

A World Beside Itself


Jakob von Uexküll, Charles S. Peirce, and the Genesis of a Biosemiotic Hypothesis

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DECLARATION BY CANDIDATE

I hereby declare that this thesis is my own work and effort. Where other sources of information have been used, they have been acknowledged.

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Abstract

This thesis explores the conceptual origins of a biosemiotic understanding of the human as a consequence of the vital role of signs in the evolution of life. According to this challenge to definitions of man as the sole bearer of knowledge, human society and culture are not only characterised by the use and production of signs, human life and thought are the products of ongoing processes of semiosis.

Along with Thomas Sebeok's argument concerning animal architecture, examples from Modernist and Contemporary art are presented to introduce a new perspective on the natural and cultural significance of acts of inhabitation. By tracing its historical development in the nineteenth and twentieth century via the concept of the environment, this perspective on both human and non-human life is shown to contest those methods of modern science that are rooted in anthropocentrism

The precedents of this perspective are then elaborated through an explication of the work of two of the forefathers of biosemiotics: the biologist Jakob von Uexküll and the philosopher Charles S. Peirce. Uexküll's theory of the Umwelt demonstrated that in order to make sense of its surroundings each living organism must be situated within an integral world of signs. Peirce's philosophical account of semiotics explained the evolution of signs in terms of processes of habit formation and the abductive power of thought. Together Uexküll and Peirce provide an impetus for reconsidering the metaphorical implications of aesthetics in terms of the semiotic inheritance of ecological systems.

While having critically interrogated their differences especially with respect to their derivation from Kantian philosophy and German Idealism, in conclusion, the ideas of Peirce and Uexküll on the reciprocity of life and signs are shown to mutually contribute to a more advanced comprehension of human subjectivity.

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Bibliographical Note

References to the *Collected Papers of Charles Sanders Peirce* are cited in brackets, with the initials CP, the relevant volume number, followed by the page number (e.g. CP x.xxx). Where relevant the title of the particular text is cited, along with any pertinent dates. These citations refer to the Past Masters *Electronic Edition of the Collected Papers of Charles Sanders Peirce*, edited by John Deely <<http://www.nlx.com/collections/95>>, which reproduces Vols. I-VI ed. Charles Hartshorne and Paul Weiss (Cambridge, MA: Harvard University Press, 1931-1935), Vols. VII-VIII ed. Arthur W. Burks (Cambridge, MA: Harvard University Press, 1958).

When referring to manuscripts by Peirce that are not included in either the *Collected Papers* or Peirce's other published works the initials MS are cited, along with the number assigned by the Department of Philosophy of the University of Helsinki. Details of the publication in which the manuscript was quoted are also included. All other references to texts or collections of texts authored by Charles Peirce are cited in the same style as applies to other publications.

Chapter four of the present thesis is a modified version of an article published by the author as 'Uexküll's Ecology: Biosemiotics and the Musical Imaginary' in *Green Letters* 15 (2011), pp. 43-60. Some modified passages from this thesis, including the greater part of the conclusion, have appeared in another article, again written by the current author, entitled 'The Circle and the Maze: Two Images of Ecosemiotics', in *Sign System Studies*, 44, 1/2 (2016), pp. 69-93.

PREFACE (at the threshold of biosemiotics)

On the one hand, it is true that we do not dwell in signs but in houses, and on the other hand, it is likewise evident that builders' tasks are not limited merely to providing us with dens and shelters. [...] Any edifice is simultaneously some sort of refuge and a certain kind of message.¹

Roman Jakobson

A Thought for Celant [1969]

The broken glass is like violin players, the stakes the organ, the bundles of branches have a marvellous sound, what more do you want?
Of course we have to believe that the street and houses are full of people.²

Mario Merz

The genesis of this project depended on an encounter with an igloo. In 2006, on a friend's recommendation, I visited the London Gagosian on Britannia Street, and was confronted with an installation devised by the Italian artist Mario Merz. Merz's igloos, as their name suggests, are dome-shaped hut-like structures which, superficially at least, look readymade for human inhabitation. Superficially because in fact these archetypal objects are far from being shelters fit for purpose. Sealed and so inaccessible, much of their appeal depends on their proportions, along with our perhaps instinctive urge to regard enclosures of this size and shape as potentially suitable dwellings. Rather than blocks of snow and ice, Merz made his igloos from a variety of materials. The first, 'Giáp's Igloo', constructed in 1968, consisted of clay-filled plastic bags covering a metal cage, and was adorned in neon tubing, spiralling around and spelling out the words of the North Vietnamese general, Võ Nguyên Giáp: "If the enemy masses his forces, he loses ground; if he scatters, he loses strength."³ This igloo, then, was not solely a memorial to a pre-industrial age, nor a testament to the nomadic identity of modern man, as some curators and critics have indicated, but a statement about territory, a sign that at the meeting point between humanity and nature exists not just a relationship of interdependence, but that of conflict and conciliation, a frontier fragile enough to collapse, if not integral enough to endure.

The igloo at the Gagosian, entitled '8-5-3', and originally built in 1985, comprised not one, but three hemispheres or domes, two adjoining one another, and the third centred within

¹ Roman Jakobson, 'Language in Relation to Other Communication Systems' (1968) in *Selected Writings II: Word and Language* (The Hague: Morton, 1971): p. 703.

² Mario Merz, 'Pensierino per Celant', in *Arte Povera: Conceptual, Actual or Impossible Art*, edited by Germano Celant (London: Studio Vista, 1969). Qtd. in *Arte Povera*, edited by Carolyn Christov-Bakargiev (London: Phaidon, 1999): p. 252.

³ Mario Merz qtd. in Robert Lumley, *Arte Povera* (London: Tate, 2004): p. 41.

the larger of this pair. The two outer structures consisted, on the one hand, of a steel frame, studded with clamps, acting as scaffolding for large panes of glass, and on the other, a densely woven carapace of twigs. Again that neon signature of Merz's work, this time the phrase 'Objet cache-toi', 'object hide-yourself', encircled the thatched material of the second of these domes rendered in bright red lighting. The third and smallest dome was visible through the glass of the first, plain black and mysterious, connected by three white neon tubes which each pierced the glass and converged on the surface of this opaque centre. The glass and steel dome also loomed over its somewhat smaller thatched neighbour, and the contrast – rigid ribs of metal together with smooth, sharp-edged glass, against an irregular, haphazard tangle of bundled up twigs – seemed almost too obviously evidence of a more general tension between nature and culture. The third dome, perhaps, the kernel of the contradiction contained within this opposition, the contradiction in which culture, born out of and yet poised to master nature, immanently becomes a second nature in its own right.

In retrospect, as the third dome implied, Merz's juxtaposition of organic and man-made material already went well beyond the straightforward staging of that conflicted interdependence which informs our conceptions of nature and culture. Such juxtapositions are a frequent motif in the work of not only Merz, but many of those artists associated with what Germano Celant called *Arte Povera* (i.e. poor art) in reference to their use of simple techniques, and scavenged materials, commonplace within the lives of ordinary people. Celant emphasised an art of embodiment and the everyday, 'the free-self projection of human activity', stressing the subversion of those 'codified and artificial languages' which he believed had become stultified in post-war styles like Pop and Op art.⁴ Yet, despite the visceral appeal of the tactile, textured materials which these artists made use of, the work of those associated – artists like Michaelangelo Pistoletto, Giovanni Anselmo, Pino Pascali, and Luciano Fabro, along with Merz himself – remained, at best, much more conceptually complex than an emotional response to Italian industrialisation, and a reactionary revival of nature's value. Often manifestly sculptural and never entirely breaking with the artist's beginnings as a painter, Merz's work appeared much more traditional than that of some of his peers. All the same, he suggested that the key gesture of his practice was directed towards conceiving a kind of intellectual energy within image, object, and setting, as opposed to contriving a one-sided impact upon the senses. Asked by Richard Koshalek whether he was particularly concerned with the aesthetic quality of materials such as newspaper, glass, neon, and cloth, Merz replied to the contrary, underlining instead the reproduction of words and thoughts, and suggesting that even the use of blank

⁴ Germano Celant, 'Arte Povera: Notes For a Guerrilla War' [1967], translated by Paul Blanchard, in *Arte Povera* (London: Phaidon, 1999): pp. 194 – 196.

materials like glass contributed to this grammar of ideas.⁵ In another statement, from 1967, Merz claimed:

[M]y working method is the same thing as a method for living: only by recomposing one's own genesis each day, through grafting the day before's expressive acts on to what is being said today, can temporal density be understood as a bundle of meaningful relations.⁶

In constituting 'a method for living', these 'meaningful relations' bypass the bipartite boundary between objective nature and subjective culture, moving, instead, towards a plurality of significant values and materials which defies convenient categorisation. With this heterogeneity in mind it seems that Merz's work must also escape the dichotomy of being either at home or abroad. Accepting this departure from our conventional narratives of belonging to a familiar, stable domain, I ought to have realised that I would be unable to forcibly insert myself into the picture. I would have to learn to participate in the aesthetic ecology of Merz's installation, rather than trying to conquer the area it circumscribed. Merz's 'Thought for Celant' (quoted above) would have offered a clue: the pertinent response was not envisaging an individual occupant, no matter how noble, but registering the sensuous dynamic which an igloo might muster in its own right. Yet, without the benefit of this background knowledge, upon encountering the edifice of '8-5-3' my initial reaction verged on dismay. Overlooking the oblique inner dome, as well as the part played by light within this assemblage, I felt left out; there was no way into the so-called igloo which filled the space, pushing me out onto the periphery. My vague notion of the igloo as a house derived sustainably from its surroundings, nourished a naive ideal of integration with an environment. Where, in keeping with this preconception, I had expected intimacy, or a kind of domesticity, instead I was met with exclusion, a monument to the dubious and duplicitous metaphysics of modernity. All I could do to engage with the installation was wander in circles, looking in on what I could not access. Eventually, in circumnavigation, this feeling changed.

The three numbers of the title represented both the proportions of the igloos – eight, five, and three metres – as well as the Fibonacci sequence, that famous series of numbers which, when plotted as a curve bisecting tiled rectangles, forms a spiral, a form emblematic of those logarithmic patterns of growth said to be recurrent in nature. Subsequently this reference would prove significant to my understanding of Merz's work, but I don't recall if I grasped its

⁵ Richard Koshalek, 'Interview with Mario Merz, 1971', in *Arte Povera* (London: Phaidon, 1999): p. 252.

⁶ Mario Merz, 'Artist's Statement' [1967], translated by Liz Heron, in Germano Celant, *Mario Merz* (London: Whitechapel Art Gallery, 1979).

implications at the time. What I do remember quite clearly, thanks to being suddenly struck with awe, was the sight of those words written in neon light, reflected in the glass, and spiralling, as it seemed up towards infinity. In a flash I no longer felt excluded. I went from being outside and oppressed by an unyielding surface, to being drawn inside as, through an impression of ascent I was immersed in depth. The closeted thing or hiding place, which Merz had helped to open up, lay, not on the interior of a space which depended on privileged access, or the revelation of some secret belonging, but in the vertiginous dissipation of a point of view, and in the loop of sensuality that this entailed. Seeing the neon inscription break with its boundaries, and, through the dynamic diffusion of light, carry my concentration inwards, upwards, and through, reminded me that my own assumption of a stable inner-self and corresponding outer-sense were readily, even unremittingly transgressed. This was not the reflection of myself as subject upon the world as object, nor the clearing of a secure environment in which to anchor my identity, but the visceral disclosure of the inadequacy of these ideals. Reading between the lines, here was evidence that there was no locus of self other than in the vehicle of its evacuation, that the practice of living was forever deep, that I was not just *in*, or *on*, but *of* the world.

In recalling this episode I expect I stray beyond art interpretation towards a much more personal and possibly hermetic account of a particular reminiscence. As such, I anticipate that I could easily be overestimating its connotations, and retrospectively attribute more meaning than can strictly be derived from a critical analysis of Merz's work. An important task in what follows in later chapters is to make sense of this experience, rather than merely attempting to revive its impact in prose. Nevertheless, I feel it is important to avoid too quickly diminishing what, to me, still seems palpable in the actual event of this encounter. Especially since recounting this episode might serve to foreshadow the difficulties I would later meet, when it came to constructing a more general argument in explanation, a task which would lead me to explore biosemiotics, and hence very different resources from those directly related to the practice of post-war artists like Mario Merz. What seems to me definitely worth recollecting, though perhaps as the product of a less exceptional revelation than I have so far suggested, is the intense quality of the reaction that '8-5-3' induced. Here, surely, was a prime example of the sublime, as, in Kantian terms, my imagination's incapacity to comprehend the magnitude of what I perceived gave way to a sense of that which exceeds representation: the image of mirrored letters endlessly shuttling back and forth, twisting and climbing beyond the limits of my perception.⁷ Unexpectedly, in place of the most humble and grounded of dwellings, Merz's igloo seemed to offer up a simulation of transcendence. Yet, unlike some of those other

⁷ Immanuel Kant, *Critique of Judgement*, translated by Werner S. Pluhar (Indianapolis; Cambridge: Hackett Publishing Company, London): pp. 244 – 246.

architectural structures designed to induce a comparable effect, the ornate and beguiling perspectives displayed by Baroque cathedrals for example, I guessed it wasn't an impression of the divine or the miraculous that was intended to dizzy me. Instead, here, I thought, was a lesson about the ecstatic character of the act of inhabitation itself.

In taking hold of a place, marshalling resources in order to make somewhere fit for the purpose of dwelling, success eventually, if not immediately, leads to an overstepping of the mark. Where we are, or where we want to be, becomes, through the raw action of subsistence, somewhere else. But more than this, the conversion or inversion of an appropriated environment into an alien territory is not just a passively registered consequence of our survival, or even of our greed. We are sometimes impulsively or intuitively led to deliberately intervene within a setting in order to make it appear other than our own; paradoxically, only through this act of ostensible displacement can we continue to accustom ourselves to a changing situation. Prompted by '8-5-3', two examples stood out in my mind. Firstly, pre-historical cave paintings, with those famous images of animals in the Lascaux and Chauvet caves providing a memorable point of reference.⁸ The style of Merz's own paintings, the thick outlines and smeared splashes of colour of his *Rinoceronte blanco* for instance, backed up this association. Secondly, what I believed must be a commonplace act of minor transgression, wherein a child takes their paints or crayons and, dissatisfied with sheets of paper, instead defaces the walls of their home.⁹ Contentious anthropological and psychological questions underlie both of these examples, and I could not presume to explain their motivation or meaning exhaustively, but they do have something in common which bears being singled out. In both cases the identity of a secure space is, in some sense, deliberately compromised, not to the point of collapse, but in such a way that an element of what remains outside is imaginatively interjected onto the interior. Whether this practice is mimetic and representational, serving the purposes of memorialising

⁸ I have in mind here Georges Bataille's account of the transgressive role of art with respect to the sacred. For Bataille, art supplies a means of staging the overcoming of prohibitions associated with death and sex which govern everyday life and work. As applied to Lascaux, Bataille's interpretation leads him to posit an ambivalence and nostalgia for a lost condition of animality, as embodied in the images of bulls and stags caught in their death throes. Bataille's interpretation is problematic in its uncritical assumption of a universal category of art. He also neglects the possibility that the sympathetic magic that these cave paintings apparently represent might have served a more practical purpose, such as educating the inexperienced concerning the objectives and principles of hunting. Yet, this pragmatic explanation cannot detract from the enduring aesthetic power of these images, and Bataille's emphasis on transgression, as in an overcoming of limits, perhaps points to other important questions concerning the relation between the artifice of a segregated space and the world beyond its boundaries. Georges Bataille, *Prehistoric Painting: Lascaux; or, The Birth of Art*, trans. by Austryn Wainhouse (Lausanne: Skira, 1955).

⁹ The importance of drawing as a creative endeavour pivotal within childhood development has long been emphasised, Jean Piaget and Lev Vygotsky having both stressed its value in marking the maturation of symbolic and conceptual representation. The issue of in what medium and context a child chooses to conduct their drawing has not received so much attention, let alone whether this activity deliberately or inadvertently defies prohibitions against defacement, vandalism, and sacrilege.

and communicating knowledge, or connotes a vaguer, more impetuous aspiration to scratch the surface, resulting in scrawled lines, and abstract daubs, the urge to not just survive within, but to *sign* a place seemed to me fundamental to the very possibility of inhabiting an environment. I realised that, by definition, I must understand an environment not just as a locale of indifferent surroundings, containing, supporting, and curtailing a life, but as a mode of relating to a world that, at its outset, was derived from a moment of expressive interpretation.

On the face of it Merz's igloo seemed to shelter and enclose a physically demarcated space – my initial disappointment stemmed from being locked out of this prefabricated dwelling – but the real efficacy of this prosthetic structure depended on turning the actual state of living somewhere inside out. Reflected through the structure, and hence echoing its message, that illuminated phrase – 'Object cache-toi' – marked the moment of marking an interior from an unprecedented angle, laying bare the basic necessity of this act. It was as if this neon sign lit up a state of mind, making manifest the establishment of thought on a composite of select and so *in-formed* materials. This parallel between the aesthetically-charged explosion of a space, and the embodied coordination of cognition, ought to baffle those who presume that what we think is fixed inside, within the recesses of a precisely pin-pointed position shielded from interaction. But again, this was my wager: that creaturely thought, as the upshot of processes already nourishing a system in flux, stemmed from extending a consolidated frontier in new directions, embellishing or effacing the built and bound routines of habit, and thereby reaching out towards the world. The igloo represented not just the function of inhabitation, but the evocation or evacuation of a meaning inherent within the urge to carve out a niche, the work beyond the work: a world beside itself. Like a snail secreting the layers of its shell, or even like a single cell somatically extracting chemicals from the medium in which it is suspended, '8-5-3' amassed steel, glass, and twigs so, metaphorically at least, something could make its way elsewhere.

Merz said of the first igloo he created:

I was fascinated by the sensual structure. The idea is round. Look at how the idea of General Giap neutralizes itself. If you follow the phrase through, you come back to the beginning; it circles around and then comes to a rest. There is no clarity, no logic, no progression to it. It is a contained dynamic force [...] It has no support, it is concave as well as convex just like the military tactic.¹⁰

¹⁰ Mario Merz qtd. in Corinna Criticos, 'Reading Arte Povera', in *From Zero to Infinity: Arte Povera 1962 – 1972* (London: Tate, 2001): p. iv.

Reading, today, Merz's own account of his practice helps me to articulate what I then perceived only dimly: as interventions at the cutting edge of interior and exterior, Merz's igloos symbolically materialize that recursive relationship with its self and its surroundings, which the living organism, like the Ouroboros, the snake swallowing its tail, perpetually extends and consumes.¹¹ This relationship at once exemplifies and surpasses the basic need for defence against the elements, along with metabolic nourishment, which serves to define the physiological condition of a particular life. As an autopoietic system, a biological system encapsulated in an autonomous loop of self-reference, a living organism must not only maintain, in flux, the boundaries of its own existence; as a system coupled with an environment, it must simultaneously make sense of the world in which it is situated, orientating its own development towards that which is beyond the limits of its own identity. In my eyes Merz's igloos are not just physical structures harking back to the spiritual or poetic heritage of human dwelling, eminently conceptual as well as sensual, they are evidence of a deeper relation between an act of inhabitation and the means by which a mind grasps the consequence of its surroundings. They are – to borrow a phrase from Francisco J. Varela – signs of that 'surplus of significance', rooted in the difference between an environment and a world, 'which haunts the understanding of the living and of cognition'.¹²

Merz's account of his work also makes me aware of where my own understanding, to some degree, parted ways with the artist's professed intent. Contrary to Merz, I would affirm that the idea embodied in his igloos was indubitably a *logic*, not solely a 'contained dynamic force', but an intensive and expansive articulation of sense, lacking clarity, quite possibly, but progressively rationalising a portion of the world all the same. This may not be logic in the familiar guise bequeathed to us by the ancient Greeks as *logos*; it lacked the perspicuity that tends to be attributed to purely linguistic truth, but for me it remained legitimately logical all the same. 'Logic', not as a set of obdurate rules, but, as in the view of Charles Peirce: 'only another name for *semiotic* (σημειωτική), the quasi-necessary or formal doctrine of signs' (*CP* 2.227). Logic, therefore, as in a configuration of the boundaries of reference, an ongoing resolution of what does and does not belong, incorporating the possibility of breakdown between these categories, and so a framework in which meaning is at stake. The key to unravelling the logic of this framework, I would later discover, lay neither in the annals of art

¹¹ Compare Merz's thoughts on *Giáp* with Maturana's emphasis on circularity throughout his 'Biology of Cognition', an essay that would set an important precedent for the subsequent development of a theory of autopoiesis: 'Living systems as they exist on earth today are characterized by exergonic metabolism, growth and internal molecular reproduction, all organized in a closed causal circular process that allows for evolutionary change in the way the circularity is maintained, but not for the loss of the circularity itself.' Humberto R. Maturana, 'Biology of Cognition' (1970), in *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht: D. Reidel Publishing Co., 1980): p. 9.

