as both particularism and contextualism (1979: 31). I will argue that this also holds for strict naturalism,⁵ as described in the previous section.

Upon disciplined scrutiny, it can be observed that negative arguments, whether they are based on scepticism, empiricism, solipsism or otherwise, share a common characteristic. They most commonly suggest that the claims they challenge go further than the latter’s own standards allow. In this sense, most negative arguments suggest that positive claims purport to account for something that is inscrutable. This “flagged” inscrutability, further, can be identified as one of two kinds:

⁵ The term strict naturalism is commonly used by detractors of the position (i.e. De Caro and McArthur 2010, 2004) to describe the position that is defended in the present work, namely a commitment to both first-order naturalism (ontological naturalism), and second-order naturalism (reference naturalism). This work fits unapologetically within such description and as such I follow these authors in the use of the term.

- a) The inscrutability of foreign or alien (individual, cultural) experience, perspective or point of view (relativity or situatedness).
- b) The inscrutability of the future.

The first of these covers the plethora of arguments that question the epistemic certainty required to stipulate normative determination or prescription that purports to hold validity and import which transcends the situation of its author. It does so because it is impossible to determine if, from a different perspective, these same arguments would still hold the assumed validity. The inscrutability of the foreign perspective is as old as Western philosophy itself, and forms the helm of Pyrrhonian scepticism and the “ten ‘modes’ by which ‘suspension’ [of judgement] is to be brought about” as described by Sextus Empiricus (1933).

This general strategy, however, is also behind some of the most recent and persuasive attacks on epistemological (or otherwise normative) standards. These include proposals that:

- a) Contend that the possibility that normativity (validity) is relative to “cultural” or other social standards. These might include Wittgenstein’s (1953) later position as a move from the study of “natural” logic, to the study of “conventions” and the notion of the “language-game”. Similar positions can be also seen amongst the logical empiricist challenge to metaphysics, particularly in their commitment to linguistic conventionalism, as proposed by Carnap’s (1937) “Principle of Tolerance”.
- b) Proposals that contend that normative import is relative to situation, and that different normative situations may be incompatible and/or incommensurable with one another. This may be because of a personal or cultural situation, and may only be assumed in light of historical evidence in some cases. Quine’s negative positions

are all, in one sense or another, versions of the principle in question. Examples include linguistic/theoretical holism, its corresponding indeterminacy of translation, and the inscrutability of reference (Quine 1969b), as well as his thesis of under-determination of theory by data (1975). Khun's (1970) theory of scientific incommensurability is yet another example.

- c) Finally, this strategy also includes proposals that suggest that, not only are standards relative, but furthermore, there is always the possibility that as a consequence of communication with another agent, what was previously considered as "foreign" or "false" might seem to have better grounding than our own previous position once internalised. A persuasive instance of this strategy is Steve Fuller's *Principle of Humility* (Fuller and Collier 2004: 256; Fuller 1993: 424).

The other resilient argument against the possibility of positive normativity could be called "the inscrutability of the future". That is, something that is not yet known, once known may shed light on past errors. Therefore (from a realistic perspective) it is impossible to ascertain what elements of our present theory are true and which are erroneous. There are two different variants of this strategy. The first of these is the ontological inscrutability of the future, or the inscrutability of the future proper, whose mayor exponent is David Hume ([1748] 1999). The second is the epistemological inscrutability of the future or the inscrutability of future knowledge (Popper 1959).

Hume's "problem of induction" is one of the most solid versions of the inscrutability of the future argument, which may apply for both the ontological and the epistemological versions of the inscrutability of the future. Hume ([1749] 1999) argues that there is no logical or rational warrant to assume, from past experience, 1) that the future will continue to behave in the same manner and/or 2) that a correlation

between the “sensible qualities” and the “the secrets powers of nature” can be made through experience.

In both cases, the basic problem is the same: experience of a finite number of cases does not logically translate into general statements that describe all possible scenarios of a determined situation. Arithmetically:

$$1 + 1 + 1 + 1 [...] + 1 \neq \infty$$

The weak, or epistemological, consequence obtains from the consideration that from the observation of a determined and finite number of cases, one is not able to determine general causality, on account of the impossibility of accounting for all variables. In Karl Popper’s (1959) words:

It is usual to call an inference ‘inductive’ if it passes from singular statements (sometimes also called ‘particular’ statements), such as accounts of the results of observations or experiments, to universal statements, such as hypothesis or theories. Now it is far from obvious, from a logical point of view, that we are not justified in inferring universal statements from singular ones, no matter how numerous; for any conclusion drawn in this way may always turn out to be false (Popper 1959: 27).

Unfortunately, amongst that which cannot be predicted is future knowledge itself. Future knowledge is, by definition, unforeseeable (if one already “knew” something that could no longer count as “new”). This can also be simply phrased in the following manner: “‘learning’ involves the acknowledgement that our current knowledge – or view of our surrounding circumstances – is either wrong or incomplete”. And therefore, all present states of affairs are potentially subject to change.

The second, stronger, claim is the intimately related problem, of the ontological inscrutability of the future. From the statement “I have found that such an object has

always been attended with such an effect” in order to conclude that “I foresee that other objects which are in appearance similar will be attended with similar effects”, one must assume that nature behaves regularly, a claim that is (according to Hume’s empiricism) neither *a priori* nor empirically obtained. In fact, the opposite is the case (Hume [1748] 1999: 117).

Hume argues, that for these reasons, one can “never employ his conjecture or reasoning concerning any matter of fact or be assured of anything beyond what was immediately present to his memory or senses” (Hume [1748] 1999: 120).

As mentioned earlier, the core of these arguments rests in the indication that attempts at positive contribution perform an unwarranted jump from particular, limited, situated, temporal or contextual circumstances to general, non-temporal and universal claims.

The following example, provided by Wesley C. Salmon (1967), serves as a useful illustration of the above, as well as an introduction to some of the issues behind Quine’s (1952) rejection of the synthetic-analytic distinction, which I will reference below:

Consider a determined observer who takes various balls from an urn, and tastes them. He realises that all the tasted black balls are liquorice-flavoured, and therefore concludes that all black balls in the urn are liquorice-flavoured:

His first premise would then be:

1P) Some black balls from this urn have been observed (“true” a posteriori synthetic statement).

His second premise would then be:

2P) All observed black balls from this urn are liquorice-flavoured (“true” a posteriori synthetic statement).

His conclusion, however, is:

C) All black balls in this urn are liquorice flavoured.

In order to ascertain if this conclusion follows, or what is implied in order for such a conclusion to follow, we might proceed by asking what Alec Fisher (2004) calls the assertability question: “What argument or evidence would justify me in asserting the conclusion?”

In order for the conclusion not to be “ampliative”, this is, in order for the conclusion not to assert anything that does not follow from the premises (Salmon 1967: 8) the following implied premises must be acknowledged:

3P) Any two balls in this urn that have the same colour will also have the same flavour

4P) All possible experiences (and/or observations) regarding this matter are uniform with that accounted for.

These statements, however, could hardly count as synthetic *a priori* truths; nor is there absolutely anything that might suggest them from the agent’s experience.

In so many words, it is not possible to determine if certain values or certain prescriptions which one holds as valid, or which are held to be valid in one’s context, are also held as such (or should be held as such) from another perspective or in another context. In order to claim that this could be possible it is necessary to assume premises and circumstances that are simply not warranted by philosophy or science. That is, holding these assumptions effectively constitutes an unwarranted jump from limited, particular and finite circumstances that correspond to the worldview that

results from scientific scrutiny, to universal and infinite circumstances that have no place in time and space and/or the physically contextual circumstances in which science finds everything. Holding these assumptions is, in sum, equivalent to the de-contextualization or de-physicalization of the standpoint for reference.

As might be recalled from the first part of the present chapter, it is possible to find referential standpoints for normative determination within the domain of space-time and causality. From the perspective of a situated or contextual point of reference, all experience is limited. For example, no physical scientist has ever experienced the behaviour of all physical phenomena, which constitute the object matter of his research. Nor have the bulk of human scientists achieved it between them, for that matter. In this sense, all experience is contextual. The unwarranted jump supposes logically what a metaphysical (or otherwise meta-contextual) point of reference supposes ontologically. This is, to effectuate such unwarranted claims is equivalent to de-contextualizing the matter that justified the claim. For economic purposes we might call this practice "the decontextualizing jump". Indeed, this practice, which forms the basis for all sorts of realism and is embedded in the manner in which we commonly speak, is not that dissimilar to the naturalistic fallacy: particular circumstances, in virtue of themselves, are now proposed as the referential standard for all similar matters. The tacit or express methodological practice of the unwarranted jump, is precisely what could be said to distinguish or differentiate strict and disciplined scrutiny (or science) from other (not-as-strict) forms of study.

Statements that claim to transcend context are logically problematic. Scepticism, in this sense, can be understood as the result of another form of strict disciplined scrutiny, namely the scrutiny of philosophy or logic. General or universal statements – which as stated above constitute a common form of communication – purport to hold positive.

They seem to claim, in addition to their substantive content, that their content is true or valid independently from the circumstances of their interlocutors. When categorical determinations are placed under strict, disciplined scrutiny (including philosophy as presently illustrated), the “constructed” and logically unwarranted boundary between their purported “universal”, or “objective” standpoint of reference, and the contingent, transient and limited circumstances of their source, will be simply elucidated. Their claim to positivity will be challenged, and with it their capacity to assert non-arbitrary consequence beyond their source.

If our language, for example, were constituted in such a way that we could only formulate hypotheticals when speaking in the third person, but that allowed us to speak with certainty in the first, the sceptical challenge could not result: “judgement (and or normative determination) would be suspended” for all matters with the exception of the claimer’s point of reference, which corresponds in turn, to her context (the only place from which she is “naturally” allowed to claim certainty).

It would seem then, that we communicate in a manner that is incongruent with our own standards of strict scrutiny. To argue in the defence of our way of communication by invoking the fact that it *is* our way of communication, moreover, constitutes circular reasoning.

As will be elaborated upon in the fourth chapter, Philosopher Huw Price (2011), holds that “placement problems” (the problematic placement of norms and other phenomena within a naturalist worldview), are the result of an assumed primacy of “object naturalism” over “subject naturalism”. While the latter emphasises the scrutiny of a non-referential reality (i.e. objects), the former emphasises the disciplined scrutiny of referential standpoints, namely subjects. The placement problem for Price is a problem of subject naturalism, not a problem of the world. Specifically, it is a

problem of human linguistic behaviour; a problem that arises from the representationalist assumption or the assumption that “linguistic terms [...] stand for something non-linguistic” (Price 2011: 189). For all practical purposes, this issue is identical to the practice of claiming that my contextual experience holds in objective terms. In summary, the placement problem, for Price, results from a lack of attention as to the placement of subjects and therefore of contextual points of reference.

Scepticism is a form of scrutiny that illustrates the impossibility for a contextual agent to claim non-contextual consequence. It illustrates the unwarranted boundary that is created between the domain of reference, and the domain of realisation. In this sense, it also works as challenge to any qualitative distinction between the domain of reference and the domain of realisation, which implies that the domain of reference is as limited, transient, and contingent as its counterpart. In other words, the translation of the de-contextualising jump into ontological matters corresponds to the placement of referential standpoint beyond nature.

Using similar premises, W.V. Quine (1952) challenged the distinction between synthetic and analytic knowledge, which for all practical purposes amounts to the claim that all knowledge is revisable, including all meta-theoretical parameters one may have for the evaluation of knowledge. This implies that, whatever formal structure we hold for the pursuit of scrutiny and deliberation (i.e. logic, mathematics), it can be also subject to change upon future revision.

For example:

Suppose that I recognise the *a priori* validity of some sort of rules or norms that dictate my reasoning. Let's call this form “logic”. If I were doing so, I would have to award epistemic validity to all that results from the computations of the rules, including

those challenges that question a certain universally stable and non-temporal validity for the laws of logic that I'm currently acquainted with (such as the problem of induction). This would imply awarding epistemological validity to the claim that there is a possibility that communication or future experience may change all of my current epistemic positions, including my current assumptions on the nature of *this form*. Not doing so would imply an arbitrary choosing of logical validity contingent to epistemological convenience.

If all knowledge is transient, there is then no "firmer standpoint" to judge or value knowledge (specifically scientific knowledge) beyond knowledge itself. The possibility of having some forms of knowledge that are able to hold as a referential standpoint that may serve to value upon and describe other forms of knowledge is nonsensical. This then, leads to the rejection of the possibility of a "first philosophy", a prior or objective referential standpoint from whence different scientific theories could be valued in accordance to their epistemic merit (Quine 1969a). In other words, without qualitatively different sorts of knowledge, all that remains is "knowledge". This implies that all scientific theories serve as their own point of reference for value determination, and further, to the strongest rendition of methodological naturalism possible, namely "the recognition that it is within science itself, and not in some prior philosophy, that reality is to be identified and described" (Quine 1981: 21). By eliminating a prior or "higher" framework for the determination of higher value or reference, this sort of epistemology then commits itself to a relativist or contextualist understanding of reference and (epistemic) value. Each theory, then, is held to serve as its own referential standpoint. Quine's meta-theoretical perspective is the rejection of a meta-theoretical perspective. Both of these attributes then, are necessarily contingent on a particular theoretical perspective that cannot be valued as being higher or lower

than any other perspective. In Quine's (1969a) words, "reference is nonsense except relative to a coordinate system" (1969a: 48).

For all practical purposes, scepticism and strict naturalism lead to the position that there is no ontological difference between the domain of reference and the domain of realisation. All reference is contextually situated, which implies that normative consequence asserted beyond context of source is unable to explain its non-arbitrariness. For the purposes of certain non-arbitrary consequence all normative determinations and prescriptions, including that of science, are located in context and are, therefore, self-referential. In other words, scepticism or negative philosophy does not specifically challenge the ontological "substance", of claims. It cannot, and so remains agnostic as to these matters. Scepticism, rather, suggests that all normative determination is self-referential, which is equivalent to suggesting that all value determination only proceeds from a determined site or context.

Quine, of course, is not alone in this regard, as some of the most compelling arguments regarding the nature of systems point towards their self-referentiality. Amongst the most notable of these are Kurt Gödel's (Godel, Feferman, Dawson, Kleene and Morre 2006) demonstration that a complete, consistent attempt at the axiomatization of mathematics is logically impossible. Other examples of accounts that suggest the self-referentiality of systems are Derrida's (1997) deconstruction and Niklas Luhmann's (1995) Social Systems.

2.5 The Scrutiny of the Social Sciences

As was mentioned in the opening section of the present chapter, methodological naturalism can also be understood as a historical tendency in which items, entities and phenomena posited as having qualities or characteristics outside the bounds of space-time (thus sparing them from strict and disciplined scrutiny), are found, once placed

under the treatment of science, as transient and as contextually contingent as the rest of nature. As illustrated above, the normative dimension of science is no exception. In the previous section I focused on the logical or philosophical problems that result from the de-contextualisation of the normative frame of reference. In this final section I will focus on sociological and anthropological evidence on the matter, as well as an approximation to social theory that attempts to understand such circumstances and the consequences that this “reflective” problem may have on contemporary society.

Scientific knowledge, traditionally understood as being valid beyond context, was initially spared from the scrutiny of the sociological endeavour. In the words of Charles Camic and Neil Gross (2001), the “old sociology of ideas” (i.e. Manheim 1929; Parsons and Platt 1973; Merton 1970) “assumed unproblematic distinction between the content of ideas”, this is, their “internal substance”, and any and all “external factors”. They contend that within the methodological framework of the “old sociology of ideas”, the “substance” of scientific thought was assumed to be “in varying degrees the realm of an asocial, scientific rationality about which sociology could have little to say” (2001: 238-9). It is in this sense, that Manheim (1929) for example, contended sociology was only suitable for the explanation of certain forms of knowledge, such as religious, moral or social, but not for the “exact sciences” (1929: 43).

In this sense, the methodological exclusion of these matters from sociological (or otherwise social-scientific) scrutiny translates into the assumption that the “content” of “scientific knowledge” requires no contextual explanation and is, thereby, causally independent of all social phenomena or context. For these studies, the cause or source of scientific knowledge (if they assume that the production or possession of such knowledge is attributed to anything at all), must then be something that is also

independent of context. Examples could include “Method”, “Rationality” or other means of acquiring a situation-transcended “Truth” or validity.

Once this *a priori* methodological constraint is no longer operative, scientific knowledge (and matters pertaining to its production and justification) are placed under the purview of systematic empirical scrutiny (in this case social science), phenomena such as “epistemic value” and “knowledge” show characteristics at odds with those described above.

Early examples of the above are found in the work of Ludwick Fleck ([1935] 1979), who, as a result of the empirical research of scientific practices, claimed that “truth” and “perception” were relative to what he termed “thought-collectives” or “*Denkkollegive*” ([1935] 1979: 100). Recent and better-known work in the same vein is found within that which is commonly grouped under the heading of the Strong Program in the Sociology of Scientific Knowledge (see Barnes, Bloor and Henry 1996; Barnes and Bloor 1996).

Preceded and influenced by both Kuhn (1970) and other previous historical studies such as Paul Forman’s (1971) study on Quantum Theory and Weimar Culture, the SPSSK characterises itself as studying “the casual [...] conditions which bring about belief or states of knowledge”, whilst being impartial as to the truth or falsity, rationally, irrationality of the beliefs in question, and holding to the “symmetry thesis”. This is to the methodological subscription that “the same types of causes” are able to explain beliefs which are held to be “true” as well as those that are not (Bloor 1976: 4-5). Armed with such methodological commitments, the SPSSK provided sociological explanations for the production and reception of knowledge which included: a) the evidence that confirmed Fleck’s earlier claims of cultural and contextual determination of scientific “categorisations” and “reasons for belief validity” (Barnes 1977: 5, Barnes

and Bloor 1982: 22-23); b) sociological evidence that suggested that the “sociologically interesting causes of scientific action are the goals and interests” associated with the specific manner in which a specific form of research is conducted (Barnes, Bloor and Henry 1996: 114).

The best received, and also most controversial research movement continuous with a methodological commitments in line as such described above, is that which is commonly grouped under the heading of Science and Technology Studies (STS).

Proceeding under a methodological naïveté constituted by an attempt to forgo all preconceptions and thereby eliminating all *a priori* assumptions that could lead to certain phenomena being excluded from systematic empirical treatment (Latour and Woolgar 1986: 43), research under the banner of the STS has stumbled upon findings that further confirm the situational and cultural nature of scientific research (Latour and Woolgar 1986; Latour 1983, 1987, 1988; Knorr-Cetina 1983, 1999; Pickering 1984). The following count amongst the most interesting findings of the addressed research programme:

- a) Facts are created by contingent action.

A seminal piece within the field is Bruno Latour and Steven Woolgar’s (1986) collaborative fieldwork study of a neuroendocrinological unit engaged in fierce competition over the analysis and identification of TRF (thyrotropin-releasing factor). “Facts”, the social scientists report, are created by means of elaborate negotiation amongst the members of the lab and their relation to the outside world. A constructed “out-there-ness” of substances, begins to result whenever “inscriptions” (figures or diagrams) are read as “being the same as other inscriptions produced under the same conditions” (Latour and Woolgar 1986:

84). Amongst the materials used by the scientists, one finds publications from other scientists. Members of different laboratories “notice how their own assertions are rejected, borrowed, quoted, ignored, confirmed or dissolved by others”. Some statements are irrevocably annihilated by a certain “operation” and are never “taken up again”. In contrast, there are situations in which a statement in “quickly borrowed, used and reused [and] there quickly comes a stage where it is no longer contested. Amidst the Brownian agitation, a fact has then been constituted” (Latour and Woolgar 1986: 86-87). A statement finally becomes a “fact” when it is:

Freed from the circumstances of its production... Once one purified structure has been chosen out of all the equally probable structures... its history fades away, and the remaining traces and scars of its construction become less and less significant for practicing scientists (Latour and Woolgar 1986: 148).

b) The boundaries between science (the “laboratory”) and the rest of society are also constructed.

Latour’s subsequent work (1983, 1987, 1988, 1992) focused on the relationship between the “laboratory” and other “areas of social reality”. The most recognised text in this set of literature is *The Pasteurization of France* (1988).

Social, political and economic forces form part of the scientific process by means of “translation”. Pasteur’s technicians in the field collected infected matter, which was then “translated” in the laboratory as “dormant spores” (Latour 1988: 76), but also as the “needs, desires, and problems” of a society into wishes that would “emanate from a body of pure research” (Latour 1988: 72). “Translation” of interests, explains the alliances of divergent interests of groups of people who

don't understand each other well, but who find a point of convergence within the "network" (Latour 1988: 65).

Because such findings present a truly circular challenge to scientific positivity (scientific evidence challenging the positive normative consequences of scientific evidence), these studies have been extremely controversial. In the words of Ian Hacking (1999), both social programs challenge science's claim to "neutrality" by offering evidence that suggests that: a) scientific results and claims are "contingent" on local circumstances, b) this in turn translates into the problematic position of nominalism, and finally c) the process of justification of "scientific knowledge" may involve elements that are "external to the professed contents of science" (Hacking 1999: 73-9).

Not unlike scepticism, second-order naturalism renders itself as contextual as that which is its object of study. This is, because studies such as those described above consider themselves to constitute an attempt at science (of the "social" kind) what ever holds for their object of study, also holds for them. This problem -- an inverse rendition to the naturalistic fallacy - is explained by Roderick Chisholm as the "epistemic circle". This is, all theories of "knowledge", or all "knowledge" whose object of study concerns "knowledge" itself, find themselves in a peculiar problem: they differentiate between what counts as "knowledge" and what counts as "conjecture", however it must do so *a priori* in order for its own premises to count as "knowledge" (Chisholm 1982: 65).

So, for example, Larry Laudan (1977) whose own attempt at "naturalistic epistemology" finds itself thwarted by the findings of SPSSK, has commonly accused the latter of this circularity, claiming that the sociology of science needs to accept the neutral rationality of natural science on pain of the seriousness of

their own claims (1977: 204; 1990: 160-161). The most interesting critiques of circularity, however, result from debates within the social science camp. Latour (1988, 1992) for example, has in many occasions accused his Edinburg counterparts of being “sociological realists” (1992: 278). The Strong Program responds with the same claim: sociological realism, they claim, is a valid and necessary cultural standpoint which forms part of that way in which “all cultures must grow and understand themselves”. This standpoint, further, is as valid as whatever cultural resources (i.e. Actor-Network-Theory) the STS brings into play in order to perform their work (1999: 119).

It is not hard from the above to understand how the sociology or the anthropology of science, when unburdened by a priori assumptions, finds itself an empirical “cousin” to the philosophical counterpart explored above. Both the empirical study of factual claims and the reflective gaze of philosophical form upon itself find the culprit in the same place: an unwarranted jump from the limited and the particular to intransient, the real and the Universal. The sociology of science finds scientific normativity, in the same location naturalism would have predicted: as the referential standpoint that guides the pursuit of a determined set of outcomes. The point of arrival is not ontologically different to the point of departure. Part of the outcome, however, involves separating the products of such endeavour from their source, and thereby constructing a boundary between the domain of realisation and the domain of reference. Upon strict disciplined scrutiny, however, the constructed nature of this boundary is elucidated and re-contextualised, to the detriment of the studied institution’s capacity to assert the certain and non-arbitrary consequences of its prescriptions and value determinations beyond the contextual location of their source.

Like its philosophical cousin, further, the de-construction of the unwarranted jump is taken to have circular consequences, rendering thereby, the de-construction's force as withered as its object. The hidden assumption is that all consequence beyond location requires unwarranted jumping.

This crisis of reference, which results from the reflective scrutiny of "disciplined institutionality" of its own frame of normative reference, is, of course, not exclusive to science, and can be observed throughout modern institutionality. Both within and outside the boundaries of academia, this "crisis of reference" has been referred to as "post-modernity" (Lyotard 1984), and increasingly as "reflexive modernity" (i.e. Giddens 2013; Beck, Bonss and Lau 2003).

Beck (2003), for example, understands the process of reflexive modernisation as a tendency of modern institutions to challenge their own constitutive institutionality upon reflection. He describes it as a radical "distinct second phase" of modernisation, in which the basic social principles, the "touchstone ideas", the institutions (and/or the "stable system of coordinates" of modern society) are "thrown into flux", by phenomena that it produces. This is an event, further, that can only take place on the basis of modernity's own peculiar normative and cognitive infrastructure (2003: 1-8).

2.5.1 Reflexive Modernity

For Beck (2003) "first order modernity" or "first order modern institutionality", which is the state of modern society before its widespread exercise at reflection, is understood as being unavoidably whelmed in paradox. On the one hand, it assumes and allows for a domain of constant change, flux and/or openness. On the other hand, however, the possibility of such a domain is understood to be seemingly contingent on a determined framework: a set of stable and "necessary" institutions, "coordinates,

categories and conceptions” that determine and define the possibility of change; they both provide for it and transcend it. A constitutive aspect of such a “meta-domain” finds form in what Beck calls “a clarity of thought based on several clear distinctions: between society and nature; between established knowledge and mere belief; and between the members of society and outsiders” (Beck, Bonss Lau 2003: 1-2, 10, 15).

The process of “reflexive modernity”, begins to take place as the domain of change, flux and openness intrudes within the (“closed”) domain of reference that was supposed to be a necessary requirement for the latter to take form. In consequence, the assumed stability, necessity and neutrality of the framework finds itself confronted, even rendered contingent, by the openness, flux and change, which it was supposed to frame. Boundaries previously supposed as “stable”, are then “multiplied”. They “cease to be given and instead become choices” (Beck, Bonss Lau 2003: 19).

As an example, Beck offers a description of what he considers to be, a “paradox” of modern institutionalisation, namely, the paradox that results from the dual and related institutionalisation of historicity and the nation-state. On the one hand we find a modern understanding of history as a “cultural *imaginaire*” of “continuous change” embedded with “the consciousness of the constantly renewed uniqueness of the new situation”. Within this worldview, the relation between space and as time is understood as being dominated by the future as opposed to the past (Beck, Bonss and Lau 2003: 10-11).

On the other hand, we find the notion of nation, nationalism and the corresponding institution of the nation-state occupying a meta-domain. This meta-domain formed a framework for history, in such a way that the reality of continuous change became “eternalized into the idea of an autonomous self-reproducing society into the structures and categories of the nation-state” (Beck, Bonss and Lau 2003: 10-11).

History, then, becomes tacitly understood as the history of the nation, and is practiced as the history of nation-state.

Once society is assumed to be contained within a determined space, the understanding of social flux finds itself unavoidably limited by this spatial frame of reference. The nation-state is now understood as the framework for all change, and so seems tacitly, and unavoidably, excluded from the openness that its own framework provides. The hierarchy of the future can now be considered to take place only within the bounds of such a framework, and thereby in meta-theoretical terms the dominance of the future is lost: the stability of the nation-state cannot but presume a “particular hierarchy of history” in which the past and the present are assumed to hold dominance over the future (Beck, Bonss and Lau 2003: 14). Beck (Beck, Bonss and Lau 2003), in this sense, attests that the “openness of the modern world was answered immediately by the closeness of the nation-state, both as an idea and an institutional reality” (2003: 11).

As the modern “openness” of historicity invades the closeness of the nation-state (i.e. globalisation), the assumed stability of the former is perturbed upon reflection. The inevitability of continuous change permeates even that which was tacitly assumed to constitute its own spatial framework. The “*imaginaire*” of continuous change and the dominance of the future thus call into question the nation-state’s identity of space and time (Beck, Bonss and Lau 2003: 12).

2.6 Conclusion

In this chapter I have tried to advance a simple notion: a worldview results from the practice of strict disciplined scrutiny. This worldview is a familiar one; it is the domain of “nature” or the “scientific worldview”. Everything found within this domain-

under-scrutiny is ontologically contingent on everything else; all entities, phenomena and items that constitute its content occupy a specific site in time and space (in more general terms, a site within dimensions). Reference is not an exception. Under the purview of scrutiny, referential standpoints are also situated in time-space and are ontologically contingent on their context. Normativity, in this regard, is found to be a relationship between a contextually prescribed state and a realised situation. The arguments and the evidence that suggest this to be the case are overwhelming.

Contemporary institutions – including and especially science – operate under the presumption that their prescriptions and value determinations hold unproblematic and non-arbitrary consequence independently of the context of their reception or of the source of their production. This understanding of meta-contextual normative consequence, which following previous use, I have proposed to refer to as positivity, results from the performance of a unwarranted de-contextualising jump, in which circumstances sourced from a determined and specific context are generalised as being universal, metaphysical or otherwise meta-contextual. This unwarranted jump is embedded into our language, and forms important aspects of our ways of understanding science and society. That which results from the “jump” however, simply cannot be accounted for by science, and further the strictest forms of disciplined scrutiny challenge it. Upon reflective scrutiny, then, science will find its own normative standpoint as contextually situated. Under the purview of strict scrutiny the boundaries between the domain of reference (or the domain of “humanities”) and the domain of nature (or the domain of “science”) are elucidated as constructed.

This results in a contradiction between science’s normative dimension and the worldview that results from its practice. In more general terms it also results in a

contradiction between the “modern” normative or institutional domains and the social reality that results from these.

In the next chapter I will elaborate on various attempts to provide an account of normative and positive consequence within the boundaries of the worldview that results from scrutiny; in other words, accounts that attempt to provide for positivity whilst maintaining their epistemological and ontological commitments within the boundaries of naturalism.

3. Naturalist Epistemology

3.1 Introduction

This chapter will illustrate the difficulties of attempting a naturalist epistemology. I will argue that the two most important attempts at providing a naturalist account of positivity were unable to overcome the challenge of circularity that seems to inevitably result from naturalist epistemological commitments. In order to proceed under strict naturalist assumptions one cannot claim the a priori positive consequences of one's claims, as this would conflict with naturalism's commitments to contextualism. The solution to this conundrum is to proceed without claiming the meta-contextual purchase of one's position and then attempt to produce a hypothetical (or contextual) imperative. As will be illustrated this is a difficult endeavour.

I begin the chapter by explaining the problems between science and society that ensue when the challenges that strict naturalism presents to positivity are taken seriously. Once positivity, or in this case the universal purchase of scientific knowledge, is questioned, then many of the material consequences that result from science's assumed authority become problematic.

I then proceed to explain Quine's (1969b) position on the matter. Quine (1969b) did not consider that the justification of science was necessary. Most probably this was because he thought that science could explain itself, and by doing so, then provide a hypothetical justification for its relationship with society. As illustrated by Fuller (Fuller and Collier 2004) however, all authority (including epistemic or cognitive authority) carries social consequences. Hypothetical imperatives can only hold consequence if given purchase within a determined context. In light of the problematic relationship between science and society that ensues once positivity is questioned, it would seem that for the continuous procurement of scientific advancement, the

judgement of usefulness or value of scientific knowledge cannot be deposited in the scientists themselves, but rather in society, as the affected agents. Knowledge, from Fuller's (2002) perspective is therefore something different to what we hold it to be in traditional terms.

His account, however, is also problematic. It supposes that those affected can hold the authority to justify such a proposal, but it does not explain how its own commitments to transcendental values are different than the ones naturalism challenges.

The seeming impossibility of producing a naturalist account of positivity, has led to a converging position in both in analytic philosophy and the philosophy of the social sciences. This claims that, in order for science and society to be intelligible, the phenomena pertaining to positivity must be assumed to be of a "different nature" than that which is afforded by strict naturalism. These positions, however, assume a priori that such an account cannot be produced, and therefore that knowledge and positivity must be as we already understand them. I finish the chapter by explaining exactly what requirements a strictly naturalist account of normativity would seem to demand, and providing a hint as to where this approach might come from.

3.2 Science and Normativity

In the second chapter, I elaborated on the problematic circumstance that obtains when strict and disciplined scrutiny gazes either at other points of reference or reflectively at itself. Everything that occupies a place within the gaze of unassuming eyes is found to be "natural". That is another way of saying that it is limited, particular, transient, and situated in both time and space. Within this domain, all referential standpoints are found to be in these exact circumstances. Contextually constrained referentiality, or contextually contingent referentiality, implies self-referentiality. All reference (assuming a strict commitment to this view) is found "contained" in normative

and/or semantic terms, and only allowed to claim the certain consequence of its categorisations, value determinations and its prescriptions for that which regards its own context. In other words, the worldview that results from the practice of science is unable to account for any sort of normative or semantic consequence beyond the framework of its source of production.

The position, for obvious reasons, is problematic. By questioning or denying the capacity for the determinations of a specific site (A) to have non-arbitrary normative or semantic consequence in another site (B) without the latter's express consent, the strongest and strictest commitments to naturalism seem to reduce all social relation to force or agreement. The mere possibility of science and/or society challenges such a view. Human beings operate, at least seemingly, under a common referential framework for both communication and action. The very possibility of agreement or consent, further, supposes a shared framework; one at least that may provide for the "object" of agreement, or consent.

In this sense, whilst some i.e. (i.e. Rorty 1979; Wittgenstein 1953) have renounced the attempt to provide for a viable philosophical solution to the above, others (De Caro and MacArthur 2010, 2004; Putnam 2010, 2002; Longino 2002; Bhaksar 1989; Fuller 2002; Kitcher 2003) maintain that it is only by supposing the possibility of knowledge or positivity as traditionally understood, that the possibility of science and of society is rendered intelligible.

In the case of science, this seemingly unbridgeable incompatibility between naturalism and normativity is particularly troublesome. Science seems to be a profoundly normative endeavour, not only in terms of internal prescriptive dispositions such as

methodology, but also, and most importantly, in its relationship to society. That is, scientific determinations are formally and tacitly received as “objective” and thereby consequential independently from context, but they also operate, in many regards, in similar ways to legislation in the sense that within certain contexts scientific determinations may have commanding effect on acts of public authority. This situation presents a complicated, and even embarrassing, matter for science, as it would seem to be the case that science’s normative dimension is directly at odds with the worldview that results from its practice.

Science is a normative endeavour that acts in ways at odds with what has, in the context of this work, been described as strict naturalism. In the first instance, science is a methodological and therefore prescriptive endeavour. As explained above, this would not be at odds with naturalism (specifically its epistemological component) if science abstained from judging the epistemic value of that which obtained from the adherence to its methods, or in other words, if it maintained a hypothetical attitude in regards to its produce. This, however, hardly seems to be the case.

This is, it is hardly controversial to sustain that “science”, understood as the formal, systematic effort at the production of knowledge, proceeds under the assumption that the adherence to such methodological prescriptions does lead to the production of epistemological value, and that these, further, provide an “objective” framework for epistemic discrimination. Science, for example, differentiates itself and its claims from the claims and practices of other knowledge producing ventures that are deemed, by its own (methodological) standards, as pseudo or un-scientific (astrology, for example). Scientists and/or scientific experts are differentiated from those who are not. The categorisation of practices, intellectual positions, statements, professional

qualifications into headings such as “scientific” or “unscientific”, implies a necessary discrimination, judgement and the assumption of what constitutes a valid source of authority (of whatever sort).

Science does not seem to pronounce these deliberations in the first person, or allude to their contextual validity. Science, rather, speaks in universal terms: it treats its pronouncements as “facts”. In continuance with the above, this would imply that “science” assumes authority which derives from circumstances that are tacitly or expressly posited as being outside the realm of space-time, causality and scrutiny. These are characteristics, further, that, as explained, are unsupported by any empirical account that does not assume their presence in *a priori* terms. If one is willing to concede that “science”, however understood, is committed to the empirical support of its affirmations and to the continuous scrutiny of its body of theory, and whose overall spirit is contrary to the positing of entities that seem to be (as assumed or posited) located outside the possibility of all scrutiny, it is not hard to contend that the bases on which such an organisation is grounded are hardly “scientific”.

If “science”, as currently organised were to proceed from the position that its authority stems from assumptions such as those described above, it would be safe to say then that “science” is a contradiction in terms. It would be afflicted by a negative circularity in which the assumed point of departure for scrutiny and organisation (its normative [epistemological] dimension) would be contradicted and directly challenged by its point of arrival (its ontological “worldview” and its [ontologically uncommitted] results). In other words, “science” would seem to be committed to naturalism in regards to all ontological matters, with the exception of its own framework of reference (its own normative dimension).

In this sense, scientific prescriptions and determinations of value hold formal consequence in society at large. Or in other words, the assumption of science's universal authority over epistemic matters negotiates a complicated normative relationship between science and society, in the sense that scientific (epistemic) judgements have practical, economic and political consequences for society at large (Fuller 2002: 177). For example:

- a) Science and/or scientists, because of their recognition as such, are able to procure vast amounts of economic capital and manpower in order to both conduct their professional activity and extend the products of their work into the domain of laymen. In those cases in which research has been commissioned for a specific purpose, said resources may be subject to scrutiny from the provider (whether public or private) using as a standard the benefit they obtained from them. Most of the time, however, said standards correspond to specific eligibility criteria that are determined beforehand within the boundaries of science itself (Rouse 1987: 212-226).
- b) The accreditation, and "knowledge" formally related to science provides professionals such as "scientists, engineers, and physicians considerable power over their clients and significant advantages in competition for social resources" (Rouse 1987: 240).
- c) More importantly, however, is what could be called "the legislative power of science". In this regard, disciplines and individuals that manage to acquire the formal label of "science", "scientists" or "experts" acquire, as a result, the capacity to "promulgate truthful and reliable knowledge". In this regard, "scientific" or "expert" knowledge plays an important part in the diagnosis and determination of possible courses of action for both individual and social

problems (Rouse 1987: 227). In formal terms, the scientific establishment is the foremost authority concerning the standardisation of the education curriculum and health provision (Fuller 2002; 177, 2000: 8). Finally, it is easily contended that secular states formally defer to the epistemic authority of science regarding that which is to be formally considered as “objective”, “secular”, “valid” or “neutral” in making statements and claims to knowledge.⁶

From the above, a relationship between science (A) and the rest of society (B), or between formal “experts” (A) and “laymen” (B), can be inferred. Again it is identical to that previously described as positivity. In other words, from the above it is safe to affirm that the epistemic judgments of science or scientists (A) have import on the capacity of action of wider society or laypeople (B). However, the determinations of (A) are assumed to be valid before or independently of the participation or position (situation/location/context) of (B). The source ([X] i.e. method) of the normative authority that (A) is able to exert in regards to (B) must, therefore, be assumed as transcending (B)’s situation/location/context (Fuller 2002: 175-189).

In short, the internal organisation of science, as well as its formal relationship to the rest of society, presupposes an epistemic/cognitive hierarchy in which certain individuals ([A], “experts”) have a higher standing than others ([B], “laymen”) in virtue of a source of authority (X) that is independent of both: again Nagel’s (1986)

⁶ This is evidenced by a plethora of examples, of which the most significant are: 1) The admissibility of “expert testimony” for both judicial and administrative matters in most “secular” states is commonly regulated by procedural legislation that defers to “scientific standards” (i.e. Rule of Evidence 702 in the U.S.A. [see Bernstein and Jackson 2004]). And, 2) Even though “secular states” formally distinguish the “neutral” or “secular” from the “religious” or “sectarian”, there are no formal parameters in regards to the determination of this distinction. That is, secular states have not found a manner in which to define religion, and “although many international and regional human rights instruments guarantee rights related to freedom of religion or belief, no one attempts to define the terms” (2003: 189-90). Because science is considered “secular”, in many cases (i.e. educational curriculum) the determination of this distinction falls to the products of scientific practices.

“view from nowhere”: a perspective ontologically (and epistemologically) located beyond that which it observes (nature).

These circumstances, assume that truth, or any other form of epistemic value is (ultimately⁷) obtained by adherence to a set of established prescriptions. That which is scientific, or otherwise valid, is assumed to be that which has successfully managed to obtain such adherence. This assumed source of authority (X), is supposed to hold independent of context or relation (i.e. [A] and [B]). That is, it is assumed to have normative consequence in terms of it being able to categorically distinguish between the “scientific” and the “non” or the “pseudo-scientific”, independent (but without excluding the possibility) of agreement, or of scrutiny from all concerned or affected parties (e.g. those, external to the “scientific enterprise”, whose possibilities of action might be influenced or limited by said normative epistemic normative determinations) (Fuller 2007a: 43-52; 2002: 175-189). This understanding of cognitive authority is equivalent to what Camic and Gross (2001) identify as the “Internal/External” distinction found in the “old sociology of ideas” (see above).

In this sense, factors that are posited as being within the purview of science, such as economic, political forces, psychological issues, or what could be considered cultural bias, are understood as being external to the production of “objective” knowledge and, thereby, problematic.

The solution lies, then, in eliminating these biases by providing for the conditions that would lead to the strictest adherence (of the scientist and scientific practices) to that

⁷ Differently than previous attempts at epistemology or demarcation (Popper 1959; Laudan 1977) other attempts at social epistemology (Kitcher 2003, 1993; Longino 2002) take into account the possible situational determination of “scientific knowledge”. As a result, they offer varying degrees of scientific democracy in order to address the problem. Their normative prescriptions regarding the ideal organisation of disciplined inquiry, however, still maintain a (situational) transcendent standard as the ultimate guiding force of knowledge production. This may take the form of “Truth” (Kitcher 1993), “Truth” plus ethical-political ideals (Kitcher 2003) or and Longino’s (2002) “fit”/“conformance” to “reality” or nature.

which determines the achievement of epistemological value, namely (“rational”) “quality standards of scientific methods and theory”. Within such accounts, social scrutiny, if considered as integral to the process, is understood as a conduct (possibly the most important conduct) to guarantee adherence to the pre-determined standard (see note 6).

This situation also implies a tacit and formal socio-political hierarchy in regards to cognitive/epistemic matters. Since it is implied that the “expert” (A) is (in objective or realist terms - X) more “knowledgeable” than the “layman” (B), then (A) has a higher cognitive/epistemic ranking than (B), also in objective or realist terms (X). “Scientists” and “experts” (A) are then assumed to be those who have managed to reach such “high standards” (X). In other words, it is their relationship with the defining characteristic of “science” that provides them with cognitive authority (in their relationship to those affected by the exercise of their authority).

With this understanding of cognitive authority, the ideal is then to formally reproduce this assumed factual cognitive hierarchy. A boundary between the domain of the experts (A, science), and the domain of the layman (B, society-at-large) is considered to be desirable. In practice, it means that members of the cognitive hierarchy are selected from the top down. That is, those (A) who, as a result of their future formal relation to science will acquire the capacity to act in ways that will affect others (B), are not selected by the bulk of those possibly affected (B), but rather by those who already have a high rank in the cognitive hierarchy (+A). The choosing of future experts and scientists (A) is done by, and according to standards (X) developed by, firmly established experts and scientists (+A) “through examination and publication policies that proceed with little external scrutiny” (Fuller 2000: 8).

Expertise varies in terms of specialisation; an expert (A) in one area is a layman (B) in another. Epistemological or methodological boundaries between fields of expertise or disciplines are also seen as positive. Academic disciplines, in this sense, can be understood as the horizontal dimension of the cognitive hierarchy (Fuller 2002: 191-195, 1997: 49-59).

Many attempts (i.e. Quine 1995a, 1995c, 1990, 1981, 1976, 1975, 1969b; Laudan 1977; Goldman 1999, 1995; Giere 1998, 1988; Kitcher 1993; Kornblith 1994) have tried to bridge the embarrassing and seemingly insurmountable discrepancy between science's normative dimension and the worldview that results from its practice. In this sense, only W.V.O. Quine has attempted to provide an explanation of scientific success without resorting to transcendentalism. That is, continuing his commitments to epistemological, "framework" or "second-order" naturalism, Quine proceeds in his pursuit without assuming *a priori* a definition of "knowledge" or epistemic value.

3.3 Epistemology Naturalised: W.V.O Quine

3.3.1 Quietism and Methodological Constraints

On various occasions (i.e. MacArthur 2004; Putnam 2002), naturalism has been argued as continuous with quietism. MacArthur (2004), for example, holds that Quine's (1969b) "quietist" response to the scepticism that obtains from strict naturalism is unable to diffuse the sceptical challenge it invites (2004: 107). It is important, before I proceed, to clarify some issues in this regard. As will be further elaborated below, Quine (1969b) does admit that, on pain of circularity, science is not able to justify itself. There could, therefore, be grounds to interpret this as "quietism" in line with work such as Rorty (1979) or Wittgenstein (1953). There are, however, categorical differences that must be elucidated, and which show Quine's (1969b) efforts as the advancement

of a philosophical movement that transcends his own account. That is, independent of the fact that Quine's account does result in similar consequences to the "quietist" efforts cited above, his motivations are very different. Quietism capitulates to an assumed incapacity of positive contribution, in the words of Rorty (1979):

Philosophers' moral concern should be with continuing the conversation of the West, rather than insisting upon a place for the traditional problems of modern philosophy (1979: 394).

Strict naturalism, such as that promoted by Quine (1969b) and pursued by the present scholarship, understands the sceptical challenge differently: as naturalism. This challenges the distinction between philosophy and science, and would then locate scepticism (commonly labelled philosophy) as an instance of this now undifferentiated form of knowledge, namely science. This implies that, in contrast to quietism, naturalism does not understand the sceptical challenge as a challenge, but rather as a validation of naturalism, and of the contextual and/or physical nature of all that occupies a place in reality. It holds that science, understood in these new contextual terms, is nevertheless an evidently positive matter (Quine 1981: 22).

Holding that there is no such thing as "knowledge", or that "knowledge" is not beneficial, does not result from the sceptical challenge, nor does it correspond to the results of our experience. It can be safely assumed that "knowledge" or "science" is positive and capable of producing viable and beneficial explanations in a way that science herself has as yet not been able to account for. The only way forward, then, seems to be to attempt to find such an account within already accounted for restrictions of knowledge.

What MacArthur (2004) seems to be conflating, is that naturalism most definitely challenges knowledge as traditionally understood, and in that sense it challenges all social organisation that is justified or informed upon such assumptions. In order to hold that naturalism questions the value of science *tout court*, however, one must hold that scientific value can only be understood in the terms we currently do.

With Quine's naturalism, however (1995a, 1995c, 1990, 1981, 1976, 1975a, 1969b) Quine assumed that science could provide itself with *hypothetical* normativity (Quine [1986] 1996: 664-665). In other words, the assumption was that science could provide a scientifically sourced account that provides itself with a "pragmatic" or "instrumental" source of guidance. As was explained in the preceding chapter, hypothetical, instrumental and pragmatic norms or imperatives do not find themselves at odds with the strict contextualism that results from naturalism. I initially described them as the referential standpoint for the pursuit of a determined outcome, in other words, as the normative imperative that obtains when an empirically supported hypothesis expects a desired outcome. In Ronald Giere (1988), words: "if you want to accomplish goal G, try method M" (1988: 379-380).

Regarding what Quine tries to accomplish, hypothetical normativity can be adequately described as a result of the predictive capacity of any explanatory system. That is, naturalism cannot provide an account of how might it be possible for (A) to claim non-arbitrary normative implications (epistemic validity in this case) over (B). There is no way to account for a non-contextual source of epistemic authority (X). This does not, however, imply that (A) cannot claim anything, it only implies that (A) must withhold judgement; it must maintain a hypothetical attitude in regards to its own claims. If it can be said that a certain set of circumstances (M), lead to a determined

outcome (G), then if agent (B) desires said outcome (G), (B)'s desire or requirement turns into the source of purchase for the normative account (X).