¹² Francisco J. Varela, 'Pattern of Life: Intertwining Identity and Cognition', *Brain and Cognition*, 34, pp. 72–87 (1997): p. 79.

history, theory, and criticism, nor solely in the better known philosophical accounts of inhabitation, but in the pursuit of an unorthodox scientific approach to the means by which organisms come to inhabit an environment.

In a lecture given in 1967, entitled 'Des Espace Autres', Michel Foucault described the shift from a nineteenth century obsession with historical development, toward the ascent, in the twentieth century, of ideas of 'space', 'simultaneity', and 'juxtaposition', observing that 'our experience of the world is less that of a long line developing through time than that of a network that connects points and intersects with its own skein'.¹³ Almost undeniably, it seemed to me, 8-5-3 belonged to the latter view of things; its success in exemplifying this sense of space lay in its use of ordinary, seemingly benign materials, combined with Merz's own rationalisation of his work, which, despite harking back to the mathematics of the ancient Greeks, conspicuously belonged to the twentieth century. It was this subtlety which caused some art critics to overlook Merz's own interest in relationality and complex, recursive structures, ideas that were clearly linked with contemporary science and philosophy, instead, opting for an interpretation based on nostalgia for lost life styles. A prevailing theme within his mature practice, Merz understood the Fibonnaci series as the perpetuation of a more than human network, imparting a concept of space, which departed from the anthropocentric conception of measured spatial limits he associated with the Romans, and moved towards an 'infinity', which was not 'abstract', but 'biological'.¹⁴ Expanding in an accelerated manner, the Fibonacci numbers approximated patterns of development like the increasing speed of a rowing boat, or the rapid proliferation of individuals within a growing population. By widening, as well as extending, within a confined area, these numbers also poured space into itself, folding, coiling, and dilating matter, in this way expressing the variegated logic of organic self-renewal, a logic that was not just linear, but intense. 'Numbers are the vitality of the world' Merz claimed, but this maxim did not necessarily imply a transcendent or mystical order guiding nature.¹⁵ Instead, it was the physical articulation of numbers which mattered, the patterning which joined numbers to reality, as in the 'relative extension of the body through [...] five fingers.'¹⁶

In singling out Merz's igloos I had eschewed the more obvious technological representatives of the new order of things to which Foucault alluded: the internet as a network of displaced places mediated by computers for example; the feedback and coding mechanisms fundamental to cybernetics and information theory; as well as the analogy of earlier devices designed to disseminate information, from typewriters, radios, and telegrams, to even more

¹³ Michel Foucault, 'Of Other Spaces', translated by Jay Miskowiec, in *The Visual Culture Reader: 2nd Edition*, edited by Nicholas Mirzoeff (London: Routledge, 2002): p. 229.

¹⁴ Koshalek, 'Interview with Mario Merz, 1971', in *Arte Povera* (1999): p. 252.

¹⁵ Koshalek, 'Interview with Mario Merz, 1971', in *Arte Povera* (1999): p. 252.

¹⁶ Mario Merz, 'The Fibonacci Numbers and Art' [1971] in *Arte Povera* (1999): p. 252.

primitive and ancient systems of passing on messages over great distances. Although it was indisputably 'manmade', both as an intentionally composed assemblage, and in terms of most of the materials of which it was constructed, somehow 8-5-3 succeeded in giving the impression it did not belong to the same regime of human production and consumption in which both spectator and art gallery were implicated. As evidence of a life lived elsewhere, walking in on the installation was like stumbling on a fox-hole, or finding a deserted nest. This synthetic structure suggested a means of nurturing life, or at least the remains of such a structure, but, at the same time, it uncannily implicated the spectator in a transformation of the environment that was not wholly under their own control. Here was the *unheimlich* simulacrum of a dwelling that had been put together by forces beyond human agency, yet which covertly undercut the claim of sole ownership which man might stamp on the conception and creation of his own *Lebenswelt*. Symbolically, 8-5-3 embodied a node within a network that was not a technological extension of man's domination over his environment, but which instead was embedded within a nexus of relations, dependencies and independencies, open and closed systems, stretching beyond the grasp of human discourse. The notion of an epistemic shift, moving from a particular idea of history, towards a particular idea of the space, seemed to hold the clue to deciphering the significance I perceived here.

Before turning, at last, to begin the work of reconstructing what, in the logic of biosemiotics, brings to light a more general truth about both the act of intervening artistically in a place, and the more basic relation between life and inhabitation, I want to hesitate to acknowledge a final dimension implicit in my interpretation of Merz's '8-5-3'. It should be admitted, and indeed affirmed, that there is something deeply utopian in the notion that a single work of art might – even if only symbolically – synthesise those divided categories which apparently remain unavoidable as the contemporary condition of our apprehension of a world. However portentous it might seem, this utopian moment bears affirmation because of the political implications it connotes, that is the negative capacity of the art work to determine the utopian as that which is definitively not yet present, existing only as possibility. By no means should I be understood as suggesting that '8-5-3' is autonomously capable of transforming and thereby redeeming the world, or alone presents an adequate image of that transformation. On the contrary, the themes of enclosure, exclusion, and conflict, which may just as convincingly be used to characterise Merz's igloos, and so too my original experience of estrangement, should not be discarded, since they persist as reminders that the resolution promised by '8-5-3' is only accessible as a projection. Yet, this projection is unlike that of a tourist taking a snapshot of a landscape, if such a gesture cannot avoid aestheticising a lost aura.¹⁷ By assembling an

¹⁷ '[T]he American tourist no longer lets the landscape "be in its being" as Heidegger would have said, but takes a snapshot of it, thereby graphically transforming space into its own material image. The

inaccessible environment Merz does capture an aspect of the tension between a sense of human inhabitation as it ought to be, and the abject disarray which continuously threatens the dwelling of so many, if not all human beings. Nature conveyed by culture in this guise remains incomplete, but it is this unfinished work of settling human nature and culture which helps demonstrate that the present state of the world is not the only conceivable reality.

Ernst Bloch invoked something of the same spirit I sought in '8-5-3' when, in *The Principle of Hope*, he wrote:

Nature is not something that can be consigned to the past. Rather it is the construction-site that has not yet been cleared, the building tools that have not yet been attained in an adequate form for the human house that itself does not yet exist in an adequate form. The ability of problem-laden natural subjectivity to participate in the construction of this house is the objective-utopian correlate of the human-utopian fantasy conceived in concrete terms. [...] Nature's conceptual frontier [*Grenzbegriff*] is not the beginning of human history, where nature (which is always present in history and always surrounds it) turns into the site of the human sovereign realm [*regnum hominis*], but rather where it turns into the adequate site [for the adequate human house] as an unalienated mediated good.¹⁸

Bloch's attitude to nature, here, was far from a naïve faith in the inevitability of its progressive potential, and some distance too from the pathetic fallacy that the aesthetic state of nature is an adequate indicator of the condition of human society. Nature, here, does not exist as a unified unchanging ideal, no matter whether viewed as a self-perpetuating harmony or as inhuman and corrupt. Rather, Bloch's Marxian nature represents a 'conceptual frontier' in development, stretching from the evolution of life in general to the *Bildung* of the human species in particular. If Bloch was truly suggesting that the outset of human history depends on the subjugation of nature then his contention remains problematic. However, as Murray Bookchin points out, the inclination to conceive of nature and society in terms of their commonalities is worth reviving, so long as their concordance is not stated as a given, but conceived as a complex relation which

concrete activity of looking at a landscape-including, no doubt, the disquieting bewilderment with the activity itself, the anxiety that must arise when human beings, confronting the non-human, wonder what they are doing there and what the point or purpose of such a confrontation might be in the first place-is thus comfortably replaced by the act of taking possession of it and converting it into a form of personal property.' Fredric Jameson, 'Reification and Utopia in Mass Culture' *Social Text*, 1, 130-148 (Winter, 1979): p. 131.

¹⁸ Qtd. in Murray Bookchin, *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy* (Edinburgh: AK Press, 2005): p. 100. An alternate translation is to be found in Ernst Bloch, *The Principle of Hope: Volume 2*, trans. by Basil Blackwell (United States: MIT Press, 1996): p. 690.

must still be worked through.¹⁹ Cultural practices, as may be crystallised in art works, attest to the intertwining of natural and social history; the contested question of whether artistic beauty outweighs or only imperfectly imitates its natural counterpart hints at the tension in this relation. Perhaps too much time has already been spent trying to definitively and decisively separate these strands, severing the knot that knits nature, biology, society, technology, and culture together, when truly unravelling and thus understanding their entanglement may rely on recognising a deeper continuity. It is in the name of grasping the nature of this continuity that this thesis seeks to establish a refreshed sense of the link between culture and inhabitation.

¹⁹ Bookchin, *The Ecology of Freedom*: p. 690.

INTRODUCTION. The Life of Signs Prefigured

In his 'Prefigurements of Art', while surveying assorted examples of animal architecture, Thomas Sebeok turns to the 'multitalented bowerbirds' as a superlative example of artefactual activity which is not straightforwardly utilitarian. These examples lead Sebeok to a number of controversial questions: ethologically-speaking 'how does tool-using behaviour become ritualized [...]?' or, in semiotic terms, how does a tool 'acquire a superimposed sign-function [...]?' Quoting Karl von Frisch's *Animal Architecture*, Sebeok asks 'What passes in the mind of a bowerbird when he builds and decorates his bower?'²⁰

Bowers are doubly uncanny. Firstly, they resemble human works of artifice, seemingly exhibiting an aesthetic sensibility which would not normally be attributed to the constructive efforts of animals. To find beauty inherent in nature is no surprise, with the song and brightly coloured plumage of birds representing familiar examples. Yet, it is the concerted effort bowerbirds go to in order to build these structures which remains remarkable, as they apparently prioritise form over practical function, and seemingly employ principles of discrimination which would otherwise be associated with self-conscious judgement and subjective choice. While we are accustomed to the idea of a bird possessed by song, the notion of a bird as a kind of abstract sculptor is more eerie, redolent of a complex and capricious inner life that strays from instinct, intruding upon the convictions and conventions of culture.

Secondly, bowers are unsettling because they resemble and even parody another activity closely associated with the nature of birds. In this respect, bowers are uncanny in the German sense of *Unheimlich*, they invoke an impression of a home which is in reality the object of a different purpose. As Gaston Bachelard observed, in the chapter of his *Poetics of Space* devoted to the topic, nests have a deep-seated symbolic value in human culture as an image of warmth, rest, peace, security, and intimacy; a nest seems to reassure us that an instinct of hospitality is preserved and perfected in nature.²¹ Yet bowers are not nests built to nurture young, they are not constructed simply to act as shelters, but contrived to be *seen*. Bowers are signs of sexual selection, deliberately fashioned to attract and seduce a mate. The elaborate and idiosyncratic appearance of the bowers of different species – categorised as 'maypoles', 'avenues', and 'stages' – and the articles which adorn these structures – from flowers, shells, bones, and berries, to the bright blue objects accumulated by the satin bowerbird – are not only striking evidence of the evolution of increasingly specialised courtship behaviours.²²

²⁰ Thomas A. Sebeok, 'Prefigurements of Art: Animal Architecture' in *Image and Code*, edited by Wendy Steiner (University of Michigan, 1981): pp. 46 – 48.

²¹ Gaston Bachelard, *The Poetics of Space*, translated by Maria Jolas (Boston: Beacon Press, 1994).

²² Peter Goodfellow, *Avian Architecture: How Birds Design, Engineer, and Build* (Princeton: Princeton University Press, 2011): pp. 134 – 143.

Charles Darwin referred to bowerbirds in his *Descent of Man* as evidence that a taste for beauty was not unique to humans, but had its origins in the capricious affections and aversions of other animals. To illustrate this point Darwin reproduced John Gould's depiction of spotted bowerbirds in situ.²³ While the ornithologist Gould had observed that bowers were not nests, but constructed to attract females, he still described bowers somewhat whimsically as 'sporting-places' and 'playing-grounds'; Jonathan Smith argues that Darwin's appropriation of Gould's artwork had a more explicit intent, stressing the function of bowers to entice females 'for the sole purpose of courtship', along with detailing the lascivious behaviour of the male bird, so as to shock and disturb the sensibilities of Victorian society.²⁴ By subverting the tranquil domesticity of what, at first glance, appeared to be nests, and by tacitly questioning the motives underlying those artistic practices that might otherwise be taken as proof of human exceptionalism, Darwin sought to strengthen his case that the sexual component of natural selection was a prime-mover in the evolution of all animal and human life. By contrast, while agreeing, along with Frisch, that aesthetic feeling, together with the rudiments of artistic practices, are already in evidence in the development of non-human life, Sebeok is not content to explain these phenomena by reducing evolution to competition for the sake of reproduction. Instead, Sebeok proposes that these examples of animals employing the 'delicate sieve' of aesthetic sensibility indicates that the sifting out of 'forms "endowed with signification"' has a much deeper and robust role to play in the evolutionary emergence of life – not just in the sedulous discrimination of bowerbirds, but through the preferential activity of habitat selection which characterises life more generally.

Interestingly, Darwin seems to fleetingly humour a comparable idea, when he admits that '[t]here is also good reason to suspect that [lower animals] love novelty, for its own sake.' Nonetheless, this concession comes only after Darwin has redrawn a stricter divide between the culture of human civilisation and the nature of savages and brutes:

Obviously no animal would be capable of admiring such scenes as the heavens at night, a beautiful landscape, or refined music; but such high tastes, depending as they do on culture and complex associations, are not enjoyed by barbarians or by uneducated persons.²⁵

²³ Charles Darwin, *The Descent of Man, and Selection in Relation to Sex: Volume 2* (New York: D. Appleton and Company, 1873): pp. 65 – 68.

²⁴ Jonathan Smith, *Charles Darwin and Victorian Visual Culture* (Cambridge: Cambridge University Press, 2006): pp. 119 – 124.

²⁵ Charles Darwin, *The Descent of Man, and Selection in Relation to Sex: Volume 1* (New York: D. Appleton and Company, 1873): p. 62.

Sebeok is led to a subtler expression of the opposite conclusion – challenging the unquestioned dichotomy between the natural sciences and the humanities which Jan Mukařovský underlined in his 1934 lecture ‘L’art Comme Fait Sémiologique’, Sebeok argues that the ‘context-orientated relationship’ of an ‘artefact’ (signifier) and the ‘aesthetic object’ it represents (signification) to the ‘thing signified’ ‘obliterates’ this ‘factitious schism’.²⁶ The processes of interpretation embodied in an artwork recapitulate the urge to classify and compare, identifying patterns and parallels, as well as irregularities and redundancies, skills which all help organisms mediate the relationship between themselves and their environments, and which attest to the lasting bond between living things and living forms. Far from denying the specialised intelligence exhibited in the ontogeny of human education, Sebeok presents this tendency as being exemplified in the sophistication of human artistry: while the expressive scribbles of human infants and chimpanzees are initially comparable, the drawings of older children gain unrivalled mimetic qualities and recognisable features. As Sebeok shows, this divergence arises not as a mark of the unaccountable mystery of man’s superior mind, but as a much more remarkable consequence of the evolution of learning, a process predicated on the critical role of signs in the development of life.

The intimate tie between human life and symbolic signs has been remarked upon throughout the history of ideas. To take just one instance of this well-rehearsed definition of the human, Kenneth Burke characterized man as ‘the symbol-using (symbol-making, symbol-misusing) animal’.²⁷ This thesis takes the implications of biosemiotics, together with a sense of the biological and environmental inheritance of artistic practices, as an impetus for at once extending and re-contextualising this definition: the human does not merely use and abuse symbols, as a form of life a human being is itself a sign, and so, in turn, the outcome of processes of making and mistaking signs.

Again this definition is not entirely new. Thinking through the implications of Objective Idealism, at the beginning of the nineteenth century Romanticism already discerned the vital affinity between living organisms and symbols. ‘[E]very plant is a symbol of the intelligence’ Friedrich Schelling wrote in his *System of Transcendental Idealism*.²⁸ With the same sort of sentiment in mind, Samuel Taylor Coleridge declared that a symbol ‘always partakes of the Reality which it renders intelligible; and while it enunciates the whole, abides itself as a living part in that Unity, of which it is the representative’.²⁹ Yet, it is not the Romantic

²⁶ Sebeok, *Prefigurements of Art*: p. 56.

²⁷ Kenneth Burke, *On Symbols and Society* (Chicago: University of Chicago Press, 1989): p. 70.

²⁸ Friedrich Schelling, *The System of Transcendental Idealism*, translated by Peter Heath (Charlottesville: University Press of Virginia, 1993): p. 122.

²⁹ Samuel Taylor Coleridge, *The Statesman's Manual: or, the Bible the Best Guide to Political Skill and Foresight: A Lay Sermon Addressed to the Higher Classes of Society* (London: Gale and Fenne, 1816): p. 37.

expression of this theme which provides a locus for the current articulation of this argument, but a Pragmatic formulation by Charles Peirce:

[T]he fact that every thought is a sign, taken in conjunction with the fact that life is a train of thought, proves that man is a sign; so, that every thought is an external sign, proves that man is an external sign. That is to say, the man and the external sign are identical, in the same sense in which the words *homo* and *man* are identical. Thus my language is the sum total of myself; for the man is the thought. (CP 5.314)

The objective in what follows is not so much to explore the consequences of an up-to-date realisation of this idea, as it is to offer a kind of genealogy of the development of some of those concepts and theories which would go on to make its elucidation possible now, in the twenty-first century. While ordinarily a genealogy might avoid associating the emergence of new epistemologies with particular individuals, thanks to their profound influence on the formulation of biosemiotics, two figures stand out as focal points. Along with the philosopher Peirce, the biologist Jakob von Uexküll provides an equally indispensable contribution in making sense of the connection between life and signs. While in Idealism and Romanticism the affinity between organism and symbol seemed effectively inexplicable, apparently predicated on an immaterial soul or inner essence which remained inaccessible, the further development of the concept of the environment helped to reframe the identity of the sign in terms of the external conditions which supported life's survival, as well as its metamorphosis into new forms. The first part of this expanded understanding of the relationality of life attained clarity in Uexküll's research: the environment, in the form of an *Umwelt* was integral not only to the organism's sustenance, but its sentience, supplying that structured configuration of the world upon which the survival of each species was predicated. Although writing in advance of Uexküll, Peirce predicted the second part of this understanding: through the shifting and sometimes unstable context of their interpretation, in conjunction with life, signs and symbols may evolve into new forms.

First published in the journal *Semiotica* in 1979, Sebeok's 'Prefigurements' should be read in the context of his contributions as, in Kalevi Kull's words, 'the architect of biosemiotics'.³⁰ Having helped to introduce and define the term 'zoosemiotics' in 1963, to guide the study of animal communication, Sebeok went on to revive an interest in the importance of the works of Uexküll, most decisively through the talk he gave on 'Neglected Figures in the History of Semiotic Inquiry' delivered at the *Third Wiener Symposium on*

³⁰ Kalevi Kull, 'The Architect of Biosemiotics: Thomas A. Sebeok and Biology' in *Semiotics Continues to Astonish: Thomas A. Sebeok and the Doctrine of Signs* (Berlin: De Gruyter Mouton, 2011): pp. 223-250.

Semiotics in Vienna in 1977. The discovery of Uexküll's concept of the Umwelt was something of an epiphany for the semiotician who, on the basis of this precedent, went on to argue with increasing conviction that the dynamics of semiosis were coextensive with the processes fundamental to life.³¹ Combining Uexküll's insights with a formal semiotics, derived from, among others, Roman Jakobson, Juri Lotman, as well as Charles Peirce, Sebeok advanced a biological way of thinking which was eventually consolidated as biosemiotics itself.

Biosemiotics is, to quote Kull, 'the science of signs in living systems'.³² It combines the biological study of those organisms and ecosystems that support the development and perpetuation of life, with the study of semiosis, the actions of signification and communication which enable individual beings to interact with one another and negotiate a world. By blending theories of living systems with those applied to systems of signs, nature (commonly understood as the domain of science) and culture (the creation of which concerns both semiotics and the humanities) are put into dialogue with one another prior to being registered in isolation. Thereby, at the crux of each field, two factors are bound which are, in a sense, a pre-requisite for the comprehension of both: life, on the one hand, and meaning, on the other.

As Don Favareau explains it, this thesis represented a substantial break from the dissociative consequences of the traditional scientific method, the reductive categorisations of thought and world which underlay the originally innovative contributions to Western science and philosophy made by figures like Rene Descartes and Francis Bacon in the seventeenth century. Against this enlightenment episteme which uncoupled knowledge from matter, biosemiotics could claim that 'a semiotic process' was not that of 'ghostly, mental, human thought', but rather the 'natural interface by which an organism actively negotiates the present demands of its internal organisation with the present demands of the organisation of its external surround'.³³ In Sebeok's reading of his work, Uexküll's theoretical biology provided a justification for conceiving of organisms holistically as semiotic beings, at the level of the specific physiological attributes by means of which they interacted with their environment. Although the biologist himself never really made this implication of his work entirely plain, at least not in those terms employed by biosemioticians, it can still be maintained that refracted and diffused through the framework of each and every Umwelt, and thus at the heart of Uexküll's biology, is a process of semiosis. It was precisely this point that Sebeok argued in favour of when, in 1977, he delivered his paper on Uexküll. As Sebeok explained it, through his categorisation of terminology such as *Merkzeichen* (the organism's perceptual signs),

³¹ Thomas A. Sebeok, *The Sign and its Masters* (Austin; London: University of Texas Press, 1979): p. 69.

³² Kalevi Kull, 'Biosemiotics in the Twentieth Century: A View from Biology' in *Semiotica* 127, 1/4 (1999): p 386.

³³ Donald Favareau, 'The Evolutionary History of Biosemiotics' in *Introduction to Biosemiotics: The New Biological Synthesis*, edited by Marcello Barbieri (Dordrecht: Springer, 2007): p. 24.

Wirkzeichen (their transformation into active impulses), and *Umwelt* (a species-specific model of the lived world, which enabled these signs to coincide), Uexküll's work gave rise to 'a sophisticated, elaborate, and original classification of signs [...] striving for a kind of informational ecology'.³⁴

Crucially, in order to appreciate why Uexküll's biology gains in cogency by being construed along the same lines as semiotics, a key characteristic of Peirce's philosophy of signs must be taken on board. Signs are not only to be understood as the components of a linguistic system, nor solely via a more general analogy with language as a medium of representation, but rather as themselves existing entities which work to inform, compose, and express those possibilities that make up the fabric of reality: hence Peirce's assertion that 'the entire universe [...] is perfused with signs, if it is not composed entirely of signs'.³⁵ In this respect Peirce's identification of man as a sign in 'Some Consequences of Four Incapacities' is misleading, since in this early article, published in 1868, he still equated language with the 'sum total' of this thought. In fact, both Uexküll and Peirce supplied a much richer account of what a sign could be, beyond the linguistic and the symbolic. Uexküll's investigations into the idiosyncrasies characterising the *Umwelt* of different species, ranging from hermit-crabs to dogs, vividly demonstrate how far the signs of meaning encountered by other organisms diverge from those taken for granted by human beings as being mediated by language. Peirce devised a detailed typology of different signs in terms of the logical structure of their relation to meaning; along with symbols, he defined indexicals and icons, and ultimately detailed ten different classes of signs, by introducing, in 1903, additional distinctions, between qualisign, sinsign, and legisign, along with rheme, dicent, and delome, and specifying the combinations thereof (CP2.254 – 263).

It should be emphasised that this thesis is not an attempt to supply a complete history of either semiotics in general or biosemiotics in particular, partly because wide-reaching versions of these histories have already been produced by a number of authors, which could not easily be improved upon, but also because the frame of reference here is much narrower. Furthermore, it is worth acknowledging that, because this thesis attempts to articulate ideas linking life and signs primarily in terms of some of their early proponents, it cannot do sufficient justice to the ever-expanding volume of recent writings on biosemiotics, which more directly confront the implications of this field for culture, epistemology, and an enhanced understanding of the humanities. This is certainly not to say that these more recent texts have failed to influence the arguments developed here; on the contrary, the precedent for reading Uexküll and Peirce in conjunction with one another was to be found in these writings, and inevitably they

³⁴ Thomas Sebeok, *The Sign and its Masters* (Austin; London: University of Texas Press, 1979): p. 196.

³⁵ Charles Peirce, 'The Basis of Pragmatism in the Normative Sciences' in *The Essential Peirce: Selected Philosophical Writings: Vol. 2*, (Bloomington: Indiana University Press, 1998): p. 394.

have done much to steer the interpretation of each. To grant some understanding of their importance, before summarising the structure of the chapters to follow, it is worth detailing some of those texts that have acted as essential point of reference, guiding the arguments developed here, while also conceding some further omissions of relevant themes and concepts.

Favareau's *An Evolutionary History of Biosemiotics* represented an indispensable starting point so far as this thesis is concerned. Favareau's *History* provides a thorough, systematic account of those philosophical and scientific trends which served to elide the fundamental role of sign relations in living processes, as well as an introduction to that new understanding of the reach of semiotics pioneered by Sebeok. As in turn an important source for Favareau's *History*, John Deely's *Four Ages of Understanding* supplies a philosophical history of semiotics and the study of sign as a whole, from its origins in the work of the pre-Socratics and the golden age of Platonic and Aristotelian philosophy, through the further development of its classification in the Latin age of Augustine, Aquinas, and the Scholastics, to its gradual elision in the Enlightenment of René Descartes and John Locke, which would shape modern science, and finally its postmodern revival, via the works of Charles Peirce, its curtailment in Saussurean semiology, up to its more recent analysis by Umberto Eco. Significantly, Deely identifies John Poinsett as the first to elucidate the triadic structure of the sign, which was only later rediscovered by Peirce. As Deely asserts, it is the re-emergence of this conception of the semiotic which demonstrates that objective experience consists of 'an irreducible interpenetration and interweave of the working of the physical environment with the workings of the mind itself.'³⁶

As far as the current work is concerned, as close to a definitive and cohesive statement of the current state of biosemiotics as could be found was presented in Hoffmeyer's *Biosemiotics: An Examination into the Signs of Life and the Life of Signs*.³⁷ Building on Sebeok's work, Hoffmeyer synthesises concepts derived from both Peirce and Uexküll, and applies these concepts to concrete biological examples, while elucidating the many advantages of biosemiotics, compared to mainstream biology, when it comes to explaining the evolution and behaviour of living organisms. Through his *Biosemiotics* together with his earlier book, *Signs of Meaning in the Universe* and his many published articles, Hoffmeyer has devised several key concepts: along with the notion of 'semiotic freedom' which I do directly discuss, these include 'double-coding' (formulated in collaboration with Claus Emmeche), 'semiotic scaffolding', and the conception of the brain and body of a multi-cellular organism as a 'swarm

³⁶ John Deely, *Four Ages of Understanding: The First Postmodern Survey of Philosophy from Ancient Times to the Turn of the Twenty-first Century* (Toronto; London: University of Toronto Press, 2001): p. 448.

³⁷ Jesper Hoffmeyer, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs*, translated by Jesper Hoffmeyer and Donald Favareau (Chicago: Univ. of Scranton Press, 2008).

of signs'. Crucially, and not necessarily in agreement with all those involved in biosemiotics, Hoffmeyer suggests that the advent of symbolic functioning in human communication (i.e. syntactic language), which could be seen to subsume the indexical and iconic relations of animal life, was in fact foreshadowed by the establishment of genetic reference relations, which already effected a transition from purely *indexical* relations to a *symbolic* world.³⁸ Further, and in accordance with the repercussions of this sense of pre-linguistic genetic symbolisation, Hoffmeyer maintains that the interactive embodiment of animals already entails a corporeal articulation of the symbolic mind. Drawing on the phenomenology of Maxine Sheets-Johnstone, he writes:

In general, then, corporeal communication occurs precisely as a *symbolization* of the spatial and tactile dynamics that the animal itself experiences – experiences that its biologically similar conspecifics can also be counted on to share.³⁹

More simply put, these claims would seem to support the thesis that the symbolic inheritance of life, as always articulated in conjunction with an environment, prefigures the emergence of the human species as a user of signs. Critical aspects of Hoffmeyer's account of biosemiotics extend to endosemiotics, which details the role of signs within the body, rather than as directed towards the external environment, and to a sophisticated semiotic conception of the part played by the apparatus of genetics in evolution. The resources to study life at this molecular level, along with a corresponding understanding of genetic functionality, were not available to either Peirce or Uexküll, and accordingly I have not attempted to verify my interpretation of their work on this basis, even though this has meant many of my conclusions must remain theoretical and speculative, lacking the empirical justification which Hoffmeyer is able to propose.

Another research programme, which developed prior to biosemiotics, but still bore traces of the influence of Uexküll and Peirce, was cybernetics. Cybernetics especially as interpreted by Gregory Bateson, and in terms of its contribution to the work of systems biologists like Humberto Maturana and Francisco Varela, would go on to help shape the ideas of Sebeok and Hoffmeyer. Yet, as Hoffmeyer along with Søren Brier have argued, one of the leading principles arising out of cybernetics is worth disputing: as such, they contend that the idea of a purely quantifiable definition of information, as formulated by Claude Shannon, is *not enough* when it comes to comprehending the relation of living organisms to their environments.⁴⁰ Following on from an assertion of life's irreducible relationality, as Hoffmeyer

³⁸ Hoffmeyer, *Biosemiotics*: p. 300.

³⁹ Hoffmeyer, *Biosemiotics*: p. 303.

⁴⁰ Søren Brier, *Cybersemiotics: Why Information is Not Enough!* (Toronto: University of Toronto Press, 2008).

and Emmeche have repeatedly asserted, the significance of the basic element of biosemiotics is perhaps best articulated with reference to Bateson's definition of information, unorthodox in so far as it resists mathematization. A fragment of DNA, a gene, is not *mere* substance; its role in life must be appreciated as that of a sign, *a difference which makes a difference*.⁴¹ Both Peirce's triadic conception of the sign, rooted in the interpretant, and Uexküll's sense of the Umwelt as a model of the environment specifically differentiated by the organism, approach this definition. Since it falls outside of the historical period which is my main focus, I do not explicate cybernetics and systems theory in detail, but readers familiar with its principles will notice strong parallels between some of the concepts discussed and those developed subsequently. The lucidity gained by rediscovering these concepts retrospectively is worth the risk of anachronism, which to a certain extent must remain unavoidable.

In the first place, my initial introduction to biosemiotics came via Wendy Wheeler's *The Whole Creature*, which situated this field in the context of the development of complexity science in the twentieth century, while also expounding many of those traits, stemming from the perfusion of signs in living systems, which characterise the evolution of culture as a whole. By playing on the tacit forms of knowledge embodied in those relations linking organisms and environments, living systems perpetuate creativity and openness. As described by Hoffmeyer and co. as being derived from this process, Wheeler's book presented the emergent symbiotic 'swarms of swarms' as evidence of a continuum of life, which highlighted the danger, both theoretical and practical, inherent in any isolation of the individual mind: contrary to the twin threats of seclusion and egotism, it should be recognised that '[o]ur natural and cultural worlds are us'.⁴² As such, Wheeler helped give substance to the idea of cultural artefacts as products of an evolving process, which at once preceded and expedited the specificity of its own expression in human society, legitimising the parallel analysis of these artefacts in terms of natural science as well as cultural and critical theory. Much later, an article by Paul Cobley helped to clarify the ethical orientation of this thesis in opposition to a humanism which might otherwise present the subjectivity of the mind as facilitating an unwarranted ungrounded voluntarism.⁴³ Because the greater part of this thesis was devised prior to their publication, I have not engaged with the more recent works of Wheeler and Cobley, *Expecting the Earth: Life/Culture/ Biosemiotics* and *Cultural Implications of Biosemiotics* respectively, though I anticipate that the ideas discussed here may resonate with both, and be productively distinguished from each.

⁴¹ Claus Emmeche and Jesper Hoffmeyer, 'From Language to Nature: The Semiotic Metaphor in Biology' in *Semiotica* 84, 1/2 (1991), pp. 1–42. Gregory Bateson, *Steps to an Ecology of Mind* (New York: 1972, Ballantine Books).

⁴² Wendy Wheeler, *The Whole Creature*: pp. 107 – 109.

⁴³ Paul Cobley, 'Semioethics, Voluntarism and Anti-Humanism', *New Formations* 62 (Autumn 2007), pp. 73-88.

The first chapter begins by tracing some of those developments in the history of ideas which preceded and occluded the insights of biosemiotics, as well as those which would eventually foreshadow and help to make this new perspective possible. Starting with Foucault's seminal interpretation of Velasquez' *Las Meninas* in *The Order of Things*, the figure of the human which emerged through modernity, and became understood as the privileged subject of knowledge, is put into question. Biosemiotics can be understood as contesting the assumptions underlying the advance of this version of scientific knowledge: these assumptions erroneously dictate, not just that mind and body are ontologically independent, but that signs be readily confused with linguistic tokens, and ultimately dismissed as a derivation of human thought alone. As both Favareau and Deely observe, through the gradual elision of the role played by semiotics in both ancient and medieval thought, what was lost was the possibility that signs be understood as organisational relations in their own right. Although Descartes' division of the natural world has been vigorously contested ever since it was first formulated, something of its spirit has remained prevalent, and in effect the fractured form of thought that it entails was obscured by a persistent privileging of specifically human subjectivity. Tasked with acting as both subject and object, the human comes to stand for a contradiction in knowledge which disconnects the mind from nature, while the reality of sign relations falls away though the gap between these two spheres of existence. Yet, the influence of this contradiction might remain ubiquitous and so effectively invisible if it were not for the advent of an alternative means of grasping the origin of mind.

Recapitulating the interpretation of 8-5-3 that was explored in the preface, several other examples from twentieth century art are cited, as each, in different ways, presenting a sense of emergent meaning which does not depend on the intervention of human agency alone. These examples lead into the question of what epistemological condition replaces the abstraction of the human subject, facilitating the development of biosemiotics, as well as those new forms of art which can be seen to challenge classical conceptions of representation. A clue to the answer to this question is again identified in Foucault's work, calling to attention a shift in focus, from time and history in the nineteenth century, to a new understanding of space in the twentieth century. The networked sites which exemplify this transformed sense of space are associated with those technological and scientific developments which rose to prominence through the twentieth century. New media and information technologies, along with scientific efforts to make sense of unpredictability through statistical analysis, as well as systems theory, all contributed to a conception of the world in which the role of human agency was less clearly defined.

From amongst these interconnected factors, one particular concept is singled out, which refines Foucault's observation of a transformed of space. The idea of the environment, along with its French and German counterparts, of *milieu* and *Umwelt*, all contributed to the development of

new ideas about the relation between life and the natural world. Yet, it was Uexküll's account of the *Umwelt* as a species-specific world, a particular formation of a lived environment inseparable from the biological makeup of each organism, which most decisively expressed a radical new means of conceiving of the relationship between mind and nature. My argument is not that Uexküll alone pioneered a change in attitude towards the conditions of both life and thought, and indeed, just as important to my overall thesis are some of the less convincing aspects of his theories, but his work is taken as a paradigm of the understanding of organism and environment rooted in reciprocity which would gain a firmer traction through biosemiotics.

The second chapter continues to explicate Uexküll's theories, detailing a number of the distinctive interconnected concepts he employed to explain the relation between organism and *Umwelt*, including the *Funktionskreis*, *Innenwelt*, and *Bauplan*. Uexküll's evocative account of the life-cycle of a tick, detailed in terms of the narrow constraints of this organism's *Umwelt*, brings a vital philosophical question into play: what is the place of subjectivity in Uexküll's theory of life? Uexküll did not make the mistake of pinpointing a fixed site for the subject, but his notion of a transcendental 'rule of life' guiding its activity, as might be inexplicably embodied in protoplasm, did not provide a satisfactory answer to this question. As a means of avoiding this irresolvable quandary, a conception of subjectivity as inherently transitory is tentatively advanced, with attention to the aesthetic disposition of the organism, invoked in selective acts of sense-making, providing an incentive to investigate this notion further. Some pertinent aspects of Uexküll's scientific and philosophical legacy in the twentieth century are then explored, reinforcing the need to introduce an evolutionary explanation of living systems. Ernst Cassirer's use of Uexküll's work provides a telling example of an interpretation of the biologist's thought which ends up further entrenching the divide between human subjectivity and that of other forms of life, potentially severing the link between the human relation to signs and the natural environment. On the other hand, the rejection of Uexküll's perceived vitalism by some psychologists and ethologists seeking a more deterministic account of the behaviour of living organisms is shown to obscure the profound relation between life and its setting, which the theory of the *Umwelt* brought to the fore.

While apparently it developed independently, the emergence of Pragmatism in North America, both as a philosophical framework, and as an important trend in the early advance of scientific psychology, presents some revealing parallels with those themes investigated by Uexküll. John Dewey's work is singled out as offering a rare, early means of linking the work of Uexküll with that of Peirce, illuminating the conceptual framework of each. In the final section of this chapter, Hoffmeyer's conception of 'semiotic freedom' is cited in order to contest an overly reductive portrayal of the relationship between an organism and its *Umwelt*, while the necessary constraints perpetuated by this bond are also acknowledged. The tension between these two points of view reinstates the relevance of a central metaphor for this thesis, in the

form of a living creature's efforts to construct a viable residence by transforming its surroundings. This occupation is not simply functional, but intrinsically imbued with significance, as such it provokes an almost paradoxical tie between two orientations on behalf of life: on the one hand, the need to secure a stable place in the world, on the other, the urge to pursue curiosity, departing from the given setting of an environment, and reworking the conditions of existence.

Chapter three of this thesis opens with a reiteration of the debt owed by both Uexküll and Peirce to Kantian philosophy. Yet, Kant's philosophical aesthetics also provides a means of distinguishing the perspective on inhabitation which can be derived from a deeper sense of the constitution of an Umwelt in orientating life in conjunction with the evolution of signs. As such, a critique of at least one version of Kant's philosophy is developed, with reference to music, as well as those post-war installations which challenged the traditional conception of the art-gallery. As opposed to justifying the conditions of knowledge in terms of their *a priori* existence beyond lived experience, the origins of sense and thought are attributed to those externally discovered signs, which tie together feelings, judgements, and reasons, in the shifting, mutable context of a natural and cultural world. This criticism is further fortified through reference to a Marxian critique of Kant, borrowed from Michel Serres. Read in conjunction with Peirce, Marx helps introduce an ecologically engaged conception of the communal and material grounds of rationality. Diverging from Kant, both Marx and Peirce present reason as the natural as well as historical consequence of evolutionary change. Nonetheless, Marx's early denigration of non-human forms of life, in favour of a socially-mediated ideal of consciousness, obscures the place of the environment in the evolution of thought. A Cartesian reduction of animal and non-human life to the level of automatons is all the more prominent in the Hegelian idealism which shaped Marx's methodology. By contrast, Peirce goes so far as to find a dead remnant of rationality in the reflexes of a cadaverous frog, but what separates this corpse from the collective existence of living organisms is its inability to sustain the evolutionary logic linking life and mind. Effectively drawing together ecological and aesthetic principles, Peirce's notion of a 'law of mind' can also be set apart from Uexküll's 'rule of life', based on its articulation through a tendency to take habits, and hence a creative potential for action which may progressively change the relations organising living processes.

The final appended section of this chapter explores the example of bee communication in more detail, taking a passage from a novel by Samuel Beckett as a motivation for this foray. Although the waggle dance of bees is categorically not equivalent to human language, this distinction should not be allowed to efface the intelligibility of the relations of bees prompted by their collaborative existence in relation to a hive. This case study also occasions a brief critique of Aristotle's privileging of particular forms of human life by virtue of their possession of *logos* as well as access to a *polis*; against the prejudice that Aristotle's definition of the

human can entail, the communal cohabitation of bees demonstrates that at least a certain sense of symbolic existence, i.e. a being together, predicated on the unitary differentiation of an environment, cannot be allied to one sovereign form of life alone. Disputing the anthropomorphism which would equate an individual bee with an individual human person should not involve denying that meaning is invested and so at stake for bees in the context of a hive.