In order for a naturalist account of science to provide a hypothetical imperative that could replace (contingent to the desires of society) the currently operating transcendental assumptions that seem to inform its own conduct, and which are challenged by naturalism, science would need to provide an account of circumstances that explain why science is a desirable endeavour as currently understood.

3.3.2 *Quine's Account of Knowledge*

In his last decades, Quine's work focused on what he referred to as the "genetic project" (Quine [1975] 2009, 1974). This was a naturalist attempt at explaining how it is that humans acquire knowledge, and what relation this knowledge has with the world. Specifically, he set out to explain how cognitive agents "find out about the world from such meagre traces" as "optical projections", "impacts of air-waves on the eardrums" and "gaseous reactions in the nasal passages" (Quine 1974: 2). He attempted to provide a "scientific" explanation of exactly how it is that cognitive agents (and in particular children) acquire a "system of reference", which in turn, accounts for the relationship between evidence and theory (1974: 3-4). Quine's account is elaborate and its particulars are not relevant for our purposes. His specific conclusion on the causal and implicative relationship between evidence, is however pertinent. In his words, it is between the "bombardment of our surfaces on one extreme [and] our scientific output on the other" (Quine 1995b: 349). Quine re-affirms the impossibility of correlating evidence with theory in realist terms. He finds, rather, that the connection between evidence and theory takes place in two phases. The first is causal, "the

bombardment of the exteroceptors causes a neural intake". This is then connected with language (Quine 1995b: 349).

The second and most important link consists of what Quine refers to as "observation categorical". An observation categorical is a relation between observation sentences, "to the effect that the circumstances described in one observation sentence are invariably accompanied by those described in the other" (1990: 10). An "observation categorical", is, in other words, a sentence of the form "Whenever A, B", or "Whenever this, that". An example might be "Whenever there's smoke, there's fire". An observation categorical creates links or connections between observation sentences and language and/or theory through means of successful prediction. Because the observation categorical is constituted by two sentences related by expectation, "true" reference, then, becomes unnecessary. As long as the expected outcome obtains, the agent will refer to the constituents of the observation categorical assuming their referential success. According to Quine (1995b), then, the ultimate relationship between theory, language and/or observation sentences and evidence results from the successful realisation of the expectations contained in observations categorical. Theories, then,

are tested by deducing an observational categorical from it and testing the categorical. If it fails so does the theory. One or another of its component assertions is false and needs to be retracted. If the categorical passes the test, then so far so good. A favourable test does not, of course, prove the theory to be true; it does not even prove the categorical to be true (1995c: 44).

In ways as described above, the above empirically sourced explanations lead to approximations of what exactly (scientific) knowledge is, and also to what it is that science does. It leads, specifically, to the understanding of scientific knowledge as

predictive, and of science's utility and purpose "fulfilled expectation: true prediction" (Quine [1975] 2009: 258-9).

These descriptive and explanatory accounts are able, in turn, to provide Quinean naturalism with a hypothetical capacity of prescription. That is, they provide an explanation of knowledge as prediction-able referential-systems, while the utility of science as the production of successful prediction leads to an understanding of science that is not at odds with the current scientific status quo. It would initially seem, then, that Quine's empirical theory of knowledge works as a naturalist replacement for the foundational accounts that strict naturalism rejects. If so, this would then provide his philosophy with what would seem to be its intended effect: an affront to traditional epistemology and philosophy of science, rather than an affront to science as a practice and as a social establishment.

3.3.3 The Failure of Pragmatism

There are, however, important complications with the above-described solution. The general problem can be described thusly: if Quine's naturalist theory of knowledge is interpreted as above, then, whilst apparently naturalist on epistemological grounds (on account of it being empirically obtained) it is not naturalist in ontological terms. As it will shown, if the epistemological and ontological aspects of a position are not continuous, they will be at odds with one other.

We may start elaborating on the above by explaining how it is, or how it is not, that Quine's "synthetic" theory of knowledge assumes or presupposes the ontological meta-natural.

As was explained above, Quine ([1975] 2009, 1995c) understands scientific theories as instruments for making predictions. This, in turn, is what gives them prescriptive

capacity. By defining what a theory is, Quine (1995c) then is also defining what a theory is not. In this sense, Quine is, either intentionally, or not, providing an account of validity, in the sense that the utility of theory, science, or even knowledge can be valued upon its capacity to predict.

Initially, it would seem that there is no reason to label the above account as meta-natural, or meta-contextual in any way. If we consider nature as that which is located in time and space, contingent on causal forces, Quine's (1995c) functional-pragmatic definition would seem to be unproblematic. It could be understood perfectly well as a hypothesis of the functional (and therefore practical) value of cognitive-semantic phenomena with predictive capacity. That is, in his account of semantic-utility (like all accounts that obtain from scientific, systematic or otherwise experiential scrutiny) entities and phenomena are hypothesised as explainable. Explanations, in turn, do not account for entities of phenomena in virtue of themselves, as doing so would result in circularity. As noted above, Quine (1995b) accounts for the relationship between "bombardment of sensorial surfaces" and "systems of reference" in this very sense: a) observation sentences result from sensorial input; b) whenever a consistent correlation between two or more observation sentences is recorded by the agent, an observation categorical results; c) finally, observations categorical constitute the final link through which evidence and theory find causal connections.

In Quine's (1995c) view, then, "theories", or rather, "systems of reference" are not ontologically independent. Instead, they are contextually situated or spatiotemporally situated. They have a precise causal, and thereby ontological, relationship with the environment. This implies, however, that their capacity of prediction is also contextual and situated. In other words, "sensorial bombardment" in different dimensional (i.e. spatial and temporal) circumstances can always alter the agent's "system of reference"

in such a way that its previously assumed capacity of prediction is rendered erroneous or obsolete (i.e. the inscrutability of the future).

In a “true” naturalist account, in which there is no room for the *a priori*, there is also no room for the ontologically independent, or the causally transcendent. Entities and phenomena are ontologically contingent, and thereby subject to change in virtue of the circumstances of their environment. This also goes, however, for Quine’s (1995c) purported semantic utility. In Quine’s (1995c) account, the utility of theories could be judged based on their capacity of prediction, but such a judgement can only take place from the perspective of the agent or group of agents that produced the theory, and therefore, the judgement is ultimately subjective.

This reading of Quine’s (1995b, 1995c) positive account,⁸ however, leads to widespread relativism, and is, thereby, unable to provide the standards of objectivity that Quine requires in order for it to serve as a hypothetical imperative capable of replacing the challenged epistemological foundationalism that justifies and informs the conduct of the scientific establishment.

This, however, does not seem to be Quine’s reading. In “Naturalism or Living within One’s Own Means” (1995a) he takes opportunity to clarify his position on these matters. Quine concedes that what he calls “perceptual similarity”, described as “a relation between a subject’s neural intakes” is entirely a “private” matter: “any one range of perceptually fairly similar intakes may prompt the subject’s assent to any one of a range of semantically kindred sentences” (1995a: 253).

In contrast with the above, however, Quine holds that “observation sentences and their semantics are a public matter”. He contends that “learning” (specifically in the

⁸ This reading is identical, for all normative purposes, to strict cognitive situationism as described in chapter 5.

case of children) “depends indeed both on the public currency of the observation sentences and on a pre-established harmony of people’s private scales of perceptual similarity” (1995a: 254). He then establishes that:

Intersubjectivity of observation sentences is [...] essential [...] to assure objectivity of science. [...] The sharing of vocabulary by observation sentences and sentences of science was necessary not only for the emergence of scientific language (1995a: 255).

Regarding how his positive account might operate normatively, Quine states: “what might be offered [...] as a norm of naturalised epistemology is *prediction of observation* as a test of hypothesis. I think of this as more than a norm: as the name of the game” (1995a: 258).

From the above, it can be safely assumed that Quine (1995a) reads his “naturalist” account of epistemic-semantic utility, as holding sway in “objective”, rather than “subjective” terms.

This would imply, however, that even though he considers that the causality of this utility or functionality to be contextually situated, he holds that the utilitarian or functional value itself transcends context. In other words, if he assumes that the utility of science, theory or the utility of “systems of reference” holds in “objective” terms, this seems to necessarily imply that it holds independently of ontological situation and therefore independently of the cognitive circumstance of the agents who might be involved or affected in/by the consequences of the (assumed) prescriptive.

According to this interpretation of the account it may very well be the case that in a hypothetical relationship between two determined agents, (A) and (B), each holding a different position regarding a particular matter that concerns them both, (A)’s position (or [A]’s “system of reference”) has, in objective terms (X), a greater predictive

capacity than (B)'s position. According to this interpretation of Quine's (1995c) theory, for all practical purposes, (A)'s position, then, would be considered more useful than (B)'s, and it would, thereby, be considered to have, again in objective terms, more practical or pragmatic value.

Quine's (1995c) account would seem to assert that a course of action that results from the prescriptive capacity of (A)'s position, that may have implications for both (A) and (B), is, in objective terms (X), and therefore irrespective of (B)'s position or cognitive circumstances, a more positive course of action. In other words, according to Quine's position it may very well be the case that (A) has, in objective terms (X), cognitive authority over (B).

Within his hypothesis, therefore, Quine has committed the de-contextualizing jump. Quine (1995a, 1995c) seems to make an unwarranted ontological jump from causally (and therefore contextually) determined semantics and predictive capacity of theory, to objective, non-situated semantic utility and value.

Once the value of predictive capacity holds irrespective of its site, semantic utility, within Quine's (1995a, 1995c) hypothesis, turns ontologically independent. It operates, therefore, as a meta-contextual source of authority. Within Quine's ontology, such a source of authority is beyond the domain of change and therefore beyond the domain of (experiential) scrutiny. This means that, as mentioned above, it is beyond the scrutiny of science and within the bounds of the *a priori*.

As such, by means of the described unwarranted ontological jump Quine (1995a, 1995c) is, tacitly and unknowingly, importing the *a priori* into his account. By reducing inter-subjectivity to objectivity he is incorporating assumptions of ontological independence that do not result from his causal explanation. In order to maintain

methodological (and, in this case, epistemological) naturalism, Quine cannot make such an unwarranted jump, and maintain the utilitarian value of prediction within the same context of its cause. This would result in a subscription of strict ontological naturalism continuous with his epistemological position. This would also imply however, that within his hypothetical account, semantic utility cannot prescribe beyond “site” or “system” (a condition that he had already subscribed to in meta-theoretical terms).

Once dissected as such, it is clear again that Quine’s (1995c) (naturalist) theory of scientific utility (or of instrumental, utilitarian and/or functional scientific validity) cannot operate as replacement for the meta-theoretical normativity that the negative components of its position challenge. Quine seems to be forced to either forgo the normative capacity of naturalism, at least as accounted by him, or he must forgo naturalism altogether.

Without the capacity to act as a positive norm, Quine’s (1969b) version of (epistemological) naturalism, does however, constitute a challenge to the traditional (and operating) understanding of scientific validity and thereby a challenge to manner in which science is currently practiced and organised. MacArthur (2004) is, in a sense, correct. Naturalism does not challenge the validity of science, but it does challenge its claims to contextual transcendentalism and universalism. This, in turn, does represent an affront to the manner in which we currently understand knowledge.

Using similar arguments, Hilary Putnam (1982) famously decreed that reason cannot be naturalised. Most of the following “naturalist” attempts (i.e. Goldman 2014, 1999, 1995; Giere 1998, 1988; Kitcher 1993; Kornblith 1994; Laudan 1977) assume the presence of some sort of meta-contextual standpoint which provides them with the capacity to account for the value and epistemic consequence of their position in terms

prior to the undertaking. This eliminates the threat of circularity, but also the possibility of a strict naturalism in both its ontological and referential standpoint.

With pragmatism and other instrumentalist accounts of normative consequence, Steve Fuller (Fuller and Collier 2004) finds that a problem lies in the fact that “pragmatism lacks a theory of power” (2004: 215). Commonly, pragmatism assumes that pragmatic determinations are able to hold non-arbitrary consequence for two agents ([A] and [B]) independently of their consent and will. As such, pragmatism also assumes its prescriptions and value determinations are objective, and in a sense independent of context. That is, with pragmatism, it is possible to distinguish between its contextual commitments in regards to source and in regards to its claims to currency or consequence. In terms of the circumstances that give rise to pragmatist determination, it is definitely the case that pragmatism is committed to contextualism. That is, it determines fortune or utility in regards to success or consequence, and therefore in regards to causality. In that which regards the exogenous or meta-contextual consequence of its determination, or in other words, in that which regards the domain of validity for its determinations, pragmatism does not seem to be necessarily committed to contextualism, or rather, it does not (necessarily) take it into account. Unlike constructivism, contextualism is not a constitutive component of pragmatism. Social context and social phenomena do not necessarily impinge on pragmatic determinations. When a pragmatic account of semantic and/or cognitive utility that does not explicitly take into account social matters is confronted with the seemingly necessary social and/or relational constitution of normative, or positive, phenomena, the pragmatic account is shown to have a contextually transcendent account of non-arbitrary normative consequence. In Fuller’s words:

No one follows a hypothetical imperative in isolation from other people and other imperatives. [...] The pragmatist misses here what has traditionally been regarded as the source of the normative dimension of such imperatives (Fuller and Collier 2004: 213).

The project of naturalist social epistemology (Fuller 2007, 2006, 2002, 2000, 1997, 1993; Longino 2002; Kitcher 2003, 1993; Rouse 1996, 1987) departs precisely from such realisations, namely that positive phenomena (positive norms, and in this particular case knowledge), can only be understood as social. In the case of Fuller (2002) the argument is stronger: all authority, including cognitive authority, that assumes to transcend the social (e.g. [A]+[B]), assumes itself as having transcendent validity. Therefore, an epistemology that provides an account of knowledge in which knowledge is said to hold its normative purchase in regards to circumstances internal to its production will inevitably fall into the decontextualizing jump. This is identified by Fuller (1993) as “internalism”, and its identification marked the beginning of what is recognised as social epistemology.

3.4 Social Epistemology

3.4.1 Analytic vs. Naturalist Social Epistemology

Most of the work under this heading observes the evidence produced by the STS and the SPSSK and thereby all of it is, in the study of reference, naturalistically inclined. However, only Steve Fuller’s naturalist epistemology (i.e. 2002, 1997) and Joe Rouse’s (2003, 1987) account of scientific practices subscribe to strict naturalist commitments in line with those proposed by Quine (1969b).

It is important to note that, unlike other thinkers who share a similar object of study, this methodological position allows the authors at hand to diagnose problems

regarding knowledge production that would be otherwise undisclosed to those methodologically committed to a prior understanding of knowledge.

Unlike other authors who also understand knowledge in social terms, these authors find profound problems with epistemological assumptions that guide the conduct of science. They also find that any assumptions of positivity or knowledge that assume a source of authority beyond the relationship between the involved agents can be very problematic. In consequence, they differentiate themselves from others in finding science's present status quo highly problematic.

In this regard, Fuller stands alone in prescribing a complete overhaul of the scientific establishment, which follows directly from the problems identified. I follow Fuller (2007) in distinguishing these two different camps of social epistemology as "naturalist" (those in agreement with a Quinean stance) and "analytic". In order to illustrate how *any* a priori assumptions regarding the nature of knowledge and/or positivity can be problematic in both practical and theoretical terms, it is useful to compare Steve Fuller's program with Helen Longino's (2004).

Amongst the most naturalist committed works in the analytic camp (i.e. Goldman 1999, 1995; Longino 2002; Kitcher 2003, 1993) is Helen Longino's (2002) *The Fate of Knowledge*. Here the author offers a solution that might seem successful at first glance. She diagnoses the deadlock between the sociologists and the philosophers as a misunderstanding centred on a dichotomising view of the rational versus the social (Longino 2002: 77). As a solution, she proposes to draw from social scientists and redefine rationality as a social process, while maintaining a philosophical notion of knowledge.

As mentioned, her naturalist commitment is ample. She subscribes to an understanding of contextually situated knowledge as well as knowledge producing practices. She contends, furthermore, that “scientific observation is dialogical in nature”, and she proposes to treat subjects of knowledge as “located in particular and complex interrelationships, [as well as] acknowledging that purely logical constraints cannot compel them to accept a particular theory” (Longino 2002: 128).

Longino (2002), however, understands knowledge following a transcendental or meta-contextual approach of representation. In other words, she posits the presence of an objective referential standpoint. Upon this, she holds, it is possible to establish if a determined “model”, or theory, “fits” certain aspects of reality. She concurs, however, with the sociologists in the sense that the choice of these models may also depend on goals (2002: 118). Models may be chosen socially, but only amongst those that “conform” (2002: 89). Knowledge, then, is an honorific term awarded to content that successfully describes or predicts (Longino 2002: 121).

By combining this philosophical notion of knowledge with the social practices involved in knowledge-production, Longino arrives at a definition of knowledge, based on her notion of “social-rationality”:

Some content A is epistemically acceptable in community C at time t if A is supported by data d evident to C at t in light of reasoning and background assumptions which have survived critical scrutiny from as many perspectives as are available to C at t, and C is characterised by venues for criticism, uptake of

criticism, public standards, and tempered equally of intellectual authority (Longino 2002: 135).

Longino's (2002) is committed to naturalism to a great degree. It can be clearly seen here, how, differently than Quine (1995a, 195c), Longino accounts for the normative relationship between different agents in a naturalist manner. As might be recalled, norms require two domains: the realised and the standard (or the ideal). In nature, one can only find these two domains occurring within a pursuit of outcome: the standard corresponds to the desired state, and the realised to the diagnosed circumstances. Norms, including epistemological determinations, can only be understood as part of the departure point (or the referential standpoint) for the pursuit of outcome. This includes semantic order and expectation. From a social perspective, then, the only non-arbitrary norm is one expressly agreed by the members. Those (B) under the consequence of norms which they have not agreed upon are then, from this perspective, subject to determinations pursuant to reference determined by others (A). In this regard, Longino's (2002) account of norms seems to contextualize reference within discussion and deliberation.

Longino's naturalism, however, is limited, as she does posit a "predetermined" reference that operates within the system independently of context or site. It is constituted by objective "fitness" of "models" (her preferred understanding of theory) to "reality". This is actually the only component of her account that excludes her from the naturalist camp. This component saves her, as well, from the conundrums of circularity: her account, I presume, is to be counted amongst that which "fits".

Longino's (2002) account would seem to be perfectly successful at first glance. Her de-contextualizing jump seems to be harmless. That which "fits", however, is still nevertheless independent of context. It is easier to illustrate exactly where this minimal component of transcendentalism may be problematic, by comparing her account to Fuller's social epistemology (Fuller 2002, 2007a, 2009; Fuller and Collier 2004).

Like Quine (1969b) Fuller, although avoiding defining knowledge in *a priori* terms, also holds knowledge and science to be evidentially positive matters. Unlike Quine (1995a, 1995b, 1995c), Fuller (2002, 1993; Fuller and Collier 2004) is not out to explain knowledge as we currently assume it, or explain what role knowledge plays in justifying the status quo of knowledge producing practices. Fuller (2002), rather, supported on empirical evidence provided by the social sciences, is out to find exactly what's going on in science without assuming that knowledge is what we currently think it is, but assuming, nevertheless, that it is a positive matter.

Fuller (2002) takes the empirical evidence provided by the social sciences seriously, and therefore holds that a source of authority (X) that is un-revisable, non-contingent to the causal forces of its spatial-temporal context, and un-situated in nature, is unwarranted. If this is the case, and science's validity is different to that which legitimises its cognitive hierarchy, then in a situation such as that described above, the primary incentive of science's highest ranking members (A+) is to maintain or further the hierarchical structure of the establishment, in spite of the consequences this may have for the production of knowledge.

From a naturalist perspective, in which it is doubtful whether it is possible to delimit science, and/or areas of expertise in non social and therefore purely epistemological grounds, this results in various practical and political problems related to the production of knowledge. They take the form of a vicious circle in which science's interests and incentives as a class (A) are geared towards furthering the gap between them and the rest (B) so as to reduce competition as well as necessary risk seeking and taking (Fuller 2000: 7-46). This may work in the following ways:

- The scientific hierarchy is able to set the evaluation criteria of its own activity. That is, it establishes the appropriateness of methods. As the benchmarks of "progress" or "improvement" are altered to benefit the current orthodoxy, the history of standards is altered as well, so that it appears that the current situation would also seem positive from the perspective of previous times (Fuller 2000: 10, 2002: xx-xxi, 2007a: 25).

- With new theories or research approaches that might seriously challenge the current orthodoxy and therefore the hierarchical arrangement of the discipline in question, the lack of external scrutiny allows the established structure to decide how will they incorporate or import theories into their research. In this sense, it is then in their best interests to "capitalise on their initial conceptions, and ignore - not test - the theories that challenge" these (Fuller and Collier 2004: 32). Furthermore, as scientific research begins to increase in terms of scale, growing in terms of "size, complexity, hierarchical level and [required] material investment", the incentives to allow challenges are reduced dramatically (Fuller 2000: 29).

- If, however, a significant challenge is being posed from *within* (scientific hierarchy), or a specific scientific movement manages to acquire the social, political and economic capital required to compete against the established status, the former competitor will most probably not disappear, but rather a new discipline will find its place amongst the others. Two disciplines may then have orthogonal objects of study, (such as cognitive psychology and neurophysiology). This is equivalent to a spatial (as opposed to a temporal) paradigm shift in Kuhnian (1970) terms. In this sense, “disciplinary boundaries may be seen as fault lines that conceal future scientific revolutions” (Fuller 2002: 195). In this regard, maximising the available pool of research funds would not necessarily translate into increased knowledge production but rather “enable all to continue on their current trajectories as they see fit” (Fuller and Collier 2004: 43).

All true scientific progress, then, can be understood as a transgression of boundaries, since it is precisely the scientific hierarchy in its horizontal dimension that serves as the most pressing social epistemological problem. This doesn't imply that, under the organisational assumptions at hand, scientific research will not lead to *any* results that might translate into practical benefits. It does mean, however, that the incentives are not geared to that purpose, but rather to the maintenance of the present status, the accumulation of resources, and the increased cognitive separation between “expert” and “layman”. As this takes place, the layman begins to rely increasingly on the opinions of experts, to the point where a greater number of issues are increasingly removed from the arena of public debate and placed under testimony of “scientists” (Fuller 2002: 11). This leads to the main political problem that arises from this situation, namely that:

carried to its logical extreme, cognitive authoritarianism of this sort would claim that the only decision that the public is entitled to make is to fund more social scientific research to determine the identity of the 'public interest' from the many misleading things that people say and do (2002: 287).

In light of the above, the question arises of how science is to be organised. For Fuller (2002), the endeavour of naturalist epistemology involves the continuous search, revision and scrutiny of what knowledge is, and of what precisely the "ends of knowledge" are. Social epistemologists would be charged with conducting such research. In Meta-theoretical terms, "knowledge" is not defined. Nor is "epistemic", "semantic" or "cognitive" utility, fortune or success. The social epistemologist would constantly operate in *media res*, treating each studied case of knowledge production as the best case of knowledge production and then judging its fortune upon its own terms in order to produce prescriptive import for the future (2002: 24-30).

This still leaves open the second component of the naturalist vs. normative conundrum. The revise-ability and changeability at the base of all socio-epistemic prescription recognised by Fuller's meta-theory (or in other words his commitment to hypothetical attitude such as that of Quine [1969b]), would eliminate positive capacity of all prescription. For Fuller, however, normative import does not, in fact cannot, result from the account itself. This would constitute an attempt at normative "internalism" and thereby result in a necessary collapse into meta-contextual or transcendental epistemology (and/or positivity *tout court*). There is, however, another choice. In Fuller's (1993) words, although there might not be "an epistemically privileged mechanism of conferring epistemic privilege it does not follow that there is no non-epistemically privileged way of conferring privilege" (Fuller 1993: 107; Fuller

and Collier 2004: 90). Epistemic privilege, according to Fuller (2002) is a social function (2002: 188-9) and thereby, epistemic consequence is contextually determined.

Following this line of reasoning, it is easy enough to determine where Fuller (2000, 1997; Fuller and Collier 2004) finds the source of contextual normative consequence (X). He finds it in (B) those affected by the endeavour of research, either economically, or on account of the possible implications of its claims. In short, Fuller (1997) holds that science, for both epistemological and political reasons, should be responsible towards those its conduct may affect. Specifically:

1. If scientific knowledge is indeed a 'public good', then the government needs to scrutinise both the rate and the distribution of return on the public's investment in science.
2. If scientific knowledge is not a public good, then special interest groups should invest in the sorts of inquiries that are most likely to serve in their respective constituencies. This will involve considerations of both the process by which knowledge is produced and the products themselves. In addition, raising the support needed to produce a favoured form of knowledge may require expanding the base constituency through proselytizing and marketing" (1997: 3).

In order to achieve the above, Fuller's political social epistemology proposes a complex and sophisticated project that seeks to subject scientific practices to wider social scrutiny, by appealing to the elaboration of a republican constitutional regime for science. In this, the currently assumed "transcendental" authorities are replaced by social counterparts that have a final direct link to those directly interested in the production of knowledge (Fuller 2000: 100-55, Fuller and Collier 2004: 187-260).

Identifying this situation as a pressing political – but most importantly socio-epistemological – problem, Fuller’s program seeks to address the situation by prescribing a new set of normative principles for the organisation of science. The project basically involves reorganising all scientific efforts upon the principles of “the civic republican tradition of democracy” (Fuller 2000: 11). In practice, this would translate into a “constitution of science” whose prescriptions would provide the necessary social and political scrutiny for cognitive authority that seems to be unnecessary for traditional epistemology and absent in the current *status quo*. The general spirit behind such a suggestion is to “recast disciplinary boundaries as artificial barriers to the transaction of knowledge claims” (Fuller and Collier 2004: 31), and to place researchers “in direct competition with one another where they previously were not”, in order to force them to account for their findings “not only to their own discipline’s practitioners, but also to the practitioners of other disciplines and maybe even the public” (2004: 23).

The hypothesis is that such a regime would transform the normative dimension of science from its current “geometrical” model, in which the normative component is understood as located in a higher (metaphysical/epistemic) ground, into a “dialectical” model, in which a meta-normative form (i.e. epistemic republican constitutionalism) allows the normative dimension (i.e. principles for production and epistemic judgement) to be in constant conflict with the empirical dimension or the practice of science. This locates all knowledge within the possibility of scrutiny and change, subjecting all cognitive hierarchy to the same conditions. In short, it leads to the “perpetual project of preventing any form of knowledge from becoming a vehicle of power” (see Fuller 2000, 2002; Fuller and Collier 2004).

It is now easier to see the how Longino's (2002) objective framework may be problematic. As outlined above, she proposed a contextual understanding of knowledge, based in her contextual understanding of rationality. The key feature of her proposal read as follows: "content A" counts as "knowledge" in a determined community C at a determined t as long as it "survived [...] scrutiny from as many perspectives available at C and C is characterised by venues for criticism". The only limit she places on her seemingly all-inclusive social account of rationality is an objective referential, which she holds is able to determine if a specific "model", or theory, "fits" certain aspects of reality.

In comparison with Fuller's (1997, 2000; Fuller and Collier 2004) account, Longino's (2002) objective standard seems either redundant or problematic. That is, if it is designed to allow some (A) to determine that the cognitive/epistemic participation of others (B) does not "fit" the standard (X) and thereby cannot form part of the discussion C, then Longino's ideal epistemic circumstances are identical or closely related to those Fuller is attempting to amend. If this is not the case, and (X) is not designed to provide some (A) with the capacity to evaluate the cognitive/epistemic products of others (B), then Longino's (2002) ideal epistemic circumstances would seem to include society-at-large, and would thereby be reduced to something very similar to what Fuller (2002) is trying to propose.

Steve Fuller's attempt, therefore, seems to be the most viable proposal for a normative framework that avoids falling into any sort of epistemological transcendentalism. The attempt, however, also seems to be laden with crippling flaws.

3.4.2 Problems of the Republic of Science

Fuller's (2002) account takes off from epistemological naturalism. That is, it continues from the results of the strict and disciplined, specifically sociological, scrutiny of science's assumed meta-contextual frame of reference (i.e. SPSSK and STS). In this sense, Fuller's proposal begins by taking the contextualisation of science's referential framework seriously. In response, however, Fuller offers another meta-contextual framework for positive value determination and prescription: a universalist political framework of reference. As a sociologist, his answer to the identified problem finds itself at odds with the very same reasons that prompted such an answer. In other words, the identified problem resides in the fact that sociological scrutiny finds all referential frameworks to be contingent on context. This means that the characteristics of a determined referential framework, are contingent on the circumstances from which they result. They respond to the pursuit of an outcome that, in sociological terms, cannot be anything but an outcome determined by those who have the power to do so.

In the words of Joe Rouse (1991), Fuller's proposal constitutes "disembodied policy for embodied knowledge".

Fuller (1991) responds as a philosopher, claiming that evaluative rhetoric and normativity are a "transcendental condition of society", as they are necessary for its possibility. What needs to be done, rather, is to create circumstances that allow for complete openness as to which practices will embody the norms and values of a society. If this is granted, from the perspective of political and legal philosophy, the question remains of whether Fuller's republic of science, as proposed, would be able to achieve such a feat.

It would initially seem so. In practice, constitutions that purport to follow principles such as those endorsed by Fuller (2000: 11-27) do seem to provide the means for revision, correction and challenge of every principle (and therefore every social focus of value) they contain, including their own tenets. Article Five of the Constitution of the United States of America and Article 135 of the Constitution of the Mexican United States are both examples of the above. Civic republican constitutionalism would, in effect, work as viable means to subject the organisation of science to a dialectical model in which all principles, including the normative dimension, could be subject to the scrutiny of scientific practice.

On closer scrutiny, however, one is able to find various meta-theoretical principles that cannot be scrutinised by the system even if one were to assume its ideal operation.

Consider, for example, the case of determining the franchise; that is, deciding who is allowed to take part in the political system (those allowed to vote) in the system established by the “civic republican” constitution. Contemporary social and liberal democracies, for example, limit the franchise to what they define as “nationals”. These definitions, which ultimately translate into theories of ethnic or political difference (i.e. theories of citizenship and nationalism), delineate social boundaries very similar to the scientist-layman boundary opposed by Fuller (Fuller and Collier 2004). In this sense, within a political sovereignty such as the one Fuller (2000) suggests for science, it is the representatives of those allowed to take part who determine who will be allowed to take part in a manner not dissimilar to the way that academics and scientists who are already established are the gatekeepers of the scientific “establishment”. As such, even if it were the case that “civic republican constitutionalism” were exempt from acting as a vehicle of power (i.e. an ideology), the determinations of those allowed to take part within such a system will still be made by those who already partake and, most

possibly, by those who have the greatest possibility to do so. This is the case in every constitutional democracy.

It is arguable that in practice, these precise determinations translate precisely into what is suggested above, namely, into groups of individuals exercising un-scrutinised power under the auspices of universal legitimacy. At many times authorities and other agents who are (at least theoretically) under the formal scrutiny of the constitutional powers that represent a particular franchise (i.e. the electorate of the USA) exercise authority and power over actors who are excluded from such rights (i.e. foreign nationals) legitimised upon determinations that were, in no way whatsoever, influenced or produced under import or scrutiny of the most affected parties. Who will constitute the franchise of Fuller's (2000) republic of science, then, is a key question to answer. We must ask who might be able to escape scrutiny, and thereby lack any incentive to change or challenge aspects of an arrangement from which they benefit politically.

Finally, it would seem to be the case that the principles of civic republican constitutionalism themselves are theoretically available for scrutiny by the very system they establish. This arguably allows all, even meta-theoretical, matters to be held under scrutiny. They are not, however, even in theoretical terms, located in the same circumstances they prescribe upon and evaluate. What impact, then, does the fact that discussion and deliberation is ultimately guided by these principles have on the discussion and deliberation of opposing or incommensurate political positions? The point is that even within a purely philosophical examination of such political positions, it is also possible to find pockets of sanctioned arbitrary determination within their own premises and in regards to their own framework.

Fuller's proposal, like that of many liberals, conventionalists and constitutionalists (Linz 2000; Popper [1962] 2011; Gaus 1994; Ackerman 1991; Habermas 1984) seems to assume that its own prescriptions or valuations as to what exactly counts as "open", "plural" or "democratic" count as beyond its own evaluative framework. The account, however, is unable to provide reasons for such a stance on its own terms.

Notions such as these have been quite possibly the most targeted objects of sociology in general and of the sociology of knowledge in particular (i.e. Foucault 2002; Marx 1977; Mannheim 1936). For an illustration of how such a position is problematic, consider the following critique of Juan Linz's (2000) description of what counts as a totalitarian society, using the naturalist framework so far followed in the present work.

Juan Linz (2000) argues that the main difference between non-authoritarian ["democratic or open"], authoritarian and totalitarian regimes is the presence of an overreaching "ideology", a "set of central ideas" which guide all aspects of society and promote "mass organisation" and the participation of all members in the reproduction of the system (2000: 67). In opposition to these circumstances, he offers the description of the democratic society as one that allows the free formulation of political preferences through the use of basic freedoms of association, information and communication, which then provide for the free competition between leaders. He claims, further, "Liberal political rights are a requirement for that public contestation for power and for the expansion of the right to participate in elections" (Linz 2000: 58).

Linz's (2000) distinction, however, does not seem to categorise "liberal political rights", as an overreaching "ideology" or as a "set of central ideas" which might guide all aspects of the society. Doing so, however, would imply such a description of the democratic society as to fit perfectly with his account of totalitarianism. From another (possibly Marxist) perspective, liberalism can be perfectly understood as an

“overreaching ideology” which through the means of mass consumption, elections, debate, competition, etc., promotes “mass organisation” and participation in the reproduction of the system. Both the “totalitarian” and the “democratic” normative frameworks can be understood, from the perspective of the naturalism so far followed in the present work, as very similar circumstances: both correspond to a referential standpoint that serves as the departure point for the collective pursuit of an outcome that is determined by those who have the power to do so.

It was the naturalisation of science, in the first place, that which prompted Fuller (2002) to offer such a solution. In this sense, it is important to note that the empirical work on the matter (i.e. SPSSK and STS), researched scientific practices that operated within the context of political systems whose theoretical premises are in line with what Fuller suggests. That is, the circumstances that Fuller elucidates operating within science are sociological circumstances of an establishment operating within the bounds of constitutional democracies. The social context that leads to the sociological circumstances explored by the SPSSK and STS within the scientific establishment and which provides for the construction of a universalist framework of scientific truth, are, then, the very same that lead to whichever circumstances allow for the construction of the universalist framework of constitutionalism and its corresponding philosophy (universal rights, liberalism, representative democracy, etc.). In other words, if we consider that, from a naturalist perspective, normativity is equivalent to a standpoint for the pursuit of a determined outcome, the problematic aspects of scientific endeavours constitute part of a power structure that provides for determination of outcome by some (A) at expense of others (B), and whose global normative framework is precisely constitutionalism. From a sociological standpoint, there is no reason to believe that universalist constitutionalism is a solution rather than yet another

construction, contingent on determined sociological circumstances and specific power relations.

There has been a sophisticated effort to hurdle the circular implications of that obtain from the relationship between normativity and naturalism. Even so, the attempts to find a possible account of normativity that may be able to fill the vacuum that is left after the gaze of science by the thinkers most strongly committed to naturalism, namely Quine (1995a, 1995b, 1995c) and Fuller (2002, 2007a, 2009; Fuller and Collier 2004), seems to fall back, in one way or another, on that which they are trying to avoid. In this sense, there seems to be no way to produce a hypothetical imperative without assuming the a priori in one sense or another. Quine de-contextualised the purported purchase of “knowledge” as he hypothesised it. Fuller, in turn, identified the internalism that plagued naturalist accounts such as Quine’s, and realised another by not accounting for the relationship the science (A) and society (B). They all assumed transcendentalism in one way or another. The only way to hurdle these circumstances and provide for a truly naturalist account of science that would also not be problematic in practical and political terms, was to prescribe the establishment of a system in which (A) science was accountable to (B) society. The prescription of this system however, required the positing of transcendent values and norms. By doing so, Fuller falls back into assuming the meta-contextual positivity he critiqued in the first place.

3.5 Indispensability

We seem then, to be left with two positions – or two domains – that are, at the same time, irreconcilable as well as indispensable to each other.

The first of these corresponds to the worldview that results from strict disciplined scrutiny. It is the “world of nature”. It is explainable and sometimes predictable. It is causally (or otherwise ontologically) contingent on its context and environment; it is available to our senses.

This worldview, however, is seemingly unable to explain most of the phenomena that are arguably necessary for the conduct of society and make science possible. It is unable to explain reference that is not contextually determined, and as such, it is unable to account for non-arbitrary categorical norms, or for semantics. In virtue of being unable to account for value and prescription beyond context, it is unable to account for good or bad, but most importantly for worse or better, and as such it is unable to account for progress.

On the other hand, we have what would seem to be the domain of non-contextual reference. It allows for the explanation of everything that naturalism does not, but seems to be unsupported by both empirical and philosophical matters.

These circumstances, this apparently “indispensable” marriage between immanence and transcendence, has led to a convergence of thought in both analytic philosophy and the philosophy of the social sciences. The position, for general purposes, can be appropriately called “indispensability” and includes that which in analytic philosophy has been increasingly referred to as “liberal naturalism” or “Broad scientific naturalism” (i.e. Putnam 2010, 2002; De Caro and McArthur 2010, 2004). It has been established for some time now as “critical realism” in the philosophy of the social sciences and social theory (i.e. Sayer 2000; Bhaksar 1989; Archer 1995). The general position that unites these different authors seems to result directly from the addressed discussion. They commit themselves to the strongest possible rendering of naturalism, limited to that which challenges the intelligibility of science and/or society.

In more elaborate terms:

- 1) They all hold that the worldview that results from the strictest scrutiny, naturalism, is unable to account for features of reality that are “indispensable” for the possibility of science, or for the conduct of society. Amongst these requisite items, or phenomena they count:
 - Norms and/or all sorts of normative notions, including “ineliminable epistemic values” such as “coherence”, “universality”, “rationality” etc., as well as political, ethical or moral “values”, “realities” or “universalities” (MacArthur 2010; Putnam 2010, 2002).
 - “Truth” understood in realist terms as reference to an “intransitive dimension” (Sayer 2000; Bhaksar 1989)
 - “Concepts”, “semantics”, “meaning”, and/or “ordinary language”, understood as the whole vocabulary we have for describing the world of human agents (Putnam 2010).
- 2) They all understand this troublesome collection as “natural”. Not of the same ontological nature as the object of study of the natural sciences, but “natural” nonetheless. This domain, which is identical to that which we have been referring to as the domain of reference, corresponds to the object of study of the social sciences, and therefore to a “second nature”.

The circumstances that led to this convergence are particular. “Liberal naturalism” stems from a need in analytic philosophy to locate these troublesome items in order to avoid the embarrassing circumstances of having science being organised upon non-

scientific assumptions (see De Caro and MacArthur 2004). “Critical realism” results from the need to provide philosophical grounding for a discipline as inherently reflective as sociology (Sayer 2000; Bhaksar 1989). The result is similar: both camps assume an objective framework of reference in order for social science to conduct its work. However, they must remain agnostic as to which references hold true and which ones hold false. Philosophy, already relegated to an under labourer for the sciences, is now placed under the social sciences as well, as epistemology becomes the subject matter for these.

A very useful philosophy obtains as it allows for the scrutiny of both “nature” and “social nature” without the burden of circularity. Philosophy is rendered as a necessary evil that allows for this ontological distinction between the subject matter of the sciences and that of the social sciences.

This compromise, however, is also problematic. For example, a naturalist perspective allowed Fuller (2002) and Rouse (1987) to identify politically problematic circumstances in one of the least politically vulnerable sites, namely the scientific establishment. The problem found is not one of ontology, but rather one of authority: the authority of the value determinations and the prescriptions of a determined site or agent (A) to have material consequence upon the circumstances of another site or agent (B) legitimised upon a assumptions (X) whose account and/or explanation is troublesome in regards to the results of (A)’s practice.

The liberal naturalists and the critical realists fall into a fallacious conservatism. They find naturalism to question the way we understand science, society and even language. Because the source of such a position is actual science, actual society and actual language, they assume naturalism to be self-defeating, and thereby, look back to science, society and language in order to discern exactly what assumptions must be

held in order for these to remain “intelligible”. They then subscribe to these assumptions in order for this to be so.

They fall, ironically, into the naturalistic fallacy, and into an unwarranted sort of conservatism in result. This is they are claiming that things should be a certain way because they already are that way. Putnam (2002) for example, holds the following:

Each and every one of the familiar arguments for relativism (or contextualism) with respect to ethical values could be repeated in connection with these epistemic values. Rather than accept those arguments in either case, what we need to do is recognise that both ethical values and epistemic values are indispensable to our lives. [...] Indeed, the demand that we accept only what we can give a reductive account of would, [...] eliminate only value-talk, but talk of reference as well as talk of causality, talk of counterfactuals, and much besides. Something indeed is wrong here, but it is reductionism (alias “*naturalism*”) that is wrong and not value talk (Putnam 2002: 132).

In so many words, they are claiming, as many have before them, that if the produce of strict and disciplined scrutiny is challenging the way we understand the world, it must be the scrutiny which is wrong and not the way we understand the world. After all, it is from this world we so comfortably understand that scrutiny came to be in the first place. They are then denying the possibility that there is something to be found on the other end of strict naturalism. The matter of “indispensability” is better understood when placed on its head. All significant social and philosophical changes proceed from a departure point. All philosophy proceeds from previous philosophy and all society proceeds from society as well. The circumstances of arrival must necessarily be different to those of departure, hence the change. In this sense, if one connects to the history of science, or rather, to the history of scrutiny in general, the negative component of naturalism, that which challenges the way in which the world

is currently understood, is more adequately understood in the way Quine (1969a) did, namely, as the opening for a way forward. Against Quine (1995c) however, everything suggests this new way will provide a very different understanding of science and society.

In summary, against Putnam (2002) if it is the case that naturalism (and therefore science) is challenging the ways we understand science, society and language, then it is most probably the case, considering that science has proven once and again to lead into positive outcomes, that it is not science and naturalism which are wrong, but rather our current understanding of science, society and language.

3.6 Conclusion and a Way Forward

In the present chapter I detailed the problematic relationship that ensues when the challenges of naturalism upon positivity are taken seriously. I then elaborated on Quine's (1995a, 1995c) attempt. Quine failed because he assumed that contextually sourced knowledge could have non-problematic and unaccounted purchase in another context. This translated into ontological transcendentalism. Fuller identified this problem as "internalism" and realised that all naturalist accounts of knowledge that did not consider the relationship between context of production and context of reception were problematic. Not only was this problematic in naturalist terms, but it also resulted in important practical consequences as the assumed "internal" source of authority provided capacity of arbitrary action to scientists (A) vis-a-vis laymen (B). Both accounts, however, required a retreat to the transcendental in order to fulfil their desired objectives.

The seemingly impossible naturalisation of knowledge and other positive values has led to a convergence in analytic philosophy and the philosophy of the social sciences. The position that ensues, however, is unwarrantedly conservative, as it assumes that things should be on account of how they are. Or in other words, it assumes that no other understanding of knowledge and meta-contextual norms is possible.

The way forward, however, could only be justified if naturalism, in its strictest rendering, were proven to be able to sustain itself. This is, to provide for an account of norms and positivity, a point of arrival that would allow its point of departure to have normative consequence beyond its own site.

From what has been discussed so far, it can be predicted that such an account would be characterised by the following:

- i. It would be sourced from scientific evidence; and congruent with precise philosophical form;
- ii. As a result it would maintain all of its ontological posting within the bounds of that which falls under the purview of strict, disciplined scrutiny (namely entities and phenomena contingent to context and space time);
- iii. This implies that it would not assume any source of normative import for its determinations that are able to hold beyond the possibility of revision, correction, scrutiny or change; and,
- iv. Would be capable of positivity. Or in other words, capable of having non-arbitrary normative consequence in another context (B) independently (without excluding the possibility of agreement or consent).

The discussion so far, however, already hints as to where such an account can be sourced. As has been explained on various occasions, science has no problem locating

norms in nature. Again, value determinations and prescriptions are perfectly understood as the difference between an actualised circumstance and a desired, required or expected outcome. The problem, rather, is to find positivity, which so far I have described as normative consequence beyond context. In social terms, this is equal to the capacity of a determined value determination or prescription, which is sourced or holds non-arbitrary consequence in (A) to also hold non-arbitrary consequence in (B), independently (without excluding the possibility of agreement or consent).

So far, the challenge to provide a positive account has been addressed by the proposal of a normative meta-context (X). This is a framework that contains both (A) and (B),⁹ and in which certain values and prescriptions hold for all those included within its bounds. The ultimate meta-context, of course, is reality, understood as the ultimate framework of value. My proposal then, is that if we can already account for normativity within context, and therefore account for non-arbitrariness in regards to determined outcome, I propose that instead of looking for positivity in meta-context, we look for it in the natural relations that exist between contexts. This includes agreements and consent, of course, but also relations between sites that could be understood as being necessary or constrained.

In other words, if the key to understanding the ontological nature of science and society resides in understanding the phenomenon of reference, instead of trying to find reference in circumstances that seem to be inaccessible to the practice of strict and disciplined scrutiny, I suggest we search in those places where strict disciplined

⁹ There are some proposals of a meta-framework that do not fit this description. Bruno Latour (2010) calls for a new “universality” composed by the relations between both “subjects” and “objects”, acting in line with something that could roughly be recognised as citizenry. Latour here is not claiming a prior meta-context, for example, but neither is he attempting to provide an account of positivity. Within his account, non-arbitrary consequence results from “composition” which implies the interplay of all the actors involved. In other words, this does not imply normative consequence independently of consent.

scrutiny *is* able to account for reference. If positivity involves non-arbitrary consequence between these sites, I suggest that instead of looking for this source of non-arbitrariness in a meta-site, we look for it precisely in the “natural” relations that occur between these sites. In regards to humans then, positivity is to be found in the “natural” relation that is present between human minds.

4. The Logic of Difference

4.1 Introduction

The present chapter consists in a diagnosis of why exactly naturalism is unable to find items and phenomena pertaining to positivity, and a proposal of how this could be accomplished.

The first part of the chapter illustrates the ontological nature of contextual norms. By doing so, it also illustrates exactly why it is that naturalism is able to account for these. The reason is fairly simple. What naturalism is able to account for is what could be called *constraint*, which is the reason behind normative consequence. Constraint can be accounted for by the limited nature of the referential standpoint and the requirement for outcome. That is, because agents or societies have a limited capacity to produce ways in which to accomplish their objectives, and because these objectives are required for their sustainment and reproduction, agents and societies are constrained in the ways prescribed by their limited procedural arsenal. For economic purposes, I label this aspect of normativity as the *vertical* aspect or component.