In chapter four, Uexküll's use of metaphors derived from music is explicated, supplying a stronger conception of the ecological dimension of his thought. As a metaphor for the semiotics of living systems, music holds at least one advantage over language in that it directly imbues significance with an emotional quality, without perpetuating the incessant translation of reference (replacing one convention linking signifier and signified for another) which purely symbolic communication would seem to permit. Although this provides a very vivid sense of the rhythmic patterning and resonant relationality which organises interactions between organisms of different species, Uexküll arguably errs in so far as he restricts his idea of music to classical standards of composition. The notion of a score guiding the behaviour of each different species, which Uexküll puts forwards, chimes well with a more contemporary understanding of the symbolic grounds of genetic reference. What potentially gets lost, in his insistence on the preponderance of order guiding the symphony of nature, is an appreciation of indeterminacy. Indeterminacy, in the form of chance variation, may act as a constructive compliment to the harmonic tension linking different forms of life, rather than a ruinous detraction. To make this point Uexküll's dismissal of what he calls the 'clown's cacophony' is turned against itself: the capacity for improvisation which this haphazard band of instruments promotes, receptive to unexpected changes in its surroundings, and offering both recollections and deviations from familiar patterns, is potentially a better candidate for representing the creative potential of evolution, than the image of a traditional orchestra studiously sounding a prescribed set of notes.

A last example in this chapter concerns the biology of slime-molds, an unusual organism in so far as its life-cycle includes freely living single cells, as well as an aggregated form, which seems to exhibit organised, purposive behaviour, in the mode of much more sophisticated animals. Uexküll himself was fascinated by this form of life, envisaging that its transition to a collective existence demonstrated the disparate 'tones' of individual cells coming together as an ensemble. In turn I speculate that the secretion of the chemical signal which induces these individual cells to synchronise their movements and aggregate, may originally have been a waste product, metaphorically-speaking a *noise*, which, in their evolutionary emergence, slime-molds effectively began to creatively interpret, organising into a new form of harmony.

Chapter five returns to the work of Charles Peirce in order to further elucidate his triadic style of reasoning, and to accentuate its difference from a doctrine which might mistakenly conflate signs with the components of language alone. The tangential relevance of aesthetics along with ecology is again brought into play. Peirce's sense of a visceral mixture of all three of his major types of signs, as together being indispensable to the life of thought, is contrasted with an impoverished version of Saussurean semiology, which might otherwise end up resurrecting Cartesian dualism on the basis of linguistics. For the sake of expediency, I do not detail Peirce's later ten-fold classification of signs, this is not to deny the value and precision that these additional divisions bring to Peirce's semiotics, but for the purposes of discriminating his philosophy from less dynamic and more anthropocentric accounts of rational thought his earlier, simpler framework is sufficient. To make clear the dissociation of Peirce's thought from an idea of representation as a kind of detached picturing, the active and singular role of the interpretant is foregrounded, as a means of at once displacing and recontextualising reference. This account of the interpretant leads back to Peirce's pragmatism, as a conception of the relation between sign and object based on the practical bearings of truth, conduct, and belief. Against the reduction of Peirce's pragmatism to a kind of epistemological code, relevant as a justification of human knowledge alone, the importance of his metaphysical cosmogony is upheld, and the question of the part played by signs in the development of non-human forms of life is brought back into focus. Peirce himself did not necessarily reach an entirely satisfactory conclusion with respect to this question, seeming torn between ideals of pansemiosis and the conventions of humanism so far as his sense of the purchase of signs was concerned. Nonetheless, the Peircean concept of the mind is put forward as a prototype of the idea of an environment, which gained a different kind of clarity in Uexküll's sense of the *Umwelt*. From a Peircean point of view the mind can act as a vessel for evolutionary ideas, establishing the means by which habitual cultures of thought may transform the relation between life and its setting.

The subsequent section of chapter five deals with Peirce's engagement with the metaphor of the sphinx in his 'Guess at the Riddle'. Through the injunction to 'know thyself' Peirce's attempt to answer the sphinx's riddle is traced back to his definitive conception of the human as an evolving sign, and hence a symbol maker made by symbols. Yet again, the unity that this definition proposes in its connection with the human individual is qualified by a sense of the plurality of signs, and hence the communal setting of life, which necessarily structures this evolving process of semiosis.

In chapter six Peirce's idea of abduction is considered as a fundamental constituent of his method of inquiry, a method which he believed was continuous with the means by which the world evolved new forms of intelligibility. Partly so as to substantiate Peirce's conviction of a continuity between life and thought, this last chapter is introduced with extensive detail

from the philosopher's biography, and Joseph Brent's text has been an essential source here. Along with the multidisciplinary character of Peirce's intellectual life, his low opinion of his own writing, and the difficulties he experienced in completing his more ambitious projects, are all acknowledged here. Abduction is presented as a third logical alternative to inductive and deductive forms of reasoning, but it is also distinguished from purely linguistic forms of reasoning, instead being exemplified by acts of perception. Peirce's understanding of a 'play of musement' is discussed as an important precedent for occasions of abductive thought.

To clarify the roots of abduction, the postulations underpinning Peirce's conception of logic are critically compared with those of Gottlob Frege: both philosophers made decisive steps in advancing formal predicate logic, thereby setting the scene for those revolutionary advances in the twentieth century, that would reveal both the limits of mathematics, and the possibilities of computing. This achievement was all the more remarkable given that so little progress had been made in the study of logic beyond the tradition of Aristotelian syllogism, prior to George Boole's development of a system of formal notation. Although both Peirce and Frege understood logic to be normative and independent of psychology they had quite different senses of its application. Frege remained convinced that the objective form of logic transcended the senses as a kind of universal medium for rational thought, excluding the seemingly irrational caprice of life. By contrast, Peirce's logic pursued what Jaakko Hintikka has called the 'model-theoretic perspective', a viewpoint which accords well with the use of relational models by biologists to study living processes, along with the role of the environmental model of an Umwelt in structuring the transactions of organisms. Peirce found grist for his conviction that mind and matter were continuous, and so mutually subject to the development of logic, in both the findings of experimental psychology concerning the extension of cognition in space and time, as well as his own phenomenological methods of 'introspection'.

To evoke the potential of abduction to establish new forms of continuity between mind and matter, and hence life and environment, while also admitting the confusion and entanglements that this process may entail, Peirce's use of metaphors related to textiles is extended. The difficulties Peirce encountered in finalising the construction of an architectonic system of philosophy helps to divulge the fallibility of abductive reasoning. Yet, the risk inherent in a process of building that cannot be completed potentially also confirms that philosophical thought alone does not replace the ongoing task of inhabitation which occupies the life of mind, and which situates each organism within an Umwelt. Evidence of the biological inheritance of abduction is presented in Peirce's example of a newborn hatchling selectively relating to its surroundings. Finally, the elusive ubiquity of abduction is connected with Peirce's sense of the perfusion of signs in the variety of nature.

In conclusion, along with summarising my argument, I offer a foil to the example interpreted in the preface, and, finally, indicate some directions through which the claims of

this thesis might continue to be productively criticised and refined. To gain a complete comprehension of the coexistence of life and signs requires an appreciation of their reciprocity both at home and abroad, and this condition is reflected in the two parts of this thesis. A reading of Uexküll shows how the lived world inhabited by an organism gains sense through signs; reading Peirce reveals how the intelligibility of these living relations are abducted through thought: together, these complimentary perspectives reveal the potential for creating original habitual configurations of life and knowledge.

PART I. Inhabiting Sense

CHAPTER 1.

The Birth of the Environment: Contextualising the Biosemiotic Episteme

The Departures of the Human: Art and Knowledge after *Las Meninas*

Michel Foucault's *The Order of Things* famously opens with an interpretation of Diego Velázquez's *Las Meninas*. As a portrait of portraiture in action, and thus 'a picture in which the painter is in turn looking out at us', for Foucault, Velázquez's seventeenth century painting stood for both the inauguration and the imminent conclusion of Classical representation.⁴⁴ For, at the same time as depicting the framed reflective space which would serve to displace the semantic web of resemblances characterising Renaissance thought, it exposed the essential void at the heart of this enlightened structure. Conceived, not only as windows onto the world, but as fallible fabrications, paintings mimic both the promise and the peril of a representational theory of mind, presenting the world as framed in isolation from the onlooker, with visible forms lying in wait, ready to be seized upon and matched to reality, or, if necessary, dismissed as illusory. René Descartes can be seen to have typified this flawed perspective when, in his *Meditations*, he identified ideas with images, and dreams with paintings, distinguishing between the formal and objective reality of things, and so inserting a veil of visibility between things themselves, and the disembodied mind disposed to consciously know the world.⁴⁵ Still, Descartes was far from alone in severing *res cogitans* and *res extensa*. As Donald Favareau recounts in his 'Evolutionary History of Biosemiotics', what had already gone missing in the history of ideas was a sense of the reality of those cognitive relations which established knowledge in conjunction with the material composition of the world.⁴⁶ From William of Ockham to Francis Bacon, the objects of the mind and the things of the world were pulled apart, a separation that cloistered away thought, made doubt ever-present, and set the scene for the 'tidal wave' of nominalism which Charles Peirce would eventually identify as such a pervasive fallacy (CP 1.19).

⁴⁴ Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 2001): p. 5.

⁴⁵ René Descartes, *Discourse on Method and Meditations on First Philosophy*, trans. by Donald A. Cress (Indianapolis: Hackett, 1998): pp. 61, 74.

⁴⁶ Favareau, 'The Evolutionary History of Biosemiotics': pp. 25 – 26.

For Foucault, *Las Meninas* at once simulated and subverted the withdrawal of the mind from the world, highlighting the lacunae in the Classical conception of representation by exposing a mismatch in the reciprocal exchange of gazes it appears to offer. While the artist, taking a step back from the large canvas on which he has been at work, seems to be meeting the gaze of whoever scrutinizes the painting, a glowing section of paint just off centre betrays a different story. Situated between the other large paintings that adorn the walls of the room in which this scene is staged, a mirror can be seen to reflect a couple, revealing the King and Queen who are the true subject of the painter's portrait. As Foucault explained, the duplicity of representation necessitates that the subject and object of an image remain estranged: 'it is not possible for the pure felicity of the image ever to present in a full light both the master who is representing and the sovereign who is being represented.'⁴⁷ It is for this reason that the gaze of both the occupants of the painting and its observer must appear misdirected, failing to connect in a manner that would divulge each as belonging to one and the same world. Yet, as if stepping out of the depths of *Las Meninas*, another figure comes to the fore, standing in for the fissure at the heart of the Classical and Cartesian conceptions of representation.

Ever since its first formulation, Descartes' dualism has been contested in a variety of ways. Refusing to see reality as intrinsically split, Materialism and Idealism have favoured physical substances, on the one hand, and mental categories, on the other, as the grounds on which knowledge is founded, thereby either reifying or dissolving the concerns of their counterpart.⁴⁸ Others have sought to sidestep this antinomy altogether, by appraising only the facts borne out by empirically gathered information.⁴⁹ In line with this latter attitude, the principles of determinism (every event can be referred back to a definitive cause, and interpreted as inevitable on this basis) and reductionism (events should be understood in terms of the interaction of their component parts) have together provided a powerful means of explaining physical phenomena.⁵⁰ It is the broad reach of this approach which has become closely associated with the success of the scientific study of at least one side of the bifurcation

⁴⁷ Michel Foucault, *The Order of Things*: p. 17.

⁴⁸ George Berkley's subjective idealism and the eliminative materialism of Patricia and Paul Churchland can be seen as extreme versions of each approach. George Berkley, *Principles of Human Knowledge; and, Three Dialogues* (Oxford: Oxford University Press, 1999). Paul M. Churchland, *Matter and Consciousness* (Cambridge, Massachusetts: MIT Press, 2013).

⁴⁹ Positivism is one scientifically orientated philosophical approach which may be associated with an avoidance of issues that stray beyond the assessment of evidence based on sense perception. However, the term has been used broadly in connection with a wide variety of distinct philosophies, which are not always consistent with its origins in Auguste Comte's formulation of the doctrine, including some which would not ascribe to the label. Paul B. Roscoe, 'The Perils of 'Positivism' in Cultural Anthropology', *American Anthropologist*, New Series, Vol. 97, No. 3 (Sep., 1995), pp. 492-504.

⁵⁰ John Dupré has provided a thorough critique of the limits of these principles in terms of the belief that the sciences are unified by a common method. Significantly several of the examples he offers to refute this belief are connected with biology and ecology. John Dupré, *The Disorder of Things: Metaphysical Foundations of the Disunity of Science* (London: Harvard University Press, 1993).

of existence. By, for the most part, bracketing the elusive traits associated with the mind, the experimental method and the institution of science have flourished since Robert Boyle established the Royal Society in 1660, progressively broadening the horizon of knowledge to an unprecedented extent.⁵¹ This is not to say that attempts to comprehend the workings of the mind on the same basis have been entirely lacking: the establishment of psychology as an experimental science, and the subsequent successes of neuroscience have likewise promised to pick apart the mechanism of thought. Double-aspect theory, otherwise known as psychophysical parallelism, might be seen as the most orthodox metaphysical justification of this project, identifying mental events as merely passive epiphenomena or as inner aspects of more rigorously determined physical processes.⁵²

From a methodological perspective, what potentially unifies all of these approaches, and in so doing effectively preserves the rupture in representation in a series of disguised forms, is the tendency to conflate ‘mindedness’ with specifically ‘human mindedness’. Though, from the point of view of psychology, many animals evidently have brains, and hence comparatively underdeveloped minds, this attribute has frequently been understood only by way of what can be witnessed concerning the animal’s behaviour, not as a valid source of subjective feeling and knowing in its own right. Early proponents of behaviourism, such as Edward Thorndike and B. F. Skinner, sought to understand animal intelligence in terms of observable responses to particular situations.⁵³ In this manner the roots of the human mind were also pursued, and this project had the virtue of escaping the idea that mindedness must be reduced to an inaccessible interiority. However, explaining behaviour with reference to conditioned reflexes, and hence reducing animal activity to determinate sequences of cause and effect, effaced the phenomenological and epistemological dimensions of this activity, while effectively preserving the Cartesian conception of animals as automatons.

As then the living embodiment of a contradiction, the human alone has been committed to acting as if it were always accompanied by an incommensurable doppelganger, taking the stance of either a subjective mind or an objective body in accordance with the generation and determination of knowledge. From an academic perspective, the disparity between the disciplines of natural science, social science, and the humanities, and the penchant of their proponents to regard one another with indifference, at best, if not misunderstanding and

⁵¹ Donald Favareau, ‘The Evolutionary History of Biosemiotics’: p. 26.

⁵² In accordance with his psychophysics, which, by establishing a correlation between physical events and individual perception, helped to demonstrate the viability of an experimental psychology, Gustav Fechner formulated a foundational version of psycho-physical parallelism. Gustav Fechner, *Elements of Psychophysics*, trans. by Helmut E. Adler, (Leipzig: Breitkopf & Härtel, 1889).

⁵³ Edward Lee Thorndike, *Animal Intelligence: Experimental studies* (New York: Macmillan, 1911). Ivan Pavlov, *Conditioned Reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex*, trans. by G. V. Anrep (London: Oxford University Press, 1927).

antagonism, is a telling indication of the detrimental consequences of this contrarian attitude towards human knowledge.⁵⁴ This split may have even more damaging social, political, and psychological consequences, in so far as certain forms of knowledge are assumed to be mutually exclusive.⁵⁵ The study of culture in the form of the semiosphere, as the milieu in which the tendencies of the human mind are embodied and gain a greater degree of permanency, can be understood as an attempt to oppose this trend towards a fragmentation of thought and matter.

It would seem imprudent to single out a lone candidate to take over from Foucault's use of *Las Meninas*, but this caution need not nullify the question of what image, in more recent history, might perform the same trick of unravelling epistemological assumptions, this time those that gained prominence in the nineteenth and twentieth centuries. Although, as already described in the preface, Mario Merz's 8-5-3 did go some way towards fulfilling this role on a personal level, a number of other works of twentieth century art might be seen to serve the same purpose. Pablo Picasso went as far as to paint several different versions of *Las Meninas* in a cubist style, as part of a series of works connected with this title. Picasso's paintings can be seen to radicalize the lesson of Paul Cézanne: vision is not just a passive picturing of things, which replicates the dimensions of what can be seen with more or less accuracy, it involves the intertwining of the visible with the motion of the body, and the mutual configuration of eye and mind.⁵⁶ The relatively simplified, yet no less vivid geometric forms and planes of colour which Cézanne painted, and their exaggeration and proliferation in the work of Picasso, reflect the multi-faceted surfacing of sense as a dynamic process of interpretation.⁵⁷ Objects are not presented simply as they are, but as subject to varying degrees of distortion and accentuation in line with the shifting focus of embodied perception. Small wonder then that Maurice Merleau-Ponty found a visceral corroboration of his philosophy of embodiment in Cézanne's work:

⁵⁴ C. P. Snow's identification of *Two Cultures* remains a historically important account of one aspect of this problem. Charles Percy Snow, *The Two Cultures*, (Cambridge: Cambridge University Press, 1993). The so-called science wars were another notable episode in the history of divided epistemologies, pitting the proponents of social constructivism against those maintaining the objectivity of scientific access to nature, in the wake of the Sokal hoax. For a critical discussions of the issues surrounding the science wars see Ian Hacking, *The Social Construction of What?* (London: Harvard University Press, 1999).

⁵⁵ As Wheeler points out, the failure to grasp that not only the perturbations of a hazardous natural environment can cause illness or death, but so too those of an inimical social environment, demonstrates the short-sightedness of a culture in which nature and mind are held to be antithetical. Wheeler, *The Whole Creature*: p. 108.

⁵⁶ 'Cézanne already knew what cubism would restate: that the external form, the envelope, is secondary and derived, that it is not what makes a thing take form, that that shell of space must be shattered' Maurice Merleau-Ponty, 'Eye and Mind', trans. by Michael B. Smith, in *The Merleau-Ponty Aesthetics Reader: Philosophy and Painting*: p. 140.

⁵⁷ Don Favareau makes a related point with reference to the neurobiology of vision: 'sensory signification per se is intimately bound up with motoric processes of bodily and environmental interaction in an ongoing process of semiosis that cuts across the sub-systemic distinctions of brain, body and world.' Don Favareau, 'Constructing Representema: On the Neurosemiotics of Self and Vision', *SEED* 2 (4), pp. 3-24: p. 11.

“Nature is on the inside,” says Cézanne. Quality, light, colour, depth, which are there before us, are there only because they awaken an echo in our bodies and because the body welcomes them. Things have an internal equivalent in me; they arouse in me a carnal formula of their presence.⁵⁸

Nevertheless, in a certain respect neither Merleau-Ponty nor Picasso surpass the fractured model of representation which *Las Meninas* began to subvert. Picasso’s most accomplished reworking of the painting intricately unfolds the structure of crisscrossing gazes which defines the original, but if anything it intensifies the prominence of that figure which would come to obscure the underlying persistence of a divided epistemology. As a proxy for the human subject, the painter in Picasso’s version grows in stature, and appears much more elaborate than the accompanying figures, as if the capacity for uniting forms with reality enriches his own being; he seems to stand as a kind of superhuman, Janus-faced, and gifted with a faculty of perception which elsewhere can only appear flawed and impoverished.

In ‘Eye and Mind’ Merleau-Ponty criticized Cartesian and Classical science for analysing vision only in terms of reflective thought, reducing its innate depth and distance to the sense of touch, and denigrating painting as a matter of mechanical artifice.⁵⁹ Similarly, the ‘operational thinking’ and ‘data-collecting’ of contemporary science is denounced, along with cybernetics, for failing to attend to the fullness of Being.⁶⁰ There is much of value in this critique: Merleau-Ponty is right to distinguish painting as something more than a view upon the outside, and to reconnect the existential reality of vision with a being-in-the-world that is intimately grounded in embodiment. Yet, by effectively fetishizing the painter as the only one able to ‘look at everything without being obliged to appraise what he sees’, and simplistically opposing the intellectual exercise of science to the ‘innocence’ and ‘brute meaning’ of art, Merleau-Ponty potentially mystifies, rather than repairs the flawed model of representation he aims to escape.⁶¹ From the outset of his essay the ‘object-in-general’ is seen only as a technical abstraction, not, in the form of a sign, as a figure of relationality which has a constitutive role in the possibility of knowledge at the level of living processes. Signs themselves are referenced only in Cartesian terms, that is as symbolic technical objects and mental tokens abstracted from embodiment, they are not understood with respect to any deeper role in the course of life. Arguably, in ‘Eye and Mind’ and in the vein of Picasso’s *Las Meninas*, Merleau-Ponty once

⁵⁸ Merleau-Ponty, ‘Eye and Mind’: pp. 125 – 126.