The other aspect or component – which is the *horizontal* relationship between different contexts – cannot be accounted for by science. Following Huw Price (2011) who diagnoses this situation as a problem of “object naturalism” as opposed to “subject naturalism” (i.e. the scrutiny of the world vs. the scrutiny of humanity) I propose to employ a different ontology: the worldview that results from the study of the human cognitive point of reference. When the human referential standpoint (i.e. perception and abstraction) is scrutinised without a priori assumptions, a particular worldview ensues. This worldview can be understood as a “second order-naturalism” in which

not only “objects” are found, but human cognition as well. Unlike “object naturalism” and its logic of identity, this “subject naturalism” understands ontological relation as mutual and not linear. I content that, whilst linear ontological relations (i.e. causality) are able to account for the vertical aspects of norms, mutually constitutive ontological relations are also able to account for horizontal relation of normativity, namely positivity.

The final section of the chapter will present a comprehensive account of evidence and arguments regarding the empirical research of colour vision in order to demonstrate precisely how it is that the “logic of difference” results from such empirical evidence.

4.2 The Ontology of Contextual Norms

The past chapter focused on the attempts of the most naturalistically committed authors to provide sources or frameworks for positive and normative consequence that were able to hold their own against the strictest naturalist commitments. The result of Quine’s ([1975] 2009, 1974) empirically sourced account of knowledge was perfectly able to account for epistemic normativity, in a way not dissimilar to other hypothetical, functional or pragmatic accounts of knowledge (i.e. Rorty 1979). Quine’s (1995b, 1995c) “knowledge”, in this sense, was understood as an instrument for predictive capacity. By positing such capacity as being able to hold non-arbitrary normative consequence in two agents ([A] and [B]) Quine (1995a) inadvertently posited an ontologically meta-natural framework of reference, which later conflicted with the original epistemological position that prompted the need to produce a naturalist account of knowledge in the first place. Nowhere in the empirical evidence that supported his theory, was there anything to suggest the possibility of the observed, contextually sourced, predictive capacities to command the objective and

normative force that is assumed for scientific knowledge. This component of his theory was completely imported.

Steve Fuller (2000, 1997; Fuller and Collier 2004) also falls into similar circumstances. Fuller's social epistemology (2007, 2006, 2002, 2000, 1997, 1993; Fuller and Collier 2004), as well as other work under the same label (Kitcher 2003, 1993; Rouse 2003, 1987; Longino 2002) is motivated precisely by the realisation that "knowledge" cannot be understood except as an intrinsically social phenomenon, in the sense that inter-subjective scrutiny and power relations play important roles regarding epistemological matters. Epistemological matters, conversely, play an important role regarding power relations and inter-subjective scrutiny. If knowledge was "in the world" as Quine (1969b) assumed it must be, it could not be simply something whose acquisition by one or by some could translate into benefit for everybody. Like any other social attribute or property, "knowledge" responded to economic and political forces. Whatever it is that "knowledge" may be, Fuller (2002) identified it is a vehicle of both ontological and social power. That is, it provides its users with the capacity to both transform their environment as well as command the fortune of others. This, further, was supported by evidence from the social sciences (i.e. SPSSK and STS). Knowledge, then, seemed to be a source of power, not authority. It was unwarranted then, and ideological, to hold that knowledge provides those who have it (A) with the legitimacy (X) to govern knowledge in the name of those don't (B). And yet, such a proposal also counts as knowledge. Or in any in case, it would seem that for the purposes of its own positive consequence, it appeals to very same source of authority that it previously deconstructed, or be satisfied with having no way to claim any positive consequence of its own. It is a circumstance, however, that would defeat its normative purpose.

Quine (1995a, 1995c) naively ignored the social dimension that accompanies an understanding of knowledge as “in the world”. The omission of this account translated into the tacit assumption of an unproblematic socially transcendent realm of epistemic consequence. Fuller (2002, 2000, 1997, 1993; Fuller and Collier 2004), in turn, recognised the ignored social dimension, and realised that Quine (1995a) was not alone in his assumptions. These assumptions, rather, constituted the justificatory component of the political arrangement that negotiated the social dimension of knowledge production. To try to amend the arbitrary circumstances that resulted from social circumstances organised under “transcendental” assumptions, he advanced the proposal of a political regime, itself, unfortunately, supported on transcendental assumptions.

In both these efforts, and I dare say for any other attempt at providing a naturalist account of positive normative consequence, once the powers of scrutiny are used to particularise the universal, limit the unlimited, and/or contextualise the objective in order to advance the attempt at positive normative consequence, a universal, or unlimited or intransient frame of reference is then required to suppose non-arbitrary consequence beyond their own site. Upon reflection, the account is deconstructed by its own commitments; again the infamous epistemic (or normative) circularity.

The only way for a normative account to hold itself within the bounds of strict naturalism would be one that upon reflection would find itself located in the same domain in which it locates everything else. In other words, it must be able to account and achieve positive consequence beyond its own site, whilst at the same time being strictly located in context.

This would initially seem impossible or even a contradiction in terms. This is so, because normative consequence can also be understood as *constraint*. That is, in order

for a norm to *act* as a norm, its evaluative and/or prescriptive consequences must obtain independently of the will of those under its sway.

For example, if it is the case that eating pork is a sin, then the pork eater is a sinner. This must hold whatever the pork eater may wish to think. Legal imperatives, on the other hand, may require the use of force in order to effect consequences.

As was discussed in the second chapter, a norm necessarily implies two domains or elements: the standard and the scenario that is evaluated. In order for a norm to be possibly observed in the “world of nature” these two scenarios must be found *within* “the world of nature”. This is the reason why “pragmatic”, “instrumental” or “functional” imperatives do not find themselves at odds with contextualist challenges. Hypothetical norms and their instrumentalist/pragmatic cousins can be perfectly understood as the referential framework operating in regards to a specifically desired or required outcome. The “context” in “contextual norms” is then constituted by the relationship between the expected outcome and the point of departure. The constraint and the consequence result from this relationship. The agent, or for present explanatory purposes the “outcome pursuer”, is limited in his procedural arsenal. In other words, in regards to a determined desired outcome, every agent will have a limited number of ways to go about achieving it. In regards to every desired outcome, there is, from the perspective of the agent at hand, a hierarchical valorisation in regards to the different procedures. For the specific outcome, this hierarchical valorisation for the agent is not arbitrary. It is a result of the limited capacity of engagement every agent possesses and the inherent need to engage with the environment. From a strictly naturalist perspective, the constraint and consequence of a determined norm is contingent on the specific relationship between a framework of

departure (i.e. the specific cognitive state of an agent, or the political/legal/cultural framework of a collective) and a determined outcome.

A causal relationship ensues that is perfectly accountable by naturalism. If a determined agent requires a determined outcome, the difference between her perceived circumstances and her required outcome will result in prescriptions and value determinations. The difference between required or desired outcomes and realised circumstances is the cause of norms. Their consequence is caused by the desire or requirement of a determined outcome, and the limited means that a determined framework has to pursue such results.

For example, a farmer is required to engage in various farming activities in order to sustain his living. He has, for these purposes, a specific amount of knowledge of how to successfully proceed and achieve such goals. The relationship between his requirement to sustain his life, his procedural knowledge in regards to farming, and the objective of success will constitute an important component (probably the most important) of the normative dimension of said farmer's life. With this relationship, he will evaluate circumstances in the positive or in the negative and will be constrained to act in a certain way (i.e. wake up at a certain time, perform certain activities, moderate his spending, etc.), based on his best knowledge.

The same occurs in the case of a farming community. Such a group also has to engage in farming in order to sustain their living. The community will probably have a structure of decision-making that will possibly attempt to include the knowledge of its members as much as possible, in order to determine the best ways to proceed in regards to the success of their endeavours. The determined procedures will include a sophisticated normative framework that will regulate the behaviour of its members, in order to produce the outcomes. Taking into account all the sociological factors that

may obtain from such an arrangement (gender-relations, reproduction of inequality, etc.) the normative framework of such a scenario is again easily explained in causal terms.

This constraining component of normativity can be adequately labelled as the *vertical* component of normativity.

The problem arises when it is supposed that the constraint and consequence that obtains in a determined context (A) also holds in another context (B), independently of (B)'s intervention on the matter. That is, normative constraint and consequence in (A)'s context is determined by the relationship between (A)'s referential standpoint and (A)'s required outcome. Normative constraints and consequences in (B) then are also determined by that relationship between reference and outcome. In order for (A) and (B) to count as different contexts, they must then be held to have different referential frameworks, different outcomes, or possibly both. In this regard, if (A) and (B) had the same relation between framework and outcome, they would then, for all ontological purposes, constitute the same context.

A different framework implies different means of engagement or pursuit, and so, even if (A) and (B) were pursuing the same outcome, their different frameworks would have different relations of constraint and consequence. In other words, they would not be constrained in the same way, and therefore, the norms that resulted would be different.

Naturalism can find no ontological relationship between (A) and (B)'s normative frameworks. That is, from a naturalist perspective, there seems to be no causal connection between the normative frameworks of (A) and (B). In this sense, within strict naturalist commitments, there is simply no way to account for the constraint or

consequentiality of (A)'s norms in (B)'s context without reducing them to the same context, or assuming a meta-context which is applicable to both.

If a meta-context is assumed, then two options follow. It may be considered that the constraint and consequence of meta-context (AB) results out of a deliberation between (A) and (B). If it does, there is then no problem whatsoever in locating the source of such normative constraint and consequence, as an exhaustive deliberation would have included discussion and decision upon the ways to proceed in regards to the determined outcome. In this regard, the cognitive and procedural limits to pursue the chosen outcome become the same for (A) and (B) in anything related to their collaboration. If they wish the outcome to obtain, then according to their joint, but limited, arsenal of procedures they must observe the result of their dialogue, and a clear causal relationship results that explains how the constraint and consequence ensues.

If either (A) or (B) were not included in the deliberation, then two different things might obtain. If (B) is the party not included, then it might be considered that the relationship between the referential framework of the meta-context (AB) and the pursued outcome does not correspond to the best possible valorisation that (B) has, or might have, in regards to the interpretation of his own framework and the pursued outcome (in which case the consequence and constraint for the meta-context can be easily found in [A]'s limits and whatever material circumstances he is afforded to impinge in [B] in order for the outcome to be desirable for her as well). Alternatively, it might be considered that the relationship between the referential framework of the meta-context (AB) and the pursued outcome *does* correspond to the best valorisation that (B) has or might have, independently of his role in the decision. This would imply that these circumstances assume that the relationship between the referential

framework of the meta-context (AB) and the pursued outcome corresponds to the best valorisation that (B) *must have*.

In this case, because there is no express consent involved in the determination of pursuit and outcome, but because (A), (B) and (AB) necessarily constitute different contexts (since they cannot be reduced to each other) then (AB) must be assumed as transcending, or being an essential characteristic of, both (A) and (B). If any material circumstances are used to promote compliance, they will be justified on evaluative and prescriptive standards that are argued to be either not located anywhere (i.e. the will of God), or located in every single individual (i.e. the common good) independently of their participation or involvement that, for our purposes, amounts to the same thing. In other words, the assumption of either a “transcendental” or an “essential” framework, neither of which corresponds to the transitive, limited, revisable, empirically accessible, dimensional or spatial-temporal circumstances that characterise that which results from the purview of science.

Naturalism, then, has the philosophical instruments to account for the normative constraint and consequence that results from the relation of a determined framework and a specific outcome. It is unable, however, to account for consequence and constraint between two contexts, unless it locates them within a meta-context. This unaccountable component, in turn, can be adequately labelled as the *horizontal* aspect of normativity, or as the relationship between contexts.

This, in turn, can result from:

- Dialogue, consent, agreement or other product of shared volition;
- Power, and the use of physical or material force; or,
- Transcendence or essence.

Positivity, which implies the independence of the first item in the list (i.e. product of volition), can only be accounted for hierarchically. In other words, naturalism does not seem to have the philosophical tools to account for horizontal positivity. In order to so, it must posit a vertical dimension that applies to both (A) and (B).

It is impossible for all those that may be affected by a socially pursued outcome to fully participate by means of dialogue and consent in the determination of such pursuits. There are, however, a great number of overreaching pursuits whose nature does not seem to correspond to the exploitation of power, such as the pursuit of political equality (i.e. liberalism), the pursuit of material equality (i.e. socialism), the pursuit of cultural plurality (i.e. cosmopolitanism) and the pursuit of knowledge (i.e. science). This leads in turn to locating the referential framework hypothesised as serving as the departure point for each of these pursuits in essence or transcendence (i.e. indispensability).

What remains of the present work will contend that there is a way to account for non-arbitrary normative relations within a naturalist framework, and provide empirical evidence from whence it is derived.

4.3 Object vs. Subject Naturalism

My approach is both informed and preceded by Huw Price's (2011) *Priority Thesis*. To wit:

Subject naturalism is theoretically prior to object naturalism, because the latter depends on validation from a subject naturalist perspective (2011: 186).

Price (2011) contends, that the seeming impossibility of finding all that pertains of the explanation of certain “indispensable” circumstances within the bounds of the natural realm (the “placement problem”), is more appropriately understood as a problem of “linguistic behaviour”. He holds that the “placement problem” only results within the linguistic and theoretical framework of “object naturalism”.

Price (2011) understands “object naturalism” as the view that “insofar as philosophy is concerned with the nature of objects and properties of various kinds, its concern is with something in the natural world or with nothing at all” (2011: 186). This is very much in line with the manner in which I have been using the term. Counterpoised to object naturalism, is “subject naturalism”, or the view that “science tells us that we are human creatures, and that if the claims and ambitions of philosophy conflict with this view, then philosophy needs to give way” (2011: 186).

Whilst both approaches promote a deference of philosophy to science, “object naturalism” would contend that philosophy must retreat when challenged by findings concerning non-human nature or reality, whilst subject naturalism would contend the same in regards to findings about human nature.

Price (2011) asserts additionally, however, that certain semantic notions play “a critical theoretical role in the foundations of object naturalism”, specifically “substantial, non-deflationary” notions, or in other words “representationalist” notions. The placement problem, however, does not ensue from deflationist linguistic behaviour. In other words, the placement problem does not obtain when language does not assume a “word-world” semantic relationship. If the placement problem only obtains through the use of certain linguistic assumptions, Price (2011) reasons, then, that it may very well be the case that the placement problem is one of linguistic behaviour.

Linguistic behaviour, however, does not fall within purview of object naturalism; hence the priority thesis. If object naturalism is unable to account for these “indispensable” posits within its own purview, the proper deference is not necessarily to philosophy but rather to the “naturalist” study of humanity (2011: 199).

As was explored in the past chapters, the disciplined scrutiny of society, this is, the study of society without any ontological assumptions about what society is before it is studied, leads to epistemological and/or ontological positions that conflict with representationalism. However, sociology alone cannot sustain itself epistemologically. Price (2011), in turn, offers an idea of what this deference to subject naturalism would imply, simply explaining in “naturalistic terms how creatures like us come to talk in these various ways” (Price 2011: 199).

In what follows I go a little further. As I will try to demonstrate in the second half of this chapter, when matters that pertain to the situated referential standpoint of human beings and other agents (e.g. animals) are researched without any *a priori* ontological assumptions, a particular worldview ensues. It is one that finds itself at odds with the representationalist view described by Price (2011) as “object naturalism”, and which could be also understood as a step further from the contextualism that results from the social sciences (i.e. Latour 1996; Shapin 1982; Barnes 1977; Fleck 1935 [1979]). I will then argue that this worldview, which can be understood as a “theory of distinction” (Luhmann 2002) or a “logic of difference” is able to account for a rendering of positive normativity that is entirely continuous with naturalism. If such a position were able to do so, this would imply that the whole spectrum of normative phenomena could now be accounted for by disciplined strict (philosophically precise and congruent and/or scientific) scrutiny.

4.4 Theories of Distinction and Logic of Difference

The central notion of a “theory of distinction” (Luhmann 2000) or the “logic of difference” is an understanding of *form* (ontological, metaphysical or logical) as a product of difference or distinction. George Spencer-Brown, in his *Laws of Form* (1969) describes this notion as follows:

We take as given the idea of distinction and the idea of indication, and that we cannot make an indication without drawing a distinction. We take, therefore, the form of distinction for the form (Spencer Brown 1969: 1).

Distinction is perfect continence.

When form, in all its variants, is understood as the result of distinction, or of difference, a specific ontological or metaphysical position is also implied. From the perspective at hand, an entity would be understood as being constituted by the difference between itself and everything which that said entity is not. In other words, within a “logic of difference” *relation* is paramount. It is metaphysically constitutive; nothing is, or rather can be, identified independently. This logic necessarily assumes the absolute to be ambivalent, equally positive and negative, encompassing nothingness and everything-ness, which are then understood as the same phenomenon.

A universe comes into being when a space is severed or taken apart. The skin of a living organism cuts off an outside from an inside. So does the circumference of a circle in a plane. By tracing the way we represent such a severance, we can begin to reconstruct, with an accuracy and coverage that appear almost uncanny, the basic forms underlying linguistic, mathematical, physical, and biological science, and can begin to see how the

familiar laws of our own experience follow inexorably from the original act of severance (Spencer Brown 1969: v).

In order to fully understand the logical, ontological and/or metaphysical implications of the principles at hand, consider the following example:

Imagine a universe created within a computer program. Imagine if you will a blank output produced by mathematical graphing software. The computer screen shows a computer created universe delineated by two lines, which serve as parameters: the x-axis, and the y-axis. Both axes run infinitely in both their positive and negative directions. One may say that the electronic universe created by the software is empty until an entry is computed into it. From the perspective of a “logic of difference”, it isn’t. Both axis lines already present points of reference, the constitutive elements of a metaphysics of difference.

Imagine we could eliminate both axis lines. In this case, the screen would be completely blank, and within the computer universe blankness would be infinite and absolute. We would finally have our example of a completely blank universe. Within its parameters, it would encompass everything and nothing at the same time. Now imagine that, without re-generating the axis lines, we finally compute a dot into the software. The dot then would be the only “thing” within the formerly blank universe. It would now encompass “everything” whereas the opposing blankness would encompass “nothing”. It is only now, however, that a difference between nothingness and everything-ness can be talked about within the parameters of our hypothetical universe. The dot exists only as the difference between itself and the blankness. The blankness and the dot are constitutive of each other: their relationship equals their constitution. They specify each other and they define each other through distinction.

One, however, cannot yet speak of distance. Without boundaries within the electronic universe, or any other parameters such as the lines, the dot is nowhere. It has no value in mathematical terms. One might also say that the dot is everywhere and is the only value within the system. This is so until another dot is computed into the system, and then distance and all possible value would obtain from the relationship between the two dots. The characteristics of both dots would be defined in relation to everything they are not, in this case blankness and the opposing dot. Compute further dots (and lines) and the system acquires complexity, as values are created as a consequence of the relationships between them. Within the boundaries of the system, nothing transcends it. Similarity, difference, distance, and being are created through difference and mutual specification.

Initial approximations to such a view can be traced to Husserl's ([1913] 1982) phenomenology. Notions in line of such a position can be observed, however, constantly surfacing and resurfacing in work dealing with the human perspective or point of reference (e.g. the study of language and abstraction, the relationship between perception and sensation and action, etc.) that does not assume realism or representationalism as a methodological subscription (i.e. Von Foester 2003; Chemero 2009; Merleau-Ponty [1948] 2004; Von Glaserfeld 1995; Maturana and Varela 1992; Maturana 1988b; Gibson 1979; Piaget 1954; Heidegger [1927] 1961).

On the other hand the logic of identity – which constitutes the traditional approach at philosophy – being, entities or phenomena are defined by virtue of characteristics that are proper to themselves, that is, they are identified independently.

These characteristics could then be explained by, caused by or related to other entities or phenomena, defined also by the enumeration of characteristics. As one climbs the explanatory or the causal ladder one must then, inevitably, reach a final sovereign

source of being or authority (including epistemic validity) that transcends all causality or explanation, whose characteristics are proper to itself and transcend the rest. These characteristics are then necessarily stable, objective and/or universal. Amongst these, one may find already mentioned entities such as God, Truth, Good, and Universal Desirability, Validity or/and Valid Method or Mind, amongst others.

Entities and phenomena, within a logic of identity, are tacitly or expressly posited as having ontological independence. The relationship with other entities and phenomena, in turn, is tacitly or expressly assumed as historical. As such, within the worldview developed through a logic of identity, ontological relations are linear. In an ontological relationship between (A) and (B), if (A) is identified as the cause of something that affects (B), the ontological relationship will then be understood as one in which (A) produced ontological effect in (B). There is no reason to believe, within a logic of identity, that, from this description, (B) had any effect on (A), unless (B) is then independently identified as a cause.

For a logic of difference, on the other hand, things, entities and phenomena can simply not be understood except in regard to their relationship to that which defines them: everything else. Ontological relations then, are not linear. What happens on one side of the equation is an opposite ontological reaction of what happened in its defining counterpart. The understanding of ontological relations as linear, from the perspective of the logic of difference, is quite limited.

The logic of difference is expressly conscious that there is no standard point of reference. For example: an asteroid hitting the Earth can also be understood as the Earth hitting the asteroid.

These differences may seem trivial when comparing the perspective of the logic of difference and the logic of identity in regards to physical objects, but they are categorical when applied to the relations between cognitive agents and their environment.

Most importantly for the purposes of the present work, because ontological relations within a logic of difference are not linear, but rather ontologically constitutive, the logic of difference is able to find an ontological relationship between two different normative contexts. It is therefore able to account for non-arbitrary horizontal normativity, or in other words, it is able to account for an immanent or naturalist rendering of positivity.

Before proceeding with such a matter, it is necessary to address how, exactly, a logic of difference results from the study of human reference. This is, how does it result from the study of perception, abstraction and cognition in general? It is also necessary to address the exact characteristics of the relationship between agents, their environment and between agents and other agents from the perspective of the logic of identity. The remainder of this chapter will focus on empirical matters regarding the logic of difference.

4.5 Science of Reference

The following sub-section focuses on illustrating how, when all available evidence is taken into account, and no *a priori* ontological commitments cloud the conclusions of research, empirical evidence will find that referential phenomena in biological agents is mutually-constituted. This is a circumstance continuous with the previous description of the logic of difference. It specifically implies that an agent's cognitive structure cannot be understood, except as constituted by its specific relationship to the environment. Reference, in other words, like everything else found by strict and

disciplined scrutiny, is ontologically contingent on its specific location or site. The word “contextual” can still be applied, but it does not fully encapsulate what is being explored. Within this literature, the analogous concept is referred to as mutual-constitution or ontological relationism.

Fields such as physiology and neuroscience (e.g. Thompson 1995; Thompson, Palacios and Varela 1992, Skarda and Freeman 1987, Jacobs 1981, Menzel 1979, 1986), developmental psychology (e.g. Thelen and Smith 1994; Thelen, 1995), robotics and/or artificial intelligence (e.g. Brooks 1991a, 1991b, 1999; Smithers 1994), zoology (Nuboer 1986), and linguistics (e.g. Lakoff 1987; Lakoff and Johnson 1999, Lakoff and Nuñez 2000, Gibbs 2003, 2005, 2006), have produced a substantial amount of empirical work whose findings have provided evidential support and motivation for the theories of cognition and life that are continuous with tenets compatible with an understanding of cognition as situated and relational.

As will be shown, those (e.g. Varela Thompson and Rosch 1991, Thompson 1995, Matthen 2005, Cohen 2009) who defend a “contextualist” position, or its analogue, argue that, if the seemingly contradictory results of the many varied body of relevant evidence are to be taken in account in a consistent manner, the only way to understand cognition and/or the products of cognition is as mutually determined by both the animal/agent and its environment.

By far the most researched, cited, discussed, and compelling work in this field is that which concerns the empirical study of colour vision. As such, most of the section will be concerned with analysing the evidence that is presented in this regard, as well as how it is interpreted to reach different conclusions regarding the matter of perception and therefore reference.

4.5.1 Colour Vision

Evan Thompson (1995) who, in company of Adrian Palacios and Francisco Varela (1992) introduced a radically contextualist approach to the study of colour vision, contends that the “received view” in the study of colour vision is laden with a theoretical and philosophical insistence to locate colour either “out there” (“as a complex physical property”) or “in the head” (“a projection of subjective experience”). The author argues that this position – an inheritance of the Newtonian and Lockean traditional and pre-empirical, understanding of colour – leads to empirical inadequacies (1995: 36-7). Most of the authors who support relationism (Varela Thompson and Rosch 1992; Thompson, Palacios and Varela 1992; Thompson 1995; Matthen 2005; Cohen 2003, 2009), contend that if one is to make sense of the seemingly contrasting results of the three major fields of empirical evidence related to the understanding of colour vision (neurophysiological/psychophysical, computational and comparative studies of colour) the only available options are to either explain colour as a purely “relational” phenomenon, or to resort to colour primitivism, a therapeutic position that suggests that colour is a *sui generis* phenomenon impossible (and unnecessary) to explain in causal terms.

Amongst the immense amount of empirical work done in colour vision, one may find evidence to support either subjectivism or objectivism. In order to do so, however, for example, in order to reduce colour to physical states that may have a causal relation to colour perception, one must be arbitrarily selective in regards to the evidence, as one must discard (or explain) all the empirical results that seem to suggest a “necessary” relationship between colour vision and characteristics absent in the environment. A similar situation occurs when the opposite strategy is attempted and one selects evidence supporting a purely subjectivist standpoint.

In order to demonstrate and properly address the above, a recapitulation of the evidence and the different scientific approaches on the subject is required.

4.5.1.1. Neurophysiological and Psychophysical Studies on Colour Vision

Research in both colour psychophysics and visual neurophysiology takes what is known as the “phenomenal structure of colour” or the “colour space” as the point of departure for their research.

There is a substantial amount of evidence within the field of experimental psychophysics that suggests that colour is “structurally” experienced, in the sense that colours are experienced as having distinct relations of difference, similarity and composition amongst themselves (see Turner 1997 for a historically detailed account).

The geometrical shape that arises from graphically arranging these sense ordering relations in a spatial structure constitutes a “colour space”. Based on these psychophysical studies in colour vision, neurophysiological work hypothesises, or rather assumes, the existence of lawful relations between experiential and physiological states (Thompson 1995: 40).

“Colour spaces” vary, depending on the method used to determine the specific structural relations that constitute colour relations, but for purposes of illustration, the most commonly used classification of colour experience (Munsell’s (1919) ‘colour notation’ (Kuenni and Schwartz 2007: 13)) could be used as an example. Munsell’s set orders colour experience along perceptually equal intervals determined by the three dimensions of hue, chroma (or saturation) and value (or brightness).¹⁰

¹⁰ Munsell’s (1919) colour notation resulted from an empirically based attempt to provide an “established scale with measured intervals and define terms” to facilitated the understanding and classification of colour experience (1919: 13). Munsell undertook the chore of asking a wide sample of colour experts to rate the perceptual differences amongst colour samples. As a result the three mentioned dimensions were obtained: Hue refers to the “redness, greenness, yellowness or blueness of a different colour”. Saturation

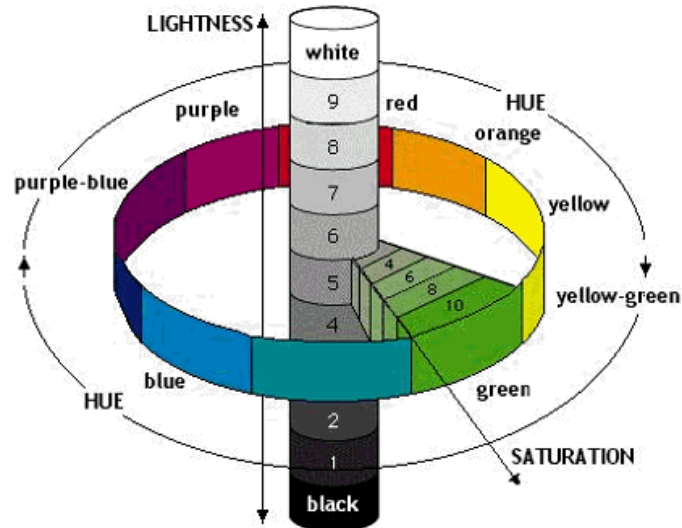


Figure 1 Munsell's arrangement of colours.

Source: http://www.regional.org.au/au/assisi/supersoil2004/s4/poster/1556_islank.htm

Within this field, the predominant paradigm and one of the, “best motivated, highly elaborated and widely accepted neuro-scientific accounts in existence”, is the “dual-process theory” of colour vision (Cohen 2003: 10).

Introduced in 1957 by Leo. M. Hurvich and Dorothea Jameson, the dual process theory of colour vision is constituted by the synthesis of the two previous (and previously competing) major theoretical accounts of colour vision, namely the trichromatic theory of colour vision (also known as the Young-Helmholtz theory) (Young 1802; Helmholtz 1866) and Edwald’s Hering’s ([1892] 1964) opponent process theory of colour.

The first of these, the trichromatic theory, hypothesises that human colour perception is the result of the combination of three general colour parameters, or “three principal colours” (Young 1802). The approach was further developed by Herman von Helmholtz (1866), who advanced the theory that the eye contained three types of

refers to the “proportion of hue in a given colour relative to the achromatic (white-black) dimension”. That is, the less saturated a colour is, the closer said colour is to grey. Finally, brightness refers to the achromatic or white-black dimension (Thompson, Palacios, Varela 1992: 3).

nerve fibres that specifically measured red, green and blue. In 1964 the trichromatic theory found empirical support in the work of P.K. Brown and G. Wald who, by measuring the different spectral sensitivities of the visual pigments in the single rods and cones of the human retina, identified three different types pigments: the “blue” or (most appropriately termed) short wave sensitive cones, which absorb maximally at wavelengths of 430-50 nanometers (nm) of the electromagnetic spectrum; the “green” or middle wave cones, which contain pigments that absorb maximally at 540-550 nm; and the “red” or long wave cones that absorb maximally at 555-575 nm.

The opponent process theory of colour hypothesises, in turn, that the visual system operates as a set of interrelated tissues, in which the activity in each element is not merely determined by an elemental stimulus response-processes (such as mere wavelength discrimination), “but also on the activities in the neighbouring and related elements of integrated tissue” (Hurvich and Jameson 1964: viii). Hering ([1892] 1962) contended that the experience of “contrast phenomena” as part of colour perception meant that “colours” were structurally constituted in opposing pairs. For example, in the case of achromatic colours (black, white and grey) it seems to be self-evident that black and white oppose each other. That is, “to the extent that an achromatic colour approaches pure white, it moves away from pure black [...] and vice versa” ([1892] 1964: 34). The same situation, however, seems to occur in the case of chromatic colours. If one takes the hue circle as an example, it is easy to perceive that the four primary colours (red, yellow, green and blue) are “interconnected by a series of transitional intermediate hues”, so that one may distinguish a “red-yellow, a yellow-green, and a blue-red” between these. He contends, however, that there are no series of intermediate hues between red and green or blue and yellow. As a result, no colour resembles red and green at the same time, or blue and yellow, on the contrary they

“appear to be mutually exclusive”. For this reason, he calls these “opponent hues” (Hering [1892] 1964: 49-50). Hering finally concludes that both colour perception and perceptual colour classification is dependent on the specific opposing relationship between brightness and hue.

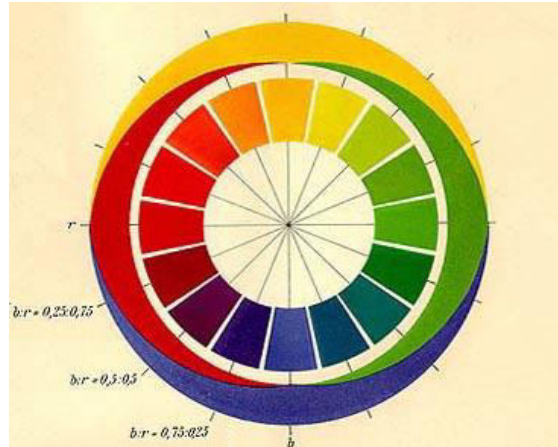


Figure 2. Hue circle explained by two opponent processes, combining two illustrations from Ewald Hering (1920), reversed to match modern colour wheel orientation. Source: <http://www.handprint.com/HP/WCL/color2.html>

In 1957, Hurvich and Jameson introduced a manner of quantifying the red/green and yellow/blue components of the spectrum in such a way that it allowed for the understanding of the trichromatic and the opponent process theories as complementary rather than competing alternatives. This dual-process approach then hypothesises that colour vision operates in two distinct stages: first photosensitive absorption congruent with trichromatic assumptions, and then a post-receptoral stage, which would involve the comparison amongst receptors in order to produce opponent signals (Hurvich and Jameson 1957: 388-93).

Support for the theory is widespread. In 1958 Gunnar Svaetchin and Edward F. MacNichol Jr. discovered that horizontal cells in fish retinas responded in an opponent manner to signals from at least two types of cones. These “single opponent neurons”,

were later found in the retinal ganglion cell and geniculate neurons of monkeys (Hubel and Wiesel 1960; De Valois and Jacobs 1968), and finally in all organisms that are known to be capable of colour vision (Jacobs 1981). They work by being excited (or inhibited) by the signals from cones in the centre of the receptive field and concurrently inhibited (or excited) by signals from other types of cones located in the surround of the field

It is important to note that evidential work on the matter did not find support for the mechanisms of opponent signals exactly as described by Hering ([1892]). In consequence, there is no clear consensus between colour scientists on the exact relation between opponent process channels (Matthen 2005: 155; Thompson 1995: 65). For the purposes of the present work, however, no further depth into the physiological and neurological understanding of colour vision is required. This is because, even though the findings of the above mentioned psychophysical work might suggest that opponent channels and/or the relation amongst them might be more complicated than originally understood, they do not question the general notions of hue opposition and the distinction between unique and binary hues.¹¹ These notions, whose validity suggests the presence of a structure of colour experience, have rather found robust empirical support from a variety of different studies (Hardin 1997: 291-2, 1988: 42; Boyton 1979: 210-1).

4.5.1.2 Comparative Colour Vision

The comparative study of colour vision is intimately related to general visual physiology and psychophysics.

¹¹ This corresponds to the understanding that chromatic channels cannot simultaneously signal their opposing hues. Unique hues are the result of one channel signalling whilst the other is neutral or balanced, and binary hues are the result of the interplay of channels amongst them.

If one understands colour vision in the terms most common to visual scientists, namely, as the capacity to discriminate between wavelength composition independently of relative intensity, the findings of comparative visual physiology would then lead one to believe that colour vision varies considerably between individuals, but most importantly amongst different species.

There are two main ways in which colour vision varies: 1) in terms of dimensionality, and 2) in terms of exclusive sensitivity, that is, without any variance in terms of dimensionality.

Sensitivity specifically refers to spectral sensitivity, different capacities of wavelength discrimination, and colorimetric purity functions. Depending on the specific characteristics of an animal's visual system, it will have different sensitivities to spectral stimuli, different abilities to discriminate on the basis of wavelength and different perception in regards to colour saturation (Thompson, Palacios and Varela 1992: 10).

Dimensionality refers to the specific amount of parameters that a specific animal's visual system has and thereby uses to structure its phenomenal colour space. As explained above, human colour vision is (normally) trichromatic; that is, humans have three different sets of cones which absorb different wavelength ranges. A human's opponent channels and their corresponding colour space is thereby structured in relation to these three available parameters. Trichromatic colour vision, even though present in almost every known animal class, is not the norm (Jacobs 1981: 153). Evidence suggests that diurnal birds such as ducks and pigeons are tetrachromats (possibly pentachromats) (Bowmaker 1980: 196; Goldsmith 1990), which means that they structure their phenomenal colour space in relation to at least four chromatic parameters. Animals such as squirrels, rabbits, some fishes, (possibly) cats and dogs,

and some portion of the female human population appear to be tetrachromats. Others, such as goldfish are confirmed pentachromats, while many other animals are dichromats (Thompson 1995: 145-6), and mantis shrimp are believed to be decachromatic (Cronin and Marshall 1989).

Individuals within the same species can also vary in terms of dimensionality. Three quarters of the females amongst squirrel monkeys are trichromats, whilst the rest of their species are dichromats (Snodderly 1979; Mollon et al. 1984; Nuboer 1986). A similar situation seems to take place amongst humans, where a small percentage of human females seem to be tetrachromatic (Jordan and Mollon 1993; Frisby and Stone: 406).

Variance in terms of dimensionality inevitably translates into variance in terms of sensitivity. Amongst other things, variance in terms of dimensionality will translate into a completely differently structured colour space. For example, by considering the phenomenal and psychophysical levels of the human colour phenomenal structure one can hypothesise the characteristics of a tetrachromatic or pentachromatic colour space. A tetrachromat's "phenomenal colour hyperspace" for example might contain "an entirely new kind of hue not found in our phenomenal colour space, namely, ternary hues" (Thompson 1995: 157-8).

Variance in terms of sensitivity is not exclusive to variance in dimensionality. Variance in terms of exclusive sensitivity takes place when two animals with the same number of chromatic structural parameters differ in the spectral range of the electromagnetic spectrum that they are sensitive to. In general terms, the spectral range of almost all studied species and individuals varies between 300 nm and 800 nm. Two species with the same number of parameters may have different spectral ranges or 'visual windows'. For example, various species of primates are trichromats in the same

manner as most bees; nevertheless primates have a 'visual window' of 400 nm to 700 nm, when the honeybee has a range of 300 nm to 650 (Menzel 1979; Menzel and Backhaus 1991).

Dimensional variance also influences the spectral range or window. For example, the spectral range of tetrachromatic (or pentachromatic) diurnal birds extends considerably further into the short-wave region, down into the near ultraviolet (Thompson 1995: 149). In contrast to the case of variance, however, in terms of exclusive sensitivity the different phenomenal colour spaces that result from two different dimensionalities cannot be said to be commensurable. That is, increased dimensionality does not imply increased sensitivity of the same spectral hues, but rather a complete rearrangement of the spectral experience. Evidence (Wright and Cummings 2005) suggests, for example, that tetrachromatic animals such as the pigeon treat wavelengths that fall to either side of 540 nm as different hue categories and humans do not. The pigeon's colour space, for example, is structured around three hue dimensions (and one non-chromatic dimension) and therefore the characteristics of a pigeon's chromatic experience are impossible to imagine "by means of projection from our own colour experience" (2005: 163). As Thompson (1995) so eloquently summarised it:

Considered as dimensional types, tetrachromatic and trichromatic colour spaces are incommensurable in a precise sense because there is no way to map the kinds of distinctions available in four dimensions into the kinds available in three dimensions without remainder (1994: 151).

The final aspect of comparative colour vision is what Thompson and collaborators call "ecology of colour vision" or the "chromatic ecology between visual pigments and animal niches" (Thompson 1995: 160; Thompson, Palacios and Varela 1992: 18).

There seems to be ample evidence to suggest that the observed chromatic variation in animals correlates to the particular behavioural repertoires of the animal in regards to its specific niche. Furthermore, related empirical studies seem to provide evidence that suggest animal-environment co-evolution; that is, that the specific characteristics of the visual system of an animal co-evolved in relation to the “colours” manifested by other living beings in its environment and vice versa (Matthen 2005: 177-87, Thompson 1995: 168-77, Thompson Palacios and Varela 1992: 18-21).

A commonly cited example (Thompson 1995: 168-71; Thompson, Palacios and Varela 1992: 18) is that of the claimed correlation between visual pigment absorption and animal niche in fish colour vision (Lythgoe 1972, 1979; Levine and MacNichol 1979, 1982).

Studies of aquatic visual ecologies show that fish retina sensitivity varies in relation to depth and therefore illumination. Deep-sea fishes without any bioluminescent organ present monochromatic retinas of only one visual pigment that displays a maximum sensitivity of 470-490 nm (Levine and MacNichol 1979; Loew and Lythgoe 1978; Patridge et al. 1980). It is also important to note that this chromatic display correlates with the maximum wavelength transmission of such an underwater setting. Some of the fish that inhabit the same environment but are fitted with bioluminescent organs present two different visual pigments: one with a maximum sensitivity of 515-20 nm and the other with a maximum sensitivity of 545-50 nm, which coincides with the emission of their luminous organ, thereby providing them with the capacity for dichromacy (Bowmaker et al. 1988; Patridge et al. 1989).

Species that inhabit depths with increasing degrees of illumination present a larger diversity of photo pigments and retinal cell arrangements appropriate for their particular settings (Lythgoe 1972, 1979; Levine and MacNichol 1979, 1982).

Bees present a particular chromatic arrangement of trichromatic vision that differs from humans in the sense that their “visible window” is shifted towards the ultraviolet (300 – 650 nm). Flowers present contrasting patterns that are only visible in ultraviolet light. The argument from those who argue for chromatic co-evolution between these two species (Lythgoe 1979; Menzel 1979; Nuboer 1986) holds that the bees’ particular (and unusual) visual arrangement results from a mutually advantageous relationship between bees and flowers. It is advantageous for the flower to be conspicuous in order to attract pollinators such as bees. Nevertheless, it also requires the ability to distinguish itself from flowers of competing species “so that the animal that successfully visited one flower of the species will tend to visit other flowers of the same species”(Nuboer 1986: 362).

A similar explanation for primate trichromancy has been proposed by John Mollon and colleagues (Mollon 1989). In the most recent version of the argument, the authors contend that the following observations support the notion that primate trichromancy might have coevolved with the colour of small fruits and berries:

- (i) Primates eat fruit and do so in large quantities,
- (ii) Plants whose fruits the primates eat compete for food dispersal, which, in turn, is critical to the reproductive success of plants
- (iii) The fruits eaten by primates are particularly conspicuous in their specific trichromatic display (which presents a middle-wave pigment with peak sensitivity around 535 nm and a long-wave pigment with peak sensitivity of around 535 nm) and not to the chromatic display of other “uninterested” species.

The authors thereby contend that this set of traits shared by fruits dispersed by a particular class of consumer can be interpreted as adaptation to that particular agent,

which is commonly known as “dispersal syndrome” (Regab et al. 2001: 234, Mollon 1989: 32-3).

4.5.1.3 The Problem of Colour Constancy

If the neurophysiological, psychophysical and comparative evidence in colour vision were to be taken at face value, it would then seem that colour is, in fact, a relational phenomenon that can be reduced to a specific capacity of wavelength discrimination relative to the specific characteristics of a particular animal.

Theories supported by the above evidence, however, run into difficulty when trying to account for the phenomenon of “colour constancy”. The one-to-one correlation assumed by dual process theory holds for settings in which a hue is experienced in isolation (an uncommon situation within a natural setting). Neurophysiological and psychophysical theories such as trichromancy and hue-opposition, however, are not fortunate in predicting colour appearance in complex, multi-coloured situations, scenes or images, much more akin to colour experience in everyday life.

Suppose, for example, that one agent perceives a determined surface as blue. According to the neurophysiological and psychophysical understanding of colour structure the agent in question would be observing the reflectance of a high percentage of shortwave light, with a lower percentage of middle-wave and long-wave light. This might be true if the observed area is isolated from any other visual phenomena. If it is part of a complex scene, it will continue to look blue even if the area now reflects more long or shortwave light on account of its surroundings. In other words, current evidence strongly suggests that colour appearances remain relatively stable and constant in natural light environments where various different

types of changes in illumination can be constantly observed (“approximate colour constancy”) (Thompson 1995: 80; Thompson, Palacios and Varela 1992: 6).

Different explanations for colour constancy have been offered. The most prominent of these, and the one that has motivated the philosophical discussion of colour ontology the most, is that provided by the computational approach to colour vision.

4.5.1.4 The Computational Approach to Colour Vision

Initially introduced by David Marr (1982), the computational approach to colour vision from its inception and for explanatory purposes assumed a position of “inverse optics”. That is, it assumed that the visual system operates by recovering what are taken to be objective attributes of a three dimensional environment though computational operations of data obtained from the visual input of two-dimensional scenes (Marr 1982: 25; Frisby and Stone 2010: 37-38).

As an illustrative example, consider the computing of the orientation of a three-dimensional surface by means of analysing and comparing the texture of a two dimensional image.

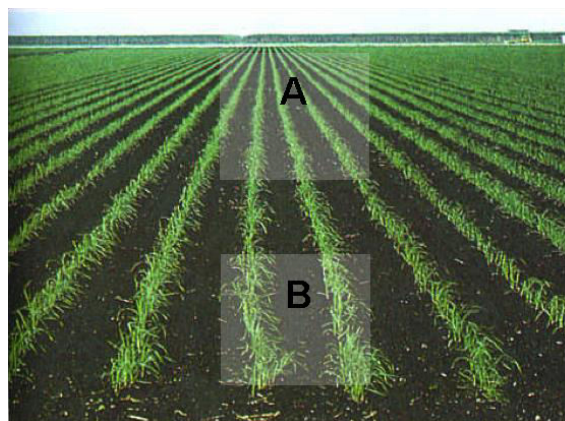


Figure 3. Texture density variation in an image as cue of three-dimensional orientation, the two highlighted squares measure the same length, but contain different texture density.

In figure 3, two different areas are highlighted by squares of the same length. The surface texture of square A, however, is evidently different than that of square B in the sense that at least 15 rows of crops are contained in A, whilst only two are in B. In this case, by equating surface density with further distance from perspective, by measuring the texture density in different image regions and then comparing the results amongst themselves, one can compute the three-dimensional orientation of the image.

Within this approach, colour constancy is understood as the prime objective of colour perception; it is understood as a computation performed by the brain in which the “true colour” of a determined surface is “recovered” through the computational discount of the “illuminant”, or the “colour of light”. “Physical” or “real colour” is equated to the spectral reflectance of object surfaces, which is, in turn, understood “as the proportion of light reflected from a surface at each wavelength”. Illuminance or the “colour of light source” is, then, equated with the amount of energy (intensity) that a specific light source generates at each wavelength (Frisby and Stone 2010: 400-2). The computational approach thereby hypothesises that the brain somehow identifies the “objective physical colour” of a determined surface, as well as the “objective colour” of the light being reflected by the surface. Neuronal computations then subtract (or add) in order to “discount” that which might interfere with the way the surface at hand would be perceived in isolation (as predicted by dual-process theory). This would then successfully explain why perceived surfaces maintain a colour, irrespective of the wavelength intensity of the light source.

The computational approach’s *a priori* assumption of an object and perceiver independent notion of colour, however, runs into trouble with its own explanations. As can be inferred from the computational explanation of colour constancy, the

approach observes the findings and consequent explanations of the neurophysiological and psychophysical account. By doing so, however, the computational approach is left looking for an explanation of precisely how is it that the visual system has access to these, assumed, objective qualities of the environment necessary for the hypothesised computation. If one assumes (as the most prominent computational theories do) “colour” to be identical to the reflectance function of surfaces, and at the same time subscribe to the trichromatic theory of human vision, one must then conclude that human vision doesn’t have “‘direct’ access to” this reflectance function, but rather only to the “outputs of three different cone receptors sensitive to different wavelengths” (Frisby and Stone: 2010: 399). It follows then that the light absorbed by the photoreceptors is the product of both the spectral distribution of the illuminant and the surface spectral reflectance function of the location. Retinal activity would thereby “hopelessly confound [...] the illumination with the reflectance properties of [a determined surface]” (Finlayson 2000: 102). This *a priori* assumption, then, doesn’t solve the problem that colour constancy presents to neurophysiology and psychophysics, but rather only reformulates it: the question now is not the one-to-one relationship between the experience of colour and wavelength identification, but rather the possibilities of access of the human visual system to the objective colour of surfaces and illumination.