⁵⁹ Merleau-Ponty, ‘Eye and Mind’: pp. 131 – 133.

⁶⁰ Merleau-Ponty, ‘Eye and Mind’: p. 149.

⁶¹ Merleau-Ponty, ‘Eye and Mind’: p. 123.

again ends up conflating sense and thought with the isolated figure of the human, albeit this time firmly anchored in the bodily presence of the individual's perception.

A better, though less obviously relevant candidate for reimagining the message of *Las Meninas* than Picasso's reworking is Kurt Schwitters' *Merzbau*. Schwitters gradually constructed the first version of the *Merzbau* in his parent's house in Hannover between 1923 and 1936. This version was completely destroyed by bombing in 1943, its image surviving thanks to a small collection of photographs, and the accounts of those few who saw the work first hand. By naming his work 'Merz' Schwitters referred to his ongoing artistic project of appropriating and assembling scavenged materials into new forms. This nonsensical word was itself taken from a cutting of 'kommerzbank' which he had incorporated into an early collage.⁶² Schwitters also frequently declared 'I am Merz', as if to acknowledge his own existence was no less invested in a process of cultural and material recycling.⁶³ The *Merzbau* reproduces the same sort of sharply angled planes made familiar through Cubism, but it goes further, directly integrating these structures with the interior walls of a building, opening up an immersive experience of an environment, as opposed to the contemplation of a sequestered image or object. For this reason, the *Merzbau* can be seen as a pioneering example of the critical engagement with the space of the gallery which would eventually become a fundamental concern for post-war art.

In *Las Meninas* the paintings within the painting, which cover the walls of the scene, mark the emergence of the art collection as a new form of culture; through the Renaissance, art was no longer tied to the sacred space of churches and cathedrals, but established an autonomous sphere, maintaining value independently of its religious and moral content.⁶⁴ Especially with its alternative title 'Die Kathedrale Des Erotischen Elends', the *Merzbau* seems to herald another later stage, which in turn would reconfigure the original development of art's autonomy. The task of art in this new sense is not to represent a world or nature *out there* for the sake of a mind withdrawn from this domain, a function which had previously preordained its seclusion within the gallery, nor even to provide a glimpse of the secretive psychology of the individual existentially estranged from the external world. By engaging critically and physically with the composition of its own boundaries, the *Merzbau* was a building which maintained an interior only by folding the world beyond its limits back into its own form,

⁶² Elizabeth Burns Gamard, *Kurt Schwitters' Merzbau* (New York: Princeton Architectural Press, 2000): p. 26.

⁶³ Gamard, *Kurt Schwitters' Merzbau*: p. 32.

⁶⁴ Giorgio Agamben describes this transition with reference to the *Wunderkammer* which appeared towards the end of the middle ages, foreshadowing the relocation of art in the exhibition space of the gallery. Giorgio Agamben, *The Man Without Content*, translated by Giorgia Albert (Stanford: Stanford University Press, 1999): pp. 28 – 34.

disclosing the constitutive role of an environment in the ongoing organisation of culture. Schwitters' own term for this process was 'rhythm':

What art is, you know as well as I do: it is nothing more than rhythm. And if that's true, I don't have to burden myself with imitation or with soul, but can modestly and simply give you rhythm, in any material whatsoever: bus tickets, oil paints, building blocks [...]. That's why you mustn't look too hard at the material; because that isn't what it's all about. Don't look for some hidden imitation of nature, don't ask about expressions of the soul, but try, in spite of the unusual materials, to catch the rhythm of the forms and colours.⁶⁵

As the methodology of 'Merz' overtly demonstrated, in the locus of the semiosphere this collective process takes in both things and signs, and hence both matter and mind. Just like its descendent 8-5-3, the *Merzbau* approximated the living system of the organism, not just through a formal analogy, but by articulating the relation between the individual and their world as a process of inhabiting emerging forms of significance.

A prominent feature visible in the photographs of the Hannover *Merzbau* is Schwitter's inclusion of a column crowned with the plaster death mask of his first son, the only conspicuous reference to the human form included within the work.⁶⁶ Some of those later post-war works which, like 8-5-3, would follow the example of the *Merzbau* in restructuring the relation between art and its environment, sought to erase the figure of human agency almost entirely. Robert Smithson's *Yukatan Mirror Displacements* (1969) involved nine photographs of sets of mirrors wedged into soil or propped up against the trees of a jungle. By autonomously reflecting their surroundings, these mirrors embedded a varied sequence of perspectives into the diverse habitats of the Yukatan, which seemed to subsume, if not do away completely with any dependency on the human subject as the sovereign initiator and witness of a point of view. In the accompanying essay, published in 1969, in which Smithson documented each displacement in turn, he covers and connects an assortment of disparate topics, including horizons, the signs of mapping, Mayan gods, Atlantis, and enantiomorphic travel. He identified a friction between the mirrors and the 'no man's land' of the environment, which recalls a corresponding friction between language and memory; preserved only in snapshots '[a] memory of reflections

⁶⁵ Gamard, *Kurt Schwitters' Merzbau*: p. 134.

⁶⁶ The *First Day Merz-column* was in fact created by Schwitter's before the rest of the *Merzbau*, and is seen as its starting point, though there is some controversy as to whether the head it incorporates is genuinely the death mask of his son, Gerd, who had died in infancy in 1919. Gamard, *Kurt Schwitters' Merzbau*: pp. 87 – 88

becomes an absence of absences', yet this sense of loss and negation also leads Smithson to ask 'Why should flies be without art?'.⁶⁷

In her extensive *Silueta* series (1973 – 1980) Ana Mendieta imprinted her figure directly into the landscape, documenting in photographs of different localities only the trace of her outline in mud, blood, sand, water, ash, fire, and foliage, a sign of her merging with a world beyond the human, which exceeded the boundaries of her own body:

I have been carrying on a dialogue between the landscape and the female body (based on my own silhouette) I believe this has been a direct result of my having been torn from my homeland (Cuba) during my adolescence. I am overwhelmed by the feeling of having been cast from the womb (nature). My art is the way I re-establish the bonds that unite me to the Universe. [...] Through my earth/body sculptures I become one with the earth ... I become an extension of nature and nature becomes an extension of my body.⁶⁸

Like Schwitters, Merz, and Smithson, Mendieta emphasised not solely the formal qualities of those materials which her work appeared to foreground, but the sensual and emotional significance inherent in these images. The subtly gendered form of Mendieta's silhouettes – noticeably evident in the breadth of her figure's hips in several images from the series – invokes another critical aspect of modernity's split epistemology, calling into question the putatively masculine identity of the subject credited with the capacity to represent its surroundings whilst withdrawing from the world.⁶⁹

In one way or another each of these works defies the isolation of the subject stepping out of the frame of *Las Meninas*, accentuating, instead, the pliable physical locality which supports and nourishes the activity of this figure, at the same time as disclosing the enigmatic intelligibility of this framework as the sign of an essential relationality. In short, their interpretation ought to begin where Foucault's *The Order of Things* ends, with the erasure of 'man', 'like a face drawn in sand at the edge of the sea'.⁷⁰ As a model of an earlier and more

⁶⁷ Robert Smithson, 'Incidents of Mirror-Travel in the Yucatan' in *Robert Smithson: The Collected Writings* (Berkeley: University of California Press, 1996): p. 129.

⁶⁸ Ana Mendieta qtd. in Petra Barreras del Rio, 'Ana Mendieta: A Historical Overview' in *Ana Mendieta: A Retrospective* (New York: New Museum of Contemporary Art, 1988): p. 10.

⁶⁹ The trace of Mendieta's figure recalls the stylised form of prehistoric representations of femininity such as the Paravita Venuses. As Amelia Jones observes, Mendieta might be criticised for her use of essentialising language, and the objectification of the female form, yet this criticism potentially overlooks the performative and metaphorical dimensions of her practice. Amelia Jones, *Body Art/Performing the Subject* (Minneapolis: University of Minnesota Press, 1998): pp. 26 – 27.

⁷⁰ Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 2001): p. 422.

widespread change affecting epistemological attitudes, the legacy of these artworks entails the abandonment of an outdated version of the human which would otherwise cast this character alone as the privileged (or victimised) progenitor and recipient of knowledge. Biosemiotics can be understood as filling the void left behind by the displacement of this epistemology, not just by proposing a revised conception of the nature of the human mind, but by relocating the origins of thought, mind and knowledge in the reciprocal evolution of life and signs.

Yet, inevitably, this starting point also entails new questions. What initially made this expulsion of the human subject possible? Already incorporating a memorial, the *Merzbau* can be understood as a kind of monument to the ongoing disappearance of a certain version of the human, a cenotaph made all the more poignant by its destruction in the course of the Second World War. Thanks to a detour through the often distinctly anthropocentric concerns of Abstract Expressionism and Pop-Art, it would take more than two decades before this sense of loss and renewal would find its continued expression in the art movements of the late 60's and early 70's, such as Arte povera, Minimalism, and the earthworks of Land art. Merz's 8-5-3 and Smithson's *Mirror Displacement* do not seem to stage the death or destruction of man, rather they presuppose that this subject had already been usurped, allowing its presence or absence to become almost a matter of indifference. Mendieta's *Siluetas* are more ambiguous still, conceivable as the troubling effacement or debasement of a different incarnation of the human, or, alternatively, as a sign of its rebirth in a new form. What then, in the wake of this occurrence, is substituted as the condition of future knowledge?

Figures of Emergence: Space and Complexity

Foucault provided his own answers to the question of how the nineteenth century conception of man came to be on the brink of effacement. It is beyond the scope of this thesis to provide a thorough account of these answers, let alone fully explore all of their implications. Yet one important point is worth developing: as also referenced in the preface, in an early text, 'Of Other Spaces', Foucault identified a shift in the focus of knowledge between the nineteenth and twentieth centuries, from a concern with sequential historical development, to a revived conception of space.⁷¹ Whilst admitting that many different conceptions of time and space were influential both before and after the moment of transition crossing these two dimensions, according to Foucault, what made the nineteenth century distinctive was its recourse to a mythology derived from thermodynamics. Specifically, pervasive in the 1800s was a sense that disorder and decay represented the constitutive cost and ultimate subsidence of progress, an

⁷¹ Michel Foucault, 'Of Other Spaces': p. 229.

idea rooted in Sadi Carnot's discovery of the irreversible nature of heat transfer. As Foucault went on to explain, in what must surely be some of the most difficult passages within *The Order of Things*, it was as a counterpart of this discovery of a natural temporality driving historical change that human being was dehistoricised, and made available as an object of knowledge in its own right.⁷² The isolation of 'man' as a being capable of knowing and articulating the conditions of its capacity to know – what Foucault calls 'a strange empirico-transcendental doublet'⁷³ – stemmed from the emerging independence of histories of life, labour, and language, the means by which man spoke, worked, and lived.⁷⁴ By contrast:

In Classical thought, the personage for whom the representation exists, and who represents himself within it, recognizing himself therein as an image or reflection, he who ties together all the interlacing threads of the 'representation in the form of a picture or table' – he is never to be found in that table himself. Before the end of the eighteenth century, man did not exist – any more than the potency of life, the fecundity of labour, or the historical density of language.⁷⁵

In some sense the isolated figure of modern man had already been lurking in the background, the equivalent of the blind-spot of *Las Meninas*, which served to represent every aspect of representation with the exception of the spectator. Yet, only by elaborating the 'quasi-transcendentals' of life, labour, and language in line with the new analytic of finitude, and so historicising the conditions of objective knowledge, could human being be brought to the fore, a being 'whose nature (that which determines it, contains it, and has traversed it from the beginning of time) is to know nature, and itself, in consequence, as a natural being.'⁷⁶ Paradoxically embroiled, through biology, economics, and philology, within forms of historical change in which he cannot directly participate, man ascends as an epistemic subject that, while no longer possessing a clear-cut role to play in the narrative of time, is compelled to bear witness to and archive the catastrophes and transformations with which he is confronted.

Foucault is less explicit about what particular scientific advances triggered twentieth century investment in the conceptualisation of space. At the end of *The Order of Things* the human is still deemed current, even as Foucault suggests that we stand on the threshold of the demise of a certain idea of man. In 'Of Other Spaces' an all too brief sketch of the succession

⁷² Foucault, *The Order of Things*: pp. 400 – 402.

⁷³ Foucault, *The Order of Things*: p. 347.

⁷⁴ 'The human being no longer has any history: or rather, since he speaks, works, and lives, he finds himself interwoven in his own being with histories that are neither subordinate to him nor homogeneous with him.' Foucault, *The Order of Things*: p. 402.

⁷⁵ Foucault, *The Order of Things*: p. 336.

⁷⁶ Foucault, *The Order of Things*: p. 338

of ideas preceding our own is outlined, registering a medieval worldview made up of a hierarchy of sacred and profane places, along with the subsequent revelation of an infinitely open universe heralded by Galileo, and the corresponding prioritisation of extension.⁷⁷ As for the contemporary epoch, Foucault describes it as being characterised by a multiplicity of interlinked sites together elaborating a heterogeneous space of relations. Space, in this new sense, abjured the fixed extension of Cartesian coordinates, and instead charted a more diverse and composite configuration of places, into localities, cycles, juxtapositions, simultaneities, imbrications, intersections, and networks. These sites can be defined pragmatically in terms of the actual relations of which they consist, the stations and crossroads that belong to a railway network for example, or the cafes, parks, and cinemas, constituting spaces of leisure. However, Foucault pays most attention to those sites that he perceives possess an oblique relation to all other spaces, potentially neutralising or inverting those relations with which they are integrated. These sites, Foucault continues, can either be deemed utopias – non places, with a reality only in representing the space of society in a perfected or inverted form – or heterotopias – sites which do possess a determinable locality, but which, by being established outside the conventional ordering of time and space, serve to generate skewed perspectives on other aspects of reality.⁷⁸

Foucault goes on to list six principles which characterise heterotopias. Admittedly, these principles would not be applied with all that much consistency in the rest of his work.⁷⁹ However, heterotopias are mentioned here not so as to establish the actual criteria of their existence, but rather to enhance further the distinctly contemporary means of imagining space which Foucault seems to not just analyse, but assume in advance as the vessel of his knowledge. The artworks described above appear to epitomise this revised conception of space. Interestingly, given the part played by reflection in these artworks, Foucault suggests that a mirror provides a limited experience of both a utopia, in the sense of projecting an unreal virtual space beyond physical extension, and a heterotopia, in so far as it *does* occupy a particular position and, via the diffusion of light, provides a visible counterpoint to the gaze of the observer. Confusingly then, Foucault does not characterise these two kinds of site as inextricably bound to the twentieth century. He affirms that ‘there is probably not a single culture in the world that fails to constitute heterotopias’, with examples ranging from brothels, boats, cemeteries, and gardens, to retirement homes and psychiatric hospitals.⁸⁰ These last two

⁷⁷ Foucault, ‘Of Other Spaces’, in *The Visual Culture Reader* (2002): pp. 229 – 230.

⁷⁸ Foucault, ‘Of Other Spaces’, in *The Visual Culture Reader* (2002): pp. 231 – 232.

⁷⁹ For a defence of the consistency of the idea of heterotopias, along with an account of its connection to the work of Maurice Blanchot and Henri Lefebvre see Peter Johnson, ‘Unravelling Foucault’s ‘different spaces’’, in *History of the Human Sciences*, November 2006, vol. 19, no. 4: pp 75 – 90.

⁸⁰ Foucault, ‘Of Other Spaces’, in *The Visual Culture Reader* (2002): p. 232.

examples are labelled 'deviant', part of a more general decline which Foucault proposes blights the twentieth century, supplanting those 'heterotopias of crisis' – boarding schools, honeymoon resorts, and other places marked as sacred or forbidden – which were previously more dominant. These heterotopias epitomise the kinds of structures which Foucault persistently described, interrogating the functionality, and changing form of institutions such as military barracks, prisons, hospitals, and schools.

What is missing from both 'Of Other Spaces' and *The Order of Things* is any complete account of what, in conjunction with the dissipation of history, and the corresponding intensification of space, might serve to efface the human. Foucault would go on to distance himself from the grand pronouncements he had made at the end of *The Order of Things*.⁸¹ He would also reject the structuralism which he had originally proposed best represented a new approach to understanding space and time, in favour of a genealogical method rooted in historiography, mapping not only ruptures in discourse, but those relations of contrary forces which constitute the actual stuff of history.⁸² Nevertheless, throughout Foucault's writings human beings continue to become subjects, not by virtue of their own innate agency, but thanks to the intervention of those networked sites which enable knowledge and power to conspire. Whether conceived in the form of socially mediated institutions, or as natural systems embedded in physical processes, the implication is that these networked sites themselves take over the role of human being, redistributing the knowledge formerly aligned with history into a multiplicity of more or less autonomous mechanisms shaping the lives of individuals.

In Foucault's later texts when it came to examining these sites of power the concept of a *dipositif* took precedence over the idea of the heterotopia. Moreover, these sites were not considered in terms of a general change affecting the conceptual organisation of space within the twentieth century, but rather as paradigms of a series of transformations in systems of knowledge and power. Still, it seems valid to aver that Foucault's own epistemic standpoint rested on a certain conceptual reconfiguration of space in relation to time. It was not the surfacing of the human subject out of the depths of history which mattered most, but the enduring immersion of subjectivity within a turbulent spatio-temporal medium. Comprised of composite channels and flows, at once organising and emptying itself of the information which made up knowledge, along with the energy which sustained power, this medium substantiated those epistemic networks which Foucault sought out. The task then is to clarify the conceptual means by which this medium began to assert itself in the twentieth century, and, further, to

⁸¹ Michel Foucault, *The Archaeology of Knowledge, and the Discourse on Language*, translated by Alan Sheridan Smith (New York: Pantheon, 1972): p. 158

⁸² Michel Foucault, 'Nietzsche, Genealogy, History', translated by Donald F. Bouchard and Sherry Simon, in *The Essential Works of Foucault: 1954 – 1984: Volume 2: Aesthetics, Method, and Epistemology*, edited by James D. Faubian (London: Penguin, 2000): pp. 369 – 391.

consider how these means might play a role in both the creation of an artwork, as well as the articulation of a form of life.

A number of different factors might be identified as contributing to the emergence of that world-view which, along with proving integral to the work of Foucault, served to problematise art's relation to the autonomy of the gallery. As has already been suggested, a significant motivation for this adjustment in the perception of space and time can be affiliated with technological changes affecting communication and production. For instance, as the nineteenth became the twentieth century, the advent of several new media technologies helped to automate the reproduction of information, while facilitating the speed of its distribution over much greater distances, and transforming its storage into an explicitly physical process. Rather than essentialising the voice and authority of the messenger, these developments can all be interpreted as accentuating the circumstance of where and when a message was passed on and received. Increasingly the background infrastructure of stations, nodes, and networks which permitted the transmission of knowledge worked their way into the foreground.⁸³

A distinct, though related line of explanation can be traced through the history of science. To begin with, Carnot's principle establishing the uncontrollable dynamics of heat transfer entailed a paradox: how could those predictable, reversible laws which, ever since Newton, had been held to govern the fundamental mechanics of cause and effect, give rise to irreversible behaviour? This paradox also incites a second question: how was it that certain entities or systems, most conspicuously those identified as living, were able to keep exchanging material and energy with their environment for longer than would be ordinarily expected? Somehow, these systems were able to 'keep going' past the point of rapid decay which characterised the mechanics of matter in the scenario which Carnot took to be typical: the functioning of a steam engine. The beginnings of a resolution to the first part of this paradox, or at least a different perspective on the problem, was attained later in the nineteenth century. Working independently, in order to clarify thermodynamics, Ludwig von Boltzmann, James Clerk Maxwell, and Josiah Willard Gibbs, all began to treat gases as statistical ensembles, adopting the heuristic assumption that the atoms of these gases were distributed evenly. Thereby, via the uniform increase of entropy, a positive value was attached to the trajectory of isolated systems, contrasting with the negativity of inexorable heat-loss.