The computational approach deals with this situation by treating it (as well as all other problems of human visual computation) as an “ill-posed problem”; this is a problem that admits no unique solution. The regularisation of said problem by computerisation is realised by the introduction of *a priori* and intuitive assumptions about the physical worlds that seem to be required for achieving an unambiguous solution for a

determined computational problem (Poggio, Torre and Koch 1985: 314; Marr 1982: 22). These are otherwise known as constraints.

Depending on the specific sort of introduced constraint, various different explanations of colour constancy are then arrived at (Maloney 1986, 1992; Maloney and Wandell 1986). The most important and influential of these is Edwin Land's retinex theory of colour vision (Land 1979, 1983, 1985).

4.5.1.5 Retinex Theory

Land explored the phenomenon of colour constancy by shining different sources of narrow wavelength illumination onto arbitrarily arranged displays of colours called "colour Mondrians" (on account of their similarity to the painting of Piet Mondrian).



Figure 4. "Colour Mondrian" as used by Land.

The wavelengths used were specifically chosen to match the sensibility of the three different photoreceptor cones identified with the human retina: 630 nm to match the long wave cone type, 530 nm for medium and 450 for the short. Land noted that if only one of the cone light sources was shined on the colour Mondrian no variation amongst the "colours" could be perceived. For example, if only the long wave source of illumination was used, the many different colours originally perceived in the Mondrian turned to different shades of red. The same occurred when only one of the other two lights were shone. The formerly perceived colours turned to shades of blue

of green (depending on the light source). Of most interest, however, was that, as the illumination changed, not only did the perceived colour of the Mondrian follow, but also the lightness and darkness of most areas (Land 1977: 1117-8). Patterns that appeared to be red when all illuminators were shining appeared to be light when illuminated exclusively with the long-wave illuminator, darker in the middle-wave light, and very dark in the short wave light. "Blue" areas, conversely appeared light when illuminated by the short-wave illuminator, and darker when other wavelengths were used. The same pattern, finally, was observed with the greens (Land 1977: 118).

However, when all three illuminators were shining at once, colour variation reappeared. Furthermore, any variation in the amount of flux of any of the differently lengthened illuminators translated into perceived variation of neither colour nor lightness: the actual amounts of each wavelength could vary a great deal without affecting the colours as perceived (colour constancy).

Land, then, arrived at two conclusions based on these findings: 1) When all of the three different wavelength illuminators were shining at once, the perceivably different coloured patterns in the Mondrian showed no visible variation as a result of variation in the amount of light shining from any of the illuminators, 2) nevertheless, when the different illuminators were shining on their own patterns, there was significant variation in terms of lightness, depending on the wavelength of the active illuminator.

It is, however, in this world of the single photoreceptor, a world uncomplicated by the experience of colour, that Land finds a solution to the problem. This because Land observed that when operating as a monochromatic system,¹² the eye does "unfailingly well to discover lightness values independent of flux". When different receptor

¹² This is when operating with a single receptor system or when an array of white, black and grey is viewed.

systems are activated without interference of the others, further, a variation in lightness is observed that is correlated with the variation in colour when all three systems are active. Based on this account, Land (1977) hypothesised that perceived colour in a determined scene can be predicted on the basis of lightness values within each of the three waveband receptors. That is to say that each type of receptor cone generates a separate lightness image, and the comparison of lightness values amongst wavelength receptors specifies the colour that is perceived. In order to achieve colour constancy the “outputs” of the different receptors (long-wave, medium-wave and short-wave) act as independent channels and separately solve the problem of lightness within each independent image (1977: 112; 1985: 7).

The main objection to Land’s retinex theory, and one that it shares with computational accounts of vision in general, is the requirement of “constraints”, or rather *a priori* assumptions that seem to hold only within a controlled environment. In the case of Land’s retinex theory an environment that offers a specific arrangement of spatial segmentation is needed. Colour Mondrians offer these conditions. They, however, hardly resemble the everyday worldview of human colour perception. That is, Mondrian stimuli do not possess specular highlights, surface irregularities, shading, mutual reflection, or other reflection features that take place in a three-dimensional environment (Hulbert 2007: R907). Land’s algorithms succeed because, within such an environment, the computational theorists are able to expect the illumination to vary slowly and continuously across the scene as well as assume that patches will have uniform spectral reflectance. This allows for the assumption that gradual changes in the intensity of signals are caused by variations in the illumination. Discontinuous step-changes can thereby be accounted to boundaries or edges of patches of different reflectance. Nevertheless, it is only when the visual field has been segmented in such a

manner that the average relative reflectance values of each unit can be calculated. In order for this to be extrapolated to the human visual system, one would have to assume that the natural environment's illumination has the same characteristics observed in the Mondrian, which it clearly does not (Hurlbert 2007: R907).

4.5.1.6 Philosophical Discussion: Colour as evidence of Mutual-Determination

If the problems of *a priori* assumptions are dismissed the computational approach not only seems perfectly compatible with neurophysiological and psychophysical findings and conclusions on colour vision, but by assuming (for methodological purposes) that colour is an objective property of the environment it seems that computationalism solves the only theoretical conundrum faced by dual-process theory.

4.5.1.6.1 Colour as a Perceiver-Independent, Objective Property of the Environment

Land's Retinex theory (1979, 1983, 1985) as well as other computational studies of colour vision (Maloney 1986, 1992; Maloney and Wandell 1986; Rubin and Richards 1982, 1984; D'Zmura and Lennie 1986; D'Zmura 1992) have served as empirical support for a plethora of objectivist (including realist) theories of colour (Hilbert 1987, 1992; Byrne 2002, 2003; Byrne and Hilbert 2007a, 2007b, 2009; Matthen 1988, 1992; Dreske 1995; Tye 1995). The most complete and persuasive defence of such a position (amongst other things because it accounts for comparative studies) is that by Byrne and Hilbert (2003b).

Like computationalism, their position also contains various *a priori* assumptions. They specifically assume ontological realism in general terms. They differentiate, in this regard, between "properties of an experience", which are purely related to a determined experiential agent, and "represented properties", related to a perceiver's

independent objective environment (or “reality”) (Byrne and Hilbert 2003b: 5). This would then imply a difference between “veridical” and “false” perception of colour, and therefore the existence of a physical property that can be reduced to this phenomenon. Following some of the cited computational studies of colour vision, Byrne and Hilbert (2003b) contend that colour is identical to surface spectral reflectance.

Regarding the specific case of the studies of comparative colour vision (in which a perceiver-relativity seems to be manifest) Byrne and Hilbert (2003b) contend that is necessary to distinguish between “the conditions necessary for perception” and that which is, in fact, “perceived” (2003b: 6). As such, the authors recognise that colour perception is extremely varied amongst different species of animals (and even amongst different individuals). They contend, however, depending on the “details of the visual system in question” that the organism will be able to represent “real” surface reflection types (colours) that might not be available to other organisms.

4.5.1.6.2 Challenges to Colour Objectivism

Colour realism (as well all other forms of colour objectivism), is a minority position amongst philosophers of colour (Byrne and Hilbert 2003b: 3), in the sense that scientists themselves (Zeki 1983: 764; Gouras 1991: 179; Backhaus and Menzel 1992: 28) commonly assume non-objective ontological positions.

The Argument from Structure

Amongst the plethora of challenges to colour “external objectivism”, the most important is that which has been sometimes been referred to as the “argument from structure” (Cohen 2003: 2). Originally introduced by Hardin (1988: xxi-xxii, 66-67), the argument has become the most prevalent opposition to realism (i.e. Boghosian and

Velleman 1991; Johnston 1992; Thompson, Palacios and Varela 1992; Thompson 1995; Maund 1995; Matthen 2005: 175).

In basic terms, these authors hold that the understanding of colour as an objective property of the environment is incompatible with the findings and conclusions of neurophysiology and psychophysics, particularly the evidence which supports a “phenomenological structure of colour”. That is, the authors who support the argument from structure argue that if the tenets of the dual process paradigm are taken into account, colour, understood as hue, is constituted structurally:

1. Hues are *relationally constituted* amongst themselves. Unique red is constituted (by the animal’s visual system) as the opposite of green, and vice versa. Likewise, purple is a binary colour constituted as a middle waypoint between red and blue, as well as the opposite of a reddish-yellow.
2. If one considers that in order for “something” to be considered a colour, it must also be a hue, then any physical (or otherwise external and objective) property that is to be reduced to colour must also be relationally constituted in this way. It must, amongst other things, have corresponding unique and binary divisions.
3. Neither light waves, nor spectral reflections, or other proposed external phenomena have the particular structural composition of hues (while internal psychophysical and neurophysiological states and processes do). Therefore,
4. Colour cannot be reduced to physical (or otherwise non-primitivist) objective and external properties of the environment.

Philosophers of different metaphysical and ontological commitments (Shoemaker 1990: 107-8; Matthen 1992; Lewis 1997; Byrne and Hilbert 1997: 274-279, 2003; Jackson 1998, 2000; MacLaughlin 2003; Cohen 2003) have contended against the fortune of such an argument. The proposed solution to the presented conundrum resides in

(again) differentiating “colour experience”, from “colour proper”, and contending that the properties at hand are only constitutive or essential of the colour experience and not of colour proper. If this is so, it is argued, it is possible for a determined set of physical properties to have such structural relations, when and if the adduced physical phenomenon is considered to be the base of those experiences. A particular material structure that causes a determined chromatic experience would count, for example, as binary as opposed to unique, because the colour experience that it causes in appropriate subjects is binary (Cohen 2003: 12; 2009: 194).

Cohen (2009, 2003) however, argues that such a strategy is unsuccessful, on account of the “modal necessity” implied in the argument from structure. The position that colour is constitutively relational (or constitutively structural in a determined sense) is equivalent to the position that colours are relational or structural in all possible worlds. This argument, however, assumes a contingent relationship between the assumed “objective colours” and their corresponding “colour experiences”. These positions would, for example, hold red to be a particular mind-independent property that merely “happens” to be the basis for the disposition to look red (2003: 12-4; 2009: 194):

But if the relation between color and color experiences is merely contingent, and if the structural properties of the colors are derived from the structural properties of the color experiences to which colors are related, then colors will have their structural properties contingently as well (Cohen 2003: 14).

The Argument from Perceiver-Relativity

As already seen, Byrne and Hilbert (2003), in their latest defence of colour objectivism, contend that perceiver-relativism can be addressed from a realist perspective by

considering that, depending on the precise visual characteristics, some animals may perceive certain colours unavailable to other animals, all of which remain objective or real.

The problem with this explanation is that perceiver relativism also leads to colour and colour space incommensurability. That is, in terms of dimensionality, agents seem to have non-comparable experiences. Two different colour spaces could not be mapped or “translated” from one to the other without remainder (Matthen 2005: 184-5, Thompson 2005: 151). In terms of sensitivity, it may be the case that two agents with the same dimensionality but different “spectral windows” perceive a specific surface in different hues. In the face of this, “external colour objectivism” would then have to account for a specific standard on which to base judgement of truth or validity, considering the many different competing and incomparable experiences of colour. A common theme amongst the many authors who support a relationalist account of colour (Cohen 2009, 2004; Matthen 2005, 1999; Thompson 1995; Thompson, Palacios and Varela 1992) is that there is simply no non-arbitrary, well-motivated manner in which to select one of the many variants. As a result, and in light of the scientific evidence available, the most adequate solution to the problem is to assume all positions are equally valid and then fit ontological theories of colour to such a position.

Colour Subjectivism, Irrealism or Eliminativism

The challenges posed to “external colour objectivism” (especially the argument from structure) have led some (Maund 1995; Hardin 1993, 1988) to contend that colours are properties that are entirely un-instantiated. The original argument, brought forth by Hardin (1988), is that, on account of the argument from structure, colours cannot be reduced to physical properties. Nevertheless, neural processes (such as the psychophysical and physiological chromatic channels) do admit structural relations

constitutive of hues. Hardin thereby concludes that colours can be purely reduced to neural process, nowhere to be found in an “external environment” (Hardin 1988: 111).

Colour relationalists¹³ (Matthen 2005, 1999; Thompson 1995; Thompson, Palacios and Varela 1992) contend that the eliminativists are taking the consequences of the argument from structure too far. For them, the problem resides in the insistence on locating colour either intra or extra-dermally. They argue that even though an understanding of colour as a perceiver-independent property may not be fortunate, this does not eliminate the possibility of a “relational” account of the phenomenon.

In order to understand how this conclusion is brought forth in face of the evidence and the argument so far presented, one must consider the question of the involuntariness of the perceiver in relation to its perceptions. The structural relations that constitute colour may not have an objective relationship with physical objects. Matthen (2005) contends, however, that this does not mean that from the perspective of the perceiver, they do not have an objective relationship to him, and amongst themselves. He argues that the characteristics of the phenomenal colour space are not subject to manipulation by the perceiver. Cone cells are not epistemic organs that perceivers are able to control (Matthen 2005: 198-9).

Matthen (2005) is claiming that colours are then objective, not in a perceiver independent way, such as a view from nowhere, but rather objective within the specific situation (biological, temporal, etc.) of the perceiver at hand. As a result, from the perspective of a determined perceiver, there are such things as “mistakes”, so that “an organism may adopt a classificatory scheme that does not well serve the purposes for which the scheme is used” (Matthen 2005: 21).

¹³ Specifically those that unlike Cohen (2009, 2004, 2003), are not committed to a general position of ontological realism in general terms.

Furthermore, according to Matthen (2005), learning requires effort, and “there are gaps in our information that make inference difficult or impossible”, this also suggests evidence of a struggle and therefore points towards the opposition of the perceiver against something other than oneself. This relates to the second challenge to subjectivism: biological classification schemes such as phenomenological colour structures cannot be “understood independently of the organism’s [evolutionary] history” (Matthen 2005: 18).

In this sense, Thompson and others (Thompson 1995: 205-14, Thompson, Palacios and Varela 1992: 19-21) contend that the empirical studies that suggest chromatic co-evolution amongst different species deal a devastating blow to the thesis of colour eliminativism. Examples of an evolutionary relationship between bee or primate trichromacy and plant appearance point towards the presence of clear extra-dermal relationships between colour experience and colour manifestation (Thompson, Palacios and Varela 1992: 19).

On account of these considerations, colour relationists (Cohen 2009, 2004, 2003; Matthen 2005, 1999; Thompson 2000, 1995; Thompson, Palacios and Varela 1992; Varela, Thompson and Rosch 1992) claim that colour can only be understood as a “relational property”. That is, it can only be understood by understanding the relationship between the perceiver and the world as ontologically constitutive of colour.

4.5.2 Evidential Work Concerning Other Sensory Organs

Work concerning the ontologically contingent (embodied, sensory-motor grounded, etc.) nature of perception is still dominated by research and arguments revolving around colour experience (Wessel 2006: 93). There is, however, some incipient

empirical (or semi-empirical) work concerned with a situational view of auditory experience (Wessel 2006, Lochhead 1995). There has also been important and continuous work related to the sense of smell (Skarda and Freeman 1987). The trend of these studies is that, in general terms, the phenomenal structure (the structure of perception) varies amongst species in relation to the specific characteristics of their bodies (and therefore their sensory motor capacities). In other words, these studies suggest that experience is ontologically contingent to anatomy. It also implies, however, that because sensory-motor capacity is constantly changing (in evolutionary terms), experience is also contingent on time, or rather on temporal situation. Crucially, depending on the specific characteristics of two animals, their phenomenal structure may be “incommensurable”. For example, with colour dimensionality, agents seem to have non-comparable experiences. In other words, two different colour spaces could not be mapped or “translated” from one to the other without remainder (Matthen 2005: 184-5, Thompson 1995: 151).

4.5.3 Language and Concepts

The above line of work has so far concerned what is called on-line cognition. That is, it explores cognitive phenomena constituted by a direct relation to the environment (i.e. sensorial experience or perception). There is substantial work, however, that suggests that a similar situation is present in the case of off-line cognition (i.e. abstraction, imagination, representation). Evidence in fields such as linguistics and psycholinguistics (e.g. Gibbs 2003; Lakoff and Johnson 1999), along with neurophysiology (i.e. Kiefer and Barsalou 2013; Barsalou 2008) suggests that cognitive phenomena such as language, imagination, and overall abstraction (what is commonly assumed to be representation), is also grounded (Barsalou 1999), embodied (Lakoff

and Johnson 1999) or otherwise contingent on the organisms' perceptual and motor mechanisms.

George Lakoff and Mark Johnson (1999) argue, based in linguistic evidence, that all concepts in human language that do not have a direct correspondent to sensorimotor stimulus or action, (what they call "basic-level concepts" [1999: 27-30, 90-1]) are metaphorical. They provide evidence for this claim by elaborating on the grounding different types of concepts and categorisations, such as colours (1999: 23-6) and "spatial-relations concepts" (1999: 30-6). In the words of the authors:

Our most important abstract concepts, from love to causation to morality, are conceptualized via multiple complex metaphors. Such metaphors are an essential part of those concepts, and without them the concepts are skeletal and bereft of nearly all-conceptual and inferential structure (Lakoff and Johnson 1999: 72).

The most important part of this is the neuropsychological work that suggests a strong relationship between abstract reasoning and the neural mechanisms used in perception and movement.

For example, Keifer and Barsalou (2013) cite a number of studies that, through the use of EEG or MEG neuroimaging recordings, have found evidence for early activity of sensory-motor systems in the performance of conceptual tasks. For example, sound related concepts quickly (150 milliseconds after word onset) activated the associated auditory cortex (Kiefer, Sim, Hermberger, Grothe and Hoenig 2008). In a different study (Pulvermüller 2005) similar results were found, this time in regards to action related concepts and motor areas. Of most interest is that various studies (Hoenig, K. Sim, E.J., Bochev, V. Hermberger, B. and M. Kiefer 2008; Kiefer, Sim, Helbig and Graf 2011) "found activity in modality-specific cortex at about 100 ms after stimulus onset" (Keifer and Barsalou 2013: 395).

Another interesting study involved asking different subjects to provide definitions for a plurality of categories. Barsalou (1993) found that at most 44% of the characteristics of a determined subject's definition were shared with the definitions of others for the same term. Definitions amongst individuals also varied significantly when definitions for the same categories were requested again two weeks later.

Findings such as these have prompted "modal theories" of representation, language, or abstraction of which Barsalou's (1999) *Perceptual Symbols Systems* and Lakoff and Johnsons (1999) *Embodied Realism* are the most influential.

Irrespective of their differences, the theories at hand share the following characteristics:

- 1) The understanding of "abstract", "representational" or "symbolic" cognition as grounded in and determined by the sensorimotor characteristics.
- 2) This grounding is normally hypothesised by suggesting that abstract cognition (including and especially imagination) is equivalent to sensorimotor simulation. The areas of the brain that are used for perception and action are the same areas used for abstract cognition (Lakoff and Johnson 1999: 20; Barsalou 1999: 582-3).
- 3) These simulations may acquire complexity and sophistication, as "subsets of them are extracted and stored permanently in long term memory (Barsalou 1999: 578). At this point, they may be no longer recognisable as sensorimotor (Lakoff and Johnson 1999: 72), which is arguably the case in mathematics (i.e. Lakoff and Nunez 2000).
- 4) This perceptual memory "can then function symbolically, standing for referents in the world, and entering into symbol manipulation" (Barsalou 1999: 578).

4.6 Conclusion

The purpose of the present chapter was to introduce an empirically supported ontology able to provide a solution for the problem that concerns this work. I began by detailing the precise manner in which “object naturalism” is able to account for normativity. I illustrated how “object naturalism” was able to account for hypothetical, pragmatic, functional or instrumental normativity, because it had no problem locating as causal the constraint and therefore the normative consequence that resulted from the relationship between a determined point of departure for pursuit of outcome, and the expected, desired and/or required arrival. Concerning normative matters, this seems to be the only causal relationship that such a rendering of naturalism is able to account for. It is, in this regard, unable to account for the ontological relationship between different normative contexts, which might provide insight as to a normative relation.

As a solution to this problem, and following the call from Price (2011) I suggested a new ontology, one that results from the strict and disciplined scrutiny of that which pertains to human and animal perception, sensation and cognition. As a solution, I offered a relationist ontology, which, in order to differentiate it from the received view (i.e. “object naturalism”) I labelled “logic of difference”. In contrast to its opposing counterpart, the logic of difference does not account for ontological relations as linear, but rather approaches them as mutually-constituted. At this stage, I hypothesised that the logic of difference would be able to explain the same normative phenomena that “object naturalism” does, plus cognitive or normative horizontal ontological relations. It would be able, thereby, to produce a naturalist, and therefore immanentist, account of positivity.

I then proceeded to demonstrate how a “logic of difference” results from the empirical study of human (and animal) referential standpoints. Because the most cited, discussed and researched body of work done in this field concerns the perception and ontological nature of colour, I focused on such work.

In continuation with a logic of difference, it was found that colour hues, or in other words simply “colours”, cannot be understood in terms of ontological independence. In order for black to be black, it requires a white. The same occurs with red, blue and yellow. All colours occupy a space within a determined spectrum and hold their characteristics in opposition to the rest of their structural universe. This relational constitution, further, is different depending on both the species and the individual. Different animals perceive and have a causal relationship to phenomena that others do not. The visual experience of different beings is, thereby, completely situated and contingent on the agent’s relationship to its environment.

Differently structured colour spaces, further, are held as “incommensurable”. That is, increased dimensionality implies a complete rearrangement of the spectral experience, so that the experience of a determined agent cannot be translated into the experience of another without residue. Finally, ample evidence shows that chromatic variation in animals is correlated to their behavioural repertoires. It is a circumstance that reminds us of the manner in which normative phenomena are observed in nature: as pragmatic, hypothetical, functional or instrumental.

From the chapter, it can also be observed how discussion regarding matters of reference revolves around very similar lines and arguments.

Naturalists in the field of epistemology find their “colour” equivalent in the relationists; that is, in those who, like them, hold to a contextualist or contextually

contingent understanding of reference. On the other side of field are the objectivists, who find their equivalent in normative/epistemological objectivism. Like their normative counterparts, the colour objectivists and realists also require an unwarranted jump: they also hold to “necessary” *a priori* synthetic truths without which their theories could not be sustained. The arguments for and against each position are also alike: indispensability and necessity vs. relativity and incommensurability. It is clear, however, how it is necessary for non-fully relationist positions to exclude certain bodies of evidence in order to sustain themselves.

Even though the most widely researched phenomenon pertaining to the subject at hand is that related of colour vision, examples of work in other fields were also provided. Amongst these, one of the most interesting is that which deals with off-line or “abstract” cognition. The evidence in this regard is also continuous with that offered by colour. Abstraction is contingent on the sensory-motor capacities of the agent, and therefore, on the specific manner of its engagement with the environment.

The next chapter will address the relationship between this evidence and naturalist theories of the mind. I will initially address the objections to a strictly relationist, or a strictly situated, theory of cognition. Once I have provided arguments to assume the viability of a position such as the logic of difference, I will address the manner in which agents relate themselves to the environment, and also to other agents from the ontological perspective that results. It is from these empirically sourced theories that an account of naturalist normativity will be provided in the final chapter.

5. Situated and Embodied Cognition: A Possible Solution

5.1 Introduction

In this chapter I will address the relationship between agents and their environments, as well as amongst themselves, from the perspective of the logic of difference.

Because the received view in cognitive science is not one aligned with the position I suggest may provide a naturalist rendering of positivity, I devote the first section of this chapter to defending this position. Once again, we find that views opposing a worldview in which all entities and phenomena are strictly situated and located in time-space or dimensionality require a priori positing in order to sustain their position. The charge levelled against the logic of difference and its allied positions in this regard, is that it is one not supported by evidence but rather by tradition.

I hold that the a priori assumption of cognitive realism can neither be proven nor refuted. Nor can the ontology assumed by those who hold to positions in line with the logic of difference. Evidence, however, clearly suggests that human beings and other cognitive agents do not have direct access to the environment. Radical embodied cognition and allied positions do not challenge realist assumptions. Their description of agent environment relations, however, corresponds to what the evidence suggests. In this sense I hold that, as scientists, we must attempt to maintain our methodological commitments in line with our empirical findings.

If no a priori assumptions are made, then Humberto Maturana and Francisco Varela's (1992) theory of autopoiesis corresponds to the most comprehensive account of cognition and life. It is clear from their position that contextualist accounts of normativity and accounts theories of cognition share almost exactly the same

characteristics. Maturana and Varela (1992), in this sense, understand life as point of departure for the pursuit of an outcome that is constantly changing in light of such a pursuit. All reference, for the agent, consists of its own history of interactions; in other words its own history of change. There are two ways, finally, in which such agents change: they change as a result of interaction with a non-living environment and also as a result of their interaction with other agents. I maintain that it is here from whence a naturalist theory of positivity can be produced.

5.2 The Historical Precedent

The empirical evidence offered in the previous chapters is not meant to be exhaustive in any terms. It does, however, comprehend the most cited research within the body of evidence that has motivated the elaboration of a substantial amount of theoretical work that is collectively known as embodied cognition, embodied cognitive science or embodied-dynamism.

At face value, and without any previous assumptions as to the nature of the ontological relationship between cognitive agents and their environments, the evidence would seem to suggest that cognition, in general terms, is determined by each agent's specific relationship to its environment. In other words, that cognition is both relative and constrained by an agent's ultimate spatiotemporal situation.

If no a priori ontological considerations are taken into account, it would therefore seem that, at least, cognitive phenomena are determined by this ultimate form of situational relativity and constraint. That is, the evidence does not provide any suggestion that cognitive agents could have access to any form of cognitive experience that transcends their specific cognitive situation. So far, the evidence would suggest that, if the situational circumstance were altered, so too would the cognitive phenomena. This would then imply that (ontological considerations aside) ultimate

(i.e. embodied) situated-ness is constitutive of cognitive phenomena, or the thesis of strict cognitive situated-ness (SCS). This position, further, would lead to a cognitive and epistemic rendering of the logic of difference.

If this claim is taken to ontological proportions (a move possibly unwarranted), it then results in the thesis of ontological mutual-determination (OMD). That is, we see the ontological consequences of the logic of difference. The aspect of cognitive relativity would be elevated to the claim that environments are ontologically defined in opposition to agents. The constraining aspect, in turn, would imply the ontological counterpart, namely, that agents are also defined in opposition to their environments. Their relationship thereby would be ontologically constitutive, in the sense that, in regards to any particular agent, its environment can only be understood in reference to it, as that which differs from it.

Nevertheless, with the exception of what are considered (Clark 2008, 1999, 1997; Chemero 2009; Thompson and Varela 2001) to be the most “radical” forms of embodied cognitive science (i.e. Di Paolo and Thompson 2014; Di Paolo 2009; Gallaguer and Zahavi 2008; Thompson 2007; Gallaguer 2005; Thompson and Varela 2001; Van Gelder 1995; Varela, Thompson and Rosch 1991; Maturana and Varela 1980, 1979; Varela 1979) the above interpretation of the evidence is not generally held to be warranted. This does not result, however, from empirical considerations but results, rather, as a consequence of historical circumstances.

The growing interest in cognitive situated-ness is a relatively recent development in the science of cognition. As discussed in the first part of this work, the notion that knowledge, or rather “epistemic validity” is relative to situation is as old as scepticism. The more specific notion that experience, or even the mind is situated, be it in a particular (social or cultural) context, in the body, or (constitutively or casually)

related to an agent's possibilities of action was already a common theme in philosophies such as those of Wittgenstein (1953), Piaget's developmental psychology (1954) as well as in phenomenology (Heidegger [1927] 1961, Merleau-Ponty [1948] 2004, 1962, 1964). Nevertheless, the research programs collectively referred as cognitive science had not been in conversation with similar ideas until Hubert Dreyfus's (1965, 1967, 1972) critique of Artificial Intelligence.

Inspired by both Heidegger ([1927] 1961) and Merleau-Ponty ([1948] 2004, 1964, 1962), Dreyfus rejected AI's ontological assumption "that what there is, is a set of facts each logically independent of all the others" (Dreyfus 1972: 68). He contended – from a view interestingly close the thesis of strict cognitive situatedness (SCS) and a logic of difference – that "objects" could hardly be understood in terms of a set of properties, a "set of facts" or "elements of knowledge". For example:

To recognise an object as a chair [...] involves a whole context of human activity of which the shape of our body, the institution of furniture, the inevitability of fatigue, constitute only a small part. And all these factors are no more isolable than the chair (Dreyfus 1972: 122).

Cognitive scientists (and analytic philosophers) of the time were, however, unimpressed by Dreyfus's considerations. According to scientific historian Margaret Boden (2006), in the early 1970's the conversation between the Anglo-American tradition and notions such as those under discussion, which were common in the realm of Continental philosophy, "was more like ships passing in a foggy night than opponents engaging in an arena" (2006: 1397). She contends that it wasn't until the publication of Richard Rorty's (1979) *Philosophy and the Mirror of Nature*, that the grounds were set for the future reception of "anti-Cartesian and even Heideggerian ideas" (2006: 1398).

Before the 1990's, cognitive science was traditionally dominated by the work commonly grouped under the heading of cognitivism (also known as "traditional computationalism") and the related research program of emergence or connectionism. Cognitivism, represented by authors such as Zenon Pylyshyn (1984), Jerry Fodor (1975, 1981, 1987), Noam Chomsky (1965, 1968, 1980), Herbert Simon and Allen Newell (1972), is characterised by its understanding of cognitive processes as rule-governed manipulation of internal symbolic representations. Cognitive phenomena are then considered to consist on the "computation" of these symbols.

Emergence or connectionism, represented by authors such as Douglas Hofstadter (1995), Ulric Neisser (1993, 1976) Moshe Abeles (1984) and Daniel Dennett (1978) is characterised by their understanding of the principles of cognition as occupying a "sub-symbolic domain" constituted as a system made up of a plurality of connected components, whose interaction leads to global behaviour corresponding to a specific cognitive outcome. Meaning arises as a function of this achieved global state. Symbolic processing could be then understood as macro-level approximations of the operations that occur in the underlying system.

Both research programs understand the objects of symbolic processing or computation as representational stand-ins for an already existent reality, whose semantic content is causally related to this "exterior". This position, in turn, translates into an implicit ontological assumption regarding a specific relationship between cognitive agency (and/or "life") and the environment. Two specific claims, then, form the base of the traditional position:

- a) The traditional ontological claim (TOC); or the claim that reality is ontologically independent of cognitive agents, and

- b) The traditional cognitive claim (TCC); or the claim that cognitive phenomena have a causal (commonly representative) relationship with this independent reality.

It was not until the 1980's, with George Lakoff and Mark Johnson's *Metaphors we Live By*, that challenging notions began to formally permeate cognitive science. It wasn't until as late as 1991 that a real alternative to the established assumptions began to take a foothold in the science of cognition. Amongst the publications that marked a watershed in the subject are the following: Francisco Varela, Evan Thompson, and Eleanor Rosch's (1991) *The Embodied Mind*, which introduced the *enactive* understanding of cognition;¹⁴ Rodney Brooks' (1991a, b) work in Artificial Intelligence, which in turn inspired Andy Clark's (1997) *Being There: Putting Mind, World and Body Back Together*, and Thelen and Smith's (1994) *A Dynamical Systems Approach to the Development of Cognition and Action*. Interestingly, Dreyfuss did not inspire any of these works, "though some cited him in support after developing their own position" (Boden 2006: 1399).

The historical precedence of the "traditional" position, however, has extremely important circumstances regarding the development of embodied cognition as well as regarding its challenges.

The most important consequence regarding such a development is that the historical precedence of ontological and cognitive "traditionalism" results in understanding all empirical suggestions of cognitive situatedness as challenges to a "standard position", assumed to be reside in the traditional approach. Seen from this perspective, the

¹⁴ Since the 1960's Humberto Maturana and Francisco Varela (Varela 1979, Maturana 1980, 1988a, 1988b; Maturana and Varela 1979, 1980, 1992) had been promoting a new biological understanding of life, continuous with a logic of difference that included a cognitive aspect. It wasn't, however, until the publication of Varela et al.'s (1991) *The Embodied Mind* that their biological proposals ideas were specifically directed at the science of cognition.

evidence, rather than suggesting a coherent picture of cognition as being ultimately situated, seems rather like a diverse set of challenges to the “standard” position. In other words, embodied cognitive science acquires its identity in opposition to a particular understanding of the mind, and specifically to that which is historically considered to be “cognitive science proper”.

The set of claims and theoretical proposals that results from this situation is then extremely varied, both in terms of its interpretation of the evidence and, in consequence, of its ontological commitments, to the point that they might even seem to be unrelated to one another (Di Paolo and Thompson 2014; Spackman and Yanchar 2013: 47; Shapiro 2014; Wilson and Foglia 2011; Adams 2010: 613; Wilson 2002: 625-6). Depending on a) the specific sort of cognitive phenomena that the particular evidential work used is concerned with, and b) the author’s considerations in regards to the persuasiveness of said evidence and the warrant it provides to challenge TCC and/or even TOC, a variety of claims are obtained.

The thesis of strict cognitive situatedness (SCS)¹⁵ loses its general application and is watered down as the following “constitutive” claim of embodied cognition (also called the embodiment thesis):

- 1) Many features of cognition are “embodied” in the sense that they are “deeply dependent on the characteristics of the physical body”. This is either because the “agent’s beyond-the-brain body plays a significant role” in said features of cognition, or because said features are both relative and constrained to/by certain features of the body, the latter thereby playing a constitutive role (this is equivalent to these particular features being ultimately spatiotemporally

¹⁵ Which is, in general terms, directly opposed to the “traditional” cognitive claim (TCC), the former being philosophically allied to a “logic of difference”, and the latter to a “logic of identity”.

situated in the body) (Di Paolo and Thompson 2014; Wilson and Flogia 2011). As a consequence, body-relative cognitive variation is claimed for these “embodied” cognitive features. This is then explained by an appeal to body variation—which may or not be reduced to variation in terms of sensorimotor capacity—or social/cultural variation. Finally, temporal situatedness may also include the notion that cognition is time-pressured.

This claim then manifests differently, depending on the above stated conditionals, into one, some or many the following (not necessarily inclusive) proposals:

The first of these are claims that contend that certain (or all) forms of cognition have a constitutive relationship with the agent’s capacities for (immediate or future) action.

- 2) The strongest of these claims can be understood as affirming both that cognition is necessarily situated in the body, and that the body can only be understood as an instrument of action. Thereby the spatiotemporal constraint provided by it can be then reduced to the general claim at hand. This might imply a) that perception is intrinsically and necessarily related to action, in such a way that it is to be considered that perception necessarily requires the capacity for (a specific form of) action (Noë 2004, O’ Regan and Noë 2001); or merely that b) all cognition considered to be sensorimotor constrained would then be also action-based, or action-directed. This, however, doesn’t imply that an agent that has lost certain capacities for action, or has not yet acquired them, is also unable to perceive in related ways (Clark 2008, 1999, 1997; and most of those committed to SCS). In its strongest form, these claims would both understand the environment to be perceived and/or cognized as a particular agent’s possibilities of

(immediate or future) action (i.e. this position is related to Gibson's [1977, 1979] notion of "affordances").

- 3) A weaker form of the claim would merely affirm that the body functions as a regulator of cognitive activity over space and time, "ensuring that cognition and action are tightly regulated" (Wilson and Foglia 2011).

Other claims, however, are not necessarily related to action. For example,

- 4) The work on modal forms of representation, internal symbolic determination or embodied realism commonly claims that those things which are usually understood as "representations", more fortunately termed "abstractions" or rather "off-line cognition", are bodily/sensorimotor based: either as off-line simulations of online experience, or metaphors (Lakoff and Johnson 1999; Lakoff and Nuñez 2000; Barsalou 1999, 2008). This claim, however, does not necessarily assume that all perception (or sensation) is action directed. That is, it may be the case that all off-line cognition is sensory-motor based, but not necessarily related to the agent's possibilities for action.

Apart from these, works in embodied cognition may also claim that,

- 5) Cognition extends the brain. That is, since certain cognitive phenomena cannot be performed or explained without the agent's reliance in a tool or other aspect of its environment, these environmental features are to be understood as constitutive of that particular feature of cognition (Clark 1997, 1999, 2008; Hutto 2007).

Finally, from a realist perspective, work subscribing to the SCS and being agnostic as to TOC (or tacitly continuous with OMD), is understood as claiming that,

- 6) The “environment is part of the cognitive system” (Wilson 2002: 629-31; Noë 2004: 209-31),¹⁶ or that the environment and the mind are both constitutive elements of the cognitive system (Di Paolo and Thompson 2014; Di Paolo 2009; Gallaguer and Zahavi 2008; Thompson 2007; Gallaguer 2005; Thompson and Varela 2001; Van Gelder 1995; Varela, Thompson and Rosch 1991; Maturana and Varela 1980, 1979; Varela 1979).

Controversy amongst the different positions is not uncommon, especially between those expressly or implicitly assuming TOC (Clark 2008, 1999, 1997; Rowlands 2006; Hutto 2007; Noë 2004) and thereby supporting a “traditional” understanding of representation in which referents are ontologically prior, and those agnostic as to TOC or expressly supporting OMD (Di Paolo and Thompson 2014; Chemero 2009; Di Paolo 2009; Gallaguer and Zahavi 2008; Thompson 2007; Gallaguer 2005; Thompson and Varela 2001; Lakoff and Johnson 1999; Van Gelder 1995; Varela, Thompson and Rosch 1991; Maturana and Varela 1980, 1979; Varela 1979). All of these, however, subscribe in one form or another to claim (1). This situation has led some (Wilson 2002) to contend that in order for the term “embodied cognition” to maintain any “meaningful use” it must then be treated, not as a single viewpoint, but rather as a loosely knit variety of claims of differing merits (2002: 625, 635).

5.3 Cognitive Realism and the Burden of Proof

The most common challenge to what could be considered the “movement’s” constitutive claim, claim (1), is also heavily reliant on the historical precedence of the

¹⁶ Alva Noë (Noë 2004; Noë 2004, O’ Regan and Noë) subscribes to a position that seems extremely unusual from my perspective. In regards to ontological matters, he seems to implicitly assume a traditional understanding. In regards to cognitive matters (or more precisely phenomenological matters) he assumes a rather strong form of strict cognitive situatedness. He claims that perception *is* action in the strongest sense, implying even that all perception requires a specific capacity for action or that all perceptual experience is constituted by the exercise (not merely possibility of exercise) of sensorimotor skills. Because action requires an environment, this thesis translates precisely into the claim that the “environment is part of the cognitive system” (2004: 209-31), unusually understood within a logic of identity and not a logic of difference.

traditional approach to cognitive science. The general argument is that any of the different manifestations of the basic claim of embodied cognition go further than their supporting evidence allows. The “shift” from understanding cognitive phenomena as pertaining to causal (cognitive or ontological) relationships to the understanding of these as pertaining to constitutive (cognitive or ontological) relationships is problematic to say the least (Adams 2010; Adams and Aizawa 2008: 88-132; Prinz 2009, 2006; Aizawa 2007; Block 2005; Wilson 2002: 630-31). In other words, they contend that an appeal to (ontological and/or cognitive) causality is as good an explanation of the evidenced scenarios, as any appeal to cognitive or ontological constituency. There is, therefore, a gap between the empirical data used by proponents of embodied/situated cognition and the interpretations they wish to place on them (Aizawa 2007: 20). In our language, this is equivalent to stating that none of the evidence presented, warrants a “shift” from understanding cognition and/or reality from a perspective of a logic of identity, to understanding these from the perspective of a logic of difference.

Adams (2010), for example, sets to the challenge of contending against strict cognitive situatedness (SCS), understood in this particular case as claim (4), namely that off-line cognition is sensory/motor constituted. He argues against a particular instance of supporting evidence (Glenberg and Kerchack 2002), but his arguments could very well be used to contend against any other evidential work that claims, on the grounds of finding correlations between off-line cognition (concepts, abstractions [in this particular case sentence comprehensions]) and sensorimotor performance, that there is a constitutive relationship between these two phenomena, and therefore the explanation of the data is “best achieved by abandoning the notion that concepts are stored in a non-modal system” (Adams 2010: 620).

Adams's (2010) main argument is that the analysed data shows clear empirical correlations between concept understanding and sensorimotor experience. This, however, is only enough to suggest a causal relationship between off-line cognition and sensorimotor experience (2010: 620). Glenberg and Kerchack's (2002) specific claim, however, is that all "symbols" are sensorimotor "grounded", in the sense that "language is made meaningful by cognitively simulating the actions implied by sentences" (Glenberg and Kerchack 2002: 559). Adams (2010) then contends that, even if he were to grant that all off-line cognition has a causal relationship to sensorimotor experience, this would not necessarily imply that any type of off-line cognition would have a constitutive relationship with sensorimotor experience. The presented evidence awards no warrant to deny that concepts acquire their meaning in relation to real world referents (2010: 625-6).

As an example, he provides Jerry Fodor's (1987) semantic theory, on which the presence of a causal relationship between concepts and perceptual motor activity is also posited:

On Fodor's (1987) view '*horse* tokens are caused by horses, via their horsy looks' [...]. What is arbitrary [non-modal] is that one set of neurons rather than another instantiate one's concept of *horse*. But what is not arbitrary is that one's concept of *horse* is causally linked to horses via the perceptual presentation of horses to our cognitive mechanisms (Fodor 1987 cited in Adams 2010).

In a different attempt, Adams, in the company of Aizawa (2008), takes on both the cognitive (SCS) and the ontological (OMD) applications of the logic of difference (2008: 88-132). The culprit, in this case, is the application of dynamical systems to the studies of cognition. According to dynamical systems, two or more variables in a set of differential equations are coupled if their values are defined in terms of each other

(Adams and Aizawa 2008: 108). The authors contend that even if one grants that the nervous system, the body and the environment are coupled, in the sense that they are all “constantly changing and simultaneously influencing each other” (van Gelder 1995: 373), this does not provide a sufficient basis to affirm that they form a single unified system. The authors argue that, in general, one cannot simply assume that “causally coupling X to a cognitive process Y is sufficient to make X a cognitive process” (Adams and Aizawa 2008: 93).

In order to explain, they then compare cognitive systems to other phenomena that could also be coupled in a dynamical manner. Of particular interest is the case of a pendulum connected to another via a spring. The authors contend that such a configuration of objects could be counted as a “non-linear system in which the pendulums are coupled in the sense of coupling used in the dynamical systems theory” (2008: 108). They argue, nevertheless, that, independently of the “coupling” taking place, and even if the “masses of the bobs and lengths of the pendulums [...] give rise to some system level feature or process not had by the individual pendulums”, this would not in any way “provide evidence against the existence of the motions of the first pendulum” (2008: 109).

If this same logic were applied to the case of cognitive systems, it would also not be warranted to deny the existence of the first entity, the intracranial cognitive system, nor the identity of the second entity, the environment, if changes in one are correlated with changes in the other, or even if their coupling leads to a new, previously unobserved, process (2008: 110).

They conclude that, given the possibility of this explanation, the evidence provided does not warrant the supposition that cognitive processing “extends from the brain into the environment”. Supported on the assumption that the burden of proof rests on

the proponents of situated cognition, the authors contend then that the “obvious” “correct understanding” in case of both pendulums and cognitive systems is that the events in one entity are simply casually influenced by the event of the other (Adams and Aizawa 2008: 111-2).

As long as the traditional ontological position and its cognitive correlative are assumed to be “neutral” or “standard”, arguments such as these (also called the coupling-constitution fallacy or causality-constitution fallacy) are very persuasive. In fact, many of these challenges (Prinz 2009, 2006; Aizawa 2007; Block 2005) are specifically directed at either the “extended mind thesis” (Clark 2008, 1999, 1997; Rowlands 2006; Hutto 2007) or other work in embodied/situated cognition that assumes, either tacitly or expressly, a traditional ontological position (whilst also assuming SCS). In these cases, the contending authors go beyond supporting themselves on the “neutrality” of traditional positions, and offer alternative evidence that specifically counters the attempt to propose a situated or “extended” account of cognition. At the same time, it expressly or tacitly subscribes to ontological traditionalism.

Without this *a priori* assumption, the argument not only loses its persuasiveness, but also falls on account of its own premises. This could be initially understood as the argument begging the question (if not for cognitive traditionalism) for an “ontology of identity”; that is for metaphysical independence or for ontological realism. As a result, their challenge completely misses the mark. This is not as obvious in their challenge to constitutional cognitive situatedness as it is for their challenge on ontological mutual determination. When dynamical systems theorists contend that the nervous system, the body and the environment are coupled, in the sense that they are all “constantly changing and simultaneously influencing each other” (Van Gelder 1995: 373), they are,

amongst other things, claiming that (for “phenomenological” or epistemologically warranted purposes) both the agent and the environment co-determine each other. Rather, they are claiming that the environment is relative to the geographical, neurological and biological situatedness of the agent, in the same manner in which the agent is dependent on the environment. Because the specific characteristics of the (“perceived” or “phenomenological”) environment depend on the characteristics of the agent, there is a possibility of understanding cognition as ontologically constitutive. The challengers’ comparison of the pendulum coupling with the cognitive system is, then, not fortunate at all, in the sense that the ontological independence of all the constituent elements of the pendulum coupling is established beforehand. As a result, the comparison and the challenge that results from it do not address the possibility of agent-environment ontological mutual determination.

The situation, however, is even direr. This is because the assumption that the traditional understanding of cognition is “neutral” or “standard” is required to save the thesis from the exact same scrutiny to which they subjecting situated cognition. As I will try to explain, traditional cognitive and ontological assumptions are more vulnerable to these sorts of challenges, than the positions their defenders are trying to contend against.

That is, when claiming that the evidenced correlation does not warrant a “shift” from causal relationships to constitutional relationships, the challenge to ultimately situated cognition is set in such a way that only those positions associated with mutual-determinism or a logic of difference are under scrutiny. Those allied with ontological independence or a logic of identity are not. The question posed by the challenge is not whether the evidence seems to be suggestive of either cognitive-mutual determination or cognitive causality, each of these on equal terms, but rather if the evidence allows

for a shift from already established traditional understanding, not subject to the scrutiny of the alternative.

If one, however, follows the philosophical consequences of the established position, as well as the ultimate philosophical consequences of the proposed challenge, it is easy to see that the former hardly holds its own against the latter. Therefore, its assumption of it being “standard” or “neutral”, especially in light of the characteristics of the posed challenge, is arbitrary to say the least.

One can only comprehend an opposing alternative to the thesis of ultimate cognitive situatedness as claiming that cognition, or some form of it, is not ultimately spatially or temporally situated. In other words, one can only understand an opposing alternative to cognitive situatedness and the claim that cognitive agents (living beings or otherwise) have cognitive access to phenomena whose constitutive nature is transcendent of all spatial or temporal situation. This is to say that an opposition to ultimate cognitive situatedness is implicitly committed to ontological or phenomenological transcendentalism.