As Robert E. Ulanowicz puts it, in effect, Boltzmann, Maxwell, and Gibbs "sanitized" the messy phenomenological world of thermodynamics, so that, for physicists, statistical

⁸³ For an accessible general history of these developments, as connected with the emerging importance of the idea of information, see James Gleick, *The Information: A History, a Theory, a Flood* (London: Forth Estate, 2012). For a more penetrating analysis of the specific role of particular technologies in reshaping conceptions of knowledge and communication see Friedrich A. Kittler, *Gramophone, Film, Typewriter*, translated by Geoffrey Winthrop-Young and Michael Wurtz (Stanford, California: Stanford University Press, 1999).

mechanics became thermodynamics'.⁸⁴ Recruited as a principle of explanation, rather than merely a means of making approximations, via probability a kind of truce was established between the ordered, deterministic picture of the world associated with Newton, and the temporal dissymmetry of ever-increasing entropy which thermodynamics entailed. This innovation also reflected the growing importance of statistical analysis in a number of different areas, not least the efforts of governments to manage nation-states, and the task of making sense of an increasingly complex global economy.⁸⁵ Thanks to advances in mathematics, as well as improved technological means of gathering and assessing data, social scientists and economists refined the statistical methods used to chart trends and predict patterns of behaviour within populations and financial markets. Another success, and for some an answer to the second question noted above, involved the application of statistical techniques to Gregor Mendel's discovery of discrete yet indeterminate genetic inheritance amongst plants and animals. Inspired by Maxwell and Boltzmann, and so building on the assumption of large populations of randomly breeding individuals, in the early 1930s the mathematician Ronald A. Fisher tracked the trajectories of genes from the point of view of probability: the basic characteristics of organisms were not determined by one, but multiple genes.⁸⁶ Along with similar efforts by J. B. S. Haldane and Sewall Wright to unite mathematics with evolutionary theory, Fisher's model of genetic distribution helped give rise to neo-Darwinism, reconciling the apparent spontaneity of genetic mutation affecting individuals, with the determinate constraints guiding the natural selection of species.⁸⁷

Among scientists the implications of these developments in which the role of indeterminacy and uncertainty became increasingly apparent remained disputed, with some insisting on the prevailing validity of a positivistic approach to knowledge, and others concluding that the grounds of their knowledge required a more radical overhaul. Beyond these debates, the warrant to interpret and explain both physical and social systems in terms of statistics shifted the focus of science, from direct apprehension of those general laws governing the totality of the universe as extrapolated from particular cases, towards a new emphasis on the relativity of the observer's perspective on a framed portion of reality. From a philosophical

⁸⁴ Robert E. Ulanowicz, *A Third Window: Natural Life beyond Newton and Darwin* (Pennsylvania: Templeton Foundation Press, 2009): pp. 34 – 35.

⁸⁵ Stengers and Prigogine suggest that Maxwell may have been influenced by Adolphe Quételet who, together with Henry Thomas Buckle, sought statistical regularities within social phenomena, and posited the concept of the "average" man in sociology. Ilya Prigogine and Isabelle Stengers, *Order out of Chaos* (New York: Bantam Books, 1984): p. 123.

⁸⁶ Robert E. Ulanowicz, *Ecology: The Ascendent Perspective* (New York; Chichester: Columbia University Press, 1997): pp. 33 – 34.

⁸⁷ Julian Huxley brought these theories together along with those of other biologists in 1942, popularising the idea of a modern evolutionary synthesis. Julian Huxley, *Evolution: The Modern Synthesis: The Definitive Edition* (Cambridge, Massachusetts: MIT Press, 2010).

perspective, the dominant guiding principle of scientific explanation switched from determinism, in the sense epitomised by Laplace's demon, to what John Dupré calls probabilistic uniformitarianism: 'where the reign of law is as universal as under determinism; it is just that the laws decree only the range of possible events and the (precise) probabilities of their occurrence.'⁸⁸ Yet, there was another trend arising in science through the twentieth century, which did take a more holistic and process-orientated approach to the complexity of empirical phenomena, emphasising not so much the predictability of physical events, as the emergent capacity of systems to attain levels of stability and self-determination which resisted reductivist explanations.

Beginning in the 1920s, and seeking a means of sidestepping the seemingly irresolvable conflict between vitalism and mechanicism, Ludwig von Bertalanffy's research into the development of living organisms led him to define them as 'open systems'.⁸⁹ Whereas closed systems maintained their structural unity and stability without letting new material cross their boundaries, the dynamic equilibrium of open systems, such as that of a metabolizing organism, persisted by way of an ongoing exchange of matter with its surroundings.⁹⁰ The crucial consequence of this distinction was that organisms, along with a whole host of complex phenomena, from weather systems to social organisations, had to be understood holistically, not just in terms of their component parts, but with reference to the self-differentiation of that supervening unity, which emerged out of the interaction of these parts. Comparable insights were developed by way of Alfred North Whitehead's process philosophy, Norbert Wiener's cybernetics, and Illa Prigogine's research into thermodynamics, each of which, in its own fashion, elaborated the self-organised patterning of complex systems, over and above any revised form of reductivism or determinism.⁹¹ Wheeler describes these and other complimentary developments with reference to what Robert Laughlin has identified as an Age of Emergence supplanting the Age of Reductionism: by ultimately explaining processes in terms of their collective character, rather than their constituent parts, and, accordingly, by foregrounding the indispensability of context, they potentially restore a bridge between the natural and the human sciences.⁹²

Emergence here does not refer to a spiritual enhancement of materiality at some mysterious threshold, as in the notion of a disembodied consciousness spontaneously

⁸⁸ Dupré, *The Disorder of Things*: p. 172.

⁸⁹ Manfred Drack, 'Ludwig von Bertalanffy's Early Systems Approach', *Systems Research and Behavioral Science*, 26, 5 (2009), pp. 563-572.

⁹⁰ Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Applications* (New York: 1968, George Braziller): p. 121.

⁹¹ Wheeler, *The Whole Creature*: p. 52.

⁹² Wheeler, *The Whole Creature*: pp. 25 – 29. Robert Laughlin, *A Different Universe (Reinventing Physics from the Bottom Down)* (New York: Basic Books, 2005): p. 208.

supplementing a body at a critical moment in the history of evolution. Nor does it verify that the equivalent of a will, or self-motivated principle of design is to be found inherent in primordial matter. Instead, emergence posits that order itself is an emergent property, whereby initially haphazard, unpredictable occurrences progressively gain unforeseen levels of consistency. From the fundamental principles of physics right up to the traditions, rituals, and habits characterising culture, and spanning all those complex chemical reactions and biological organisations in between, laws arise out of collective interactions, rather than simply programming events in advance. What ‘emergent properties’ have in common together with corresponding concepts, such as ‘downward causation’ and ‘autopoiesis’, is a dependence on *relation* – that is, a relation as a state of affairs existing over and above two or more material bodies or configurations of energy, and hence as irreducible to the identity of a single substance. Relations, in this sense, are of fundamental consequence, both to physical dynamics (such as gravity, turbulence, and solubility) and to cultural conventions (such as legal institutions, political hierarchies, kinship structures, and social classes).⁹³ Yet, as both Favareau and John Deely point out, this recognition of the importance of relation had long since been established, even as modernity eroded its implications: studied intently by both ancient and medieval scholars, signs exemplify the capacity for organisational relations to causally configure the interactions of two or more phenomena – in this way, world and mind are intertwined.⁹⁴

Admittedly, it is not clear that an appreciation for emergence *et al.* is sufficient, in its own right, to heal the fractured figure of the human that has hitherto afflicted knowledge, or whether this too may be co-opted so as to entrench further the same split perspective in yet another form. If emergent complexity entails a new idea of nature, which at once resists predictability and hence any concerted pursuit of change, while also justifying an unconditional faith in the self-organisation of systems, then, even in its dispersal beyond the human, the adverse consequences of splitting knowledge into positions of authority and subjugation remains stubbornly in evidence. Foucault’s own account of biopolitics seems to document precisely this sort of slippage.⁹⁵ With neoliberalism the sovereignty formerly identified with

⁹³ Favareau, ‘The Evolutionary History of Biosemiotics’: pp. 17 – 18.

⁹⁴ Deely finds the seed of the doctrine of signs in discussions of Aristotle’s conception of relation, tracing its development through the Latin Age, from Augustine to John Poinot, its elision in the early modern era, and its eventual revival by Charles Peirce. John Deely, *Four Ages of Understanding*.

⁹⁵ Foucault began to formulate his notion of biopolitics in the first volume of his *History of Sexuality* in terms of a shift, in the nineteenth century, towards techniques of consolidating power by administering life, rather than threatening death, as in previous forms of sovereignty. Michel Foucault, *The History of Sexuality Volume 1: The Will to Knowledge*, trans. by Robert Hurley (Hammondsworth: Penguin, 1990). This theme was further developed, through lectures at the Collège de France, in terms of its association with forms of governmentality which exploit the capacity for competition inherent in human life, and through reference to those technologies of biopower which perpetuate the control of populations. Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-79*, trans. by Graham Burchell (Basingstoke: Palgrave Macmillan, 2008).

the autonomy of the human is acceded instead to the self-governance of market forces; individualism remains a dominant ideology, but the self-interest of the human in the guise of homo economicus is made to serve a globalised financial system that thrives on novelty, complexity, and unpredictability.

Nevertheless, as another distinctive expression of the Age of Emergence, and so another articulation of an alternative idea of nature, biosemiotics serves to clarify and consolidate a vital aspect of this shift in thought, which may help guard against the recurrence of a regressive attitude towards the continuity of mind and nature. As should become apparent, biosemiotics embeds a perspective on significance directly within the *self*-organisation of systems, establishing a kind of pivot point, at which the attribution of value can neither be entirely evaporated into the abstract conception of a disembodied mind, nor reduced to a purely physical determination. This standpoint does not just affirm the emergent power of whatever happens to supervene over evermore-complex natural, social, and economic processes. Instead, it is the exceptional position of living systems as systems of disseminating and interpreting signs that takes precedence, as a source of sentience and agency at the heart of human forms of organisation, as well as being inextricably intertwined with the evolution of life more generally.⁹⁶

Conceptualising the Inhabited World: Milieu and Environment

At this juncture, attention should be directed to one concept in particular, which also began to grow in prominence at the end of the nineteenth, and the beginning of the twentieth century. More so, perhaps, than terms like ‘instinct’ and ‘organism’, the word ‘environment’ is a concept which determines our contemporary sense of nature, and represents an explanatory principle that is itself in need of explanation. In contemporary parlance, to identify a structure as an environment is generally to establish a context which goes beyond human life alone, and which may simply be understood as a clarification of a broader idea of the natural world. In connection with biology, an environment circumscribes the boundary of an organism’s physiology,

Michel Foucault, *Security, Territory, Population: Lectures at the Collège de France, 1978-79*, trans. by Graham Burchell (Basingstoke: Palgrave Macmillan, 2009).

⁹⁶ The question of the reciprocal implications of biosemiotics and biopolitics, for one another, deserves a further, much more thorough exploration. Of interest is not only Foucault’s research, but also the work of those, such as Donna Haraway and Robert Esposito, who have attempted to identify a constructive dimension alongside the emergence of the biopolitical, linked to the consolidation of communities. As opposed to the stress on an innate compulsion to compete, which has been used to characterize homo economicus, biosemiotics, especially in the work of Jesper Hoffmeyer, lays emphasis on a tendency toward symbiosis and collaboration as leading factors within both biological and social evolution. This emphasis may be seen to revive the prospect of a more open and inclusive approach to the governance of life.

together with the natural conditions upon which its functionality depend. Yet, as the medium of subjective social interaction the environment may also act as the stage and scene of human culture, as well as supplying the objective field of scientific research and experimentation. No less significant are the French and German equivalents for this word, *milieu* and *Umwelt*. Each of these words harbours a multitude of meanings, having all, on different occasions, been used to translate one another, at once expanding and interfering within the fixed definition of each. By exploring the etymological interconnections between these three words an idea begins to become apparent of what, in this concept, most decisively dislodges the assumption that the rational subjective mind is a uniquely human attribute, disconnected from the natural world.

By contrast to environment, *milieu*, and *Umwelt*, the ancient Greek word, *periéchon*, which preceded these ideas, is harder to distinguish from notions of air, atmosphere, climate, and space in general. For the Ancient Greeks space itself implied a physical substance and corporeal vessel, with fluid and even embryo or egg-like qualities, as opposed to the homogenous area, defined by mathematical analysis, which Galileo helped to inaugurate.⁹⁷ Space, in this latter Galilean sense, represents a divisible, dynamic, and functional system, as opposed to a bodily aggregate at once organic and cosmological. From this point of view, the attempt to devise new words for that which situates and surrounds individuals might be seen as an attempt to recover the organic connotations of ancient conceptions of space. What had already drastically changed, however, as Foucault would surely insist, was the episteme presupposed in the development of such concepts.

In the alternative to a preface which Niklas Luhmann inserted within the English edition of his *Social Systems*, the German word for environment is affiliated with the concept of the ‘subject’ that crystallized at the end of the eighteenth century. Luhmann concedes that this idea had many forerunners, not least that of the animistic soul. However, he maintains that the idea of subjectivity in a strict-sense did not gain force until a doubly self-referential structure was attached to consciousness, whereby ‘the modern individual conceives of himself as an observer of his observing’:

The effects of this semantics of the subject were enormous. One consequence, for example, was that a concept of an opposite, relative to the subject, had to be invented. This was called *Umwelt*, and then later “environment,” *environnement*. Before this time there had been no environment. Instead the world was understood as the totality of things or as the support (*periéchon*, literally, “envelope”) of all their particulars. This

⁹⁷ Leo Spitzer, ‘Milieu and Ambience: An Essay in Historical Semantics’, *Philosophy and Phenomenological Research*, Vol. 3, No. 1 (Sep., 1942), pp. 1-42: pp. 3 – 8.

schema subject/environment dissolved the compactness of this conception of the world.⁹⁸

Although by opposing self and other, organism and world, and subject and object, the dialectical style of thinking incited by German idealism was, perhaps, a necessary forerunner of our contemporary sense of the environment, it alone was not directly responsible for the invention and widespread adoption of this term. The German word *Umwelt*, which Luhmann somewhat misleadingly identifies as the prototype of environmental thinking elsewhere, was not popularised as a specific concept until the twentieth century, and even then its meaning differed in several key respects from its English and French counterparts. It is this concept of an *Umwelt* specifically which can be brought to the fore, in place of the more general idea of space which Foucault drew attention to in 'Of Other Spaces'. While references to the environment and *milieu* began to gain currency in the nineteenth century, it was the twentieth century application of *Umwelt* that helped usher in an alternative conception of human life, not just the effacement of its divided form, but a new means of discerning the relations between mind and world.

The idea of an environment, as a setting tied intrinsically to the lives of its inhabitants, was formulated later than might be expected. In English, as a verb, the word had formerly referred to the action of surrounding something, but it was not until the nineteenth century that it came to denote a physical or natural context, notably in connection with the writings of Thomas Carlyle. Leo Spitzer suggests that it was Carlyle's translation of Goethe which established this latter sense of environment, rendering Goethe's 'Umgebung' with the almost tautological 'environment of circumstances'.⁹⁹ In fact, Carlyle used the word in its new capacity of a noun on a number of occasions (one of the earliest seems to be in his essay on Robert Burns), and the shift in this word's meaning can just as easily be seen as an unsurprising case of linguistic nominalisation, the use of a verb for the act of surrounding something as noun.¹⁰⁰ Nonetheless, Carlyle's use of this concept to translate Goethe was no accident. As Ralph Jessop has argued, Carlyle's development of the concept of an environment was, at root, a response to industrialism, and a key part of his ongoing critique of the mechanistic conception of life which

⁹⁸ Niklas Luhmann, *Social Systems*, translated by John Bednarz, Jr, with Dick Baecker, foreword by Eva M. Knodt (Stanford, California: Stanford University Press, 1995): p. xxxix.

⁹⁹ Leo Spitzer, 'Milieu and Ambience: An Essay in Historical Semantics, cont.' *Philosophy and Phenomenological Research*, Vol. 3, No. 2 (Dec., 1942), pp. 169-218: p. 204.

¹⁰⁰ Carlyle uses his essay on Burns to make a case for the importance of place to literature: 'Even the English writers, most popular in Burn's time, were little distinguished for their literary patriotism, in this its best sense. A certain attenuated cosmopolitanism had, in good measure, taken place of the old insular home-feeling; literature was, as it were, without any local environment – was not nourished by the affections which spring from a native soil.' Thomas Carlyle, *Essay on Robert Burns* [1828] (Boston, Chicago: Sibley and Company, 1896).

had been promoted through the Enlightenment.¹⁰¹ In keeping with its origins in Goethe's writings, and in association with the broader current of Romanticism, for Carlyle the environment denoted a living whole, in which the material conditions of nature together with the social, political, and spiritual aspects of culture seamlessly intermingled. In his *Sartor Resartus* Carlyle insinuated that it is the unity of the environment, in this holistic sense, which was torn apart by a scientific mind-set coupled with industrialism: 'Man's whole life and environment have been laid open and elucidated; scarcely a fragment or fibre of his Soul, Body, and Possessions, but has been probed, dissected, distilled, desiccated, and scientifically decomposed' – supposedly all that is left is the 'grand Tissue' of clothing, a notion Carlyle used to satirise the totalising abstractions of Enlightenment thought.¹⁰²

Yet, despite the apparent opposition to a reductive determinism that the original coinage of the word conveys, this did not prevent later applications of the concept of an environment from taking on another more mechanistic meaning in their own right. Charles Darwin did not use the word 'environment' in his *Origin of Species*, preferring to refer to the 'conditions of life'.¹⁰³ Perhaps Darwin avoided this term because of its relative unfamiliarity at the time, but his decision is also telling, given the fundamental role he attributed to inheritance in natural selection, along with competition between species, principles that distinguished his work from Lamarckian theories of evolution. Nevertheless, Darwin's eschewal of this word did not prevent, Herbert Spencer, one of Darwin's most prominent exponents, from frequently referring to the environment as a technical term. Initially inspired by the positivist philosopher of science Auguste Comte, and so originally a proponent of Lamarck's theory of evolution, in his *Principles of Psychology* Spencer defined the relation between the organism and its environment as that of 'a subject placed in the midst of objects', while characterising the environment itself as a domain of mechanical action and dynamic forces.¹⁰⁴ Having adopted Darwin's theory of natural selection, in his *Principles of Biology* Spencer began by criticising Comte for failing to grasp that the continual maintenance of inner action on behalf of the organism was the necessary counterbalance to environmental conditions, and therefore constitutive of life.¹⁰⁵ The environment itself became seen, through Spencer's example, as an

¹⁰¹ Ralph Jessop, 'Coinage of the Term Environment: A Word Without Authority and Carlyle's Displacement of the Mechanical Metaphor', *Literature Compass* 9/11 (2012), pp. 708-720.

¹⁰² Thomas Carlyle, *Sartor Resartus: The Life and Opinions of Herr Teufelsdröckh in Three Books* (London: Chapman and Hall, 1871): p. 2.

¹⁰³ As Gillian Beer observes in her introduction to a reprint of the 1859 text, Darwin did move towards a more Lamarckian view in later editions, after the end of the 1860s, because he lacked that genetic explanation which would allow him to respond to some of the objections to his argument. Charles Darwin, *On the Origin of Species* (Oxford: Oxford University Press: 2008): p. xxi.

¹⁰⁴ Herbert Spencer, *The Principles of Psychology* (London: Longman, Brown, Green, and Longmans, 1855): p. 269.

¹⁰⁵ Herbert Spencer, *The Principles of Biology: Volume 1* (New York: Appleton, 1891): p. 74.

essentially structureless and more or less chaotic domain, which was nonetheless defined and manipulated in terms of function, via the organism's efforts to adjust and adapt to its surroundings.¹⁰⁶ Although Spencer did register the development of increasingly complex environments by higher forms of life, including the advent of a social environment, he theorised that this process was permitted only by the enhanced differentiation of the individual organism, as a consolidated whole, from the background of its conditions of life.¹⁰⁷

To understand how, contrary to Carlyle's holistic perspective, Spencer came to see the environment as fundamentally a physical dynamic, and a counterpoint to both organism and psyche, it is necessary to examine the word Comte used to denote the same concept. As the French equivalent of 'environment', *milieu* has a longer history. Spitzer points to Pascal's 17th century use of the word to invoke the position of man between two abysses of infinity, the "infiniment grand" and the "infiniment petit". While recalling ancient and medieval ideas of the harmony between macrocosmos and microcosmos, Pascal's recourse to the mathematical dimension of infinity, and its links to Euclidean geometry, invoke a much less hospitable conception of the universe. Here can be discerned the early stirrings of a question which would become increasingly important throughout the modern era, concerning the proper place of the human in nature. Yet, it was the use of *milieu* to translate Isaac Newton which most exemplifies the connection of this word to scientific modernity. Both Spitzer and Georges Canguilhem identify Newton's functional 'medium' as the source of a more technical comprehension of 'milieu', a translated term which appeared in Voltaire's *Éléments de la Philosophie de Newton*, as well as Émilie du Châtelet's seminal version of Newton's *Principia*.¹⁰⁸ As Canguilhem notes, Newton himself referred to a medium in connection with his idea of aether, and to help solve the problem of causal action at a distance between distinct physical bodies.¹⁰⁹ He applied the concept of a vibrating medium, not only to the phenomenon of illumination, but also to explain physiological effects, from a sensation of light to a muscular reaction, and suggested that the brain itself must be directly influenced by these perturbations.¹¹⁰ Revising Descartes' rational method in empirical and mathematical terms, Newton's work had helped to establish a firm underlying equivalence between different fields of knowledge. On the one hand, this achievement represented a triumph for materialism, and seemed to liberate scientific thought from many unverifiable presuppositions. On the other, it set the scene for an ongoing partition

¹⁰⁶ Spencer, *The Principles of Biology: Volume 1*: p. 144.

¹⁰⁷ Spencer, *The Principles of Biology: Volume 1*: pp. 149 – 150.

¹⁰⁸ Isaac Newton and Émilie du Châtelet, *Principes Mathématiques de la Philosophie Naturelle: La Traduction Française Des Philosophiae Naturalis Principia Mathematica* (Ferney-Voltaire: Centre international d'étude du XVIII^e siècle, 2015).

¹⁰⁹ Georges Canguilhem, *Knowledge of Life*, translated by Stefanos Geroulanos and Daniela Ginsburg (New York: Fordham University Press, 2008): pp. 99 – 100.

¹¹⁰ Isaac Newton, *Opticks* (New York: Prometheus Books, 2003): pp. 353 – 354.

of mind and world; in all quarters of empirical reality the same deterministic view of nature became applicable, entrenched in a mechanistic conception of cause and effect as lawful, predictable, and ultimately inescapable.

Although Lamarck is best known as having associated a deterministic conception of the environment with the evolution of life, it was Comte who went on to specify the biological definition of a 'milieu' as 'the total ensemble of exterior circumstances necessary for the existence of each organism'.¹¹¹ Comte's definition could be applied to human beings, just as well as to other forms of life, and the use of the *milieu* to deterministically explain the emergence of complex organisations could thereby readily be extended to sociology, and even the study of art and literature, as in Hippolyte Taine's work. In one respect then the barrier between natural science and social science had already collapsed, but this collapse occurred at the expense of demolishing some of those differences which were vital to living species. Taine's account of art and literature as being the result of causal factors derived from the race, milieu, and historical moment of artists and authors was influenced by Comte, as well as the English positivists, Herbert Spencer and J. S. Mill.¹¹² Yet, his conception of a milieu as a catch-all term, tying together geographical, political, social, and psychological conditions, is no less reminiscent of Carlyle's Romantic sense of the environment as an ambient meeting point of diverse influences.¹¹³

From the perspective of living organisms, neither the broadness of environment and *milieu*, as each a confluence of natural and social influences, nor their narrowness, as a means of determining those extrinsic factors which direct development, would be sufficient to overcome the divide between objective causes and their subjective effects. As Canguilhem observes, with the advent of a deterministic sense of their *milieux* animals reverted to the status of Cartesian automatons through which nature acted blindly, machines without any meaningful capacity for feeling or intention of their own.¹¹⁴ Where, for Darwin, it was the contest between organisms that took priority over the efforts of each organism to adjust to its surroundings, viewed cynically this only served to cast the relation between life and its environment as that

¹¹¹ Auguste Comte qtd. in *Knowledge of Life*: pp. 101 – 102. Canguilhem explains that Lamarck attributed the cause of evolution to 'influencing circumstances', speaking of milieus only in the plural sense of different mediums, such as air and water. In the fortieth lesson of his *Course of Positive Philosophy* Comte repudiated the sense of a milieu as a substance in which a body was immersed, and instead characterised the relationship between organism and milieu as a 'conflict of forces'.

¹¹² See for example the introduction to Taine's three volume *A L'Histoire de la Littérature Anglaise*. In a nineteenth century English translation of this text Taine's 'three primordial forces' were rendered as 'race', 'surroundings', and 'epoch', which, he proposed, enabled history to be explained in both psychological and mechanical terms. Hippolyte Taine, *History of English Literature: Volume 1*, translated by H. Van Laun (New York: Worthington, 1889).

¹¹³ Taine both admired and criticised Carlyle, publishing an examination of the style and philosophy informing his writings. Hippolyte Taine, *L'Idéalisme Anglais, Étude sur Carlyle* (Paris: [?] 1864).

¹¹⁴ Canguilhem, *Knowledge of Life*: p. 103.

of either intolerance or relative indifference, in place of the concurrent vulnerability and receptivity which Lamarck had discerned.¹¹⁵ It is as if the transition between these two perspectives on evolution reflected another trend in human history, from a precarious situation of fraught dependence on nature to a state of presumed mastery and unchecked exploitation with the advance of industrialisation. Read more attentively, along with corroborating a continuity between the human species and other forms of life, both Lamarck and Darwin pre-empted important aspects of ecological science and environmentalism that would become more prominent in the twentieth century.¹¹⁶ Yet, with none of these new accounts of evolution and the natural world was the problem of what distinguishes the subjective access of different forms of life to their surroundings adequately addressed.

From Environment to Umwelt

The concept that would eventually surpass the restricted sense of an environment as an essential, but fundamentally physical setting for life, corresponds to the German word *Umwelt*. This word is said to have first appeared in the German work of the Danish poet Jens Baggesen, specifically an elegy to Napoleon written in 1800.¹¹⁷ Spitzer claims that this neologism was a metrical accident, simply well suited to fit the rhyme schemes of German verse, but Baggesen's links with early Romanticism, including friendship and correspondence with Johann Fichte and Friedrich Jacobi, suggest that he may have already associated this term – along with similar neologisms, such as *Umland* and *Umraum* – with a burgeoning sense of the importance of an individual's setting from a developmental point of view.¹¹⁸ Goethe also made use of the word in his *Italienische Reise*, associating it with the poetic inspiration of his surroundings, but not

¹¹⁵ Typically identified as the flaw in Lamarck's reasoning is not his sense of the impact of external circumstances, but the claim that a capacity for directly passing on acquired adaptations was the main driver of evolution. In other words, he attributed evolution to a single force, rather than the two-step process of variation and selection which Darwin observed. See Stephen Jay Gould, 'Shades of Lamarck', in *The Pandal Thumb: More Reflections in Natural History* (New York: Norton, 1980). This criticism does not diminish the importance of Lamarck's contribution to the history of biology, and the resurgence of epigenetics has resulted in a revival of Larmarkian principles which emphasize the importance of developmental variation. See *Transformations of Larmarkism: From Subtle Fluids to Molecular Biology*, edited by Snait B. Gissis and Eva Jablonka (Cambridge, Mass.: MIT Press, 2011).

¹¹⁶ Although neither identified a focus on the environment as supporting a discipline distinct from natural history, the importance of both Lamarck and Darwin is well established in histories of ecology. See for example Frank N. Egerton, *Roots of Ecology: Antiquity to Haeckel* (Berkeley: University of California Press, 2012).

¹¹⁷ Spitzer, 'Milieu and Ambience, cont.': pp. 207 – 208. Umas Sutrop, 'Umwelt – Word and Concept: Two Hundred Years of Semantic Change', *Semiotica* 134, 1/4, pp. 79-102: p. 455.

¹¹⁸ Another plausible explanation is that Baggesen simply used *Umwelt* to translate the Danish term *omwerden*. Hoffmeyer, *Biosemiotics*: p. 171.

going so far as to explicitly make the link with his research into plant morphology and his ideas about the contextualised wholeness of natural forms.¹¹⁹

The first to systematically make use of the concept of an *Umwelt* in German, attributing a much more precise and technical significance to this term, was the biologist Jakob von Uexküll. It was with Uexküll's work that a turn in the sense of what could define an environment, and, all the more significantly, in the sense of how an environment defined an organism, was more fully realised. In short, Uexküll eventually defined an *Umwelt*, not just as a physical environment with which an organism enjoyed or endured a reciprocal relationship, but as a world which encompassed and articulated each living being's access to existence. Hoffmeyer identifies the notion of an 'ecological niche' as the closest contemporary term, in so far as an organism's niche within a given ecosystem is defined on the basis of those conditions upon which a species depends to live, including its territory, food, climate etc. Yet, what distinguishes an *Umwelt* is that this niche is articulated 'as *the animal itself* apprehends it'.¹²⁰ Rather than being artificially imposed from an observer's point of view, an *Umwelt* is substantiated on the basis of an animal's autonomous capacity to identify food sources, potential mates, threats, and so forth, while maintaining itself within a domain amenable to its survival. From the outset of his scientific career, in a 1900 article which tackled the connection between comparative physiology and speculation about the souls of animals, Uexküll had made plain the anthropomorphism undermining attempts to understand behaviour purely on the basis of terms taken from human psychology, such as awareness, consciousness, memory, perception.¹²¹ Instead, the *Umweltforschung* which he went on to pioneer prioritised the observation of correlations between physiological and ethological processes, establishing the character of the *Umwelt* inhabited by a particular species only on this basis, and so bracketing speculation about the qualitative contents of conscious experience.

Uexküll used the word *Umwelt* on a couple of occasions in his first major monograph, a study of the biology of aquatic animals published in 1905, but at this point gave no special attention to the term, and in fact continued to refer more frequently to the 'milieu' of living organisms.¹²² Nevertheless, many of the concepts and thematic concerns which Uexküll would develop through the course of his career are already broached in this work. In keeping with the

¹¹⁹ Though the entry referring to an *Umwelt* is dated 1786, it was not published until 1816. Goethe describes working on his *Iphigenia*, while the splendid sights of the mountainous scenery do not disturb or inhibit his muse, but 'along with movement and open air, they evoke it all the more quickly'. Johann Wolfgang Goethe, *Italian Journey: Part One*, in *The Essential Goethe* (Princeton: Princeton University Press, 2016): p. 760. Johann Wolfgang Goethe, *Italienische Reise – Band 1* (2000) <<http://www.gutenberg.org/ebooks/2404>>

¹²⁰ Hoffmeyer, *Biosemiotics*: p. 171.

¹²¹ See Brentari, *Jakob von Uexküll*: p. 76.

¹²² Jakob von Uexküll, *Leitfaden in das Studium der Experimentellen Biologie der Wassertiere* (Wiesbaden: J. F. Bergmann, 1905).

neovitalism of those who influenced his approach to biology, including Hans Driesch, and his mentor Ernst von Baer, Uexküll explored the purposiveness (*Zweckmässigkeit*) of animal behaviour, against those who would reduce the entirety of biology to the analysis of machine-like functionality.¹²³ Furthermore, he already connected this question of purposiveness with the *Bauplan* of the organism, as the organising principle which appeared to underlie each animal's physiology, enabling disparate functions to operate in harmony with one another. In connection with a telling early reference to Kant's *Critique of Judgement*, Uexküll made the familiar point that, whereas machines are devised with particular ends in mind, living organisms appear as ends in themselves, acting in order to perpetuate their own existence as opposed to serving the function of an independent user.¹²⁴ This was not to say that attempts to explain living processes in a mechanistic fashion must be without value. Well aware of its success, Uexküll continued to advocate this method of detailing the attributes of organism as the most appropriate for the study of physiology, but so far as modelling the attitude of the organism to its own environment was concerned he sought to develop a different approach, which would do justice to biological entities as unified living beings.

Systematic reference to the Umwelt of organisms, and the emergence of this term as a distinctive concept in its own right began with Uexküll's *Umwelt und Innenwelt der Tiere*, the first edition of which was published in 1909.¹²⁵ To an extent, this text simply elaborated a critical point that the biologist had already begun to advance with his *Leitfaden* in connection with the milieu of animals: the sensations by which a particular species of organism accessed its surroundings were predicated on a system of perceptual organs which could not be readily equated with that conception of the external world taken for granted in human experience. Uexküll observed that the stimuli which affected an animal were not self-evident, and that a particular organism may react decisively to chemicals which remained imperceptible from another perspective.¹²⁶ At this stage, a milieu, as that section of the external world which affected an animal, could still be primarily understood as a physical objective domain, and was effectively conflated with the sphere of experience which subjectively orientated the activity of the animal. With his later work Uexküll reframed this problem, explicitly distinguishing between the objects of external reality and the means by which living organisms registered and reacted to these objects. This distinction was reflected in the disjunction between what Uexküll called the 'Umgebung', as the objective domain of the environment in general, and the 'Umwelt' in which a specific species of organism was embedded.¹²⁷ Even for human beings,

¹²³ Brentari, *Jakob von Uexküll*: pp. 52 – 53.

¹²⁴ Uexküll, *Leitfaden*: p. 6.

¹²⁵ Jakob von Uexküll, *Umwelt und Innenwelt der Tiere* (Berlin: Verlag von Julius Springer: 1909).

¹²⁶ Uexküll, *Leitfaden*: p. 12.

¹²⁷ Jakob von Uexküll, *Streifzüge durch die Umwelten von Tieren und Menschen: Ein Bilderbuch Unsichtbarer Welten. Bedeutungslehre* (Hamburg: Rowohlt, 1956): pp. 30 – 31.

who could build up a much more accurate picture of the objective world via technology and scientific study, perception of the *Umgebung* was mediated by the Umwelt in which they immediately found themselves – hence the tendency to distort or neglect the Umwelt of other species. In a short article entitled ‘Die Umwelt’, published in *Neue Rundschau* in 1910, Uexküll summarised the methodological implications of the observation upon which his work would continue to be founded:

We have absolutely no right to affirm that the world of *our* sense organs is the animal’s world. On the contrary, every animal lives in a world specific to it, different from that of its neighbours. We must, therefore, speak of countless “environments” [*Umwelten*], amongst which the world surrounding us is only an isolated case which should not be considered normative.¹²⁸

Carlo Brentari explains Uexküll’s decision to dispense with the use of ‘milieu’, in favour of a focus on the ‘Umwelten’ of animals, with reference to another term that deviated from established accounts of the relation between organisms and their environments. Rather than being adapted to their environments through a necessarily fraught process of endeavouring to fit into and master their surroundings, Uexküll began to describe organisms as being pre-emptively structured to integrate with an Umwelt. Accordingly, in place of the German term *Anpassung*, which had already been established as an equivalent of the English ‘adaptation’ by Darwinian biologists like Ernst Haeckel, Uexküll evoked a closer match between each form of life and its setting with the word *Einpassung*.¹²⁹ With this switch in terminology, Uexküll made plain his break with both Lamarkian and Darwinian accounts of the evolution of species, preferring to emphasise the ecological reciprocity which he perceived united different organisms in relationships of mutual dependency, as opposed to the struggle for survival that indicated incessant competition. This point also introduces a more tendentious aspect of Uexküll’s work: his supposition that a kind of transcendental and effectively fixed harmony governed the form and interactions of all living beings. A more detailed analysis of this aspect of Uexküll’s thought, in terms of his use of musical metaphors to describe the relations and processes characterising life, will be conducted in chapter four. However, the critique that may

¹²⁸ Jakob von Uexküll, ‘Die Umwelt’, *Neue Rundschau* 21 (1910), pp. 638-648: p. 639. Quoted in translation in Carlo Brentari, *Jakob von Uexküll: The Discovery of the Umwelt between Biosemiotics and Theoretical Biology* (Dordrecht; Heidelberg: Springer, 2015): p. 79.

¹²⁹ Although in the first edition of *Umwelt und Innenwelt* Uexküll did not make use of this particular concept, with the second edition he stated that all animals were inserted [*eingepasst*] into their environments with equal perfection, rather than being imperfectly adapted to their surroundings. Brentari, *Uexküll*: pp. 77 – 79. With his *Theoretische Biologie* Uexküll dedicated an entire subsection to the concept of *Einpassung*. Jakob von Uexküll, *Theoretische Biologie*, 2nd revised edition, (Berlin: Verlag von Julius Springer, 1928): pp. 216 – 221.

be developed of this line of reasoning does not diminish either the validity of foregrounding the interdependency uniting different organisms, or the important legacy of the concept of the Umwelt in its own right.

CHAPTER 2.

Uexküll's Umwelt and the Disappearance of Subjectivity

According to Uexküll's theory of biology every organism ought to be conceived of holistically, in partnership with the specific Umwelt that defined its environment. Uexküll originally introduced the term 'Umwelt' in order to discriminate between the specificity of those markers of perception and behaviour that were available to different species. Since different species were endowed with different characteristics correspondingly their sense of a world must also diverge, meaning that the sense of a world available to forms of life other than human beings radically diverged. On the basis of this realisation, Uexküll argued that only by scrutinising the anatomical and physiological features of an organism's body could some genuine insight into the perception and behaviour of living creatures be gained. He conceptualised the integral unity of these somatic characteristics by means of the German word *Bauplan*.¹³⁰ In theory, the physiology of every individual organism conformed to a basic template that determined in advance the construction of the species to which it belonged. In practice, those variations that emerged between individuals of the same species would seem to undermine Uexküll's notion of a unified plan, but the biologist was prepared to overlook this possibility, and instead focused on the generalisations that could be successfully applied to the majority of members of a particular species. On the basis of its *Bauplan*, each organism could be assigned a field of significance that circumscribed a particular version of a world, a frontier inseparable from its entwinement together with the apparatus that made the manifestation of its surroundings possible. By enveloping the organism the Umwelt becomes the site of its perception and behaviour, amalgamating its sense of acting and being acted upon within a single framework, as determined by the particular physiological characteristics of the species to which a creature belonged.

The crux of the bond between an organism and its corresponding Umwelt was what Uexküll called the functional cycle. This concept developed out of Uexküll's experimental research into muscular regulation. His early reputation as a scientist was secured by his discovery that the excitation of nerves cells is directed towards outstretched muscle, maintaining what would later become known as reafferent control.¹³¹ This discovery demonstrated that the brain of an animal maintained a regulatory causal link with the muscular

¹³⁰ Jakob von Uexküll, *Environment [Umwelt] and Inner World of Animals* [1909], translated by Chauncey J. Mellor and Doris Gove, excerpts in *Foundations of Comparative Ethology*, edited by Gordon M. Burghardt (New York: Van Nostrand Reinhold, 1985): pp. 5 – 7; 223 – 224.

¹³¹ T. Rütting, 'History and significance of Jakob von Uexküll' in *Sign Systems Studies* 32, 1/2 (2004): pp. 39 – 40.

capacity of its limbs, enabling it to receptively adjust its movements in conjunction with changes to the objective of its activity. By supplying an example of the decisive role of negative feedback within a biological system, Uexküll's research in this direction has been identified as a notable precursor of cybernetics. Taking the mechanism of negative feedback as a paradigm for their investigations, those active at the Macy Conferences in the 1940s and 50s sought to elucidate parallels between technological and physiological processes, modelling the interactions between systems, information, and environments in a manner that would prove influential for both biosemiotics and ecological science. Yet, so far as Uexküll, himself was concerned, even more profound than the quantifiable dimension of this physiological dynamic, was the realisation that it must also be invested in a qualitative cognitive framework.