Take, for example, Adams’ (2010) claim, supporting Jerry Fodor’s (1987) semantic theory that affirms that the “meaning” of horse tokens is not *constituted* by the specific spatial temporal situation of the agent in relation to his environment, but rather *caused* by their horsy looks (Fodor 1987 cited in Adams 2010). In order for a horse token (horse abstractions) to be *caused* by “horsy” looks, “horseness” must have an ontological nature that is both previous to and independent of the specific spatiotemporal situation of the agent. That is, metaphysically (or ontologically) independent of the agent’s situation. Adams (2010) is thereby claiming this precise sort of transcendentalism for the ontological nature of “horseness”.

Cognitive transcendentalism need not be as strong. It may be the case that one assumes the spatiotemporal situatedness of all concepts or cognitive phenomena with the exception of laws of logic. Their “truth” values are then understood as being independent of all cognitive situatedness or relationship, and are therefore implicitly or expressly posited as being true in virtue of themselves.

These characteristics of the position are very interesting in light of the challenge that has been offered in order to salvage it from its opposing alternative.

The challenge is basically that the observance of a correlation of causalities does not warrant the “shift” to a claim for constitution. This argument is interestingly similar to the statistical and scientific warning that correlation does not imply causation. It is interestingly similar because, in fact, both arguments are versions of the inscrutability of the future, and more specifically of the problem of induction. Like the thesis that correlation does not imply causation, the so-called causality-constitution fallacy contends that a series of observations using the same sense does not warrant statements claiming ontological relations. A seemingly sound version of the argument may claim that the evidence does not warrant the claim of strict cognitive situatedness (SCS) on account of the lack of control and independent variables that would serve to better determine ontological matters. Nevertheless, even if there were any form of control, the argument that correlation doesn’t imply constitution would hold, on account of the impossibility of accounting for all foreseeable variables.

What then of any evidence that might be offered for the claim of traditional cognitive science and ontological realism? Would these efforts not also be hampered by the problem of induction?

The argument, as presented by the defenders of cognitive traditionalism, destroys our current epistemological standards for the purpose of defending the case for the logic of difference, but saves the validity of its own claims following the same fate by an appeal to the historical precedence of its position. In other words, the challenge is posited in quite a perverse manner. This is so because the defenders of traditionalism first: 1) excuse their position from scrutiny by an appeal to neutrality or it being “standard”, and then 2) offer against its competing claims an argument that questions the validity of all ontological claims. By doing so, they save their position from the scrutiny of a challenge that eliminates any possibility of valid proof.

If they were to allow their position to be challenged by the same arguments they use against claims of cognitive/environment mutual constitution, their own arguments would be harder to sustain. That is, the problem of induction leads to the conclusion that there is no warrant for universally valid statements, or claims of an ontological nature. In other words, the future is inscrutable, and therefore it is impossible to claim with certainty that determined ontological relations hold, based on empirical generalisations, or in other words, induction. This however, holds for all philosophically assumed relations between entities, phenomena or even concepts. There is always the possibility that future experience, or future communication, might challenge and change the positions I currently hold, including my assumption of the validity of this or that law of logic. Furthermore, even if I were to award universal validity to a determined logical statement, I would then have to claim as a premise either the possible scrutiny of the future, or the possible scrutiny of foreign perspective (see chapter 2). These are two statements that are either false, unknowable and/or both synthetic and *a priori*. For the moment then, we would have to assume absolute *a prioritism* and then deny the validity of all induction. Claims of a “realist”

relation between ontologically independent agents and ontologically independent objects requires more ampliative inductive claims than agent-environment mutual-constitution.

As a result, the positing of access to cognitive phenomena that transcends all temporal or spatial situation seems to be *a priorily* unwarranted. The positing of access to cognitive phenomena, constrained to spatiotemporal situation, however, does not. In other words, all scepticism, including all challenges to the possibility of claiming ontological relations from inductive generalisations, is more closely allied to cognitive-situationism than to cognitive realism.

Once historical precedence ceases to provide epistemological preference, however, the playing field between these two opposing proposals changes dramatically. Both constitutive situatedness and cognitive realism are now to be considered on equal *a priori* epistemic ground. That is, no position is considered to be “standard”, and “neutrality” is understood as the withholding of judgement. Induction is also back on the table. As a result of these two situations, the case for realism over embodied situatedness loses almost all empirical and logical plausibility.

As discussed early in the chapter, without any ontological assumptions, the evidence offered is persuasively suggestive of the embodied situatedness of both perception and off-line cognition. This, however, should not be a surprise if we consider the problem that concerns the matter of the present work. This is that science has an extremely hard time finding reference (or anything else for that matter) outside of the bounds of space-time and causality. This also includes, of course, all sorts of phenomena that are posited as un-situated, unchangeable and not contingent to their immediate context. This is exactly what cognitive realism suggests.

The evidence that suggests the presence of cognitive incommensurability, for example, provides particular strength to the case.

Without specific evidence to counter its inductively warranted suggestions,¹⁷ the thesis of cognitive incommensurability seems to warrant persuasive support for the thesis of strict cognitive situatedness (SCS). As observed in the previous chapter, there is an abundant amount of evidence that suggests that the perception of colour and smell is contingent to the sensorimotor characteristics and capacity of an agent. These are characteristics and capacity that not only vary genetically in terms of species, and ultimately individuals, but that are also subject to ontogenetic change. This evidence also suggests that in many cases (at least in the case of colour) this variation leads to incommensurable forms of experience and/or perception (such as the differently dimensioned “phenomenal colour spaces”). This suggests that the specific characteristics of the agent (such as the number of colour pigments) are *constitutive* of the colour space, in the sense, that they constitute an essential, non-interchangeable component of the particular experience of colour at hand. In the absence of these determined sensory-motor characteristics, the presence of the particular colour experience cannot be accounted for, as argued by Thompson and company (Thompson 1995; Thompson, Palacios and Varela 1992). As a result, in regards to colour experience, the presence of an independent entity that is transcendent of the specific relationship between agent and environment cannot be accounted for.

The rest of the evidence presented supports the embodied “ground” and situatedness of cognitive phenomena in different ways. If the epistemic playing field is equal, it would then seem that, in order to compete against these claims, cognitive realism

¹⁷ None of the defenders of cognitive realism (i.e. Adams 2010; Adams and Aizawa 2008: 88-132; Prinz 2009, 2006; Aizawa 2007; Block 2005; Wilson 2002: 630-31) seem to provide specific evidential support against the thesis of cognitive incommensurability.

would have to present equally persuasive evidence for the possibility of cognitive phenomena that is independent or transcendent of specific spatiotemporal situation.¹⁸ This, however, seems metaphysically impossible. The precise purpose of this work is to try to find positivity within nature, because science cannot account for matters that transcend nature. It could be said that it is rather obvious that naturally (spatial-temporally) transcendent matters are beyond the reach of science; they are transcendent, after all.

In this line, it is then not surprising that the defence of cognitive realism by cognitive realists themselves commonly takes place by means of purely philosophical or theoretical reasoning. Called “Hegelian arguments” by Anthony Chemero (2009), they are similar to our earlier deconstructed attempt, in the sense that much of their assumed strength resides in *a priori* considerations. Although Chemero (2009) contends that one may find “Hegelian arguments” defending all sorts of cognitive realist positions, he cites and analyses two of the prominent arguments of the cognitivist camp: Jerry Fodor and Xenon Phylyshyn’s (1988) “systematicity argument” (1988, Aizawa 2007).

The Fodor-Physlyshyn argument, for example, is outlined as follows:

- 1) Human thought is systematic. That is, abilities come in clusters.
- 2) Systematicity requires representations with compositional structure.
- 3) Connectionist networks do not have representations with compositional structure.
- 4) Therefore, connectionist networks are not good models of human thought
(Fodor and Phylyshyn 1988 cited in Chemero 2009).

¹⁸ As always I remain agnostic as to possibility, but this may seem to be a contradiction in terms. If so, it would suggest the absurdity of an empirical and therefore naturalist enterprise that assumes transcendental entities as its object of study.

Chemero (2009) argues that many of these premises lack any evidential support whatsoever. In this case, there is no evidence for premise (1) or (3). In fact, at the time of publication, the claim that human thought was systematic was “entirely new [...] in the cognitive sciences”, in the sense that at the moment there was no evidential precedent for the claim that human thought came in “clusters” (Chemero 2009: 8).

The cited arguments carry great weight amongst cognitive realists. However, without any *a priori* epistemic leverage, and in light of the evidential support provided for constitutive situatedness, the case for cognitive realism, or for the positing of cognitive phenomena that transcends ultimate situatedness, seems to be extremely weak.

5.4 Radical and Non-Radical Embodied Cognition

The best challenges posed to the strongest claims within the movement (Di Paolo and Thompson 2014; Di Paolo 2009; Gallaguer and Zahavi 2008; Thompson 2007; Gallaguer 2005; Thompson and Varela 2001; Van Gelder 1995; Varela, Thompson and Rosch 1991; Maturana and Varela 1980, 1979; Varela 1979) come from the embodied/situated cognitive camp itself. The self-styled “non-radical” camp of embodied cognition (Clark 1997: 143) is characterised by understanding (at least some forms of) cognition in terms of constitutive situatedness, or at least as an interrelation between agent and environment, without rejecting the “more traditional explanatory apparatuses of computation and representation” (Clark 1997: 143). Much of this work includes the research claims that fall under the label of “the extended mind thesis” (Richard Menary 2010, Andy Clark 2008, 1997; Daniel Hutto 2007), but may also include other non-extended proposals (such as Matthen 2005 and, arguably, Noë 2004).

Andy Clark (2008, 1997), for example, understands constitutive cognitive situatedness as the most empirically warranted position. He contends that both the cognitivist and the connectionist views of animal representation as universally objective and internal

are erroneous, and representations are more fortunately understood as “local and action-oriented” (1997: 149). He nevertheless, and on methodological grounds, defends an express understanding of the environment as a stable, constant and universal counterpart for all cognitive behaviour, for the following reasons:

- 1) No evidence provides a reason to deny ontological realism,
- 2) There are certain circumstances, or rather cognitive tasks, that necessarily require the use of representations as traditionally understood (1997: 167; 2008: 26).
- 3) There are problems with negative epistemic circularity that may arise from the cognitive relativity that obtains from constitutive cognitive situatedness (1997: 172-173).

Regarding point (2) it will be argued that Clark’s (2008, 1997) objection misses the mark, and the answer to (3) concerns the central thesis of the present work, namely the possibility of naturalist positivity. Before turning to address these issues, and assuming them as solved for current purposes, I would like then to turn to the fortune of subscribing to a logic of difference in regards to cognitive matters, whilst expressly subscribing to a logic of identity in regards to general ontological matters.

Clark’s (2008, 1997) position, like that of the normative “indispensability” is extremely strong. By subscribing to cognitive situatedness, whilst at the same time adopting a realist general ontology, he obtains a position continuous with other intuitively persuasive ontological positions, such as Putnam (2002) and Bhaskar (1989). His main weakness is that he is unable to provide an explanatory account of how his assumed realism deals with claims of cognitive incommensurability. His account would thereby require an explanation, in ontologically realist terms, of the incommensurability that results from the sensorimotor variation of the biosphere. Whilst Clark remains silent

on the issue, Mathen (2008), a formerly staunch cognitive objectivist turned relationist, provides an interesting account of how this might take place.

Mathen (2008) contends that living beings, “through the operation of natural selection” “classify” their environment in different and possibly incommensurable “classificatory schemes”, related and constrained to the organism’s needs, and therefore its capacity for action (2008: 18). He argues, however, for the ontological independence of “objects” in very persuasive terms; he claims specifically that objects are real because they constrain our volition. In his words:

When we attempt to act on an object, we are immediately presented with the datum that these objects resist our attempts to move them, and so on. Similarly, when we attempt to learn about objects, we find that effort is required: there are gaps in our information that make inference difficult or impossible, mistakes are made, things present inconsistent appearances, and so on. Thus it is clear that the objects we act on are independent of us (Mathen 2005: 8-9).

On these grounds, he then subscribes to an ontologically realist account of the environment, which he terms “pluralistic realism”. That is, he holds that the many different and possibly incommensurable “classificatory schemes” have “real” and “objective” referents: real properties on which the different “schemes” “hook up”. Some organism may represent “distal features” of a determined object, whilst others may hook-up to other different properties of the same object. Organisms from different species may then represent different “distal features” to suit their informational needs, all of these real in an action-relative sense (2005: 213-4).

Because his commitment to action-based cognition makes the limit of an object's possible properties unknowable, Matthen (2005) states that "properties—even physically specifiable properties—are infinitely numerous" (2005: 201).

This statement is extremely interesting for our purposes. This is because Matthen (2005) is positing an absolute infinity of "real and objective" properties.

Matthen (2005) is clearly understanding this infinity in terms of ontological possibility.

In other words, the author is positing an "unlimited" reality of objective properties.

This implies that the possibility of ontologically "real" properties is limitless, in the sense that it includes all possible limits and objects of all possible properties. Therefore,

depending on the specific set of properties which a determined organism "hooks on to"

some objects may be "classified" as unities or sets of objects. It may even be the case

that what may constitute a unity for a particular organism may constitute the

components of another unit for a different one.

One might then still say that an agent's cognitive abstraction of a determined object is

a representation of the object's "real" properties, in the sense that the object is

ontologically independent. However, because it is on virtue of the agent's specific

characteristics that the particular real property is accounted for in the classification

scheme, and these properties are unlimited, in regards to the overreaching reality of

unlimited possibilities, the agent's classificatory scheme is constitutive of form. This

position, then, seems to reach ontological conclusions identical to those continuous

with a logic of difference.

In other words, according to this interpretation of Matthen's (2005) ontology, when

speaking in regards of the cognition of a particular object, the relationship between the

object and the agent could be argued to be causal. In regards to the overreaching

reality of unlimited possibilities of properties, and therefore objects, the relationship is constituted. This is so precisely because of the differentiation of these by the agent, from an abyss of unlimited possibilities.

Even if one does not posit an ontology similar to that of Matthen's (2005), and rather argues in favour of ontological reality with clearly defined limits, because the commitment to cognitive situatedness constrains all possibilities of knowledge to situation, such posited limits would be impossibly knowable. This case would not imply an infinite set of properties in terms of ontological possibility; it would, however, imply an infinite set of properties in terms of epistemological possibility, again another metaphysical absolute.

In any case, the strongest argument for radical embodied cognition is not a defence of ontological mutual-determination, but rather an appeal to ontological agnosticism. This is the case, because what differentiates the so-called "radical" approach to embodied cognition is not its subscription to an ontology of difference but rather its lack of subscription to an ontology of identity (Chemero 2009).

That is, if we are to be naturalists (and not just philosophers), there seems to be no warrant to claim either ontological independence or ontological mutual determination. In this case, the only methodological route to avoid the bias of unwarranted assumptions would require refraining from judgement on the matter. Now, cognitive realism is not only less warranted than cognitive situatedness, but it also necessarily assumes general ontological realism. Cognitive situatedness, however, does not. It is both compatible with ontological realism and ontological mutual-determination, thereby rendering it "neutral" in regards to ontological matters.

The neutral position, then, does not seem to be a subscription to a logic of identity in general terms, but rather to agnosticism for ontological matters, and a logic of difference for all methodological matters. Because, however, from such a perspective, semantic values cannot be accounted to phenomena exogenous to the system, for all theoretical purposes, the methodological use of strict cognitive situatedness leads to the same conclusions that would result from the use of its ontological variant.

If we are to maintain such assumptions, then the most comprehensive theory of strict-situated cognition and agency is Humberto Maturana and Francisco Varela's theory of autopoiesis (Maturana 1980, 1988a, 1988b; Maturana and Varela 1979, 1980, 1992; Varela 1979), and the related program of enactive cognition, or embodied dynamism (Di Paolo and Thompson 2014; Di Paolo 2009; Thompson 2007; Thompson and Varela 2001).

5.5 Maturana and Varela's Theory of Autopoiesis

A general scientific understanding specifically of what constitutes "life" and "cognition", congruent with the above stated methodological assumptions, can be obtained from Humberto Maturana and Francisco Varela's theory of autopoiesis (Maturana 1980, 1988a, 1988b; Maturana and Varela 1979, 1980, 1992; Varela 1979). The theory of autopoiesis and the program of enactive cognition can be understood as a precise biological counterpart to G. Spencer Brown's (1969) *Laws of Form*.

Maturana and Varela's *Theory of Autopoiesis*, initially published as *De Maquinas in Seres Vivos* in 1972, is, amongst other things, an attempt at a scientific definition of "life" that differed from the dominant paradigm of organicism, in which the distinction between living organisms and inanimate systems is based in the enumeration of features or "characteristics" (Mayr 2010: 98). In opposition to this approach, Maturana

and Varela (1980) attempted to produce a conceptualisation that accounted for the “nature of the organisation of the living” in ontological terms.

In line with the logic of difference in which everything can only be understood in opposition to something else, they include their point of departure, or in other words, their referential standpoint, within their statements. In Maturana’s (1988b) words:

Constitutively we cannot claim the independent existence of things (entities, unities, ideas, etc.), and we recognise that a unity exists only in its distinction, that is, in the praxis of living of the observer that brings it forth (Maturana 1988b: 12).

By doing this, they are initially claiming two things in a seemingly foundational way. The first of these is the constitutive tenet of “the logic of difference”, namely that “things” (understood in the most general way as entities, phenomena, ideas, etc.) are what they are in opposition to what they are not. Secondly, however, they also claim that this distinction, the identification of unity from a determined background, is always “brought forth” by a cognisant agent, an “observer”. So, in a sense, we can see how their standpoint already contains the conclusions that may obtain from the application of the logic of difference in both terms of departure and arrival; in both ontological and epistemological terms.

Once the observer, which in this particular case is “science” or a “scientific community”, is taken into account, they then proceed with “scientific descriptions”.

Like any other entity or phenomenon within the logic of difference, a living entity (i.e. a biological organism) is a unity distinguished from its background. It is a specific sort of entity, however: a machine. The authors contend that, unlike other simpler entities, such as pieces of metal or grains of sand, machines are not differentially defined by the specific materiality of their components. A machine is, rather, defined as a set of

interrelations, or as interactions amongst a set of components that result in specific outcomes. A machine, then, is not a set of components, but rather a set of interrelations, and the specific materiality of its components is only taken into account in relation to the possibility of them satisfying “the desired interrelations leading to the expected sequence of transitions”.

The machine can be understood as two related phenomena. The first of these is its organisation. The organisation is described as the set of relations that define a machine as a unity and “determine the dynamics of interactions and transformations in may go as such a unity” (Varela 1979: 9). The actual relations that hold amongst the components that constitute a machine in a determined point in time, is described as its “structure”. The machine, then, is defined in regards to its organisation; depending on the plasticity of that organisation, the machine can then be “realised by many different structures” (Maturana and Varela 1980: 77).

It is in this sense that the authors contend that a living organism is a “machine”; a specific sort of machine, however:

An autopoietic machine is a machine organised (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components which: (i) though their interactions and transformations continuously regenerate and realise the network of processes (relations) that produces them: and (ii) constitute it (the machine) as a concrete unity in the space in which they (the components) exist by specifying the topological domain of its realisation as such network (Maturana and Varela 1980: 78-9, original emphasis).

To put it another way, autopoietic systems are machines in which the products of their processes are the processes themselves. They continuously generate and specify their

own organisation through their operation as a system of production of its own components.

The “positive” implication of these changes, from the perspective of the theory and of the autopoietic unit, does not require positing of an “objective” point of reference. All change is preceded by a previous state, and not all change is afforded by the organisation of the system. In this regard, all change is afforded by the previous state, and therefore held by it as an addition of an enhancement for autopoietic sustainment (Varela 1979: 36). Memory is identical to biological form. It is understood as a history of (ontogenic) structural change. In this sense, we might say that our human bodies are equivalent to our genetic memory, as they contain within themselves all the changes we have, as a species, endured through the ages. All of these changes are afforded by the specific relationship we hold with the environment. Cognitive memory can be understood as a much quicker and more sophisticated instance of a similar phenomenon.

All changes result from the agent’s “structural coupling with its environment”, all interaction and engagement with the environment, in turn, results in change. Agents are structurally coupled to their environment, as well as to other agents. There are, in this regard, two sorts of change. The first of these is evolution, or genetic change. The other sort is ontogenetic change. The main difference between these two is that in ontogeny, understood as the history of transformation of an individual unit and its specific relationship to its environment, the identity of the unity is never interrupted (1979: 37). Evolution on the other hand, is the result of selection processes of reproductively connected individuals (1979: 38). Ontogenetic changes take place during the unity’s “lifetime”. Genetic changes take place over generations of afforded transformation.

When change brought about as a result of the system's ontogeny translates into changes to its structural coupling, changes in the unit's cognitive domain, and possibly to its behavioural diversity, follow. Where applicable, such as in the case of human beings, "knowledge" (considered here to be the system's "descriptive repertoire") is also relative to the cognitive domain, and, therefore, also relative to ontogenetic changes (Maturana and Varela 1980: 119). In highly plastic organisms, this process can also be understood as "learning".

Varela (1979) further distinguishes change brought upon by structural coupling with the environment tout court and change brought upon coupling with another agent. If said agents are structurally coupled in such a way that their collective engagement results in collective autopoietic sustainment, Varela (1979) holds that the individuals in question may be capable of generating "composable symbolic components of a cognitive domain". They are, in other words, capable of generating "syntax": an exclusively social phenomenon built on the interdependence of a symbolic domain. The framework itself is a network of interaction that has no basis except the agents' history of coupling. When different organisms are coupled through the use of regular pathways, or "admissible symbolic descriptions of the cognitive domains of an autonomous system", a "linguistic domain arises" (1979: 266-7). Communication, then, is understood as behaviour that takes place within such a domain, and the domain itself, for Varela, is understood as a "society". For Varela (1979), for example, a Metazoan (an animal) constitutes both a cognitive agent, and also a "society" of cognitive agents in communication. These should be understood to be, of course, the animal's constituent cells. Human culture, tradition and conversation are not, for the author, dissimilar in a sense. As according to him, they may constitute a "distinct

phenomenology” a “cognitive domain that might behave as separate” and may, therefore, be independent of its members (1979: 269).

Self-referentiality

Autopoietic systems are autonomous in the sense that all structural changes “are subordinated to the maintenance of their own organisation, independently of how profoundly they are transformed in the process”; the products of their “functioning” are not something different from themselves. Varela (1979) calls this characteristic of autopoietic (and autonomous) systems their “organisational closure”.

To illustrate the concepts of “autopoietic autonomy” and “organisational closure”, one might use the examples of a cell and a car. A living cell, understood as machine, is a network of chemical reactions. It produces chemical species that constitute the chemical productions that in turn produce the chemical species themselves. This is the cell’s closure. The chemical species produced also specify a boundary that physically demarcates the network of production as a unit in space (Varela 1979: 201).

A car could also be identified as a machine in the authors’ terms; in this sense the car could be understood as an “organisation given in terms of a concatenation of processes”. However, the results of these processes, their products, “are not processes of production of the components [of the car]”. These, rather, are located elsewhere (at the car factory), and “are independent of the organisation of the car and its operation” (Maturana and Varela 1980: 79). Unlike living organisms, such as the living cell, the changes that cars and other “allopoietic machines may suffer, without losing their definitory organisation, are necessarily subordinated to the production of something different from themselves” (Maturana and Varela: 80).

From the above, one can already understand, from an observer's perspective, various relativist implications of the theory of autopoiesis. Firstly, and in very simple terms, since autopoietic machines are considered as defined in opposition to their environment, their environment is then also defined in opposition to them, again, in line with the tenets of "difference". In this very simple sense, "an observer" can notice how the environment and the organism specify each other ontologically. This same counter-specification, however, can also be noticed from the perspective of the operational closure. Because the outcome of all processes within autopoietic systems is part of the processes themselves, autopoietic systems can only perceive, or experience, an environment in reference to themselves. The experienced environment, or in Varela's terms the organism's "phenomenology", is determined by the organism's characteristics (1979: 32).

It could be argued, however, that this doesn't necessarily translate into the absence of an independent background or environment. After all, different organisms react and respond to a stable environment that seems to be a static point of reference for change, transformation and action. Varela (1979) doesn't deny this; he considers that, from an observer's perspective, there are two observable sources of deformations/structural transformations or ontogeny: 1) the environment or background, in the sense that these events are seemingly not determined by the organisation of the system, and 2) the system itself, as both a source of compensations for the deformations, but also as the source of deformations itself (1979: 32). As stated before, this is only from the perspective of an observer. From the perspective of the observed organism, these two sources are indistinguishable, they braid together, within the system's "phenomenology", so all "inner" structural transformations will translate into a structural transformation in the environment as well.

For example, for an *Acatias luna*, or Lunar Moth, the structural composition of its perceived environment, including its possibilities for action, will be drastically affected as a result of its life cycle, especially as a result of its transition from larva to adult. This interrelated relationship of interactions between two mutually determined systems (in this case organisms vs. environment) is what the authors term “structural coupling”. In other words, it implies that, from the perspective of the organism at hand, all changes are internal, and this can also be observed.

Most probably, the best illustrative example of how the above-mentioned aspect of mutual-specification operates is Varela’s (1979) description of the nervous system’s operational closure.

Understanding the nervous system as a closed network implies understanding it as a system devoid of inputs and outputs. This is opposed to the thesis that the nervous system “acts by picking up ‘information’ from the environment and ‘processing’ it”, which in turn leads to adequate representations of the ‘outside world’ in the animal’s mind (Varela 1979: 238). In opposition, the position contends that “information” is, rather, imposed on the environment:

The nervous system is a closed network of interacting neurons such that change of activity in a neuron always leads to a change of activity in other neurons, either directly through synaptic action, or indirectly through the participation of some physical or chemical intervening element (Varela 1979: 242).

Sensory neurons are no an exception. This is because “all sensory activity in an organism leads to activity in its effector surfaces, and all effector activity in it leads to changes in its sensory surfaces” (1979: 242). As a result, the system has no feature that would allow it to discriminate between the “internal” and the “external”. Within the

structural coupling between the two systems, one may say that the environment “only constitutes a historical determinant for the concurrence” of the structural transformations (changes, actions, etc.) the organism experiences. Rather than acting as a determinant, or a source of output or input, it *perturbs* the nervous system through its coupling to the neuronal receptor surface. The changes brought forth as a result of compensation to these perturbations however, are fully specified by the compensatory system (in this case the organism).

The contextualist implication of the above is now extremely easily to discern. Even without taking the observer into account (that is, even if one proceeded to study the nervous system under the tenets of “traditional science”) it is easy to observe that the organism has only itself as a point of reference to distinguish itself from all that which it is not. Its “phenomenology” and, for all practical purposes, its reality is relative to it, and to the specific relation or rather, “structural coupling” that it has with that which is different.

5.6 Normativity

Of the different approaches at the embodied study of cognition, the most closely related program is commonly placed under the label of the “enactive” approach to cognition (e.g. Varela, Thompson and Rosch 1991; Thompson 2007). In relatively recent years, the enactive approach has produced interesting insight on the normative implications of strict situationism. For example, consider Evan Thompson’s (2007) elaboration on the relationship between the specific sensory motor capacities of a bacteria, its metabolic needs and a specific aspect of the bacteria’s environment: sucrose.

When swimming in the presence of a sucrose gradient [bacteria] will tumble about until they hit upon orientation that increases their exposure to sucrose (Thompson 2007: 74).

The bacterium acts in such a way, because its requirement for sustenance results in a specific categorisation of the environment. Certain aspects of it, then, have functional significance to others, and in regards to its metabolic needs, certain aspect of the environment acquire value (metabolic value). Living structures, according to the author,

are thus ontologically emergent with respect to mere physical structures. They constitute a new order of nature that is qualitatively distinct from the merely physical order. [...] [A characteristic of] the living order is that the relation between organism and environment is meaningful and normative (2007: 74).

Sustainment by means of environmental engagement creates meaning and evaluation. Maturana (Maturana and Varela 1980) had already hinted as to the ontological nature of normativity when he described the difference between a machine and other sorts of physical entities and phenomena from the perspective of the logic of difference. Unlike simple units, the author explained, machines are defined as *interrelations*. They are a set of components that results in outcomes. In this sense, the machine is identical to the normative phenomena that can be identified by object naturalism. Its components are not determined by their materiality, but rather by the function they play in the achievement of the required outcome. The achievement of the required outcome is the ontological nature of the machine.

Autopoietic units are machines whose outcomes are the processes themselves. In other words, they are frameworks for departure of outcome pursuits. Their results, however, are circular, as they precisely correspond to the point for departure of new pursuits.

To put it another way, when evidence pertaining to human and animal cognition is interpreted in a manner that is as naturalist as possible (that is, without assuming any *a priori* ontological assumptions) what results is an account of life and cognition, or in other words, an account of “natural referential standpoints” that is not at all dissimilar to the normative phenomena that is not incompatible with the results of science, such as pragmatic, instrumental or hypothetical norms. That is, not dissimilar to the normative phenomena that object naturalism *does* have access to.

Normative phenomena, however, rendered through the logic of difference, have important distinctions to their counterparts in the logic of identity:

- All referential standpoints are understood as a product of change. They are understood as having a past, a present and future.
- Each change contains the previous one, and on this account each change is then, from the perspective of the affected unit, positive.
- In its pursuit of outcome, the referential framework inevitably changes, and therefore the characteristics of its prescriptions and value determinations change too. In this sense, this ontological framework accounts for other ontological relations, within the normative context, that the other framework was unable to.
- Change, finally, can be attributed to the environment, but also, to other agents; or in other words to other contexts. The nature of these changes, further, is not arbitrary or (depending the case) voluntary. It constitutes rather a non-arbitrary consequence of the agent’s relationship with its environment and its requirements for sustainment.

Such an ontological position, then, has the capacity to account for horizontal positivity and thereby for a strictly naturalist rendering of normativity.

There were, however, two challenges brought forth to this position, which must be addressed before proceeding to the next chapter.

5.7 Problems with Strict Situationism

Clark (1997) challenges strict situationism on two accounts. The first of these is with regard to what he holds to be “representation hungry problems”. Clark (1997) holds that, for a cognitive system to be considered as using representations, it must be able to “coordinate its behaviours with environmental features that are not ‘always reliably present to the system’”.

There are two main “classes” of cases in which this constraint is met. These are:

- (1) Cases that involve reasoning about absent, nonexistent, or counterfactual states of affairs,
- (2) Cases that involve selective sensitivity to states of affairs whose physical manifestations are complex and unruly (Clark 1997: 167).

The first class may include thoughts about events that are temporally or spatially distant, potential outcomes or the use of imagination. The second class, which is a little harder to grasp, corresponds to sets of items, or categorisations whose defining characteristics or relations are difficult to grasp. These would include, to use Clark’s (1997) example, “the ability to pick out all the valuables in a room”, or the “goods belonging to the Pope”.

The challenge, in a general sense, misses the mark. This is the case because strict situationism is not anti-representationalist in a general sense; it is only so in relation to

traditional theories of representation that assume an independent “outside” or an independent “inside”. As elaborated upon above, Varela (1979) accounts for “admissible symbolic descriptions” and syntax. In the previous chapter, I also elaborated on Lakoff and Johnson’s (1999) theory of concepts as metaphors, and Barsalou’s (1999) Perceptual Symbols System. These theories are compatible with strict situationism, because they do not require the claim of an agent independent ontological realm. They are, rather, theories of abstraction or representation. They suppose the organism has the capacity to cognitively simulate her experience. In this regard, all that they are claiming is that we don’t have cognitive access to anything that is not from this world, or which is based in something we did not experience.

The common principle in these theories is that representation is, rather, abstraction, and possibly codification by the system of its own characteristics.

Clarks (1997) second challenge is, once again, a new rendering of Chisholms’ (1982) epistemic circularity problem. In other words, it is a challenge based on the circular circumstance that plagues naturalist accounts of reference, in the sense that as reference is naturalised and therefore contextualised, with the same results for their own standpoint. In his words:

First, Varela et al. use their reflections as evidence against realist and objectivist views of the world. I deliberately avoid this extension, which runs the risk of obscuring the scientific value of an embodied, embedded approach by linking it to the problematic idea that objects are not independent of mind (Clark 1997: 172-73).

The answer to this question corresponds to the matter which concerns the present work, namely the capacity to provide an account of positivity that is viable in naturalist terms.

5.8 Conclusion

In this chapter, I argued that the most “scientific” and thereby naturalist, manner in which to proceed in regards to the interpretation of evidence, concerning that which regards the relationship between cognitive agents and their environments, is to withhold all posits not suggested. Because strict cognitive situatedness is neutral in regards to both competing ontological assumptions and, further, it is strongly suggested by the empirical evidence, I have argued in favour of its subscription as methodologically warranted over competing alternatives.

Because, from such a perspective, semantic (or other) values cannot be accounted to phenomena exogenous to the system, for all theoretical purposes, the methodological use of strict cognitive situatedness leads to the same conclusions that would result from the use of its ontological variant.

It was shown, then, how the nature of agent-environment and agent-agent relationships within this position is able to account for horizontal semantic and possibly normative relations between agents. Therefore, it is possibly able to provide the theoretical requirements for a naturalist theory of positivity.

The conclusion that results is that, from the strict disciplined scrutiny of the referential systems that science does have access to, there results a position that is able to account for all aspects of normative phenomena.

Two issues challenge the described position: one requires the account to produce the possibility of hurdling the circularity that seems to pervade the referential contextualism that plagues all epistemological naturalism. The second, related, matter requires the account to produce the possibility of explaining social phenomena

without the assumption of a meta-framework that is not posited as transcending its members nor posited as reduced to their number.

6. Science and Society

6.1 Introduction

As can be inferred from the discussion so far, a comprehensive naturalist theory of normativity would have to account for non-arbitrary prescriptions and value determinations, capable of commanding constraint and consequence for a plurality of agents and in a variety of socio-cultural contexts, without appealing to essence, transcendence, force, deliberation, consent or agreement.

As explained in the conclusion of the third chapter, in order for such an account to be able to hurdle the strict requirements of naturalism – which in turn are identical to the characteristics that result from the purview of strict and disciplined scrutiny – the account must:

- i. Be sourced from, and available to the reach of, scientific scrutiny;
- ii. Place all of its ontological positing within the bounds of “nature”, or in other words, within the bounds of space-time/dimensionality, and ontologically contingent on context.
- iii. Have value determinations, in this case, its claimed epistemic validity, that must be able to both claim purchase beyond its site, and not assume that such claimed consequence is able to hold beyond the possibility of revision, correction, scrutiny or change.

As discussed in Chapter Four, there are two components that such an account must produce in order to causally, or contextually, explain all aspects pertaining to normativity. The first of these concerns the source of constraint or normative

consequence. This implies that the account is able to successfully explain in terms continuous with strictest of scrutiny how it is that an agent or a collective is bound to certain prescriptions and value determinations that might oppose their own agency. I called this the vertical component of normativity.

The second component of such an account would have to explain exactly how it is that such constraint is able to hold non-arbitrary consequence for a plurality of agents and/or socio-cultural sites without appealing to essence, transcendence, force, deliberation, consent or agreement. To describe this component, and following the use of Hans Kelsen ([1934] 1960) and Michel Foucault ([1969] 1972) I have been using the term positivity. This is equivalent to the horizontal component of normativity.

As has been explained throughout, naturalism does not find problems explaining the first, vertical, component of the account. To wit, there a limited number of ways in which an agent (unit or social) is able to engage with the environment in order to produce a change of circumstances; if such a change of circumstances, such an “outcome” is required for whatever reason by the agent, her limits plus the required circumstance will result in normative consequence and constraint.

It is the second component required by a comprehensive naturalist theory of normativity that has been trickier to produce.

This chapter, then, will be divided in two sections. The first of these will be occupied with providing a naturalist account of positivity. For the purposes of illustrative clarity, in this section, I will elaborate as to that which corresponds to first component – namely the specific source of constraint and consequence – only as much as it is required to explain that which pertains to the explanation of the second component. As such, it will clear from this account how it is that a strictly naturalist account of

positivity is possible. Without its relationship with the vertical component it is unclear how the horizontal component behaves in actualised social contexts. The second section of the chapter will then be occupied with explaining the relationship between the first and the second components. This, then, results in a comprehensive and naturalist theory of norms.

6.2 Science

The promised account of naturalist positivity, results, as it would be natural to imagine, from a solution to the epistemic circle. As has been discussed throughout, because naturalism is unable to account for normative consequence transcendent of context, and is even defiant when it comes to transcendentalist attempts to provide for such, whenever it holds its own referential standpoint up to its scrutiny, it will inevitably neutralise its own claims to positive consequence or contribution. In this sense, Clark (1997) correctly diagnoses that positions in line with strict cognitive situationism which are agnostic or deny the presence of an ontologically independent reality may fall into such consequences. This is Chisholm's (1982) notorious epistemic circle.

There are, in this regard, two main epistemological approaches that strict cognitive situationism takes in order to address the issue: neurophenomenology (e.g. Thompson 2007; Varela 1996) and radical constructivism (Von Foester 2003, 1981, 1974; Von Glasersfeld 1995; Luhmann 1995; Maturana and Varela 1992, 1980, 1979; Maturana 1988a, 1988b, 1980). The first attempt can be understood as an appeal to transcendental ground, whilst the program of radical constructivism constitutes an endeavour of strict naturalist commitments in line with Quine (1969b), Fuller (2002) and Rouse (1987).

6.1.1 Neurophenomenology

The issue at hand is addressed by neurophenomenology with a strategy in line with Edmund Husserl's (2001) "transcendental phenomenology". Unlike Husserl (2001), who rejected all attempts at the naturalisation of consciousness, precisely on account of circularity (2002, I: 75), neurophenomenologists hold, as their name suggests, that empirical evidence can be used to provide support for phenomenological considerations. The naturalism neurophenomenology pursues, however, is not a reductionist one. They hold that empirical data can be mapped to phenomenal structures, but these cannot be simply reduced to the same "natural phenomena" as those studied by the natural sciences (Thompson 2007: 357). Consciousness and its characteristics are treated as transcendental phenomena. In the words of Thompson (2007),

Mind emerges from matter at an empirical level, but at a transcendental level every form or structure is necessarily also a form or structure disclosed by consciousness. With this reversal one passes from the natural attitude of the scientist to the transcendental phenomenological attitude (Thompson 2007: 87).

The position, like Husserl's (2001 I) before it, does follow a logic of difference, in the sense that it understands cognition (or consciousness) as located in the precise relationship between an agent and its environment, or in other words, as the difference between these two. By appealing to the transcendental stability of such a position, however, neurophenomenologists protect their position from the contextualism that might have resulted from such a commitment. As a result, however, the commitment is partly lost, at least for the purposes of the present endeavour. I will not elaborate on the philosophical problems that such a position entails, as applicable

arguments have been a constituent component of this work throughout. It suffices to say that such a position is not useful for my purposes.

6.1.2 *Radical Constructivism*

The alternative approach, and one which is strictly congruent with the logic of difference or a theory of distinction as advanced by George Spencer Brown in *Laws of Form* (1969), is that of radical constructivism. Radical constructivism can be understood as the epistemological counterpart to strict situationism and a logic of difference. In line with these positions, the key characteristic of the position is to assume that all cognition results from the difference between the thinker and her environment. If all cognition is situated, then, the only epistemologically sanctioned way to claim certainty of epistemic or semantic consequence is to include *both* the standpoint of reference and the standpoint of arrival within the account. In other words, within the constraints of our language, the only way not to claim universal purchase for the value determinations implicit in every statement is to include the *whole* context within the claim. In the words of Heinz Von Foester ([1973] 2003b) any “description (of the universe) implies the one who describes it” ([1973] 2003b: 247).

In this sense, radical constructivism hurdles epistemic circularity by an unapologetic commitment to self-referentiality (Von Foester [1973] 2003a; [1973] 2003b; Maturana 1988; Von Glasersfeld 1995). As a result, at many times, when radical constructivists are “claiming”, or “defining” phenomena or entities, their definitions take into account the specific perspective from whence these claims are held to hold epistemic purchase.

For example:

Constitutively we cannot claim the independent existence of things (entities, unities, ideas, etc.), and we recognise that a unity exists only in its distinction, that is, in the praxis of living of the observer that brings it forth (Maturana 1988b: 12).

By operating in such a way, radical constructivism is free from the distress of the sceptic's challenge and the scrutiny of science. In other words, it is perfectly congruent and friendly with the strictest scrutiny of reason and/or induction.

What radical constructivism is doing, however, is actually very simple. Human beings are clearly situated in time, space and context. Everything we say, we say from a determined place and perspective. In chapter four, I elaborated on Huw Price's (2011) realisation that "deflationist linguistic behaviour" does not result in the "placement problem". The reason why this is so, is because the deflationist is not claiming anything for anybody else. One does not need to be a "quietist" or a "deflationist" as can be evidenced by radical constructivism, it is a matter of logical and ontological congruence. The so-called sceptical challenge will haunt all those who do not take responsibility for their referential standpoint, located in the time of their statement and placed between their eyes and in their skull.

The problem that radical constructivists face is that whilst they may claim all they want for themselves, they are unable to claim anything beyond their own site. That is, they have silenced themselves with a seemingly unbridgeable self-referentiality. As I will try to illustrate, however, it is not unbridgeable at all. In fact, it is precisely this bridge-ability that which transforms into a naturalist theory of normativity.

It is at this point, then, that naturalist social epistemology comes back into play.

Radical constructivism, on account of its disciplinary background (i.e. cognitive science, cybernetics) understands knowledge from an individualist perspective. That

is, from a perspective consistent with Fuller's (2002, 1993) work, they fall into what was termed "internalism": the understanding of scientific success as pertaining to characteristics proper to the source of knowledge production. In the case of "transcendentalist" accounts of knowledge, this leads to transcendentalist assumptions on the purchase of scientific knowledge. In this case, which corresponds to the contextualist rendering of internalism, (A) is basically not claiming normative purchase beyond its own site. If the contextualist differences between both positions are taken aside, it is easy to see how they turn identical. That is, internalist meta-contextual epistemology claims that the normative consequence of the determinations of science are sourced from science's context (A), but have universal purchase. Internalist contextual epistemology, on the other hand, claims that the determinations of science are sourced from science's context (A) and can only be said to have purchase in that very same site.

What seems to have been suggested by the STS, and then pinned down by naturalist social epistemology, is that knowledge, whatever it is, cannot be understood except as a relationship.

What follows is the theory that results when these two insights are combined.

As explored in the previous chapter, the ontologically unassuming theory of cognition holds that each being serves as its own point of reference. Not unlike Fuller (2002), and against the traditional position of analytic philosophy, for the radical constructivists, the point of reference for the production of knowledge is dynamic and situated. In other words, not unlike Fuller (2002), they also recognise knowledge as change.

From the perspective of strict situationism, humans (and all other cognitive agents for that matter) *are* change. Humans cannot be anything other than change. They cannot

avoid changing and cannot avoid causing change. This is the ontological nature of life and humanity.

This is the first ingredient of naturalist normativity: positivity and knowledge are change. This change, furthermore, is causal. It can be produced by the environment or by one's peers.

That is, within a naturalist perspective, everything, all states, are the product of past circumstances. Everything results from being part of domain of interconnectedness in which everything is connected to everything else. Cognitive states are not an exception, and like all other physical (or natural) phenomena, cognitive states change and cause change as a result of their interaction with their domain. Being an ontological force, it is not arbitrary; it is beyond the will or volition of the affected individuals. Again, like all other physical (or natural) phenomena, the specific form of cognitive changes that result are those afforded by the circumstances of the interaction. So, for example, an iron knife may not be able to cut through diamond, but a different outcome might result from pressing it against butter. In not so dissimilar terms, not all interaction with the environment will affect my cognitive state in the same way. There may be circumstances that affect me such that they result in a profound change of what I held before to be "true", and there will be others that do not affect me whatsoever, even though they seem to affect my peers. These circumstances are not arbitrary.

As was covered in the fourth chapter, the vertical component of normativity can be understood as constraint. All agents are limited, which the same as saying all agents are particular, or all agents situated. That is, we perceive needs and requirements, and in order to sustain ourselves both individual and socially, we have to rely in the limited cognitive tools that we possess in order reach these goals of sustainment.

There are many ways in which we can perceive the precise manner of these sources of constraint. We can feel the power of the “social” and the need to act in certain ways. We can also feel the need to behave in other ways when we follow our best plan to seek a determined circumstance. But we can also feel the organic and constraining power of our own bodies. That is, our bodies are also pursuing a determined outcome, and act in order to achieve it. The outcome, of course, is also their maintenance. A straightforward way to identify such a force operating within us is to focus that which we call “beliefs”.

The term “belief” is an equivocal term: it denotes two very different phenomena. The first of these is mere subscription: the capacity of a determined agent to subscribe to a doctrine and behave accordingly. The other phenomenon denoted by the term is something that has little to do with our will, and much to do with our body’s constraint. In order to differentiate it, I call it the limit of certainty. This is, for example, the central concept behind Mathen’s (2005) position. This position is equivalent to what analytic philosophers call *doxastic involuntarism*, according to which:

- (a) [Cognitive agents] lack [...] direct voluntary control over beliefs, (b) that we have only a rather weak degree of ‘long range’ voluntary control over (only) some of our beliefs (Alston 1988: 260).

Try for example, to voluntarily believe that the USA is still a colony of Great Britain. I can say, for example, without fear of lying that I am unable to produce such a change of belief in myself. Or in other words, I am unable to change my levels of doubt and certainty in this regard: I hold a great amount of certainty that the stated circumstance is not the case, whether I try to believe otherwise or not.

Now, imagine that someone provides you with pictures of your significant other being unfaithful; or that you read a piece of research produced by means of disciplined induction and precise reasoning that promises a cure for a previously incurable ailment. Or remember any time when you have been surprised or read a book that has altered your perceptions.

There is a feeling in our bodies when we are affected by cognitive change. Again, change is involuntary, as what it challenges is precisely our centre of constraint. Every change, no matter how we categorise it, is afforded by our previous situation, and as such it is understood by our reference as breach of limit. It is held, at least from our current state, to be positive.

The other insight corresponds to social epistemology. The prescription for this account to hold normative consequence beyond its own site is identical to the solution Fuller prescribed upon transcendental internalism, only on this occasion, both the problem and the solution are inverse.

As was already explained, the radical constructivists are making the very same mistake that afflicts Quine's (1995a, 1995c) account of knowledge, with the difference being that they are not appealing to any unwarranted de-contextualising jumps in order to claim consequence for their account beyond their own context. They simply do not have any means to claim consequence beyond that context. In the contextualist rendering of internalism, the scientist (A) is simply not claiming normative purchase beyond its own site, and therefore is not accounting for the possibility of a normative relationship between her claims and (B) in any way whatsoever.

Fuller (2000, 2002, Fuller and Collier 2004), supported on evidence sourced from the sociology and the anthropology of science, suggested that, in order to remedy the

problems that resulted from an internalist and meta-contextualist epistemology, it was necessary to treat knowledge as a social phenomenon. Evidence (i.e. SPSSK and STS) seemed to suggest that knowledge, whatever it was, had an important social component, which was ignored by the assumptions that informed the normative structure of the scientific establishment. If the problem resided in the idea that the unwarranted assumption that the products of science (A) were able to hold normative consequence in (B) independently of the contextual characteristics of the latter, allowed science (A) a space of arbitrary action in detriment of (B) and the production of knowledge, the solution then resided in the establishment of a normative framework that recognised the social dimension of knowledge. In their internalism, analytic philosophers were forced to suppose a meta-context that served as a framework for non-arbitrary epistemic normativity; a position that not only seemed to be empirically challenged and unwarranted, but also problematic in regards to the relationship between science and society which it purported to justify. Fuller, then, suggested that to take the sociological evidence seriously would imply the establishment of a normative dimension of knowledge that assumed that the source of normative consequence for epistemic matters is not (A) science but rather (B) the affected parties.

As explained, the proposed solution fell into similar transcendental or meta-contextual assumptions in regards to normative purchase of its own content and consequences.

For the inverse problem, I propose the same solution: to treat knowledge as a social phenomenon. Like its meta-contextual counterpart, contextualist internalism seems to be naïve as to the difference between the “normative” and the “positive”. In terms of positivity, however, as Steve Fuller’s (1997, 2000, 2002, Fuller and Collier 2004) research suggests, it is not the context of the source that matters, but rather the context

of reception. As such, the solution to this problem resides in taking into account both the source (A) and the receiving context (B). This time around, the problem is not to provide a solution to transcendentalism, but rather to provide the means for contextualist positive purchase. Radical constructivism is as naturalistically committed as this commitment can get. It is, further, plagued by solipsism rather than authoritarianism. As will be shown, then, the solution, unlike its previous incarnation, does not lead to transcendental or meta-contextual assumptions, but rather to a viable understanding of norms in strictly scientific or naturalist terms.

Once these two positions are taken into account, positivity can be understood as the causal (non-arbitrary) effects that a determined agent or context had on another agent or context as a result of its interaction. Positivity, in other words, is the capacity of one agent or context to un-arbitrarily and un-voluntarily alter the cognitive state or the normative circumstances of another agent or context. The source of authority does not reside in the circumstances of the source of change (A) but rather in the affected party (B).

These are the basic foundations for what could be called *situational necessity*.

Situational Necessity

This position, as has been argued throughout, is not at odds with scepticism. Rather, it considers such scepticism to be a starting point for strict scrutiny. In this regard I might as well start from there:

- 1) *The (ontological, epistemological or phenomenological) relativity of experience, knowledge and cognition or the inscrutability of the impossibly experienced (IIE):* For both philosophical and empirical reasons it has been concluded that a (normative, epistemological or empirical) perspective that transcends

causality/possibility of explanation and time/change is unwarranted (by any presently known standard). This means that there is no warrant to claim for an independent (non-contingent) standpoint on which to judge reality. There is no standpoint to determine the “real” from the “unreal”, the “true” from the “false” and the “valid” from the “invalid”.

- 2) *The inevitability and inevitable experience of constraint (IIEC)*: For empirical reasons, it has also been concluded, that even though IIE implies that all (normative, epistemological or empirical) standpoints are relative, these are not arbitrary. Situation both relativizes and constrains cognition and value judgements.

IIEC is sustained by scientific evidence, but its fortune is also suggested by present and personal experience (i.e. on phenomenological grounds). That is, I can safely affirm that at the present moment I am cognitively constrained. In regards to all (off-line and on-line) cognitive matters, my certainty is limited by my doubt and the relationship between these two is not (directly) mediated by my own will. As such, when I compute $2 + 2$, I can state without fear of dishonesty, that I find myself constrained to provide 4 as an answer. In other words, I find 4 as a *necessary* answer.

If I claimed, however, that the characteristics of my experience of constraint are universal, in the sense that they apply to all I would, then, fall into a phenomenological transcendentalism of sorts, and by doing so, would then find myself in a position at odds with IIE (which I find as *necessary* as $2+2=4$).

It would then seem that the necessary outcome of this philosophical conundrum would be some sort of (normative) solipsism. This position, however, would also be at odds with IIEC. That is, even if I do not find a sufficient basis to claim anything beyond my perspective, at this present moment, the constraint I experience from my un-arbitrary perspective includes emotional and physiological necessities that I feel

required to fulfil. As part of this required fulfilment, I find myself in the position of needing to negotiate with other aspects of my experience that seem to have the same characteristics as me (i.e. other “people”). For example, at this very moment, one of the reasons I am writing this is the need to procure a safer financial future for my family and myself. In another example, I am, amongst other things, constrained to treat you, my reader, as precisely that: a reader. Finally, because I’m constrained to IIEC, I am limited, cognitively exhausted, as regards to other ways in which the cognitive structure of those that I find similar to myself might work. This constraint, then, leads me far from solipsism, at least in practical or pragmatic terms.

The only outcome, then, that I am able (and therefore constrained and necessitated) to find for IIEC + IIE is the following: because I cannot claim IIEC universally on account of IIE, and because I cannot imagine a situation different from IIEC in others like me: I am constrained to hypothesise that all others are also IIEC, but because of IIE must maintain myself open to the possibility of revision (scrutiny).

The (situational) confirmation of my hypothesis can only be realised by my receiver upon communication, and in this particular case it can only be confirmed by you as my reader.

If this takes place, however, you will also find yourself incapable of finding a solution to the inscrutability of the impossibly observed, whilst at the same time you will find yourself incapable of directly commanding the limits of your doubt and your certainty. My account would then have categorical normative implications for both of us. This is situational necessity.

The above example allows for an understanding of how situated necessity is able to provide validity to itself, without falling into any sort of transcendentalism. Situational

necessity however, is able to do this for any intellectual position. For example: I can safely state without fear of dishonesty that I am constrained to find the statement “All bachelors are unmarried” as necessarily unproblematic. This does not imply that I find it “true” in a metaphysical sense (again, if this were the case I would then do violence to IIE, which I also find to be necessarily unproblematic). Instead, it implies that, in this precise moment and from my perspective, I have no option, I am cognitively exhausted, to find it unproblematic, in the same way that I find 4 as the only result for the computation $2 + 2$. This implies that I am also constrained to hypothesise that you, my reader, are as constrained as I am to find it unproblematic. I am open, however, to the possibility that upon further knowledge – that is, upon future communication and experience – my limit of certainty on the matter may be altered. It may be the case that it is you who will change my limit of certainty, and therefore, you don’t find it as unproblematic as I do. I am unable to know what sort of communication or experience could alter my limit of certainty in this regard. If I knew, it would mean that my limit was already altered. If however, it were to be the case, that upon communication with another agent I realised something (which I cannot foresee) that enabled me to understand a problem in $2+2=4$, my cognitive capacity (we could call this “cognitive affordance”) in this regard would be dramatically changed as a result.

Furthermore, from a strictly situated perspective, in which there is no “higher” or “firmer” ground from whence to judge or evaluate cognitive positions, all positions are evaluated from the perspective of their preceding state. That is, because all changes take off precisely from my previous position, they therefore “contain” it. In other words, because the previous state served as the ground for the change at hand, the resulting outcome must then be judged as superior or complementary from the perspective of the previous situation. The new, and necessarily previously unforeseen,

possibility of action or description (affordance) is, from the perspective of the past cognitive situation, seen as “better” or complementary. From the perspective of the affected agent all changes to limits of certainty are cognitive enhancements. They are positive.

In this regard, from the perspective of situated necessity, the primary standard of epistemological valuation is not the presently identified *form*, which seems to constitute my cognitive exhaustion and thereby the means of current cognitive constraint (i.e. my present reading of the identified “rules” of “logic” and/or fortunate induction). From the perspective of situated necessity, this identified *form*, its rules or characteristics, is always subject to change. Principles of deduction and induction can be understood as first person readings of phenomenological processes that lead to constraint. These, however, can only provide explanatory import. If there is any individual epistemic standard that can be obtained from the present account, it is *cognitive change itself*. A key epistemological principle that I am exhausted/constrained to identify (and exhausted/constrained to hypothesise) is that, in epistemological terms the future is (epistemologically) stronger than the present, and the unknown (epistemologically) stronger than the known.

This then, leads to a (situationally) necessary understanding of epistemic value judgements: epistemic value is (involuntarily) awarded by an agent to that which changes her limits of certainty. From the perspective of a determined agent’s cognitive situation, however, not all communication or experience will result in changes to her limits of certainty. For example, in a hypothetical exchange between agent (A) and agent (B), if (B)’s interpretation of (A)’s communication proposed the existence of the Loch Ness monster on account of a picture (A) saw in a sensationalist journal, it may be the case that (B)’s limits of certainty in regards to the fauna of Loch Ness will not be

altered in any significant way. If (A) however, shows (B) the documentation of a HIV vaccine test that (A) coordinated in which the vaccine was 100% effective in 1000 human trials, then the limits of doubt and certainty that (B) held in regards to the possibilities of AIDS prevention would be altered. That is, in relation to the *time/moment before the exchange* (TMBE), (B) will now experience either a higher degree of doubt or a higher degree of certainty regarding the matter at hand. From her post-TMBE cognitive perspective then, (A)'s communication was laden with epistemic validity.

This epistemic standard, however, does not allow for an individualist epistemology. Amongst other things, the account of knowledge that results is one in which knowledge, as a natural phenomenon, cannot be reduced in individualist terms. Not only are all accounts of what exactly causes changes (i.e. rules of logic and induction) subject to change themselves, but also, whilst situational necessity hypothesises a natural understanding of situated epistemic validity (that which caused cognitive change), it does so in a way that makes it unable for this to be proven in any reliable way. It is only the affected agent (B) who is aware of the situation, and furthermore, who is always able to choose not to disclose the validity that his own position is awarding to a specific claim.

From this understanding of situated epistemic validity, however, a number of other premises necessarily obtain. These constitute a specific understanding of the relationship between social dynamics, cognitive hierarchy and epistemic scrutiny. It is from these, then, that hypothetical courses of action regarding the organisation of knowledge production activities can be developed.

We have already explored 1) IIE and 2) IIEC, which, as we have seen, leads to:

3) From the perspective of the affected agent (B), all cognitive change is positive.

From the perspective of the agent, all cognitive change translates into cognitive enhancement.

This, in turn, leads to:

4) Because (2, IIEC) cognitive change is not subject to agents' volition and because (3) (from the perspective of the affected agent) all cognitive change is positive, then, if a certain agent (A), through communication, is able to change the limits of certainty of another agent (B), this would mean that agent's (B) cognitive situation awards (without the need of B's volition) cognitive authority to (A)'s communication.

This last concept (4) corresponds to a naturalist account of *cognitive authority*, namely:

The capacity of a determined agent to change – through communication – the cognitive situation (limit of certainty) of another

The notion of natural authority corresponds to a social rendering of the already described notion of situated epistemic validity and is also identical to a political counterpart to the notion of naturalist positivity. Natural authority, in turn, provides the framework for a naturalist and horizontal rendering of normativity.

Unlike other attempts at normative accounts, the source of authority (in this case cognitive/epistemic) does not transcend situation. From the perspective of the offered theory, within an exchange between two agents ([A] and [B]) cognitive (or epistemic) authority always stems from the cognitive situation of the receiver (B). One (A) has cognitive authority over another agent (B) (and therefore their statements hold

epistemic validity), only if one (A) is capable of changing that agent's (B) limit of certainty.

In these terms, the historical validity of "science" can then be explained, not in relation to the approximation of a transcendent standard (i.e. science as true or universally valid) but rather on its incontestable capacity to change limits of certainty within a specific historical context, and thereby change the way a great variety of cognitive agents understand the world.

The next hypothesis that obtains from the premises of situational necessity could be called the hypothesis of *the indispensability of difference*. As implied above, in order for a determined agent (A) to have natural authority over another (B), the two must perceive some sort of difference between their position, either because (B) perceives (A)'s as adding, to his position, or because they see their positions as conflicting or incommensurate. Communication between two agents whose limits of certainty are perceived as similar is "easier" but does not promise (for either one of them) the level of cognitive alteration (and therefore enhancement) that the communication between two agents in extremely different cognitive situations may produce. Experimentation (scientific or otherwise) in these terms can be then understood as the pursuit of knowledge by means of locating oneself, through the attainment of experience, in a different cognitive situation to one's peers.

In order to simplify matters, so far we have been explaining the theory of natural (cognitive) authority and the hypothetical cognitive exchange between two different agents, as if only one of the agents (A) possesses cognitive authority over the other (B). It is more fortunate, however, to consider that whenever two different agents meet, even regarding a single matter, both will have cognitive authority over each other. One (A) will, almost certainly, have a greater capacity to change the limits of certainty

of the other (B). But also almost certainly, the other (B) will have capacity to change the limits of certainty of (A). From any exchange, all agents will be cognitively altered and therefore enhanced. If time is not an issue, then the greater the difference between these, the greater the possibilities of cognitive enhancement.

The indispensability of difference, then, can be stated as follows:

- 5) In order for a cognitive agent (A) to change, or have the possibility to change, another cognitive agent (B)'s limit of certainty, her (A) cognitive situation must be (at least partly) incommensurable with the other's (B). The greater the distance (or difference), the greater the possibility for change. Since (3) from the perspective of the affected cognitive agent (B) all change is positive, the greater the distance, the greater the promise of cognitive enhancement.

This understanding of cognitive authority (and epistemic validity), however, also has implications for the relationship between (social/cognitive) hierarchy and knowledge. That is, from the above (4) it is implied that the notion of natural authority takes into account a form of (temporal and metaphysically horizontal) hierarchy: in a relationship of (cognitive) natural authority, he who "knows" namely, he (A) who has the capacity to change the limit of certainty of another (B), sits, in regards to that particular relationship, in a higher cognitive position.

This hierarchy, however, dissolves as a result of its practice. The capacity to change limits of certainty is practiced through communication. Successful communication will result in both change and approximation (elimination of difference) between the states of both agents who are part of the exchange. As (B)'s limits of certainty are changed, and his cognitive situation is enhanced by communication, (A) begins to lose the capacity to change them. Hypothetically, if their communication is successful (this

may take time or even training) (B) will have the same capacity as (A). As a result, (A) will thereby lose all natural authority she has in relation to (B).

This leads to the fifth necessary hypothesis that obtains from IIE +IIEC:

- 6) Cognitive authority (4), namely the capacity to change the limits of certainty of another agent and the hierarchical relationships that it implies, is levelled/stabilised as a result of its practice (communication). In other words, the communication of knowledge, and the resulting cognitive enhancement, eliminates both cognitive distance and cognitive hierarchy.

Without any situation independent (transcendent) standard that may provide capacity to determine or judge epistemic value, from the above four hypotheses which (necessarily) obtain (in regards to my present situation and hypothetically in yours) from IIE + IIEC, one is constrained to predict the following:

All things being the same, which in this case is assuming specifically:

- X. That there are no mayor temporal constraints or boundaries for communication;
- Y. That there are no mayor spatial or material constraints for communication, and;
- Z. That all participating agents are willing and incentivised to engage in communication until stabilisation, and to acknowledge all changes that occur to their limits of certainty; then:

It can be predicted that unbounded communication will lead to those with less capacity to change limits of certainty towards cognitive enhancement, and that all positions (or aspects of positions) that survived change, correspond to the highest level of cognitive enhancement for both these individuals, and for the community. In other words, according to the above necessary hypotheses, it can be predicted that,

ceteris paribus, unbounded communication will act as a naturalist, specifically socio-cognitive, exercise of falsification or refutation. At the same time, it will also act as a distributor of knowledge, and a levelling of cognitive hierarchy. Without any transcendent or objective standard, it is only difference, combined with constraint, which provides us with grounds for epistemic scrutiny.

At the *time/moment after the exchange* (TMAE) the cognitive distance between all participating members will have been shortened as much as physically possible. This does not imply that all the participating agents will now hold the same cognitive situation: all agents occupy a different physical site, and as such it is impossible for them to occupy the same cognitive site. Neither does it imply consensus, a circumstance that seems impossible from a strictly situationist perspective. What this means, rather, is simply that in relation to the cognitive circumstance of every member at the *time/moment before the exchange* (TMBE) no more cognitive change is afforded. All agents have exhausted their capacity to change others by means of communication, which means, of course, that their capacity to be changed by others in regards to the TMBE has also been exhausted in every agent. There will be, of course, more cognitive commensurability at TMAE than at TMBE, but it will not be absolute. Any and all incommensurable positions that remain at post-TMBE could be considered to be, under such circumstances, physically unbridgeable, or in other words, physically incommensurable. When circumstances such as those described have been reached at the TMAE, it could be said that the collective has reached *circumstances of communicative exhaustion*.

Once all cognitive distance has been levelled, or levelled as much as the circumstances of its members may allow, the only way to acquire further collective enhancement is through the finding of new areas of difference.

Circumstances of cognitive exhaustion serve, then, as an ideal of the most effective circumstances for the acquisition of individual and collective cognitive enhancement, as, in the fortunate circumstances of their manifestation, the cognitive potential of the collective at hand can be exhaustively capitalised for the pursuit of all outcomes.

It is clear to see, however, what gets in the way of this “open society”, namely (X) temporal, (Y) spatial and material constraints, and – under the assumption that ranking members within a hierarchy have an incentive to maintain their position – then also (Z) the social boundaries for communication that a cognitive hierarchy is afforded to maintain in light of (X) and (Y). In other words, (Z) any social structure that might actively repress, or set, boundaries for communication that has the capacity to change limits of certainty; or might prescribe the individual psychological repression of these. As will be illustrated in the following section, these conditions result from ignoring the vertical aspect of normativity. As will be demonstrated, once this is taken back into the account, X, Y and Z are explained as part of the sociological dynamics of normativity.

6.3 Society

In this chapter, the first section was solely devoted to explaining the possibility of a naturalist account of positivity, and elaborating on the matter. In other words, the first section of the chapter concerned itself solely with providing an account of the horizontal component of normativity. Matters pertaining to the vertical component of normativity were left out. These matters, as has been explained throughout, pertain to that which determines constraint, and as such they pertain to the relationship between agents, their pursuit of means of sustainment as well as their collaboration or competition with others in this regard. In other words, the present section will

elaborate on the relationship between positivity and vertical or constraining normativity.

As you will recall, “object naturalism” is able to find in nature a particular sort of normativity. That is, normative constraint, as found in nature, corresponds to the relation between actualised circumstances and a departure point (the reference) for the pursuit of a determined outcome. In this sense, the point of reference will value, evaluate and prescribe depending on the difference between the expected, desired or required result as it diagnoses the situation (again actualised circumstances).

From the different work cited and explored in this thesis, human life would seem to relate to at least three different levels of constraint. The first of these, which corresponds to the subject matter of embodied cognition, is concerned with the physiological and/or non-conscious forms of constraint. These are the evaluations performed by the body in independence of the agent’s voluntary dimension. As posited by strict situationism, such forms of constraint follow the same structure as any other sort of normative constraint, namely, it operates as a standpoint for the obtainment of outcomes. Its different evaluations and classifications will then be contingent on the precise manner in which the organism pursues the sustainment of its life.

The next level of constraint that human beings are subject to is that which concerns pursuits where the agent has a conscious say on the matter. These constraints pertain to outcomes such as “maintaining a presentable appearance” or “achieving a successful career”. In these cases, the specific form of the desired outcome is mediated by choice. In order to achieve such a state, the agent needs to follow the evaluation and prescription that result from the best ways to go about achieving her aims within her procedural arsenal.

The final level of constraint pertains to social normativity. This level, like its individual counterparts, can also be characterised by the relationship between a departure point for the pursuit of a determined outcome and realised circumstances.

In a very simple sense, what this section will do is explain and elaborate on how, once the horizontal aspect of normativity is taken into account, these three levels of normativity interact with one another leading to different “social” configurations.

An on-going dispute amongst radical constructivists concerns the exact implications that the theory of autopoiesis, and the position which I have labelled in this account as strict situationism, have for the understanding of social phenomena (see Cadenas and Arnold 2015; Scholl 2012). It is not until recently that some work (e.g. Theiner, Allen, and Goldstone 2010) on the extended and the embodied mind has focused on cognitive phenomena which can be properly held as social; in other words, collective cognitive phenomena that cannot be cognitively reduced to the sum of their parts. The main focus of the bulk of work on the embodied cognition, dynamical systems and extended and enactive cognition has been the relationship between the agent and its environment (e.g. Shapiro 2014; Chemero 2009; Wilson 2002). In this sense, most of the work that takes the name of social cognition is concerned with the relationship between social interaction and embodiment, or social embodiment (Barsalou, Niedenthal, Barbey, Ruppert 2003; Niedenthal, Barsalou, Winkielman and Krauth-Gruber 2005), and social cognition, defined as the ability to interact with other agents (see Spaulding 2015).

Embodied cognition and aligned approaches, however, stay clear in general terms of the conceptual space of sociology. Most of what can be found in regards to the ontological nature of collective cognitive behaviour is found, again, within literature concerning the different incarnations of the theory of autopoiesis, both individual

(Maturana and Varela 1992, 1980, 1979; Maturana 2015 [1985] 1995) and social (Luhmann 1995, 1986).

In this sense, Maturana and Varela (1992) explain that agents, or in their words autopoietic units, may interact with each other. According to the authors, however, these interactions are, from the standpoint of internal dynamics of the organism “indistinguishable from those that come from a ‘nonbiotic’ environment”. If these interactions become recurrent, so that the interplay between the organisms involved develops into a co-ontogeny, which is to say that their relationship turns into one in which their ontogenic changes occur in a conjoined fashion, this will result in “mutual involvement through their reciprocal structural coupling”. This may then give rise to a new phenomenological domain, and ultimately to third-order structural couplings, or in other words, a new autopoietic unity (Maturana and Varela 1992: 180-1).

Luhmann’s theory of social autopoiesis (1995, 1986), on other hand, proposes a similar circumstance to the above, in the sense that Luhmann considers that society also forms a “different phenomenology” than that of its members. For Luhmann (1995) social autopoiesis consists of the capacity of a self-referential system of meaning to reproduce itself by means of communication. The social, then, is a completely different phenomenon than the individual members that participate in it. For Luhmann (1995), communication is an operation exclusive of social systems, in the sense that only communication produces communication. All other phenomena that do not count as instances of communication are not part of the system, but rather of its environment (1995: 39). For Luhmann (1995) the “social”, which, according to the authors, can also be understood as autopoietic phenomena, is not only ontologically different than those who participate in it, but ontologically independent from them as well.

Maturana (2015, [1985] 1995) has historically disagreed with Luhmann (1995) regarding these matters. For example, in Maturana and Varela (1980), the authors hold that, in order for human societies to count as autopoietic, they would have to count as biological systems. That is, if human societies depended on laws and relations that were independent of the autopoiesis of its members, they could be counted as such (1980: 118). With time, Maturana (2015) has taken a stronger position on the matter, even claiming that human society cannot be understood in naturalist terms.

Varela (1979) in turn, seems to be more open to the possibility of human society constituting an autopoietic system, or at least “second-order” autonomous systems. Amongst these he includes all social interactions “that constitute autonomous units” including even conversations in this (Varela 1979: 269).

The problem here seems to be related to some of the same issues addressed in the third chapter, namely the impossibility of accounting for social relations without the presence of a meta-context. Again, this is a consequence of limited theoretical tools, specifically the absence of notions capable of accounting for any horizontal social relationship that does not imply force or agreement. As I will illustrate in what follows, the advanced concepts of horizontal positivity are very useful in this regard.

Once the above concepts are taken into account, the first thing to take into consideration is that human (or otherwise cultural) cognition simply cannot be equated to that of other living beings. This does not imply that it corresponds to some “transcendent” phenomenon. It implies, rather, that its nature is different in many regards. It is imperative to understand these differences in order to understand the nature of human social normativity.

6.2.1 Knowledge in the Strict and in the General Sense

It is common for literature on both embodied-dynamism and radical constructivism to use terms such as “knowing”, “known” and “knowledge” (e.g. Lakoff and Johnson 1999; Glasserfeld 1995; Maturana and Varela 1992; Varela, Thompson and Rosch 1991) when referring to particular aspects of cognitive phenomena. When a definition is offered (as in Maturana and Varela 1980: 119; Varela: 1979: 48) or even when the term is used casually, “knowledge” is equated or reduced to cognitive situation. It is reduced to a cognitive state that affords determined capacities for action and/or description. Within the body of work at hand, cognition is understood as the “experiential” or “phenomenological” aspect of “life” or “autopoiesis”. Cognitive phenomena, including knowledge, are attributed to the biosphere as whole, or rather, to “nature’s autonomous organisations”. In that which regards our present concern, much of the work on strict cognitive situationism focuses on the continuity between human and other forms of cognition rather than in its differences (Varela 1979: 271).

In this sense, I find no problem with the above-mentioned and “continuous” use of the term “knowledge”, as long as one is willing to accept its use in sentences such as “ants *know* how to construct underground nests”, “bees *know* the difference between sustenance and threat” and “human infants are born *knowing* how to cry”. I’d be hard pressed, however, to concede that there is no difference in the manner in which the term is used in the previous sentences, compared to describing a physicist’s knowledge of physical phenomena, or a rocket scientist’s capacity to design rockets. Here again, these authors are not distinguishing the vertical aspects of constraint, knowledge and normativity from their horizontal counterparts. In the first case, I hold that we are speaking of the mere vertical circumstance, namely:

a) Cognitive situatedness, “knowledge *tout court*” or “knowledge in *latu sensu*”.

That is, we are accounting for knowledge in situationist terms and reducing it to individual power of action and/or description. In Maturana’s (1980) words, “the domain of interactions in which a system can enter without loss of identity” (1980: 119).

In the second case, however, we are focusing on cognitive plasticity, capacity for cognitive change and capacity for communication. In other words, we are here addressing matters pertinent to the horizontal component of normativity. Or in other words,

b) “Knowledge in *strictu sensu*”, “culture” or “cultural knowledge”. Here we are also speaking of a cognitive circumstance that provides capacity of description and action. We are, however, talking of a specific form of cognitive circumstance, one of specific ontological characteristics, in the sense that its context of obtainment and causal force makes it impossibly reducible to a product of genetic change or to the individual. “Knowledge in the strict sense” then is a necessarily interactive or social phenomenon.

The specific sort of knowledge that concerns us, “scientific” and/or “positive knowledge” is the paradigmatic case of the “cultural” variant.

At first glance, the distinction between these two different notions appears to be fairly obvious: it is equivalent to the nature vs. nurture distinction, with “knowledge in the strict sense” being equal to nurture, and thereby (as was hinted above) equal to states that provide for interaction capacities that are not genetically determined.

Such an approach, in turn, is continuous with the treatment of “culture” in the social sciences. That is, even though a precise determination of what constitutes “culture” is

a widely debated matter in the social sciences (e.g. Goodman 2007; Friedman 1994; Wuthnow 1987) most approaches to the term converge in one of two positions: (a) “culture” is understood as “learned” as opposed to other biologically determined phenomena (Friedman 1994; Benedict 1943) and (b) as a situated set of beliefs, practices and behaviours upon which a determined group is able to distinguish itself from another (Goodman 2007; Clifford 1988; Wuthnow 1987). Whilst the first position is clearly a reformulation of the nature/nurture distinction, the second one, by defining culture as “difference” amongst genetic continuity, also points towards genetic non-determination.

From a situationist perspective, all cognitive phenomena are the result of a history of change or transformation. In continuity with the above, it would seem then that the distinction at hand can be understood alluding to the genesis of cognitive states, so that genetically determined cognitive states are not “cultural” whilst their non-genetically determined counterparts are.

Although this fairly obvious distinction seems to point in the right direction, without precise specification it proves to be useless, to wit, all living organisms are able to amend their behaviour in ways that are not genetically determined. That is to say that all organisms are able to change in light of their interactions with their environment. These changes, of course, will bear some genetic determination to a certain degree, but certain aspects of these can only be explained in regards to specific interaction between the organism and the environment.

For example, the rocket scientist’s capacity to design rockets results both from genetically obtained cognitive capacities, as well as from his interaction with certain aspects of the environment, in the very same sense that a bee’s capacity to locate a specific source of sustenance (such as a specific flower somewhere) does. All living

beings experience change or transformation both singly (ontogenetic) or in groups (genetic)¹⁹ (Varela 1979: 31). Their capacity to so ontogenetically differs from being to being, in regards to what is referred to as “structural” (Varela 1979) or “behavioural plasticity” (Gottlieb 2001: 180-5).

Behavioural plasticity, however, varies significantly between species and individual organisms. It seems to be the case that (i) size of brain in regards to body and (ii) the variety of experience in the organism’s early development, are determining factors in this regard (Gottlieb 2001: 185).

There are, in this regard, observable qualitative differences between the cognitive changes that are afforded to different agents. The bee’s capacity to locate a specific source of sustenance did not, unlike the scientist’s capacity to design rockets, result from a change that allowed the organism to engage the environment in a qualitatively different way. In the life sciences (e.g. Hobaiter, C., et al. 2014; Claidière, N., et al. 2013; Dufour, V., et al. 2011) this is referred to as “novel behaviour” or “behavioural innovation”. It is defined, in turn, as the “nongenetic origin of a new skill in a particular individual, leading it to exploit the environments in a new way” (Wyles et al. 1983: 4396).

The notion of structural plasticity and its relation to “novel behaviour” leads us closer to a situationist understanding of “knowledge in the strict sense”. It does not, however, provide a definitive answer, as again, “novel behaviour”, especially in circumstances

¹⁹ To recapitulate something covered in the previous chapter. Maturana and Varela (1980; Varela 1979), and modern biology, for that matter, account, in general terms, for two different forms of change out of which “the behavioural repertoire” of a determined organism obtains:

(i) Genetically determined cognitive phenomena, or phenomena whose present form is independent of a particular system’s history of interactions, and; (ii) purely ontogenetically determined cognitive phenomena or rather phenomena determined by a particular system’s “history of interactions” (Varela 1979: 37-8).

of severe environmental shift or variation, is observed in many species – particularly in birds and mammals (Gottlieb 2001: 185-6) – and occurs in ways that would not be necessarily recognised as “culture”.

The closest approximation to the phenomenon we are trying to pin down would be the notions of “social transmission of novel behaviour” (Hobaiter, C., et al. 2014) or “inheritance of acquired behaviour” (Laland and Janik 2006). This notion, unfortunately, also falls short of our needs, as the “social learning” of novel behaviour which does not become a lasting characteristic of a determined community is observed in a plethora of species and can be reproduced in controlled conditions (see Heyes 1994).

An adequate and situationist rendering of “knowledge in a strict sense”, however, is not far ahead. The approaches addressed above concern themselves with the genesis of culture, understood as change; this is, however, not the end of the contextual story. The story, however, is easily completed when the above-suggested rendering of (situated/naturalist) cognitive authority or positivity is taken into account. That is, as was elaborated above, in order for an instance of communication to be laden with cognitive authority, it must have the capacity to change the limit between doubt and certainty in a determined agent. In other words, it requires the capacity to change the receiver’s cognitive state in a non-arbitrary manner.

Once this is taken into consideration in addition to the above-discussed definitions of “culture” a situationist rendering of “cultural knowledge” surfaces:

What distinguishes the rocket scientist’s capacity to design rockets from other “non-cultural” cognitive affordances observed in other species, is that yes, it corresponds to “novel behaviour” or in a language close to situationism, it is the result of a

“qualitative cognitive change”. Its acquisition, however, involved at some point communication that resulted in qualitative cognitive change. That is, the capacity to design rockets is a product of a *series* of qualitative cognitive changes, each of which required the previous one in order to obtain. The rocket scientist, for example, had to learn maths before he knew how to design rockets. In other words, the qualitative changes that produced his mathematical skills were required in order for the further qualitative changes that resulted in his rocket design capacity to occur. Many of these changes were produced by the scientist’s interaction with a non-social environment, namely his experiments and reflection. The non-socially produced changes, however could have never taken place without the changes that resulted from acts of communication, including his reading and studying of texts, the exchange with his teachers and peers, and even the acquisition of language in his early years. In this regard, his capacity is also, necessarily, the product of socially or communicatively induced qualitative cognitive changes. This regards the “source” of an instance of knowledge in the strict sense. In order to count as such, however, it must also be laden with cognitive authority, to wit, it must afford its possessor with the capacity to produce qualitative cognitive changes in others. Taking into account the rest of this paragraph’s elaboration, it must be able to produce qualitative cognitive changes in others, that might, in turn, serve as the springboard for further qualitative cognitive changes.

“Knowledge in the strict sense” then, is the capacity to “build knowledge over knowledge”. It can only result from previous “qualitative cognitive changes”, it necessarily involves changes brought about by means of communication, and it serves as a point of departure for further “qualitative cognitive change” in the agent or in

others. This makes “knowledge” a necessarily interactional phenomenon. In this strict sense, knowledge can be adequately described as:

A product of qualitative cognitive change, which may serve as a departure point for further qualitative cognitive changes and which, upon communication with another peer or member, has the capacity to produce change that in turn may also serve a point of departure for further qualitative changes.

It is also, then, an ontologically interactional and contextual phenomenon. Knowledge counts as knowledge only if it has the capacity to produce such a cognitive change. In this sense, if something is already known by everyone within a specific community, for the purposes of that context such communication stops constituting “knowledge”. Conversation around such matters within that that hypothetical context becomes redundant, and therefore implied. It would, however, continue to constitute “knowledge” in regards to other contexts or communities. As long as humans (or other species capable of “stacking-knowledge-over-knowledge”) reproduce, the bulk of human “culture” constitutes “knowledge” for someone. The cognitive situation of the last man on Earth, however, would be reduced to “mere cognitive situatedness”. In other words, once there is no capacity to change limits of certainty, this would also imply the end of “culture” and “knowledge” (in a strict sense), even if this (last) man (on Earth) “knows” how to design rockets.

This difference, however, implies that in that which regards their pursuit of sustainment, humans differ substantially from other, non-culture-capable, beings.

6.2.2 *Meta-Theory*

As you may recall, this section began by stating the three levels of normativity, or rather, of constraint, which humans are subject to. All of these work in the same way,

and they comprise the same structure as pragmatic or functional imperatives as well as the circumstances of “life” described by the theory of autopoiesis. That is, they all correspond to a point of departure for the pursuit of outcomes. This point of departure, a framework of reference, is limited, in the sense that it has a limited number of ways to proceed in order to achieve whichever outcomes are required.

This limit constrains the behaviour of agents, as, in order to sustain themselves, they must proceed to the best of their ability, which is in turn contingent on such a limit. This limit, in the case of organisms, is of course their cognitive standpoint, their cognitive situation.

As organisms engage with the environment, this limit – their cognitive standpoint – changes. As explained throughout, these changes are always positive from the perspective of the agent. That is, not all change is warranted and afforded, and that which is was afforded by the previous state is therefore considered positive from such a perspective. All living beings, then, are engaged in constant “movement”: in order to sustain themselves, they must engage with the environment. They do so from a determined standpoint, which in turn, constantly changes by means of such an interaction.

Human beings, however, as can be understood from the above explanation of knowledge, have the capacity to change each other by means of communication, and further to accumulate this knowledge in ways that are not genetically determined. In other words, human beings can capitalise on their own experience with the environment, but they are also able to capitalise on that of their peers. The “movement” of culture-capable agents, such as humans, is different than that of animals. Because we are able to accumulate this history of change, each human mind is capable of capitalising on the equivalent of millions of experiences.

The more human minds are afforded sustenance within a collective, the more potential for movement. Finally, this potential cannot be reduced to the sum of its parts, as it multiplicative, not additive.

For example, in circumstances of temporally unlimited communication, an agent (n) may achieve a determined amount of enhancement (E [*treating E as a differential*]) as a result of his engagement with his environment. If, working together with another agent (n_2), by means of hypothetically perfect communication (or any other sort of communication able to reach possible cognitive stability before requirement of outcome) agent (n) is able to benefit, additionally (+), from any change in the cognitive status of agent (n_2) that has provided the latter with the capacity to change his limit of certainty (En_2 En).

All circumstances being the same, when working alone, one day of engagement (t) would result in agent (n) benefiting only from his own outcome (En). Treating E as a differential, this could be expressed as follows:

$$tEn$$

As explained above, when collaborating with another agent (n_2), and in circumstances of perfect communication, agent (n) could also potentially benefit from the enhancement of the former. Treating E as a differential, this can be formally formulated as follows:

$$tEn+(tEn_2 \ tEn)$$

The potential of agent (n)'s cognitive enhancement, further, is increased as the number of collaborating agents also increases. Formally:

$$tEn+(tEn_2 \ tEn)+(tEn_3 \ tEn)...(tEn \ tEn)$$

It is then relatively uncomplicated to visualise how the number of collaborating agents multiplies their individual cognitive enhancement potential. Since we are speaking about potential, we could substitute the enhancement differential with specific values. For example, we could assume that the daily (t) cognitive enhancement of all participating cognitive agents ($[En_1], [En_2], [En_3] \dots [En_\infty]$) to equal qualitatively different 1s, and the qualitative difference between their enhancements as 0.1 (which would imply that their particular efforts lead them to extremely different cognitive sites). If so, then, after three days of working alone the enhancement of agent (n) would equal the following:

$$3(1) = 3$$

Working in collaboration with another agent (n_2), however, after three days of engagement, his potential enhancement according to the suggested values would equal the following:

$$3(1) + ((3 \times 1) - (3 \times 0.1)) = 5.70$$

His potential enhancement from three days of work in collaboration with two agents would equal the following:

$$3(1) + ((3 \times 1) - (3 \times 0.1)) + ((3 \times 1) - (3 \times 0.1)) = 8.4$$

Three days of collaboration with three agents, further, would equal 11.1, four would equal 13.8, five 16.5, and so on.

The horizontal dimension of normativity, which corresponds, of course, to the capacity of agents and contexts to have “cognitive” or “normative” effect on each other, is identical to the phenomenon of culture. As can be understood from the above, this phenomenon is synergic, which means that its sum is greater than its parts.

Contra Maturana (2015, [1985] 1995) human cognition is not an individual matter, nor can it be understood thusly. That is, because human cognition cannot be understood without taking into account this synergic phenomenon, human cognition cannot simply be reduced to the human unit. In other words, with the exception of any other freak circumstances in which a human has not had contact with another member of her species, human cognitive states cannot be explained except as a link in chain of cognitive change which goes all the way back to the moment in which we gained the cognitive plasticity to develop such a level of culture.

Furthermore, if the findings of strict situationism are to be observed, so that cognition is to be understood as contingent on sustainment and vice versa, then all human engagement with our environment is also collective, as it is precisely this synergic phenomenon that serves as humanity's means of sustainment.

Like any other pursuit of outcome, however, human collective engagement also requires a standpoint of departure. This is the collective equivalent to the cognitive situation or the cognitive state. This standpoint for departure corresponds to the normative dimension of human society. In other words, the normative dimension of human society is identical to the space for determination of collective outcome.

The characteristics of how this normative framework will be specified, are determined by the amount of participation that is afforded in space for determination of outcome by the physical constraints of the context.

Considering the *Circumstances of Cognitive Exhaustion* as ideal, we can state that there are basically three forms of constraint for the determination of outcome:

Temporal

We are in the presence of temporal constraints to participation in the determination of outcome, when the time in which a collective is required to decide or determine upon a viable form of pursuit is less than the time that is required to achieve *exhaustion* (again, the circumstances in which all members of the collective are no longer able to change the limits of certainty of their peers).

What ensues in these circumstances is that hierarchy is then required in order for the collective pursuit of outcome to ensue.

For example, imagine a group of agents involved in a competition to build a house. If it were the case that these agents, upon knowledge of their required pursuit, were given two weeks to deliberate on the matter, the most probable scenario would be that they would investigate the matter and engage in dialogue and discussion regarding the best way to proceed.

If, on the other hand, they only given one four minutes to begin their work, a hierarchy would naturally form, as the individual who, in the eyes of her peers, seemed the most capable candidate for the job would probably begin to direct the efforts.

Temporal constraints, then, depend on the nature of the outcome. Collectives engaged in outcomes that require fast decision making cannot afford to capitalise on their cognitive potential as much as collectives that are engaged in outcome that afford longer periods of deliberation.

Spatial and Material

Spatial and material constraints operate by eliminating the possibility of communication between members of a collective that are engaged in synergy. This includes, for example, the communicative circumstances of the Middle Ages, or illiteracy in a framework of representative democracy.

What takes place then depends on the sought outcome or outcomes, and the physical constraints to participation different normative frameworks obtain. There are three basic configurations:

i. Dialogue

In the configuration of dialogue, the required outcomes and the physical constraints for participation allow for full participation in the determination of pursuits.

Imagine, for example, three agents living in a deserted island and having no contact with anybody else. Because of their small number, the amount of time it takes them to reach complete cognitive exhaustion is less than the time in which they must begin the pursuit of their objectives. In other words, there is enough time to achieve exhaustion in spite of the temporal constraints related to the necessary pursuit of outcome.

In this situation, there are no physically afforded opportunities for arbitrary action amongst the agents. That is, the only way any of the agents is able to take part in creating the outcome is through exhaustive dialogue with the other two. This results because engagement is synergic. The decision to physically participate in the engagement ultimately lies in every individual member. The collective engagement loses more from losing an agent than the cost of the solitary product of her effort. In other words, by losing an agent, engagement

loses as a whole. There are no constraints to full and exhaustive engagement in the decision-making. As a result, the cheapest way for all members to guarantee the participation of their peers is to allow them to fully engage in the decision making process, which will then forcibly stabilise through what every agent is able to bring to the table. The capacity to change limits of certainty is then uneconomical to curtail.

In these circumstances then, there is also no cognitive inequality as taking part in the decision making process implies involvement in exhaustive cognitive change. The full cognitive potential of the collective can be capitalised upon as a result.

Because there is no space for arbitrary action, there are no transcendental arguments to justify or explain such circumstances. Neither is there any need for a written constitution.

ii. Competition

In these circumstances, the required outcomes and the physical constraints for participation allow cognitive exhaustion for certain matters, such as those pertaining to organisation, but the day-to-day outcomes of the collective do not afford participation for all members, mostly on account of temporal constraints.

Imagine the growth of a small community that slowly turns into a city-state. As the community grows, the time that is required for all members of the community to have full engagement in the determination of all outcomes is greatly expanded. Members then are able to organise themselves, and re-organise themselves, but once organised, the temporal circumstances simply do not allow for all those engaged to participate in the determination of all outcomes. That is, as the community has grown, so its cognitive potential and

its engagement have become more sophisticated. Large endeavours that require timely results do not afford full cognitive participation. As such, even though they may be organised by means of dialogue, once organised, they require a hierarchical structure in order to operate.

Through their capacity for intermediation, these officials begin to acquire the capacity to act arbitrarily. That is, to conduct themselves in regard to others in ways that are different than dialogue or full cognitive exhaustion. This capacity of arbitrary behaviour in regards to others can be simply understood as the agents' greater involvement in the determination of outcome.

It may be the case, then, that because the conditions allow for reorganisation, those under the leadership of the previous agent are able to reorganise themselves in the pursuit of the same endeavour. In this case, what results is that the new organisation will also have an intermediary of action. This circumstance stabilises in such a way that those who find themselves having greater roles in the determination of outcome find their capacity for arbitrary behaviour curtailed by the competition with other intermediaries, who offer less arbitrary treatment. What results is the "establishment" of the "private" sphere, which is none other than inequality in regards to participation in the determination of outcome, or in other words, capacity of arbitrary action from some at the cost of others.

In these circumstances, the cognitive potential of the collective is far greater than in the case of the first example, but it cannot be capitalised upon. Classes form in regards to their capacity to participate in outcome. A normative system which establishes the capacity of all to partake, but also protects and explains that which allows some to partake over others, obtains. In the case of city-states,

these rights are justified as the rights of the citizen, and in the case of social configurations that are not constrained to concrete communication (i.e. nation states) these rights are justified as “universally human”. Under these circumstances, arbitrariness is confused with positivity. The possibility of “truth”, “liberty” and “property”, is thought of as “indispensable”.

iii. Force

Under these circumstances, material, spatial and/or temporal boundaries to communication do not allow for exhaustive exchange for the purposes of neither action nor organisation. In the end, all hierarchy is only a function of the possibility for synergic action, and so in these circumstances, the capacity for arbitrary action of the intermediaries is also curtailed. It can only be curtailed by force. The cognitive potential in such a configuration can barely be capitalised. These circumstances always develop strong transcendental arguments to justify the arbitrary capacity of action of their hierarchy.

By means of technological developments in the field of communication, these boundaries, whether spatial, temporal or material can be reduced, allowing for more participation in the determination of outcomes and engagements that previously necessitated higher levels of hierarchical intermediation. Hierarchy, in this sense, may try to halt such occurrences by using the same technology in the creation of more efficient hierarchical structures and the introduction of material boundaries to communication amongst the populace. This, however, comes at a cost; as it neutralises the capacity of cognitive capitalisation of the society.

In this regard, “modernisation” can be understood as movement from the third configuration to the first by means of widespread printed communication, and post-modernity can be understood as the initial movement from the second configuration to the first by the introduction of electronic media.

It is also clear how the specific circumstances that Fuller (2000, 2002; Fuller and Collier 2004) identifies as operating in science, are a consequence of “modern” society’s constraint to circumstances of competition. His solution seems more like a scenario that would result from the levelling of boundaries to communication, rather than a plausible scenario for change. Unless the physical circumstances of communication are altered, social reform will not correspond to a significant difference.

“Indispensability”, then, is right to an extent. What is indispensable, or rather a “necessary evil”, is the hierarchical configuration but not its transcendental justification. This only clouds the possibility of change. Values such as the requirement or desire for political and material equality, as well as knowledge are possibly pursued. They seem transcendent, because they correspond to the meta-objective of the social organism. By holding to the transcendental justification of hierarchy, we are then reduced to thinking that these values can only be obtained in the ways that we are physically afforded today, which is by means of the hierarchy of property, of the hierarchy of bureaucracy or of the hierarchy of academia. Historical precedents suggest that ideas to pursue positive social outcomes result from naturalist thinking. This is precisely because naturalist thinking does not allow us to understand circumstances as “indispensably” established.

In order to achieve these circumstances, however, it is necessary to change our physical reality by levelling the boundaries to communication. This is done by

technological means. There is no such thing as a purely social change. This should be obvious. All social change is preceded by changes in material circumstances.

6.4 Conclusion

We do not need to account for normativity by way of transcendental or meta-contextual arguments. The first component of normativity has never had trouble being located by science. It corresponds to the relation between point of departure for the pursuit of outcome and the actualised circumstances. The second component, the horizontal component, has had a harder time. Using a “naturalist” ontology, a “second-order” or “subject” naturalism that locates the individual in the same realm as that which falls within her purview, an account of positivity can be produced.

It is easy to see now how human society is both different and similar to other biological phenomena. All life is normative, and human culture is no other thing than life. It corresponds, like all other living things, to a point of departure and point of arrival, constantly changing as they try to meet.

The point of departure of human society has different configurations, depending on how much the physical circumstances of the social context allow for participation in the determination of pursuits. This is all there is to normativity, really. Transcendental explanations operate only on those circumstances in which a non-arbitrary, non-hierarchical structure cannot be conceived.

This understanding of positivity provides for a full explanation of normative phenomena as natural, or biological, to be precise. It does not, however, afford the justification of hierarchical institutions. It does not offer the possibility for someone to claim “I am right”. If this chapter has changed the limits of your certainty, I cannot claim that for myself, only ask you to acknowledge it.

But if you are also affected by what I recognise as strict reasoning and disciplined induction, then you might also agree that once normativity is fully explained by science, philosophy can be reduced to the binary of science (scepticism-scrutiny) or ideology.

7. Conclusion

The problem of circularity (and/or the argument of “self-defeat”) is a constant critique of any effort at the study of norms (and/or reference) that is open to, any of its methodological assumptions being challenged by the results of its practice. As such, it is only by solving the problem of circularity that a “strict” sociology, a “strict” cognitive science, and ultimately a “strict” science can be successful. As I hope is clear at this point, solving the problem of circularity is identical to developing a strictly scientific account of norms and reference. That is, solving the problem of circularity can only be accomplished by developing a theory of reference and normativity that places these matters squarely within the purview of scientific scrutiny and renders them as physical as everything else found within the scientific worldview.

This results because circularity (or self-defeatism) is a consequence of the incompatibility between the precise manner in which science (and in general terms all strict scrutiny) finds things on the one hand, and the assumptions that justify scientific claims on the other.

All the scientific or empirical study of matters pertaining to norms and reference has always constituted naturalist epistemology, and can only be successfully strict if it is successful as strict naturalist epistemology. These forms of scrutiny are otherwise left with the choice of either saving all assumptions that justify their claims upon epistemological convenience or deconstructing their normative grounds without having anything to offer in replacement.

In this regard, sociology has always constituted naturalist epistemology. If sociology is to be both strict and successful, it must also operate as *strict* naturalist epistemology. Sociology, however, cannot accomplish this by itself, at least not as it is traditionally understood. To do so, it requires the scope and the insight of cognitive science. All methodological assumptions and prescriptions that limit sociology's scope and object of study to "the social" (possibly in the name of disciplinary sovereignty and independence) are also effectively limiting sociology from achieving its own objectives. Even if the strict sociologist is congruent and does not assume purchase for her claims beyond what she is afforded by her findings, and therefore her context, she will nevertheless understand "context" in social terms and inevitably assume herself to hold normative purchase over other agents. This condemns sociology to an understanding of normative and/or referential phenomena as having sway over many, independent of their particular circumstances. Even if the sociologist remains agnostic as to the normative grounds of her departure (*medias res* à la Quine or Fuller) she will still posit matters in ontologically realist terms. In short, sociology, as traditionally understood, is condemned to realism in one way or another.

Cognitive science, like sociology, is also constrained to be naturalist epistemology. Like sociology, the outcomes of its practice deconstruct its normative grounding. On its own, however, it is unable to produce such an account. Unlike the strict sociologist, if the strict cognitive scientist is congruent and does not assume her assertions to have normative purchase beyond her own context, this will effectively translate into an epistemic attitude that is comprehensively observant of the relativity of reference. Without a scope that transcends the individual, however, the strict cognitive scientist is unable to account for reference in a non self-referential way, without resorting to realism. The strict cognitive scientist, then, is condemned to realism or self-defeat.

In short, whilst sociology is able to locate the components for developing a naturalist theory of norms, it is unable to capitalise on this without falling into transcendentalism. Cognitive science, on the other hand, is able to provide a stable and unproblematic standpoint for the grounding of its own determinations, but it is difficult to see how such a position is different from (normative) solipsism.

Although the challenge to strict naturalism that is posed by critical realism and liberal naturalism is problematic, it does strike a chord. It points out that strict attempts at the scrutiny of norms and reference may be empirically and philosophically powerful, but they do not, and in their eyes cannot, offer anything in return. Unless a successfully strict account of positivity is provided, these traditional understandings remain the only option. Without an alternative, they are the only available choice for the intelligibility of science, language and society; they are indispensable, at least for the purposes of understanding. In this regard, indispensability is right. As long as strict sociology or strict cognitive science is unable to produce an account that successfully replaces that which is challenged by their results, strict naturalism constitutes a self-defeating endeavour.

The objective of this work was the illustration of how this issue can be solved by eliminating the conceptually unnecessary boundaries that exist between the sciences of reference: namely, between sociology and cognitive science. It can also be understood as illustrating how a successfully strict scientific (and thereby naturalist) theory of reference and/or norms can only be achieved in holistic terms. That is, it can only be successful if it incorporates and makes sense of the different circumstances in which phenomena pertaining to norms and reference are found, specifically at the social and individual levels.

Social epistemology and radical constructivism constitute the most strongly committed attempts to develop an epistemology that is faithful to the worldview that results from the practice of science: specifically, strict sociology (i.e. STS, SPKKS) and strict cognitive science (i.e. embodied, enactive, extended cognition). Both attempts are as exhaustive as allowed by the established boundaries of the disciplines from which they are sourced. On their own, they clearly fall into the above-described circumstances. Together, however, the grounding provided by strict cognitive science can be combined with insight pertaining to the social dynamics of normative validity, normative consequence and/or normative purchase. This exchange results in the conceptual grounds required for the development of a successful and strictly naturalist theory of norms and reference: change as positivity, situated necessity and the theory of natural authority.

In this new perspective, both reference and normativity are intrinsic to life. That is, they are intrinsic to matters that need to interact and transform their environment in order to sustain themselves. All reference results from, and is mutually determined by, the particular manner in which said entities interact with their environment. All matters are categorised and evaluated relative to the function they perform in the entity's pursuit of sustainment and/or sophistication of sustainment. As a result, distinctions obtain between the ways things are and the way they should be. The first corresponds to a diagnosis of perceived circumstances; the latter corresponds to the set of scenarios that need to obtain in order for an entity to achieve sustainment or sophistication. The first are then valued in regard to the latter. If the diagnosis corresponds to the sought scenario, then the perceived circumstances are valued in the positive and no prescription follows. If the diagnosis does not correspond to the sought scenario, the set of directives that, according to the framework, will result in

these sought circumstances will be prescribed. For a hungry lion, the gazelle under her gaze must be eaten and she will go about as best she can to achieve this. For a capitalist society, thieves (and other transgressors against private property) should be disciplined.

The framework is causally affected by the entity's interaction with the environment. That is to say that the framework changes as a result of the entity's interactions. These changes are not arbitrary: like everything else in the framework, they are also valued in terms of the entity's pursuit of sustainment. Unlike other objects of valuation, these changes affect the very same framework in which they are valued, in the sense that they become it. Changes, then, can only be valued by the circumstances that preceded them, and as such they are by definition positive.

In the case of individual (non-social) reference, the above applies almost identically. One needs only to substitute the concept of "entity" for that of "agent" and "referential framework" for that of "cognitive state" or "cognitive circumstances".

Social reference and normativity takes place when individuals require engagement in synergic outcomes in order to procure their sustainment. For these matters, the referential framework is equivalent to the overall normative and referential structure of the collective pursuit, or society. It is identical to the cultural, political and legal system. It corresponds to the result of an exchange between the different agents involved. This exchange is, however, like everything else, located in time and space: the "conversation" between these individuals is conditioned by particular spatial, temporal and material circumstances, which in turn are affected by technologies of communication. That is, communication, dialogue and/or deliberation takes time, and it requires that the participating agents have access to each other. The greater the temporal, spatial or material boundaries, the fewer agents are afforded exhaustive

participation in determining the normative structure that will inform the pursuit of the outcome, and to an extent, the overall characteristics of the outcome itself. The framework, then, will be characterised depending on the participation that leads to its result. It will be geared towards the values and interests of those who partake the most in its delimitation. In physical terms then, the social normative/referential framework is equivalent to the result of an unequal exchange, plus the physical and material circumstances that determine the extent of participation.

Technology may allow for a decrease in the communication barriers of a society, and this translates into possibilities for greater participation. Ultimately, this may result in more “equality”, but also in an acceleration of the collective’s capacity for positive movement, that is, of producing viable individual (and thereby collective) changes.

If it were the case that technology (or another possibly unforeseen source) provided the means to dramatically reduce, or even eliminate, all boundaries to communication, this would imply an absolute lack of temporal and spatial distance between the cognitive phenomena of different agents. Communication would be so fast that the changes in one determined agent would occur almost instantaneously in her closest counterparts. At that point, it would be more adequate to describe this phenomenon as a “cognitive unit”, rather than a “society”.

On the other hand, it has been made abundantly clear that contextually or physically transcendent authority has no place in a scientific worldview. As explained throughout, in order for an agent/context (A) to claim authority over another agent/context (B) without taking into full account the particular circumstances of (B), it would imply that the source of (A)’s claimed authority is either (A) herself – which would lead to arbitrariness – or some other circumstance (X) that is neither located, and therefore inaccessible to, in either (A) nor (B); something metaphysical.

My proposal, on the other hand, holds norms to be necessary for the promoter in her own site (A), hypothetical for the promoter in the receiver's site (B), and necessary for the receiver in his own site (B), hence situational necessity. It is perfectly able to account for its validity, and thereby able to hurdle circularity and/or any other allegation of self-defeatism or self-referentiality.

Once a successful, strictly naturalist account of normativity is produced, the argument of indispensability crumbles. The previously indispensable understanding of normativity turns out to be neither indispensable, nor supported by any empirical evidence whatsoever, and strongly challenged by philosophy.

Indeed, as it is illustrated by the account provided here, the possibility of one agent (A) claiming non-arbitrary authority over another agent (B), independently of the particular circumstances of the latter, is as empirically and philosophically unwarranted as it is unnecessary, in circumstances that do not require physical enforcement. That is, in circumstances in which collaboration (and/or synergic pursuit of outcome) allows full participation in the normative framework and/or in the determination of outcome and pursuit, and in which physical enforcement of some over others is simply uneconomical, there would seem to be no use for the assumption of unilateral "rightness", "validity" or "virtuousness". In these (hypothetical) circumstances, all outcomes, by physical necessity, are determined by means of dialogue, debate and deliberation. The need to suppose that one is "right" compared to another is as unnecessary as the possibility of being "right" independently of the other is (practically) useless. Whatever may result will result from dialogue and conversation. Therefore, whatever may result will result from presenting one's case (A) to the judgement and consideration of another (B). That is to say that whatever will result, will result from taking into full account the circumstances of all those

involved. What was previously understood as “indispensable” is only “useful”, or only serves a purpose, in circumstances of inequality.

The naturalist account does not, of course, deny that such circumstances are present, and even necessary in certain regards. As explained, circumstances that allow for communicative exhaustion are the result of a physical scenario that is rare, and possibly extremely difficult to achieve in the context of “modern” society. This is not to say, however, that it is impossible or unachievable. Hierarchy, and the need of some to impose themselves over others, simply results because collaborative endeavours (and/or synergic pursuits of outcome) are, like everything else, constrained by physical circumstances: by space and time. Exchange amongst individuals requires certain physical conditions in order to be possible, and in most of these it does not allow the exhaustive participation of most of the members involved in the collective endeavour. In most cases, physical circumstances only allow for a few to have strong input in the determination of the collective normative and referential framework. These circumstances, however, are subject to change, and have changed in the past. As already covered, this theory would explain the advent of, for example, liberal democracy, science, bureaucracy, the workers’ movement, and the increasing emancipation of women and minorities, as a result of the possibilities of widespread communication between all sorts of members of society that were afforded by the printing press and further technological innovations. In summary, the naturalist account explains why hierarchy is physically necessary in certain contexts, but by doing so it also explains the causal circumstances that lead to such necessity and as a result provides the conceptual tools required to change and transform these matters.

By claiming that transcendental or “vertical” positivity is indispensable for the intelligibility and the practice of science, language and society, the indispensabilist is

thereby holding to the transcendental legitimacy and necessity of some imposing themselves over others. By doing so, the indispensabilist and/or the transcendentalist, unlike the naturalist, does not provide, and is not concerned with providing, an account of the physical causes behind such circumstances. As such, the transcendentalist account is unable to provide conceptual tools that would allow for the amendment of circumstances of normative subordination. Unlike science, whose explanations are tools for the interaction and transformation of circumstances, transcendentalist explanations only serve as justifications of established scenarios. The transcendentalist account is thus useful in circumstances of inequality and subordination, because it operates as a transcendental justification of such circumstances.

This also, of course, provides the means to understand, in different terms, the disciplinary boundaries that are challenged by the present work. Once a strictly scientific account of norms and reference is provided, and it is done by insisting on the capacity of science to scrutinise normativity in spite of the challenge of circularity and apparent self-defeatism, the argument that the object of study of the social sciences differs from that of the natural sciences is rendered profoundly ideological. It is precisely by insisting on the capacity of science to ascertain the nature of norms, that a physicalist, and therefore progressively useful, distinction between power and authority is achieved. The distinctions between philosophy and science, between the social sciences and the natural sciences, and ultimately between sociology and cognitive science, are rendered as effectively operating to save the assumptions that justify power.

In summary, the use of our powers of inquiry, either sensorial/empirical or cognitive/philosophical, has historically resulted in a particular worldview.

Throughout this work, I have collectively labelled such exhaustive attempts as “strict and disciplined scrutiny”, and the worldview that results is one of physicality, immanence, transience and accessibility. Everything in this worldview is located in time and space.

On the other hand, as long as people have recorded history, most members of society have been constrained to accept values and follow prescriptions that are both posited and enforced unilaterally. Notions like “truth”, “validity”, “goodness”, “justice”, “beauty”, “rightfulness”, “virtue”, “equality” and “crime” have changed from time to time and from society to society, but a constant is observable in all circumstances, and that is that independently of context, these notions are assumed to hold for all members of the particular society, regardless of their individual history, characteristics or context. Social value and social normativity, in this sense, have historically been understood as physically transcending circumstances, or in other words, as transcending time and space.

This results in an inconsistency between the practice of science, and strict scrutiny in general, and the assumptions upon which values and prescriptions are understood, including the values of prescriptions of science. Amongst those who have identified this problem, two distinct responses result. The received view contends that science must be wrong in order to be right. If its results challenge its own assumptions, and thereby the assumptions that explain society, these must be dismissed or interpreted in ways that save such assumptions from challenge. As such, this argument holds that physical nature and normative/referential matters are ontologically different. This then, supposes a distinction between natural science, social science and philosophy.

Naturalists disagree. They do not condone the dismissal of such evidence, or its arbitrary interpretation. If scrutiny offers a particular worldview, it must be this

worldview from whence a new understanding of norms and reference must result. Naturalists, however, are unable to produce an account able to both challenge the traditional assumptions and offer a viable and unproblematic replacement. This is the problem this work has tried to solve.

Naturalism is by definition trans-disciplinary. That is, it tries to reduce the disciplines of the *a priori* to the disciplines of (hard) science. The solution to this problem, as offered by the present work, results from a simple following of the above. It consists of finding common ground between the most naturalistically committed attempts to develop a theory of normativity/reference in the social and the natural sciences, for the purpose of reducing these to each other.

What results is a physicalist theory of normativity. It provides a physicalist explanation of reference, knowledge, authority and legitimacy, in a way that allows a distinction of these from power. Like any other result of science, the theory provides a causal explanation of the forces behind normative subordination. As such, it allows for description, explanation, prediction and prescription. In other words, like any other product of science, this theory provides the tools to both understand and transform matters pertaining to normative and referential subordination. The solution offered both challenges the previous understanding of norms and reference, and is also able to function as a viable and unproblematic replacement. The previous understandings of normativity are found to be as replaceable as they were inaccessible, empirically disagreeable and philosophically questionable. Like any other attempt at transcendentalist explanation, the replaced understanding is unable to provide a causal account. It is unable, therefore, to provide conceptual tools for the transformation of the physical forces underlying normative subordination. Like all

transcendentalism, it can only justify, and in this case, it operates as a justification of the understanding of normativity, as “vertical”, or as subordination.

Because it is precisely by insisting on the strict scrutiny of norms that this account was reached, and because the disciplinary boundaries between philosophy, natural science and social science are grounded in the assumption that matters pertaining to norms and reference cannot be studied by the strict methods of the natural sciences, these boundaries are rendered ideological. Once it is seen that the strict scrutiny of norms and reference leads to accounts that challenge the understanding of these as subordination, these boundaries, which are nothing other than boundaries to the practice of strict scrutiny, can hardly be understood as anything else but as a protection for such ways of understanding.

The present work was written as a contribution to science and technology studies, social epistemology and, thereby, to naturalist epistemology. As such, it has engaged with the pertinent literature. Being a contribution to STS, and specifically to the philosophical underpinnings of STS, this work also constitutes a contribution to the philosophy of the social sciences in general. Further research is required to exhaust the precise implications that the position offered has in regard to this body of literature.

Although not written as a contribution to social theory, or at least not written as a contribution to social theory *per se*, the ultimate outcome of this research does translate into social theory: specifically into social theory and philosophy, and more specifically into an epistemologically self-sustaining social theory that presumes to be able to dispose of philosophy. The implications for social theory, then, are many, and this also requires further research in order to be fully explored.

As mentioned above, not unlike most of what is offered by the natural sciences, the offered theory is descriptive, explanatory, predictive and therefore prescriptive. As such, it is also suggestive of the possible elaboration of policy, and the pursuit of policy research. That is, its predictions, if shown to be prosperous, could very well transform into prescriptions.

For example, the theory explains and predicts that knowledge will advance faster, and/or the production of innovation will increase, the more agents are afforded participation in the determinations of pursuits and outcomes. This results because it predicts that the more agents are allowed further participation in the exchange, the more the collective can capitalise on the plethora of different individual experiences. Communication takes time, however, because participation takes time. Time, on the other hand, also constrains action. In this regard, it may very well be the case that the communicative circumstances of a particular collective pursuit do not afford more participation, even if they seem to, as it may be the case that procuring such an increase will level the capacity of the collective to achieve its results. Steve Fuller's diagnosis of the present circumstances of science and academia serves as a case in point.

According to this theory, for example, military endeavours need not always be hierarchical. It depends on the urgency or the imminence of their pursuits. Whilst it would seem that, under our present technological state, an infantry platoon engaged in battle has no organisational option other than its traditional hierarchical structure, when engaged in the elaboration of strategy, however, and especially if there is sufficient time, it may also be the case that not only may such a platoon afford the possibility of a different form of organisation, but also that such an arrangement might be beneficial for such purposes.

There exists a trade-off, then, between the capacity for innovation allowed by more horizontal arrangements, and the capacity for action allowed by their hierarchical counterparts. Depending on the available technological resources, the capacity of communication they afford, and the imminence of necessary collective outcome, there is a particular amount of participation that is afforded and that will not disrupt the collective's capacity for action. As technological advances increase the speed of communication, this point of equilibrium between action and innovation, hierarchy and horizontality, moves towards the latter in each case.

Regarding Fuller's proposals, then, it remains to be seen if what he suggests would hamper the capacity of the scientific/academic establishment to conduct their pursuits. The epistemological grounding provided by the theory hereby offered solves many of Fuller's philosophical problems and is also consistent with many of Fuller's findings, particularly the notion that hierarchy and boundaries of communication in science and academia constitute an obstacle to the attainment of innovation and scientific progress. It remains to be seen, however, and it must be the matter of future research, how many of these boundaries are physically required in order for science to pursue socially positive outcomes, and how many are prompted by the pure protection of privilege. Either way, the position offered does suggest that, if the above is to be taken into account as part of the continuing elaboration of scientific policy, the assumptions that guide the practice of science must change from their current empirically unsupported and philosophically challenged form to something in line with what is proposed here and which is consistent with the results of scientific practice.

The position offered here, however, also suggests new avenues of research in matters regarding political and economic policy. This is because, as can be deduced from the last part of the previous chapter, the theory offers a new (physical) understanding of

the “private” and the “public” spheres, and provides explanations for their different causes and consequences. From this perspective the (physical or sociological) private sphere corresponds to the capacity of one (A) (or some) to affect the capacity of action of another (B) (or of others) without the latter (B) being able to affect or scrutinise that capacity in the former (A). The public sphere, then, corresponds to those circumstances in which the value determinations and prescriptions that affect a great variety of individuals are possibly scrutinised, or better yet, produced as a result of a wide participatory exchange of all the affected individuals.

For example, if the capacity of a certain individual to affect others without being subject to scrutiny is found in circumstances that are formally labelled as “public”, they will still constitute, from a sociological perspective, part of the private sphere. As treated by Fuller, this obviously includes such capacities for arbitrary action as are found in academia, but also in bureaucracy and/or the state. Likewise, according to this perspective, there is no such thing as matters of private concern that do not affect public interest; only matters of personal concern do not. Private property, for example, is most certainly a matter of public concern.

The general prescriptive gist of the position is that, if circumstances of horizontality, innovation, progress, and incremental production of knowledge are desired, the “private sphere” must be curtailed in both the formally public and private sectors of society as much as is afforded by the physical (communicative) circumstances of the addressed context. This includes, of course, accountability, as has been historically pursued by liberal policy, but most importantly the treatment of private property. As I hope can be discerned at this point, this position suggests that it is inaccurate to understand the market, or market economies, as the prime environment for the proliferation of the private sphere. Private property, under this view, is not a product

of the market, but rather of the physical circumstances that constrain the capacity of widespread cognitive participation in collective pursuits. Private property, as currently understood, may very well be physically needed for the conduct of a market economy within the physical constraints set by the communicative circumstances of the printing press. It may also be the case, however, that private property, at least as it is understood today, is not as required, or could be significantly curtailed, as a result of on-going technological advancements of communication and the new social circumstances they may afford. In general terms, private property constitutes a boundary to communication between agents, and in economic terms it consists a boundary of entry into the market. In other words, private property, like any other aspect of the sociological private sphere, finds itself at odds with public forums of widespread exchange.

It seems only appropriate to finish in the same manner as I started: by addressing the problem of circularity. I have spent much time during this endeavour explaining why it is the case that the manner in which the value or validity of scientific and overall academic claims are made is profoundly mistaken. Yet, as result of finding a new source of value, I have found myself also claiming a great many things, the most important of which is that my new account of validity and authority is able to account for its own validity and authority. In this regard, I can only remind you, my reader, of the precise manner in which I was led to understand knowledge and authority in scientific and thereby natural terms:

The limits of our doubts and our certainty are not subject to our own will and neither are the changes to these limits. I do not have voluntary control over my perception of colour, or my belief that Mexico is no longer a political dependency of Spain, or my view of the positivity of the account contained herein. If someone were to cause doubt

in me as to the certainty of these matters, I would not be able to remain unaffected, and, from my involuntary perspective, such information would count as knowledge. Natural authority, in this regard, is the capacity of a determined agent to change the cognitive circumstances, or in other words the limit of certainty, of another. It is unknown to me if this exchange has had the capacity to change your cognitive state, or the limits of your certainty. It is impossible for me to claim or know if, from your own situation, our present exchange (the reading of this text) has constituted knowledge. If it is the case, however, that certain aspects of your worldview now appear less certain, more doubtful, or better, if you find yourself constrained to insight, then your own embodied site has already provided this account with validity. In this sense, I can only appeal to you to recognise it.

8. Bibliography

- ABBOTT, P., TYLER, M. and WALLACE, C. *An introduction to sociology: Feminist perspectives*. Routledge, New York. 2006.
- ABELES, M. *Local Circuits*. Springer Verlag, New York, USA, 1984.
- ACKERMAN, B. *We the People, Vol 1: Foundations*, Harvard University Press: Cambridge, Massachusetts, USA, 1991.
- ADAMS, F. and K. AIZAWA. *The Bounds of Cognition*. Blackwell Publishing, Oxford, UK, 2008.
- AIZAWA, K. "Understanding the Embodiment of Perception." *The Journal of Philosophy* 104 (1) 2007: 5-25.
- ALSTON, W. *Realism and Anti-Realism*. Cornell University Press, Ithaca, New York, USA, 2002.
- ALSTON, W. P.: "Belief Acceptance and Religious Faith". In JORDAN, J. (ed): *Faith Freedom and Rationality Philosophy of Religion Today*. Rowman and Littlefield, New York, USA, 1996.
- ALSTON, W. P. "The Deontological Conception of Epistemic Justification." In: *Philosophical Perspectives, 2, Epistemology*, 1988: 257-299.
- ALTHUSSER, L. *Lenin and Philosophy and Other Essays*. New Left Books, New York, USA. 1971.
- ARBIB, M.A. "Schemas for the temporal organisation of behaviour." In: *Human Neurobiology*, 4, 2005: 63-67.
- ARBIB, M.A. and M.B. Hesse. *The Construction of Reality*. Cambridge University Press, Cambridge, UK, 1986.
- ARCHER, M. S. *Realist Social Theory: The Morphogenetic Approach*. Cambridge University Press, Cambridge, UK, 1995.
- ARMSTRONG, D. M. *Sketch for a Systematic Metaphysics*. Oxford University Press, Oxford, UK, 2010.
- ASHMAN, K. and P. BARRINGER. *After the science wars: science and the study of science*. Routledge. New York, USA. 2005
- BABICH, B. E. "From Fleck's Denkstil to Kuhn's paradigm: conceptual schemes and incommensurability." In: *International Studies in the Philosophy of Science*, 17:1, 2003: 75-92.
- BACKHAUS, W. and MENZEL, R. "Conclusions from color vision of insects" (Open Peer Commentary on E. Thompson et al., "Ways of coloring:

- comparative color vision as a case of study for cognitive science") In: *Behavioral and Brain Sciences* 15(1) 1992: 28-30
- BAEKER, D.. "Why Systems?" In: *Theory, Culture, Society* 18:1, 2001: 59-74.
- BARNES, B.. *Interests and the Growth of Knowledge*. Routledge and Kegan Paul, London, UK, 1977.
- BARNES, B. and D. BLOOR. "Relativism, Rationalism, and the Sociology of Knowledge." In HOLLIS, Martin and Steven Lukes (eds.): Blackwell, Oxford, UK, 1982: 21-47.
- BARNES, B., BLOOR, D. and J. HENRY. *Scientific Knowledge: A Sociological Analysis*. Athlone, Londond, UK, 1996.
- BARSALOU, L. W. "Grounded Cognition". In: *Annual Review of Psychology* 59, 2008: 617-45.
- "Perceptual symbol systems." In: *Behavioural and Brain Sciences* (22)1999: 577-600.
- "Flexibility, structure, and linguistic vagary in concepts: Manifestations of a compositional system of perceptual symbols". In: COLLINS, A.C., GATHERCOLE, S.E. and M.A. CONWAY (Eds.): *Theories of memory*. Erlbaum, Hillsdale, New Jersey, 1993: 29-101.
- BARSALOU, L. W., NIEDENTHAL, P. M., BARBEY, A. K., & RUPPERT, J. A. "Social embodiment." *Psychology of Learning and Motivation*, 43, 2003: 43-92.
- BAUMAN, Z.. *Liquid Times: Living in an Age of Uncertainty*. Polity Press. Cambridge, UK, 2007.
- *Legislators and Interpreters: On modernity, post-modernity and intellectuals*. Polity Press, Oxford, UK, 1987.
- BECK, U., BONSS, W., & C. LAU "The theory of reflexive modernisation problematic, hypotheses and research programme." *Theory, culture & society*, 20(2), 2003: 1-33.
- BENEDICT, Ruth. *Race and Racism*. Labour Book Service, London, UK, 1943.
- BERGER, P. L. and T. LUCKMANN. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Penguin Books, London, UK, 1966.
- BERKELEY, G. "The Principles of Human Knowledge." In: WOOLHOUSE, R. (ed.) *Principles of Human Knowledge and Three Dialogues between Hylas and Phionous*. Penguin Books, London, UK, [1710] 2004: 33-113.
- BERMUDEZ, J.L. "The Moral Significance of Birth." *Ethics*, 106, 1996: 378-403.

- BERMUDEZ, J. L., MARCEL, A., and N. ELIAN. *The Body and the Self*. MIT, Cambridge, Massachusetts, USA, 1995.
- BHAKSAR, R. *The Possibility of Naturalism: A Philosophical Critique of the Human Sciences*, 2nd Edition. Harvester Wheatsheaf, London, 1989.
- BICCHIERI, C. and R. MULDOON "Social Norms" In: ZALTA, E.N. (ed.): *The Stanford Encyclopedia of Philosophy* (Spring 2014 Edition), URL = <<http://plato.stanford.edu/archives/spr2014/entries/social-norms/>>.
- BILLOCK, V. A., GLEASON, G. A. and B. H. TSOU: "Perception of forbidden colors in retinally stabilised equiluminant images: an indication of softwired cortical color opponency?" In: *J Opt Soc Am A Opt Image Sci Vis*, 18: 10, 2001: 2398-403.
- BLOCK, N. "Review of Alva Noë, *Action*" in *Perception. Journal of Philosophy*, 102, 2005: 259-72.
- BLOOR, D. "Anti-Latour." In: *Studies in History and Philosophy of Science Part A*, March, 30:1, 1999: 81-112.
- "Idealism and the Sociology of Knowledge." In: *Social Studies of Science* 26, Sage, 1996: 839-856.
 - "Left and Right Wittgensteinians." In: PICKERING, A. (ed.) *Science as Practice and Culture*. University of Chicago Press, Chicago, USA, 1992.
 - "Rationalism, Supernaturalism, and the Sociology of Knowledge." In: HRONSKY, I., FEHER, M. and D. BALAZS (eds) *Scientific Knowledge Naturalised*. Kluwer, Dordrecht, Netherlands, 1988.
 - "Polyhedra and the Abominations of Leviticus." In: *The British Journal for the History of Science*, 11 (39), 1978: 245-272.
 - *Knowledge and Social Imagery*. Routledge and Kegan Paul, London, UK, 1976.
 - "Wittgenstein and Manheim on the Sociology of Mathematics." In: *Studies in History and Philosophy of Science* 4, no. 3, 1973: 173-191.
- BODEN, M.A. *Mind as Machine: A History of Cognitive Science*, Vol. 1 and 2. Clarendon Press, Oxford, UK, 2006.
- BOGHOSSIAN, P.A. and J. D. VELLEMAN. In: *Philosophical Review* 100: 67-106, 1991
- BOWMAKER J.K. "Visual pigments, oil droplets and photoreceptors", In: P. GOURAS (ed.) *The Perception of colour : Vision and Visual Dysfunction*, Vol 6, London: Macmillan Press, 1991.
- "Colour vision in birds and the role of oil droplets". In: *Trends in Neurosciences*. 3, 1980:196-199.

- “The visual pigments, oil droplets and spectral sensitivity of the pigeon”, In: *Vision Research* 17, 1977:1129-38
- BOYNTON, R. M. *Human Color Vision*. Holt, Rinehart and Winston, New York, USA, 1979.
- BRENTANO, F. *Psychology from an Empirical Standpoint*. London Routledge and Kegan Paul, London, UK, 1973.
- BROOKS, R. A. *Cambrian Intelligence*. MIT Press, Cambridge, Massachusetts, USA, 1999.
- “Intelligence without reason”. In: *Proceedings of the 12th International Joint Conference on Artificial Intelligence*. Morgan-Kaufman, San Mateo, 1991b: 569-595.
- “Intelligence without representation”. In: *Artificial Intelligence* (47), 1991a: 139-159.
- BROWN J. H and A. KODRIC-BROWN. “Convergence, Competition and Mimicry in a Temperate Community of Hummingbird-Pollinated Flowers.” In: *Ecology* 60 (5), 1979: 1022-1035.
- BROWN, J. R. *Scientific Rationality: The Sociological Turn*. Reidel Publishing Company, Dordrecht, Holland, 1984.
- BROWN, P.K. and G. WALD. “Visual pigments in single rods and cones of the human retina.” In: *Science* (144), 1964: 45-52.
- BYRNE, A. “Color and similarity.” In: *Philosophical and Phenomenological Research*, 66, 2003a: 641-665.
- “Intentionalism defended.” In: *The Philosophical Review*, 110, 2002: 199-240.
- BYRNE, A. and D. HILBERT. “What do ‘color blind’ observers see?” In: COHEN, J. and M. MATHEN (eds.): *Color Ontology and Color Science*. MIT Press, Cambridge, Massachusetts, USA, 2009.
- “Truest blue.” In: *Analysis*, 67 (293), 2007b: 87-92.
- “Color primitivism.” In: *Erkenntnis*, 66, 2007a: 73-105.
- “Color realism and color science.” In: *Behavioural and Brain Sciences*, 26 (1), 2003b: 3-64.
- “Colors and reflectances” In: *Readings on Color, Volume I: The Philosophy of Color*. MIT Press, Cambridge, Massachusetts, USA, 1997.
- CADENAS, H., & ARNOLD, M. “The Autopoiesis of Social Systems and its Criticisms.” In: *Constructivist Foundations*, 10(2), 2015: 169-176.

- CALINICOS, A.: *Social Theory: A Historical Introduction*. Polity Press
Cambridge, UK. 2007
- CAMIC, C. and N. GROSS. "The New Sociology of Ideas." In: BLAU, J.R. (ed.)
Blackwell Companion to Sociology. Blackwell, 2001: 236-249.
- CARNAP, R., *The Logical Syntax of Language*, translated by Amethe Smeaton.
Trubner & Co, Kegan Paul Trench, London, UK, 1937.
- CHAPPEL, V.: "The Theory of Ideas" In: RORTY, Amelie (ed.): *Essays on
Descartes' Meditations*. University of California Press, Berkeley, 1986: 177-
98.
- CHEMERO, A. *Radical Embodied Cognitive Science*. MIT Press, Cambridge,
Massachusetts, USA, 2009.
- CHISHOLM, R. *The Foundations of Knowing*. University of Minnesota Press,
Minneapolis, USA, 1982.
- CHOMSKY, N.: *Rules and Representations*. Harper and Row, New York, USA,
1980.
- *Language and Mind*. Harper and Row, New York, USA, 1968.
- *Cartesian Linguistics*. Harper and Row, New York, USA, 1965.
- CLAIDIÉRE, N., MESSER, E.J.E., HOPPITT, W. and L. Rendell. "Network-
based diffusion analysis reveals cultural transmission of lobtail feeding in
humpback whales." In: *Science* 340, 2013: 485-488.
- CLARK, A. *Supersizing the Mind*. Oxford University Press, Oxford, UK, 2008.
- "An embodied cognitive science?" In: *Trends in Cognitive Science* (3) 9, 1999:
345-51.
- *Being There: Putting Brain, Body, and World Together Again*. MIT Press,
Cambridge, Massachusetts, USA, 1997.
- *Sensory Qualities*. Clarendon Press, Oxford, UK, 1993.
- CLIFFORD, J.: *The Predicament of Culture: Twentieth-Century Ethnography,
Literature, and Art*. Harvard University Press, Cambridge, Massachusetts,
USA, 1988.
- COHEN, J. *The Red and the Real*. Oxford University Press, New York, USA, 2009.
- "Color properties and color ascriptions: a relationalist manifesto". In: *The
Philosophical Review* 113 (4), 2004: 451-506.
- "On the structural properties of colours". In: *Australasian Journal of Philosophy*,
81 (1) 2003: 78-95.

- CRAIG, G. *Stop Abusing Bernoulli!! How Airplanes Really Fly*. Regenerative Press, Anderson Indiana, USA. 1997
- CRANE H. D. and T. P. PIANTANIDA. "On Seeing reddish green and yellowish blue", In: *Science* 221, 1983: 1078-1080.
- CRONIN, T.W., MARSHALL, N.J., CALWELL, R.L., and SHASHAR N. "Specialisation of retinal function in the compound eyes of mantis shrimps." In: *Vision Res.* 34, 1994c:2639-2656.
- DAW, N. W. "Colour-coded ganglion cells in the goldfish retina: extension of their receptive fields by means of new stimuli." In: *Journal of Physiology* 197, 1968: 567-92.
- DAMASIO, A.R. *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. Harcourt, Brace and Co., New York, USA, 1999.
- DAMASIO, A. R. *Descartes, Error, Emotion, reason and the Human Brain*. G.P. Putnam, New York, USA, 1994.
- DARWIN, C. *Fertilization of orchids by insects*. Reprint of the first edition published by J. Murray, London, under the title *On the Various Contrivances By Which British and Foreign Orchids Are fertilized by Insects, and On the Good effects of Intercrossing*. Earl M. Coleman, Stanforville, New York, USA, [1862] 1979.
- DARWIN, C. and E. MAYR: *On the Origin of Species: A Facsimile of the 1st Ed.* with an Introduction by Ernst Mayr. Harvard University Press, (1859) 1964.
- DE CARO, M. and A. VOLTOLINI. "Is Liberal Naturalism Possible?" In: DE CARO, M. and D. MACARTHUR, *Naturalism and Normativity*. Columbia University Press, New York, USA, 2010: 69-86.
- DE CARO, M. and D. MACARTHUR: *Naturalism and Normativity*. Columbia University Press, New York, USA, 2010.
- *Naturalism in Question*. Harvard University Press, Cambridge, Massachusetts, USA, 2004.
- "Introduction: The Nature of Naturalism". In: DE CARO, M. and D. MACARTHUR 2004: *Naturalism in Question*. Harvard University Press, Cambridge, Massachusetts, USA, 2004: 1-17.
- DENNETT, D. "Toward a Cognitive theory of consciousness." In: *Brainstorms*. MIT Press, Cambridge Massachusetts, 1978.
- *Intuition Pumps and Other Tools for Thinking*. WW Norton & Company, 2014.
- "Darwin's dangerous idea." In: *The Sciences* 35, no. 3, 1995: 34-40.

- DERRIDA, J. *Of Grammatology*. John Hopkins University Press, Baltimore, Maryland, USA, 1997.
- DERRIDA, J. *Of Grammatology*. JHU Press. 2016.
- DESCARTES, R. "Principles of Philosophy." In: COTTINGHAM, J., STOOHOFF, R. and D. MURDOCH. *The Philosophical Writings of Descartes*, Vol. I. Cambridge University Press, Cambridge, UK, 1985: 177-267.
- DESCARTES, R. *Discourse on Method and The Meditations*, translated by F. E. Sutcliffe. Penguin Classics, Penguin Books, London, UK, 1968.
- DE VALOIS, R.L. and G.H. JACOBS 1968: 'Primate colour vision'. In: *Science* 162: 533-40.
- DEVITT, M. *Realism and truth* (Vol. 296). Princeton University Press, Princeton, New Jersey, USA, 1984.
- DI PAOLO, E. "Extended Life". In: *Topoi* 28, 2009: 9-21.
- DI PAOLO, E. and E. THOMPSON. "The Enactive Approach". In: SHAPIRO, Lawrence (ed.) *The Routledge Handbook of Embodied Cognition*, Routledge Press, USA, 2014.
- DORRANCE KELLY, S. "Seeing Things in Merleau-Ponty." In: CARMAN, Taylor and Mark B. N. HANSEN. *The Cambridge Companion to Merleau-Ponty*. Cambridge University Press, Cambridge, UK, 2005: 74-110.
- DREYFUS, H. L. "Merleau-Ponty and Recent Cognitive Science." In: CARMAN, T. and M.B.N. HANSEN. *The Cambridge Companion to Merleau-Ponty*. Cambridge University Press, Cambridge, UK, 2005: 129-150.
- *What Computers Can't Do: A Critique of Artificial Reason*, 2nd Edition. Harper and Row, New York, USA, 1972.
- "Why computers must have bodies in order to be intelligent." In: *Review of Metaphysics*, 21, 1967: 13-32.
- *Alchemy and Artificial Intelligence*, Research Report P- 3244, Dec. Rand Corporation, Santa Monica, California, USA, 1965.
- DUFOUR, V., SUEUR, C., WHITEN A., and H.M. BUCHANAN-SMITH: "The impact of moving to a novel environment on social networks, activity and wellbeing in two new world primates". In: *American Journal of Primatology* 73, 2011: 802-811.
- DURKHEIM, É. *The Division of Labor in Society*, edited by W.D. Halls. Free Press, New York. [1896] 2014
- *The elementary forms of the religious life*. Allen & Unwin, London. 1964

- DURKHEIM, E., and M. MAUSS. *Primitive classification*. University of Chicago Press, Chicago, USA. 1963
- DURKHEIM, É; SOLOVAY, S. A.; MUELLER, J. H. and CATLIN S. G. E. G. *The Rules of Sociological Method by Emile Durkheim, Translated by Sarah A. Solovay and John H. Mueller and Edited by George EG Catlin*. Free Press, New York, USA. [1895] 1964.
- D' ZMURA, M. and P. LENNIE, "Mechanisms of color constancy", *Journal of the Optical Society of America A* 3, 1986: 1662-72
- FAIRCHILD, M.D. *Color Appearance Models*. Wiley and Sons, Chichester, UK, 2005.
- FEYERABEND, P. "On the Critique of Scientific Reason." In: COHEN, R.S., FEYERABEND, P, and K. WARTOFSKY. *Essays in Honour of I. Lakatos*. Reidel, Dordrecht, Netherlands, 1976.
- *Against the Method*. Verso, London, UK, 1975.
- FISHER, A. *The Logic of Real Arguments. Second Edition*. Cambridge University Press, Cambridge, UK, 2004.
- FINLAYSON, G. "Color constancy viewed from a color-matching perspective." In: DAVIS, Stephen (ed.): *Color Perception: Philosophical, Psychological, Artistic and Computational Perspectives*. Oxford University Press, Oxford, UK, 2000.
- FLECK, L. "Schnelle." In: *Erfahrung und Tatsache*. Suhrkamp Verlag, Frankfurt am Main, Germany, [1935] 1983: 30-31.
- *Genesis and Development of a Scientific Fact*. Chicago, University of Chicago Press, [1935] 1979.
- FODOR, J. *Psychosemantics: The Problem of Meaning in the Philosophy of Mind*. MIT Press, Cambridge Massachusetts, USA, 1987.
- "Fodor's guide to mental representations: The intelligent auntie's vademecum." In: *Mind*, 94, 1985: 76-100.
- *Representations*. MIT Press, Cambridge, Massachusetts, USA, 1981.
- *The Language of Thought*. Harvard University Press, Cambridge Massachusetts, USA, 1975.
- FOESTER, H. Von. *Understanding Understanding: Essays on Cybernetics and Cognition*. Springer, New York, USA, 2003.
- *Observing Systems*, Intersystems Publications, Seaside, CA, USA, 1981.
- *Cybernetics of Cybernetics*, University of Illinois, Urbana Illinois, USA, 1974.

- FORMAN, P. "Weimar Culture, Causality, and Quantum Theory, 1918-1927: Adaptation by German Physicists and Mathematicians to a Hostile Environment." In: McCORMMACH, R. (ed) *Historical Studies in the Physical Sciences* vol. 3. University of Philadelphia Press, Philadelphia, USA, 1971.
- FOUCAULT, M. *Archaeology of Knowledge*. Psychology Press. New York, USA, 2002.
- FOUCAULT, M., *Discipline and punish*, translated by A. SHERIDAN. Pantheon, New York. 1977.
- FOUCAULT, M. and G. DELEUZE "Intellectuals and Power: A Conversation between Michel Foucault and Gilles Deleuze". In: *Language, counter-memory, practice*, 1977: 205-17.
- FREEMAN, W. J. *How Brains Make Up Their Minds*. Phoenix, London, UK, 1999.
- FRISBY J, P. and J. V. STONE, *Seeing: The Computational Approach to Biological Vision*, Second Edition. MIT Press, Cambridge, Massachusetts, USA, 2010.
- FRIEDMAN, J., *Cultural Identity and Global Process*. Sage Publications, London, UK, 1994.
- FULLER, S. *The Sociology of Intellectual Life*. Sage, London, UK, 2009.
- *The Knowledge Book*. Acumen Publishing, Stocksfield, UK, 2007.
 - *The Philosophy of Science and Technology Studies*. Routledge, New York, USA, 2006.
 - *Philosophy Rhetoric and the End of Knowledge: A New Beginning for Science and Technology Studies*, Second Edition. University of Wisconsin Press, Madison, USA, 2004.
 - *Social Epistemology*, Second Edition. Indiana University Press, Indianapolis, USA, 2002.
 - *Knowledge Management Foundations*. Butterworth-Heinemann. London, UK, 2001.
 - *The Governance of Science: Ideology and the Future of the Open Society*. Open University Press, Buckingham, U.K, 2000.
 - *Science*. Open University Press, Buckingham, UK, 1997.
 - *The Philosophy of Science and its Discontents*. Guilford Press, New York, USA, 1993.

- “Social Epistemology and the Research Agenda of Science Studies.” In: PICKERING A. (ed.) *Science as a Practice and Culture*, University of Chicago Press, Chicago, USA, 1992b.
 - “Being there with Thomas Khun: A Parable for post-modern Times”. In: *History and Theory*, 31 (October) 1992: 242-275.
 - “Who Hid the Body? Rouse, Roth and Woolgar on Social Epistemology.” *Inquiry* 34, 1991: 341-400.
- FULLER, S. and J. H. COLLIER: *Philosophy, Rhetoric, and the End of Knowledge: A New Beginning for Science and Technology Studies*, 2nd Edition. Lawrence Erlbaum Associates, Publishers, London , UK, 2004.
- GALLESE, V. “The acting subject: Towards the neural basis of social cognition.” In: METZINGER (ed.) *Neural Correlates of Consciousness: Empirical and Conceptual Questions*. MIT, Cambridge Massachusetts, USA, 2000: 325-333.
- GALLESE, V. and G. LAKOFF “The brain’s concepts: The role of the sensory-motor system in conceptual knowledge.” In: *Cognitive Neuropsychology* 22(3/4) 2005: 455-79.
- GALLAGUER, S. *How the Body Shapes the Mind*. Oxford University Press, Oxford, UK, 2005.
- “The Moral Significance of primitive self-consciousness.” *Ethics*, 107, 1996: 129-40.
- GALLAGUER, S. and A. MELZOFF: “The earliest sense of self and others: Merleau-Ponty and recent developmental studies.” In: *Philosophical Psychology*, 9, 1996: 213-236.
- GALLAGUER, S. and D. ZAHAVI *The Phenomenological Mind: An Introduction to Philosophy of Mind and Cognitive Science*. Routledge, New York, USA, 2008.
- GAUS, G. F. *Justificatory Liberalism: An Essay on Epistemology and Political Theory*, Oxford University Press, New York, USA, 1994.
- GELDER, T. Van. “What Might Cognition Be, If Not Computation?” In: *The Journal of Philosophy*, Vol. 92, No. 7, 1995.
- GIBBS, R. “Metaphor interpretation as embodied simulation”. In: *Mind & Language*, 21, 2006:434-458.
- “Interpreting metaphorical sayings in the assessment of mental health”. In: *Psicopatologia Cognitiva (Cognitive Psychopathology)*, 3, 2005: 5-12.
 - “Embodied experience and linguistic meaning.” In: *Brain and Language* 84, 2003: 1-15.

- GIBBS, R., BOGDONOVICH, J., SYKES, J. and D. BARR: "Metaphor in idiom comprehension". In: *Journal of Memory and Language*, 37, 1997: 141-154.
- GIBSON, J. J. *The Ecological Approach to Visual Perception*. Houghton Mifflin, Boston, USA, 1979.
- "Theory of Affordances" In: SHAW, Robert and John Bransford: *Perceiving, Acting and Knowing*, 1977
- "A direct theory of visual perception." In: ROYCE, J.R. and W.W. ROZEBOOM (eds.) *The Psychology of Knowing*. Gordon and Breach, New York, USA, 1972.
- GIDDENS, A. *The consequences of modernity*. John Wiley & Sons, 2013.
- GIERE, R. N.: "Naturalised Philosophy of Science". In: CRAIG, E., (ed.) *Routledge Encyclopaedia of Philosophy*, vol. 6. Routledge, London, U.K, 1998.
- *Explaining Science: A Cognitive Approach*. University of Chicago Press, Chicago, USA, 1988.
- GILGEN, P.: "System - Autopoiesis - Form." In: LUHMANN, N. *Introduction to Systems Theory*, (translated by GILGEN. Peter). Polity, Cambridge, UK, 2012.
- GLASSERFELD, E. Von. *Radical Constructivism: A Way of Knowing and Learning*. Routledge Falmer, London, UK, 1995.
- GLENBERG, A. and M. KASCHAK. "Grounding language in Action." In: *Psychonomic Bulletin & Review*, 9, 2002: 558-565.
- GOURAS, P. *The Perception of Colour: Vision and Visual Dysfunction*, Vol. 6, London, Macmillan Press, 1991.
- GOLDMAN, A. *Knowledge in a Social World*. Oxford University Press, Oxford, UK, 1999.
- "Psychological, Social and Epistemic Factors in the Theory of Science". In: BURIAN, R., FORBAES M. and D. HULL (Eds): *PSA 1994: Proceedings of the 1994 Biennial Meeting of the Philosophy of Science Association*. Philosophy of Science Association, East Lansing Michigan, USA, 1995: 277-286.
- GOLDSMITH, T. H.: "Optimization, constrain, and history in the evolution of eyes". *Quarterly Review of Biology*. 65, 1990: 281-322.
- GOODMAN, D. J. "Globalization and Consumer Culture." In: Ritzer, George (ed.) *The Blackwell Companion to Globalization*. Blackwell Publishing, Oxford, UK, 2007: 330-351.

- GOPNIK, A. and A., MELTZOFF. *Words, Thoughts, and Theories*. MIT, Cambridge Massachusetts, USA, 1997.
- GOTTLIEB, G. *Individual development and evolution: The genesis of novel behavior*. Psychology Press, New York, USA, 2001.
- GRAMSCI, A., *Selections from political writings (1921-1926)* International Publishers, New York. 1978.
- GRASSWICK, H. E. "The Normative Failure of Steve Fuller's Social Epistemology." In: *Social Epistemology: A Journal of Knowledge, Culture and Policy*, 2002: 133-148.
- HAACK, S. "The Ethics of Belief Reconsidered". In: *Knowledge, Truth and Duty*, 1, 9, 2002: 21-34
- *Evidence and Inquiry*. Blackwell, Cambridge, Massachusetts, USA, 1993b.
- "Science as Social? – Yes and No." In: HANKINSON-NELSON, Lynn (ed.) *Feminism, Science and the Philosophy of Science*. Kluwer Academic Publishers, Dordrech, The Netherlands, 1993a.
- HABERMAS, J., LENHARDT, C., and S. W. NICHOLSEN.; *Moral consciousness and communicative action*. MIT press, Cambridge, Massachusetts, USA, 1990.
- HABERMAS, J. *The philosophical discourse of modernity: Twelve lectures*. John Wiley & Sons, New York. 2015
- *The theory of communicative action, Vol. I*. Beacon, Boston, USA, 1984.
- HACKING, I. *The Social Construction of What?* Harvard University Press, Cambridge, Massachusetts, USA, 1999.
- HARDIN, C. L. "Reinventing the Spectrum". In: BYRNE, A. and D.R. HILBERT (eds.) *Readings on Color, Vol. 1: The Philosophy of Color*. MIT Press, Cambridge, Massachusetts, USA, 1997: 263-288.
- *Color for Philosophers: Unweaving the Rainbow*. Hackett, Indianapolis, Indiana, USA, 1988.
- "Colors, normal observers, and standard conditions", *Journal of Philosophy* 80, 1983: 806-13
- HARDING, G. "Color and the mind-body problem", *Review of Metaphysics* 45, 1991: 289-307
- HARDING, S. and M. B. MERRILL *The Feminist Standpoint Theory Reader: Intellectual and Political Controversies*. Routledge, New York. 2004

- HARWOOD, J.: "Ludwik Fleck and the Sociology of Knowledge." In: *Social Studies of Science*, Theme Section: "Funding and Knowledge Growth", 16, 1, 1985: 173-187.
- HAYLES, N. K. *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. University of Chicago Press, Chicago, USA, 2008.
- HELMHOLTZ, H. Von. "Physiological Optics - The Sensations of Vision (translated)." In: MACADAM, D. L. (ed): *Sources of Colour Science*. MIT Press Cambridge, Massachusetts, USA, 1866.
- HELSON, H. "Fundamental problems in color vision. II. Hue, lightness, and saturation of nonselective samples in chromatic illumination." In: *Journal of Experimental Psychology*, 23, 1938: 439-76.
- HELSON, H. and J. B. JEFFERS "Fundamental problems in color vision. II. Hue, lightness, and saturation of selective samples in chromatic illumination." In: *Journal of Experimental Psychology* 25, 1940: 1-27.
- HEIDEGGER, M. *Being and Time* (translation). Harper and Row, New York, USA, [1927] 1961.
- HERING, E. *Outlines of a Theory of the Light Sense*. Harvard University Press, Cambridge, Massachusetts, USA, [1892] 1964.
- HESSE, M. "The Strong Thesis of Sociology of Science" In: *Revolutions and Reconstructions in the Philosophy of Science*. Indiana University Press, Bloomington, Indiana, USA, 1980.
- HEYES, C. M. "Social learning in animals: categories and mechanisms." In: *Biological Reviews* 69, (2)1994: 207-231.
- HILBERT, D. "What is color vision?" In: *Philosophical Studies*, 68, 1992: 351-370.
 – *Color and Color Perception: A Study in Anthropocentric Realism*. CSLI, Stanford, USA, 1987.
- HOBATER, C., POISOT, T., ZUBERBÜHLER, K., HOPPITT, W., and T. GRUBER. "Social network analysis shows direct evidence for social transmission of tool use in wild chimpanzees." In: *PLoS Biology* 12 (9) 2014: e1001960.
- HOENIG, K., SIM, E.J., BOCHEV, V., HERMBERGER, B., and M. KIEFER. "Conceptual flexibility in the human brain: Dynamic recruitment of semantic maps from visual, motor and motor-related areas." In: *Journal of Cognitive Neuroscience*, 20, 2008: 1714-25.
- HOFFREN, J. Quest for an improved explanation of lift. In: *AIAA Aerospace Sciences Meeting and Exhibit, 39th Reno, NV*. 2001.

- HOFSTADTER, D. *Fluid Concepts and Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought*. Basic Books, New York, USA, 1995.
- HUBEL, D. H. and T. N. WIESEL. "Receptive fields in the optic nerve fibre in the spider monkey." In: *Journal of Physiology* 337: 183-200, 1960.
- HUME, D. "An Enquiry Concerning Human Understanding". In: BEAUCHAMP, T.L. (ed.) *An Enquiry Concerning Human Understanding, Oxford Philosophical Texts*. Oxford University Press, Oxford, UK, [1748] 1999.
- *Hume's Treatise of Human Nature*, BIGGE, L.A.S. (ed.). Clarendon Press, Oxford, UK, [1740] 1888.
- HOUKES, W. "Normativity in Quine's naturalism: the technology of truth seeking?" In: *Journal for General Philosophy of Science* 33, 2003: 251–267.
- HURLBERT, A. "Colour Constancy." In: *Current Biology* 17 (21) 2007: R906-7.
- HURVICH, L. M. *Colour Vision*. Sinauer Associates, Sunderland, Massachusetts, USA, 1981.
- HURVICH, L. M. and D. JAMESON: "Introduction". In: HERING, E. [1892]: *Outlines of a Theory of the Light Sense*. Harvard University Press, Cambridge, Massachusetts, USA, 1964: vi-
- "An opponent theory of colour vision". In: *Psychological Review* 64, 1957: 384-404.
- HUSSERL, E.: *Logical Investigations I-II*. FINDLAY, J.N. (trans.). Routledge, London, 2001.
- *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy – First Book: General Introduction to a Pure Phenomenology*. trans. KERSTEN, F. Nijhoff, The Hague, Netherlands, [1913] 1982.
- *The Crisis of the European Sciences and Transcendental Phenomenology*. CARR, D. (trans.), Northwestern University Press, Illinois, USA, 1970.
- *Phenomenology and the Crisis of Philosophy: Philosophy as a Rigorous Science and Philosophy and the Crisis of European Man*. LAUER, Quentin (trans.). Harper & Row, New York, USA, 1965.
- In *Ideas: General Introduction to a Pure Phenomenology*. BOYCE, G.W.R. (trans), Allen and Unwin, London, UK, [1913] 1931.
- HYLTON, P. *Quine*. Routledge, New York, USA, 2007.
- JACOBS, G. H. *Comparative Colour Vision*. Academic Press, New York, USA, 1981.

- JAMES, W. "The Will to Believe". In: *The New World*, Volume 5, 1896: pp. 327-347
- *The Principles of Psychology, Vol. II*. Macmillan and Co., London, UK, 1890.
- JAMESON, D. and L.M. HURVICH "Essay concerning color constancy". In: *Annual Review of Psychology* 40, 1989: 1-22.
- JEANNERON, M. *The Cognitive Neuroscience of Action*. Blackwell, Oxford, UK, 1997.
- JOHNSON, M. *The Body in the Mind: The Bodily Basis of Imagination, Reason, and Meaning*. University of Chicago Press, Chicago, USA, 1987.
- JORDAN, G. and J.D. MOLLON. "A study of women heterozygous for chromatic illumination". In: *Journal of the Optical Society of America* 30, 1993: 2-32.
- JUDD, D.B. "Hue, saturation lightness of surface color with chromatic illumination". In: *Journal of the Optical Society of America* 30, 1940: 2-32.
- KELSEN, H. *General Theory of Norms*, translated by M. HARTNEY. Oxford: Oxford University Press, 1991.
- *Pure Theory of Law*. Translated by Knight, University of California Press, Berkeley, California, USA, (1934) 1960.
- KENDAL, R.L., CUSTANCE, D., KENDAL, J.R., VALE, G. STOINSKY, T. et al. "Evidence for social learning in wild lemurs (*Lemur catta*)". In: *Learning and Behaviour* 38, 2010: 220-234.
- KHUN, T. *The Structure of Scientific Revolutions*. The University of Chicago Press, Chicago Illinois, USA, 1970.
- KIEFER, M. and L. BARSALOU. "Grounding the human conceptual system in perception, action, and internal states". In: PRINZ, W., BEISERT, Miriam and Arvid HERWIG (eds.) *Action Science: Foundations of an Emerging Discipline*. MIT Press, Cambridge, Massachusetts, USA, 2013: 381-407.
- KIEFER M., SIM, E.J., HELBIG, H.B. and M. GRAF: "Tracking the time course of action priming on object recognition: Evidence for fast and slow influences of action on perception". In: *Journal of Cognitive Neuroscience*, 23 (8) 2011: 1864-1874.
- KIEFER, M., SIM, E.J., HERMBERGER, B. GROTHE, J. and K. HOENIG. "The sound of concepts: Four markers for a link between auditory and conceptual brain systems". *Journal of Neuroscience* 28, 2008: 12224-12230.
- KIM, J. "The American Origins of Philosophical Naturalism". In: *Journal of Philosophical Research*, APA Centennial Volume, 2003: 83-98.

- KITCHER, P. *Science, truth, and democracy*. Oxford University Press, 2003.
- *The Advancement of Science: Science Without Legend, Objectivity without Illusions*. Oxford University Press, Oxford, UK, 1993.
- KNORR-CETINA, K.D., *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Elsevier. 2013.
- *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press, Cambridge Massachusetts, USA, 1999.
- “The Ethnographic Study of Scientific Work”. In: KNORR-CETINA, K. and M. MULKAY: *Science Observed: Perspectives on the Social Study of Scientific Work*. Sage, London, UK, 1983.
- *The Manufacture of Knowledge*. Oxford, Pergamon Press, 1981.
- KORNBLITH, H. “Epistemic Normativity”. In: *A Naturalistic Epistemology: Selected Papers*. Oxford University Press, Oxford, UK, 2014: 71-87.
- *Knowledge and its Place in Nature*. Oxford University Press, Oxford, 2002.
- “In Defence of a Naturalised Epistemology”. In: GRECO, J. and E. SOSA (eds.): *The Blackwell Guide to Epistemology*, Basil Blackwell, 1999: 158-169.
- “Naturalism: Both Metaphysical and Epistemological. In: *Midwest Studies in Philosophy* (19) 1, 1994: 39-52.
- KUEHNI R., G. and A. SCHWARZ. *Colour Ordered: A Survey of Colour Order Systems from Antiquity to the Present*. Oxford University Press, Oxford, UK, 2007.
- KUHN, T. *The Structure of Scientific Revolutions*. University of Chicago Press, Chicago, USA, 1970.
- LABINGER, J.A. and H. COLLINS (eds.) *The one culture?: a conversation about science*. University of Chicago Press. 2010.
- LAKOFF, G. “Cognitive Semantics”. In: ECO, H. et al. (eds.): *Meaning and Mental Representations*, Indiana University Press, Bloomington, 1987.
- LAKOFF, G. and M. JOHNSON. *Philosophy of the Flesh: The Embodied Mind and its Challenge to Western Thought*. Basic Books, New York, USA, 1999.
- LAKOFF, G. and R. E. NUÑEZ. *Where Mathematics Comes From: How the embodied Mind Brings Mathematics into Being*. Basic Books, New York, USA, 2000.
- LAND, E. H. “Recent advances in retinex theory”. In: OTTOSON D. and S. ZEKEI (eds.) *Central and Peripheral Mechanisms of Colour Vision*. Macmillan, London, UK, 1986.

- Recent advances in retinex theory and some implications for cortical computations: color vision and the natural image”. In: *Proceedings of the National Academy of Sciences U.S.A.* (80), 1983: 5163-9.
 - “The Retinex Theory of Color Vision”. In: *Scientific American* 237: 6, 1977: 108-128.
- LATOUR, B. “An Attempt at a ‘Compositionist Manifesto’”. *New Literary History*, 41(3), 2010: 471-490.
- “The Promises of Constructivism”. In: IDHE, Don (ed.) *Chasing Technology: The Matrix of Materiality*, Indiana Series for the Philosophy of Science, Indiana University Press, Indiana, USA, 2003: 27-46.
 - We have Never Been Modern*, translated by PORTER, C. Harvester Wheatsheaf, London. UK, 1996.
 - “One more turn after the social turn...”. In: McMULLIN, E. (ed.): *The Social Dimension of Science*. University of Notre Dame Press, Notre Dame, Indiana, USA, 1992: 272-294.
 - The Pasteurization of France*. Harvard University Press, Cambridge, Massachusetts, USA, 1988.
 - Science in Action: How to Follow Scientists and Engineers Through Society*. Harvard University Press, Cambridge, Massachusetts, USA, 1987.
 - “Give Me a Laboratory and I Will Move the World”. In: KNORR-CETINA, K. and M. MULKAY. *Science Observed: Perspectives on the Social Study of Scientific Work*. Sage, London, UK, 1983.
- LATOUR, B. and S. WOLGAR. *Laboratory Life: The Construction of Scientific Facts*, 2nd Edition. Princeton University Press, Princeton NJ, USA, 1986.
- LAUDAN, L. *Science and Relativism: Some Key Controversies in the Philosophy of Science*. The University of Chicago Press, Chicago, USA, 1990.
- Science and Values: The Aims of Science and their Role in Scientific Debate*. University of California Press, Berkeley, California, USA, 1984.
 - Progress and its Problems*. University of California Press, Berkeley, USA, 1977.
- LENNON, T. “The Eleatic Descartes”. In: *Journal of the History of Philosophy*, 45(1), 2007: 29-45.
- LEONARDI, P. and M. SANTAMBROGIO (eds.) *On Quine: New Essays*. Cambridge University Press, Cambridge, UK, 1995.
- LEVINE, J. S. and MACNICHOL, E.F., Jr. “Color vision in fishes”. *Scientific American* 246, 1982: 140-9.

- “Visual pigments in teleost fishers: effects of habitat, microhabitat and behaviour on visual system evolution”. In: *Sensory Processes* 3, 1979:95-131.
- LIVINGSTONE, M. S. and D. H. HUBEL. “Anatomy and physiology of a colour system in the primate visual cortex”. In: *Journal of Neuroscience*, 4, 1984: 309-56.
- LOCHHEAD, J. “Hearing new music: Pedagogy from a phenomenological perspective”. In: *Philosophy of Music Education Review* 3(1), 1995: 34-42.
- LOCKE, J. *An Essay Concerning Human Understanding*. WOOLHOUSE, R. (ed.): Penguin Books, London, UK, [1690] 2004.
- Two Treatises of Government*, P. Laslett (ed.). Cambridge University Press, Cambridge, UK, [1689] 1988.
- LOEW, E.R. and LYTHGOE, J.N. “The ecology of cone pigments in teleost fishes” *Vision Research* 18, 1978:715-22.
- LONGINO, H. H. *The Fate of Knowledge*. Princeton University Press, Princeton, New Jersey, USA, 2002.
- LUFT, S. and S. OVERGAARD (eds.) *The Routledge Companion to Phenomenology*: Routledge, Milton Park, UK, 2012.
- LUHMANN, N. *Introduction to Systems Theory*. GILGEN, P. (trans). Polity, Cambridge, UK, 2012.
- Theories of Distinction: Redescribing the Descriptions of Modernity*. Stanford University Press, Palo Alto, California, USA, 2002.
- Social Systems*. BEDNARZ, J. Jr. (trans). Stanford University Press, Stanford California, USA, 1995.
- “The Autopoiesis of Social Systems.” In: GEYER F. and J. VAN D. ZEUVEN (eds.): *Sociocybernetic Paradoxes: Observation, Control and Evolution of Self-Steering Systems*. Sage, London, UK, 1986: 172-92
- LUKÁCS, G.: *History and Class Consciousness*. The Merlin Press, London. [1923] 1971
- LYOTARD, J. F. *The Inhuman: Reflections on Time*. Stanford University Press, Stanford California, USA, 1991.
- The Post Modern Condition: A Report on Knowledge*. Manchester University Press, Manchester, UK, 1984.
- LYTHGOE, J.N. *The Ecology of Vision*, Oxford: Oxford University Press, 1979.
- “The adaptation of visual pigments to their photic environment”, in: H.J.A. Dartnall (ed.) *Handbook of Sensory Physiology*, vol. VII, Berlin: Springer, 1972.

- MACARTHUR, D. "Taking the human sciences seriously". In: DE CARO, M. and D. MACARTHUR. *Naturalism and Normativity*. Columbia University Press, New York, USA, 2010: 123-137.
- "Naturalism and Scepticism" In: DE CARO, M. and D. MACARTHUR. *Naturalism in Question*. Harvard University Press, Cambridge, Massachusetts, USA, 2004: 106-24.
- MAFFIE, J. "Naturalism and the Normativity of Epistemology". *Philosophical Studies* 59, 1990: 333-349
- MALONEY, L. T. "A mathematical framework for biological color vision" (Open Peer Commentary on E. Thompson et al., "Ways of coloring: comparative color vision as a case study for cognitive science" *Behavioral and Brain Sciences* 15: 1-74). *Behavioral and Brain Sciences* 15, 1992:45-6
- "Evaluation of linear models of surface spectral reflectance with small numbers of parameters", *Journal of the Optical Society of America A3*, 1986: 1673-83.
- MALONEY, L.T. and B.A. WANDELL. "Color constancy: a method for recovering surface spectral reflectance". *Journal of the Optical Society of America A3*, 1986:29-33.
- MANNHEIM, K. *Ideology and Utopia*. Routledge, London, UK, 1936.
- MARR, D. *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information*. W. H. Freeman and Company, New York, USA, 1982.
- MARTIN, A. "The representation of object concepts in the brain". In: *Annual Review of Psychology*, 58, 2007: 25-45.
- MARX, K. *A Contribution to the Critique of Political Economy*, Progress Publishers, Moscow, 1977.
- *Resultate des Unmittelbaren Produktion-Processes*. Verlag Neue Kritik, Frankfurt, Germany. 1969
- MATTHEN, M. *Seeing, Doing, and Knowing*. Clarendon Press, Oxford, UK, 2005.
- "Color nominalism, pluralistic realism, and color science". In: BYRNE, A. and D. HILBERT. "Color realism and color science". In: *Behavioural and Brain Sciences*, 26 (1) 2003: 3-64: 39-40.
- "The disunity of color". In: *The Philosophical Review* 108 (1), 1999: 47-84.
- "Color vision: content versus experience" (Open Peer Commentary on E. Thompson et al., "Ways of coloring: comparative color vision as a case study for cognitive science", *Behavioral and Brain Sciences* 15:1-74), In: *Behavioral and Brain Sciences* 15, 1992:46-7.

- “Biological functions and perceptual content”, In: *Journal of Philosophy* 85, 1988: 5-27.
- MATURANA, H. R. “What Is Sociology?” In: *Constructivist Foundations* 10(2) 2015: 176-179.
- “Biología del fenómeno social”. In: *La Realidad: ¿Objetiva o Construida? I. Fundamentos Biológicos de la Realidad*. Anthropos Editorial, Universidad Iberoamericana, Barcelona, Spain, [1985] 1995: 3-18.
 - “Reality: The search for objectivity or the quest for a compelling argument”. In: *Irish Journal of Psychology*, 9, 1, 1988a: 25-82.
 - “Ontology of observing: The biological foundations of self consciousness and the physical domain of existence”. In: DONALDSON, R. (ed.) *Texts in Cybernetic Theory: An In- Depth Exploration of the Thought of Humberto Maturana, William T. Powers, and Ernst von Glasersfeld*. American Society for Cybernetics [conference workbook], Felton CA, USA, 1988b.
 - “Introduction”. In: *Autopoiesis and Cognition: The Realisation of the Living*. D. Reidel Publishing Company, London, UK, 1980.
- MATURANA, H.R. and F.J. VARELA. *The Tree of Knowledge: The biological Roots of Human Understanding*. Shambhala Publications, Boston Massachusetts, 1992.
- *Autopoiesis and Cognition: The Realisation of the Living*. D. Reidel Publishing Company, London, UK, 1980.
- MAY, R. *Existential Psychoanalysis*. Basic Books, New York, USA, 1958.
- MAYR, E. “What is the meaning of ‘life’?” In: BEDAU, Mark A. and Carol E. Cleland. *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge University Press, Cambridge, UK, 2010: 88-102.s
- MCCORMICK, B.W., *Aerodynamics, aeronautics, and flight mechanics*. New York: Wiley.1995.
- MELTZOFF, A. “Understanding the intentions of others: Re-enactment of intended acts by 18-month-old-children”. In: *Developmental Psychology*, 31, 1995: 838-50.
- MELTZOFF, A and M.K. MOORE. “Explaining facial imitation: A theoretical model”. *Early Development and Parenting*, 6, 1997: 179-192.
- “Imitation of facial and manual gestures by human neonates”. *Science*, 198, 1977: 75-78.

- MELTZOFF, A and R., BROOKS. “‘Like Me’ as a building block for understanding other minds: Bodily acts, attention and intention”. In: B.F. Malle et al. (eds.) *Intentions and Intentionality: Foundations of Social Cognition*. MIT, Cambridge, Massachusetts, USA, 2001: 171-191.
- MENZEL, R. “Colour pathways and colour vision in the honey bee”. In: OTTOSON D. and S. ZEKI (eds.) *Central Peripheral Mechanisms of Colour Vision*. MacMillan, London, UK, 1985.
- “Spectral sensitivity and colour vision in invertebrates”. In: AUTRUM, H. (ed.) *Springer Verlag*, Berlin, Germany, 1979.
- MENZEL, R. and BACKHAUS, W. “Color vision in insects”, in GOURAS P. (ed.) *The Perception of Colour: Vision and Visual Dysfunction, vol 6*, London: MacMillan Press, 1991.
- MERLEAU-PONTY, M. “The Primacy of Perception”. In: EDIE, J.M. (ed.) *The Primacy of Perception, and Other Essays on Phenomenological Psychology the Philosophy of Art, History and Politics*. Northwestern University Press, Evanston, USA, 1964.
- *The Phenomenology of Perception*, translated by Colin Smith. Routledge and Kegan Paul, London, UK, 1962.
- *The World of Perception*, translated by Oliver Davis. Routledge, London, UK, [1948] 2004.
- MERTON, R. K., *The Sociology of Science*. University of Chicago Press, Chicago, USA, 1970.
- “The Mathew Effect”. In: “Science: The Reward and Communication Systems of Science are Reconsidered”. In: *Science*, 159, 1968. 3810: 56-63.
- MERVIS C. B. and E. ROSCH “Categorisation of natural objects”. In: M. R. Rosenzweig (ed.) *Annual Review of Psychology* 32, 1981.
- MINSKY, M. *The Society of Mind*. Simon and Schuster. New York, USA, 1986.
- MOLLON, J.D. “‘Tho’ she kneel’d in that place where they grew...’ The uses and origins of primate colour vision”, *Journal of Experimental Biology* 146, 1989:21-38.
- MOLLON, J.D., BOWMAKER, J.K. and G.H. JACOBS “Variations of colour vision can be explained by polymorphism of retinal pigments”. In: *Proceedings of the Royal Society B* 222, 1984: 373-99.
- MOLLON, J. D. and L.T. SHARPE (eds.) *Color Vision*, London: Academic Press, 1983.
- MOORE, G.E., *Principia Ethica*, Cambridge University Press, New York, USA, 1903.

- MORI, L., SOBAGAKI, H, KOMATSUBARA H. and K. IKEDA “Field trials on CIE chromatic adaptation formula”. In: *Proceedings of the CIE 22nd Session*, Melbourne, 1991: 55–58.
- MUNSELL, A. *A Colour Notation*. Munsell Colour Co., New York, USA, 1919.
- LINZ, J. J. *Totalitarian and authoritarian regimes*. Lynne Rienner Publishers, 2000.
- MORITZ, S., R., NEURATH, O. and S. SARKAR. *Logical empiricism at its peak: Schlick, Carnap, and Neurath*. Taylor & Francis, London, UK, 1996.
- MURATA, A. FADIGA, L., FOGASSI, L., GALLESE, V., RAOS, V. and G. RIZZOLATI. “Object representation in the ventral premotor cortex (area F5) of the monkey”. *Journal of Neurophysiology*, 78, 1997: 2226-2230
- NAGEL, T. *The View from Nowhere*. Oxford University Press, Oxford, UK, 1986.
- “What Is It Like to Be a Bat?” In: *The Philosophical Review*, 83, 4, 1974: 435-450
- NASSEHI, A. “What exists between Realism and Constructivism”. In: *Constructivist Foundations*, 8:1, 2012: 14-15.
- NEISSER, U. *The perceived self: Ecological and Interpersonal Sources of Self Knowledge*. Cambridge University Press, Cambridge UK, 1993.
- *Cognition and Reality: principles and implications of cognitive psychology*. WH Freeman, 1976.
- NIDA-RÜMELIN, M. and J. SUAREZ “Reddish Green: A Challenge for Modal Claims About Phenomenon Structure”. In: *Philosophy and Phenomenological Research*, 78:2, 2009: 346-391.
- NOË, A. *Action in Perception*. MIT Press, Cambridge, Massachusetts, USA, 2004.
- NUBOER, J. F. W. “A Comparative review on colour vision”. In: *Netherlands Journal of Zoology* 36, 1986: 344-380.
- O’ REGAN, K. and A. NOË “A sensorimotor account of vision and visual consciousness”. In: *Behavioural Sciences and Brain Sciences* 24, 2001: 939-1031.
- OSAKA, S. “The Underdetermination of Theory by Data and the ‘Strong Program’” in the Sociology of Knowledge. In: *International Studies in the Philosophy of Science*, 14:3, 2000: 283-297.
- PAPINEAU, D. “Naturalism”, In: Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy* (Fall Edition), 2015, forthcoming URL = <<http://plato.stanford.edu/archives/fall2015/entries/naturalism/>>.
- PARETO, Vi. *Trattato di sociologia generale*. Barbèra, Florencia, Italy, 1916.

- PARSONS T. and G. PLATT. *The American University*, Harvard University Press, Cambridge, Massachusetts, USA, 1973.
- PATRIDGE, J. C., SHAND, J., ARCHER, S.N, LYTHGOE, J.N., and W.A. GRONINGENLUYBEN. "Interspecific variation in the visual pigments of the deep-sea fishes", In: *Journal of Comparative Physiology A*, 1989: 165-513-29.
- PELLMYR, O. and J. LEEBENS-MACK. "Forty million years of mutualism: Evidence for Eocene origin of the yucca-yucca moth association" In: *Proceedings of the National Academy of Sciences of the United States of America* 96 (16), 1999: 9178-9183.
- PERELMAN, M. "Karl Marx's Theory of Science". In: *Journal of Economic Issues* 12 (4). Association for Evolutionary Economics. 1978: 859-70.
- PIAGET, J. *The Construction of Reality in the Child*. New York: Basic Books, 1954.
- PICKERING, A. *Constructing Quarks: A Sociological History of Particle Physics*. Edinburgh University Press, Edinburgh, Scotland, UK, 1984.
- POGGIO, T., TORRE, V. and C. KOCH. "Computational vision and Regularisation theory". In: *Nature* (317) 26, 1985: 314-9.
- POPPER, K. *The Open Society And Its Enemies, Complete: Volumes I and II*, Fifth edition (revised). Routledge Classics, Routledge, London, UK, [1962] 2011.
- *The Logic of Scientific Discovery*. Hutchinson, London, UK, 1959.
- PRICE, H. *Naturalism Without Mirrors*. Oxford University Press, Oxford, UK, 2011.
- "Naturalism Without Representationalism". In: DE CARO, M. and D. MACARTHUR. *Naturalism in Question*. Harvard University Press, Cambridge, Massachusetts, USA, 2004: 71-88.
- PRINDLE, S.S., CARELLO, C. and M.T. TURVEY "Animal-environment mutuality and direct perception". In: *Behavioural and Brain Sciences* 3, 1980: 395-397.
- PRINZ, J. J. "Is consciousness embodied?" In: ROBBINS, P. and M. AYDEDE (eds.) *The Cambridge Handbook of Situated Cognition*. Cambridge University Press, Cambridge, UK, 2009: 419-36.
- *Putting the brakes on Enactive Perception*. *Psyche*, 12 (1), 2006: 1-19.
- PULVERMÜLLER, F., "Brain mechanisms linking language and action". In: *Nature Reviews: Neuroscience*, 11, 2005: 351-360.

- PUTNAM, H. "Science and Philosophy". In: DE CARO, M. and D. MACARTHUR. *Naturalism and Normativity*. Columbia University Press, New York, USA, 2010: 89-99.
- *The Collapse of the Fact/Value Dichotomy and Other Essays*. Harvard University Press, Cambridge, Massachusetts, USA, 2002.
 - "Why Reason Can't Be Naturalised" In: *Synthese* (52) 1, 1982: 3-23.
- PYLYSHYN, Z. *Computation and Cognition: Toward a Foundation of Cognitive Science*. MIT Press, Cambridge Massachusetts, USA, 1984.
- QUINE W.V. "The Nature of Natural Knowledge". In: FØLLESDAL, D. and D.B. QUINE (eds.): *Confessions of a Confirmed Extensionalist and Other Essays*. Harvard University Press, Cambridge, Massachusetts, USA, [1975] 2009: 257-70.
- "Reply to Morton White". In: HAHN, L.E. and P.A. SCHILPP (eds.) *The Philosophy of W.V. Quine*, 2nd Expanded Edition. Open Court, Peru, Illinois, USA, [1986] 1996: 663-665.
 - "Naturalism; Or, Living Within One's Means". In: *Dialectica* (49) 2-4, 1995a: 251-61.
 - "Reactions". In: LEONARDI, P. and M. SANTAMBROGIO (eds.): *On Quine: New Essays*. Cambridge University Press, Cambridge, UK, 1995b: 347-363.
 - *From Stimulus to Science*. Cambridge University Press, Cambridge, UK, 1995c.
 - *The Pursuit of Truth*. Harvard University Press, Cambridge, Massachusetts, USA, 1990.
 - *Theories and Things*. Harvard University Press, Cambridge, Massachusetts, USA, 1981.
 - *Ways of Paradox*, 2nd Edition. Harvard University Press. Cambridge Massachusetts, USA, 1976.
 - "On Empirically Equivalent Systems of the World". In: *Erkenntnis* 9:3, 1975: 313-328.
 - *Roots of Reference*. Open Court, La Salle, Illinois, USA, 1974.
 - "Ontological Relativity". In: *Ontological Relativity and Other Essays*. Columbia University Press, New York, USA, 1969a: 27-68.
 - "Epistemology Naturalised". In: *Ontological Relativity and Other Essays*. Columbia University Press, New York, USA, 1969b: 69-90.
 - *Word and Object*. MIT Press, Cambridge, Massachusetts, USA, 1960.

- *From a Logical Point of View*. Harvard University Press, Cambridge, Massachusetts, USA, 1953.
- “Two Dogmas of Empiricism”, In: *Philosophical Review* (60), 1952: 20-43.
- RAILTON, P. “Marx and the Objectivity of Science”. *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association 1984*. [University of Chicago Press, Springer, Philosophy of Science Association]. 1984: 813–26.
- RAM, N. “Review of M. De Caro and D. MacArthur, eds. *Naturalism in Question*”. In: *Philosophical Review* 116, 2007: 662.
- REDNER, H. *The Ends of Philosophy*. Croom Helm, London, UK, 1986.
- REMEDIOS, F. *Legitimizing Scientific Knowledge: An Introduction to Steve Fuller’s Social Epistemology*. Lexington Books, New York, USA, 2003.
- RIZZOLATI, G. FOGASSI, L., and V. GALLESE. “Cortical mechanisms subverting object grasping and action recognition: A new view on the cortical motor functions”. In: GAZZANIGA (ed.) *The New Cognitive Neurosciences*. MIT, Cambridge, Massachusetts, USA, 2000: 539-552.
- RODRIGUEZ M. D. and J. TORRES “Autopoiesis, la unidad de una diferencia: Luhmann y Maturana”. In: *Sociologias* (9), 2003: 106-140.
- RORTY, R. *Philosophy and the Mirror of Nature*. Princeton University Press, Princeton, USA, 1979.
- ROSCH, E. “Wittgenstein and categorisation research in cognitive psychology”. In: CHAPMAN M. and R. DIXON (Eds.) *Meaning and the Growth of Understanding: Wittgenstein’s significance for Developmental Psychology*. Lawrence Erlbaum, Hillsdale, New Jersey, 1987.
- “Principles of categorisation.” In: ROSCH, E. and B.B. LLOYD (eds.) *Cognition and Categorisation*, Lawrence Erlbaum, Hillsdale, New Jersey, 1978.
- ROSCH, E., C.B. MERVIS, W.D. GRAY, D.M. JOHNSON, and P. BOYES-BRAEM “Basic objects in natural categories”. In: *Cognitive Psychology* 8, 1976: 382-349.
- ROTH, P. A. “The bureaucratic turn: weber contra Hempel in Fuller’s Social Epistemology”. In: *Inquiry* 34, 1991: 365-76.
- ROUSE, J. “Naturalism and Scientific Practices: A Concluding Scientific Postscript”. In: CHIENKUO, Michael Mi and Ruey-lin CHEN (eds.) *Naturalised Epistemology and Philosophy of Science*. Rodopi, Amsterdam, Netherlands, 2007: 61-86.
- *How scientific practices matter: Reclaiming philosophical naturalism*. University of Chicago Press, Chicago, USA, 2003.

- “Beyond epistemic sovereignty”. In: GALISON, P. and D. J. STUMP (eds.) *The Disunity of Science*. Stanford University Press, Stanford, California, USA, 1996.
- “Policing knowledge: Disembodied policy for embodied knowledge”. In: *Inquiry* 34, 1991: 353-64.
- *Knowledge and Power: Towards a Political Philosophy of Science*. Cornell University Press, Cornell, New York, USA, 1987.
- RUBIN, J.M. and W. A. RICHARDS. “Color vision: representing material categories”, MIT AI Lab. Memo 764, reprinted In: W. Richards (ed.) *Natural Computation*, Cambridge, Mass: MIT Press, 1984.
- “Color vision and image intensities: where are changes material?”, *Biological Cybernetics* 45, 1982: 215-26.
- SAEZ WILLIAMS, P. “Natural Authority”. In: *Social Epistemology Review and Reply Collective* 2 (12), 2013: 46-50.
- SALMON, C. W. “An Encounter with David Hume”. In: FEINBERG, J. and R. SHAFER-LANDAU. *Reason and Responsibility: Readings in Some Basic Problems of Philosophy*, Twelfth Edition. Thomson-Wadsworth, Belmont, California, USA, 2005: 224-243.
- *The foundations of Scientific Inference*. University of Pittsburgh Press, Pittsburgh, Pennsylvania, USA, 1967.
- SAYER, A. *Realism and Social Science*. SAGE, London, 2000.
- SCHACHER, J. “Action and perception in interactive sound installations: An ecological Approach”. In: *Proceedings, New Interfaces for Musical Expression, NIME 2009 Conference Pittsburg, PA, 2008*.
- SCHOLL, A. “Between Realism and Constructivism: Luhmann’s Ambivalent Epistemological Standpoint.” In: *Constructivist Foundations*, 8:1, 2012: 5-17.
- SEARLE, J. R. *Mind, Language and Society: Philosophy in the Real World*. Basic Books, New York, USA, 1998.
- SEXTUS EMPIRICUS *Sextus Empiricus / with an English Translation by R.G. Bury*. Harvard University Press, London, UK, 1933.
- SHANON, C. “The Mathematical Theory of Communication” In: *Bell Systems Technical Journal*, 27, 1948: 379-423 and 623-656.
- SHAPIN, S. “The History of Science and Its Sociological Reconstruction”. In: *History of Science* 20, 1982: 157-211.

- “Homo Phrenologicus: Anthropological Perspectives on a Historical Problem”. In: BARNES, B. and S. SHAPIN (eds.) *Natural Order: Historical Studies in Scientific Culture*. Sage, Beverly Hills, CA, USA, 1979.
- SHAPIN, S. and S. SCHAFFER. *Leviathan and the Air Pump*. Princeton University Press, Princeton, NJ, USA, 1985.
- SHAPIRO, L. *The Routledge handbook of embodied cognition*. Routledge, London, UK, 2014.
- SIMON, H. A. and A. NEWELL. *Human Problem Solving*. MIT press, Cambridge Massachusetts, USA, 1972.
- SKARDA, C.A. and W.J. FREEMAN “Chaotic dynamics versus representationalism”. In: *Behavioural and Brain Sciences* 13 (1), 1990: 167-168.
- “How brains make chaos in order to make sense of the world”. In: *Behavioural and Brain Sciences* 10, 1987: 161-195.
- SMITH, K.. “Neuroscience vs philosophy: Taking aim at free will.” In: *Nature News* 477.7362, 2011: 23-25.
- SMITH, K. *Matter Matters: Metaphysics and Methodology in the Early Modern Period*. Oxford University Press; Oxford, UK, 2010.
- SMITHERS, T. “What the dynamics of adaptive behaviour and cognition might look like in agent-environment interaction systems”. In: *3rd International Workshop on Artificial Life and Artificial Intelligence, The Role of Dynamics and Representation in Adaptive Behaviour and Cognition*, San Sebastian, Spain, 1994.
- SNODERLY, D.M. “Visual discrimination encountered in food foraging by neotropical primate: implications for the evolution of color vision”. In: BURTT, E. H. Jr. (ed.) *The Behavioural Significance of Colour*. Garland STPM Press, New York, USA, 1979.
- SNOW, C.P. *The Two Cultures*. Cambridge University Press, Cambridge, UK, [1959] 1993.
- SNOWDEN, R., THOMPSON, P. and T. TROSCIANKO. *Basic Vision an Introduction to Visual Perception*. Oxford Univeristy Press, Oxford, UK, 2006.
- SPACKMAN, J. S. and S. C. YANCHAR. “Embodied Cognition, Representationalism, and Mechanism: A Review and Analysis.” In: *Journal for the Theory of Social Behaviour* 44 (1), 2013: 46-79.
- SPENCER BROWN, G. *Laws of Form*. George Allen and Unwin LTD, London, UK, 1969.

- SPRIGINGS, E.J. and J.A. KOEHLER The Choice Between Bernoulli's or Newton's Model in Predicting Dynamic Lift. In: *International journal of sport biomechanics*, 1990: 6(3).
- STERNHEIM, C. E. and R.M. BOYTON. "Uniqueness of perceived hues investigated with a continuous judgmental technique". In: *Journal of Experimental Psychology* 72(5), 1966: 770-6.
- STEUP, M. "Belief Control and Intentionality". In: *Synthese*, March, 2011. Available at: <http://www.springerlink.com/index/10.1007/s11229-011-9919-3>.
- "Doxastic Voluntarism and Epistemic Deontology". In: *Acta Analytica*, 15:24, 2000: 25-56.
- STROUD, B. "The Charm of Naturalism". In: DE CARO, M. and D. MACARTHUR (eds.) *Naturalism in Question*. Harvard University Press, Cambridge, Massachusetts, USA, 2004: 21-35.
- SVAETCHIN, G. and E. F. MACNICHOL "Retinal Mechanisms for chromatic and achromatic vision". In: *Annals of the New York Academy of Sciences* 74, 1958: 385-404.
- THEINER, G., ALLEN, C., and R.L. GOLDSTONE. "Recognizing group cognition". In: *Cognitive Systems Research*, 11(4), 2010: 378-395.
- THELEN, E. "Motor development: A new synthesis". In: *American Psychologist*, 50(2), 1995:79-95
- THELEN, E. and L. SMITH. *A Dynamical Systems Approach to the Development of Cognition and Action*. The MIT Press, Cambridge, Massachusetts, USA, 1994.
- THERBORN, G. *Science, Class and Society: On the Formation of Sociology and Historical Materialism*. Lowe and Brydone, Thetford, Norfolk, London.1976
- THOMPSON, E. "Précis of Mind in Life". In: *Journal of Consciousness Studies* 18, 2011: 10-22.
- *Mind in Life: Biology, Phenomenology and the Sciences of the Mind*. The Belknap Press of Harvard University Press, Cambridge Massachusetts, USA, 2007.
- "Sensorimotor Subjectivity and the Enactive Approach to Experience," *Phenomenology and the Cognitive Sciences* 4, 2005: 407-427.
- "Comparative Colour Vision". In: DAVIS, S. (ed.) *Color Perception: Philosophical, Psychological, Artistic and Computational Perspectives, Vancouver Studies in Cognitive Science*, Vol. 9. Oxford University Press, Oxford, UK, 2000: 163-86.

- *Colour Vision: A Study in Cognitive Science and the Philosophy of Perception*.
Routledge, London, UK, 1995.
- THOMPSON, E. and F. VARELA “Radical Embodiment: Neural Dynamics and
Consciousness”. In: *Trends in Cognitive Sciences* 5, 2001: 418-425.
- THOMPSON, E., PALACIOS A. and F. VARELA “Ways of colouring:
Comparative colour vision as a case study for cognitive science”. In:
Behavioural and Brain Sciences 15, 1992:1-74.
- THOMPSON, J. N. *The co-evolutionary process*. Chicago University Press,
Chicago, USA, 1994.
- TURNER, S. “What is the Problem with Experts?” In: *Social Studies of Science* 31
(1), 2011: 123-49.
- TURNER, S. *In The Eye’s Mind: Vision and the Helmholtz-Hering Controversy*.
Princeton University Press, Princeton, USA, 1997.
- ULMAN, S. “Against Direct Perception” In: *Behavioural and Brain Sciences*, 3,
1980: 373-415.
- UNWIN, N. “Why do colours look the way they do?” In: *Philosophy* 86: 03,
2011: 405-424.
- VARELA, F. J. “Neurophenomenology: A methodological remedy for the hard
problem.” *Journal of consciousness studies*, 3(4), 1996: 330-349.
- *The Principles of Biological Autonomy*. Elsevier, New York, USA, 1979.
- VARELA, F.J., THOMPSON, E., and E. ROSCH. *The Embodied Mind: Cognitive
Science and Human Experience*. MIT, Cambridge Massachusetts, USA, 1991.
- WERNER, J.S. and B.R. WOOTEN. “Opponent chromatic mechanisms:
Relation to photopigments and hue naming”. In: *Journal of the Optical
Society of America* 69, 1979: 422-34.
- WESSEL, D. “An Enactive Approach to Computer Music Performance”. In: *Les
Feedback dans la Creation Musical*, Lyon, France, 2006: 93-98.
- WESLEY, A. “Philosophy of Science and the Sociology of Knowledge”. In:
Innovation: The European Journal of Social Science Research, 10:1 1997: 7-15.
- WHEELER, M. “From activation to activity”. In: *AISB Quarterly* 87, 1994: 36-42.
- WILSON, M. “Six Views of Embodied Cognition”. In: *Psychonomic Bulletin and
Review* 9 (4), 2002: 625-636.
- WILSON, R. A. and L. FOGLIA. “Embodied Cognition”. In: ZALTA, E.W. (ed.)
The Stanford Encyclopedia of Philosophy (Fall 2011 Edition). URL =
<http://plato.stanford.edu/archives/fall2011/entries/embodied-cognition/>.

- WITTGENSTEIN, L. *Philosophical Investigations*. Basil Blackwell, Oxford, UK, 1953.
- WRATHALL, M.A. "Motives, Reasons and Causes". In: CARMAN, T. and M.B.N. HANSEN. *The Cambridge Companion to Merleau-Ponty*. Cambridge University Press, Cambridge, UK, 2005: 111-128.
- WUTHROW, R. *Meaning and Moral Order*. University of California Press, Berkeley, California, USA, 1987.
- WYLES, J.S., KUNKEL, J.G. and A.C. WILSON "Birds, behaviour, and anatomical evolution". In: *Proceedings of the Natural Academy of Sciences USA*, 80, 1983: 4394-4397.
- YOUNG, T. "The Bakerian Lecture: On the Theory of Light and Colours". In: *Philosophical Transactions of the Royal Society of London* (92), 1802: 12-48.
- ZEKI, S. "Colour coding in the cerebral codex: the reaction of cells in monkey visual cortex to wavelengths and colours". In: *Neuroscience* 9, 1983: 741-65.