As Brentari recounts, the notion of the functional cycle represented something of a watershed in Uexküll's thinking: the replacement of a chapter on 'The reflex' with that entitled 'The functional cycle' in the second edition of Uexküll's *Umwelt und Innenwelt der Tiere* attests to the importance of this shift.¹³² The introduction of this concept enabled Uexküll to integrate a sequence of stimulus and response together with the environment in which these interactions gained cogency, and to expose the question of the underlying cause of behavioural acts, which reflex models of behaviour failed to adequately confront.¹³³ The functional cycle illustrated the means by which the capabilities of a particular organism and the features attracting its attention slotted into one another, comprising a systematic whole.¹³⁴ It schematised the process whereby the animal was at first able to recognise the implications of a particular object or event, and thereafter couple this manifestation with a practical response. As Uexküll outlined in a diagram of the functional cycle, each impulse for action was arranged in a self-contained feedback loop, dividing the inner world of the organism into two halves.¹³⁵ One half received those impressions derived from external stimuli, establishing a facet of the world as sensed, the other converted this information into a practical response, creating a world of effective action. The rules that dictated which features were available for recognition, together with the functions they triggered, were always specific to a particular species, being intransigently determined by the bodily organs this species possessed. This meant that the categories and values which human beings took for granted when making sense of their surroundings were inappropriate when it came to apprehending the *Umwelt* of another species.

Building upon his concept of the functional cycle, Uexküll realised that this form of embodied self-reference not only allowed animals to control their movements, but also

¹³² Brentari, *Jakob von Uexküll*: pp. 97 – 98.

¹³³ Brentari, *Jakob von Uexküll*: p. 98.

¹³⁴ Jakob von Uexküll, *A Foray Into the Worlds of Animals and Humans* [1934], with *A Theory of Meaning* [1940], translated by Joseph D. Neil, introduction by Dorion Sagan (Minneapolis, Minnesota: University of Minnesota Press, 2010): p. 10.

¹³⁵ Jakob von Uexküll, *Theoretical Biology*: pp. 155 -156.

amounted to an indispensable prerequisite for the composition and coherence of their perceptual experience.¹³⁶ The word *Umwelt* denoted the corresponding encapsulation of the organism within a field of stimulus and response, or, as Uexküll would put it, *Merkmal* and *Wirkmal*, which in conjunction with one another circumscribed a creature's capacity for interacting with those forms, events and processes that described a physical locality. In addition to an *Umwelt*, encapsulating all relevant objects and properties within the external environment, in some species this was partnered with an 'Innenwelt'. Uexküll identified an *Innenwelt* with the animal's capacity to register its own bodily processes and thereby build up an internal sense of the world outside. Consisting of those specialised biological structures which enabled certain organisms to map out various features of their perception, an *Innenwelt* allowed a select group of so-called 'higher animals' to represent the circumstance of their surroundings within an integrated structure.¹³⁷ Crucially the interdependence of these two structures created a closed unity, peculiar to those attributes through which the animal was able to make sense of and respond to its environment. Consequently, it was not only a portion of the area surrounding the animal, a fragment of objectivity demarcated by metrical coordinates of space and time which defined its *Umwelt*, rather it was the lived experience of the organism itself. So far as Uexküll was concerned the presumption of a single-shared world in which every being participated unreservedly no longer amounted to an adequate basis for biological science (especially in so far as that world was assumed mastered definitively in human perception). Only by scrutinising the 'Bauplan' (construction plan) of each organism, Uexküll argued, as articulated in the anatomy and physiology that made possible its integration within an *Umwelt* and *Innenwelt*, could life as lived be genuinely appreciated.

The earlier work of Claude Bernard in the 1860s had set a precedent for this kind of distinction by discriminating between a *milieu extérieur* and a *milieu intérieur*.¹³⁸ In this way Bernard opposed the inorganic surroundings of the organism to the environment of membranes and circulating fluids enclosed within its own body.¹³⁹ By preserving homeostasis, this inner environment maintained the individual's relative autonomy despite the variable conditions of the world outside. This refined model of the medium of living processes was an incentive for new forms of biological experimentation, but Bernard also remained attached to a mechanistic

¹³⁶ Rüting, 'History and significance of Jakob von Uexküll': pp. 50 – 52.

¹³⁷ Uexküll, *Theoretical Biology*: pp. 126 – 127.

¹³⁸ In fact, Bernard's reputation in his own lifetime was secured by his many experimental innovations, while his ideas about the internal environments of organisms were not explicitly adopted until more than fifty years after their first formulation. In the first decades of the twentieth century several prominent physiologists would make use of the concept, including J. S. Haldane and Walter B. Cannon. See Charles G. Gross, 'Claude Bernard and the Constancy of the Internal Environment', *Neuroscientist*, 4 (1998), pp. 380–385.

¹³⁹ Claude Bernard, *An Introduction to the Study of Experimental Medicine*, translated by H. C. Greene ([New York]: Henry Schuman, 1949): pp. 63 – 64.

conception of life which neglected the organism's own perspective on this division between an outer and inner world.¹⁴⁰ As Spitzer put it, through Bernard's division of the organism's milieu determinism was insinuated even 'under the skin of the individual':

Man is at the mercy, not only of the *milieu extérieur* of which he is the product, but also the *milieu intérieur* which his own organism has produced (and any possibility of equilibrium, of harmony, between the two *milieux* is granted only to the lower orders of creation); man must realize he is a given sum total.¹⁴¹

By contrast, Uexküll's *Innenwelt* was not a microcosm containing the material medium of the organism's metabolism, rather it referred to an organism's physiological capacity for elaborating a depiction of its external surroundings in accordance with the Umwelt which predetermined their significance. In higher animals the knowledge afforded by an *Innenwelt* depended upon a network of neurological pathways which together organised stimulations spatially and in terms of different sensory categories. The resulting impression of a world was not isomorphic with external reality, nor was it equivalent to a psychological 'representation' of the environment, instead, what emerged from the mediation between stimuli and their reception was a sign, a relation organising the conveyance of sensory information from environmental events and the organism's corresponding reaction to this stimulus:

[I]n the nervous system it is not the stimulus itself that sets forth, but, instead, there appears a completely different process, which has nothing to do with environmental events. This has to be read as a *sign* that a stimulus is present in the environment and that it has encountered a receptor. Nothing is said about the quality of the stimulus. Stimuli from the external world are globally translated as a nervous sign language.¹⁴²

In accordance with the translation of stimuli into signs, another no less vital characteristic of each Umwelt concerned its further differentiation into what Uexküll called the 'Merkwelt', as the environment of sensory awareness, and the 'Wirkwelt', as the environment

¹⁴⁰ 'Now, a living organism is nothing but a wonderful machine endowed with the most marvellous properties and set going by means of the most complex and delicate mechanism. There are no forces opposed and struggling one with another; in nature there can be only order and disorder, harmony or discord.' Bernard, *Experimental Medicine*: p. 63.

¹⁴¹ Spitzer, 'Milieu and Ambience, cont.': pp. 183 – 184.

¹⁴² Jakob von Uexküll qtd. in translation in Brentari, *Uexküll*: p. 86. The original text reads: 'Er kann nur als Zeichen dafür dienen, daß sich in der Umwelt ein Reiz befindet, der den Rezeptor getroffen hat. Über die Qualität des Reizes sagt er nichts aus. Es werden die Reize der Außenwelt samt und sonders in eine nervöse Zeichensprache.' Uexküll, *Umwelt und Innenwelt*: p. 192.

of behaviour and effective action.¹⁴³ With this distinction Uexküll addressed the underlying separation between those sensory organs, such as the eye, that supplied information about the organism's surroundings, and those effector organs, such as the muscles and limbs, by means of which the organism reacted to stimuli. An *Umwelt* served to integrate these two contrasting, yet complimentary aspects of a single lived world. By articulating the relation between an organism and its environment, not only in terms of a passive reception of forces and information, but equally through the capacity of a creature to actively intervene within its surroundings, Uexküll opened up the connection between life and its setting as a dynamic hinging on interpretation. What mattered was not just the organism's ability to sense and so have its behaviour determined by particular stimuli, but the predisposition to register and respond to these sources of sensation in a manner which might render their apprehension meaningful.

Throughout his life Uexküll continued to develop the connotations of his concept of *Umwelt*, refining through experiment its implications for biology, and in some cases elaborating philosophical dimensions not necessarily explicit in its initial formulation. What remained critical within his work was the assertion that biology should proceed by means of a subjectivist epistemology, directed towards conceptualising the organism's capacity to grasp the objects of its subsistence, rather than treating the organism itself as if it were no more than a markedly complicated object.¹⁴⁴ Conversely, to attend solely to the *Umgebung*, the objective domain or geography which science tended to take for granted, but which was in fact simply the projected surroundings of the human *Umwelt*, was to neglect the intricate configurations of existence which, in actuality, delineated the living world.¹⁴⁵ Whilst these myriad facets of reality intersected, they could not straightforwardly communicate; their cooperation was predicated upon the compatibility of each organism's *Bauplan*. Supposedly, only human beings were endowed with the unique privilege of representing and articulating the state of their surroundings as they might be viewed independently of any single subjective perspective.

As for those organisms which lacked nervous systems, and so could not possibly establish a unified picture of their surroundings, the notion that such creatures inhabit an *Umwelt* may seem less valid. Yet, arguably, this concept is all the more appropriate in so far as it captures the degree to which biological entities are not wholly self-contained, but always caught within the scope of an environment that selectively orientates their activity. Strictly speaking, Uexküll aligned an *Umwelt* in the fullest sense only with those animals of sufficient complexity to coherently model their surroundings. Lacking the rudiments of the neurological framework which made reflexes possible, single-cellular organisms, plants, and some other

¹⁴³ Uexküll, *Theoretische Biologie*, 2nd revised edition, (Berlin: Verlag von Julius Springer, 1928): p. 111.

¹⁴⁴ Jakob von Uexküll, *Theoretical Biology*: pp. xi – xvi.

¹⁴⁵ Jakob von Uexküll, *Environment [Umwelt] and Inner World of Animals*: pp. 240 – 241.

forms of multi-cellular life, did not possess the capacity to reproduce a unified form of their environment as an *Innenwelt*, in the same manner as animals. Instead, lacking true synthesis, their interaction with external events was enacted only at the level of essential stimuli, apprehending the properties of objects, rather than distinguishing objects themselves as ensembles of properties.¹⁴⁶ Yet, so far as identifying organisms not just with their physiological attributes, but with the organisational plan that contextualised their existence, and guided the selection of stimuli from a given environment, the same principles applied across all forms of life.

Between the life of lower-organisms and that of their descendents Uexküll interposed a psychological barrier in the form of the ‘Gegenwelt’, the counter-world by means of which physiologically more complex beings could consolidate an internal representation of their environment. A primitive indication of the kinds of developments that might give rise to this counter-world was apparent in the neurology of earthworms, in which the distribution of ganglia into two separate centres suggested a means of discriminating between left and right. From this foundation, more sophisticated counter-worlds could be conceived as modelling the Umwelt of other species, depending upon the organisation of their nervous systems. Nuclei predisposed to successive excitation implied motorreception, the drafting of images upon the retina iconoreception, and accompanying distinctions of colour chromoreception, as an intensification in the intricate arrangements of nerve-endings was reflected in the sophistication of the organism’s counter-world.¹⁴⁷ For lower organisms such as the sea urchin, on the other hand, the lack of a continuous nervous system meant that not so much as a unified impulse could be attained; with the exception of shadows, all other stimuli generated only weak undifferentiated excitations. As a consequence of this lack of sensory unity, as far as a sea urchin was concerned it was apparently the ‘legs which moved the animal’, rather than, as we are accustomed to expect, the animal which moved its legs. Yet, in spite of its apparent disarray, Uexküll maintained that the contiguous construction of this ‘reflex republic’ was enough to draw the relevant features of the sea urchin’s surroundings into an organised Umwelt.¹⁴⁸ So long as an organism could receive stimuli and transform them into excitations Uexküll contended that they were able to form a function-cycle and correspondingly a specialised version of the world. It was the conditional unity of this Umwelt which sustained the life of the

¹⁴⁶ Uexküll did sometimes attribute a form of Umwelt to single cellular organisms, including within his *Theoretical Biology*. This makes his denial that plants possess an Umwelt, being immersed, instead, within a *Whonhülle*, a ‘dwelling integument’ that curtailed their relationship with the external world, somewhat puzzling. For a more detailed discussion of this question see Kalevi Kull, ‘An Introduction to Phytosemiotics: Semiotic Botany and Vegetative Sign Systems’, *Sign System Studies* 28 (2000), pp. 326-350.

¹⁴⁷ Jakob von Uexküll, *Environment [Umwelt] and Inner World of Animals*: pp. 235 – 236.

¹⁴⁸ Jakob von Uexküll, *Environment [Umwelt] and Inner World of Animals*: p. 231.

organism as a whole, suggesting that in the form of a nexus of signs, the lived environment obtained a precedence, which could not be subordinated to the mind, body, or soul of the creature in question.

The Lesson of the Tick

More than once in his writings Uexküll drew attention to the condition of the female tick following its fertilisation through mating:

The theme of life of the tick is simple. For her eggs to mature she needs warm blood. Mammals all have warm blood. To get warm blood the tick has to attack a mammal of any kind. How does the tick recognize a mammal?¹⁴⁹

As Uexküll explained, the tick has none of the so-called five senses in the form we might commonly understand these organs. Instead its sensory access to the world is differentiated only by those carriers of significance sufficient to complete the final stage of its life-cycle: reproduction followed by death. In addition to the dermal photosensitivity necessary to orientate a climb upwards towards sunlight, and thereby secure a vantage point from which it can drop onto a suitable host, in its fertilised state the tick's Umwelt consists of three other *Merkmalträger*, each of which induces a specific response. Firstly, the butyric acid which emanates from the skin glands of mammals, announces the proximity of the tick's approaching prey, and thus signals that it must release itself from its promontory, allowing either gravity or physical contact to guide it onwards. Secondly, having met with some kind of surface, attention to temperature allows the tick to detect whether it has encountered anything that is likely to be warm-blooded. Finally a degree of tactile awareness and sensitivity to texture enables the arachnid to locate a site unobstructed by hair, where it can bury its mouthparts beneath the skin, engorging itself with blood. All other possible indicators of a world beyond the tick's own impulses, ensuring the survivability of its eggs, recede into an indistinct background, a perimeter of absolute shadow. Those effects which might ordinarily be assumed to invoke the 'nature' of the tick's environment - the sound of birdsong, the scent of blossoms, the rustling of leaves in the wind – remain obscure. Even the chemical makeup of the liquid consumed is ignored; the tick lacks all sense of taste and will ingest any fluid of the right temperature.¹⁵⁰ If, having been dislodged from its post, the tick does not encounter anything of a suitable temperature then it will simply attempt to begin its ascent once again, thereafter potentially

¹⁴⁹ Jakob von Uexküll, 'The New Concept of Umwelt: A Link Between Science and the Humanities' (1936) *Semiotica*, 134, 1/4 (2001): p. 119.

¹⁵⁰ Uexküll, 'A Stroll Through the Worlds of Animals and Men': p. 7.

waiting without nourishment for up to eighteen years, until the scent of butyric acid brings an end to its suspense.¹⁵¹

As Giorgio Agamben has remarked, in its dedication to a single project the tick establishes a passion, together with these very few, intensely determined relations, that seems incomprehensible when weighed against the many layered intricacies of human consciousness: ‘The tick is this relationship; she lives only in it and for it’, fastidiously trailing those cues that instigate its movements, living only in the tension of their incorporation.¹⁵² In keeping with Martin Heidegger’s interpretation of Uexküll’s ideas, Agamben argues that what is most immediately striking about this Umwelt is its narrowness, a perceived poverty which defies empathy to the extent that it seems quite possibly absurd to associate it with any kind of awareness, or even to regard it as a ‘world’ at all.¹⁵³ Yet, Uexküll himself would not necessarily have appreciated this characterisation of his work. It was not simply the labelled parts of the tick’s *Bauplan* that should be acknowledged, nor should the restricted constituents of its Umwelt be emphasised in isolation, rather what deserved emphasis was that ethos of life which drove these distinct elements and sustained their relation to one another; in this sense Uexküll affirmed not only the poverty of the tick’s world, but its security, order, and vitality. What bound these distinct elements together was the tick’s own biology; its integral commitment to a set of laws structuring its environment, and the specific *Bauplan* that acted as a cipher, hinting at the rule of life that its physiology followed:

The tick’s life history provides support for the validity of the biological versus the heretofore customary physiological approach. To the physiologist, every living creature is an object that exists in the human world. He investigates the organs of living things and the way they work together, as a technician would examine a strange machine. The biologist, on the other hand, takes into account each individual as a subject, living in a world of its own, of which it is the centre. It cannot therefore, be compared to a machine, but only to the engineer who operates the machine.¹⁵⁴

This quotation helps attest to the role of what can be found at the centre of Uexküll’s biological understanding of life. What remained critical within his work was the assertion that biology should proceed by means of a subjectivist epistemology, directed towards

¹⁵¹ Uexküll, ‘A Stroll Through the Worlds of Animals and Men’: p. 12.

¹⁵² Giorgio Agamben, *The Open: Man and Animal*, translated by Kevin Attell (Stanford, California: Stanford University Press, 2004): p. 47.

¹⁵³ See Martin Heidegger, *The Fundamental Concepts of Metaphysics: World, Finitude, and Solitude*, translated by William McNeill and Nicholas Walker (Bloomington, Indianapolis: Indiana University Press, 1995).

¹⁵⁴ Jakob von Uexküll, ‘A Stroll Through the Worlds of Animals and Men’: pp. 7 – 8.

conceptualising the organism's capacity to grasp the objects of its subsistence, rather than treating the organism itself as if it were no more than a markedly complicated object. In addition to analysing the set of causally connected physical apparatuses described by physiology, Uexküll sought to appreciate the being that he purported must operate this device. This 'subject' did not necessarily amount to an immaterial reflective consciousness as in the Cartesian cogito. Instead it was defined primarily by the fact that it had 'a world of its own', the plot of a 'life history'. What gave rise to this world was the physiological capacity of this 'subject' to register phenomena as immanently significant, for example detecting the chemical presence of butyric acid as an invitation to 'let go' and relinquish a relatively secure position for the sake of a more pressing urge. It was the difference sustained by the relation of the 'subject' to its world that engendered meaning: for Uexküll's tick, butyric acid was not just a collection of molecules, but the sign of something other than itself, the presence of a mammal that, in turn, was not just a class of animal, but a creature possessing warm-blood, the tick's potential host and prey. In the same way that a machine must not only be engineered to be autonomous, but also triggered or switched on and thereby operated in order to function, through the corporeal interpretation of its world the organism endows the attributes of its body with a purpose ('Zweckmässigkeit') or directedness ('Zielstrebigkeit'), the anticipated telos of its drives, instincts and desires. As Uexküll's own phrasing has it, indications of stimuli, in their immanent connection with objects, 'enable the animal to guide its movements, much as the signs at sea enable the sailor to steer his ship', and the animal 'by the very fact of exercising such direction, creates a world for itself'.¹⁵⁵

According to Uexküll a 'subject' was not necessarily connected with an ego, in the psychological sense of a unified and self-conscious process of apperception. From a biologist's point of view, the subject was to be seen solely from the outside, a formation cohesive only in so far as its existence could be extrapolated from physiological facts. The subject's agency could only be determined hypothetically, without reference to its quality, as the inaccessible source of those ordered impulses directed towards the exterior.¹⁵⁶ It is through attention to these considerations that a decisive question arises: what is the nature of the 'subject' which is being exposed here? If, at its simplest level, the definition of this subject rests upon no more than the fact of it having a world, specifically the Umwelt which lends some organic coherence to otherwise incommensurate stimuli and excitations, then what makes this subject anything more than an inflection of the observer's perspective, the equivalent of a syndrome abstracted from diverse yet disparate symptoms? In Uexküll's account of it, the answer to these questions depended upon the 'natural factor' which enabled the cell, the basic framework of organic life,

¹⁵⁵ Jakob von Uexküll, *Theoretical Biology*: p. 126.

¹⁵⁶ Jakob von Uexküll, *Theoretical Biology*: pp. 226 – 227.

‘to be a law unto itself’ and thus to select indicators in keeping with its *Bauplan*.¹⁵⁷ Given that the impulses responsible for implementing this ‘natural factor’, and maintaining its framework, were supposedly irreducible to any material or mechanical basis, and so essentially inexplicable, this answer alone does not seem satisfactory.

From the outset of his *Theoretical Biology* Uexküll made plain his debt to the Kantian epistemology which he insisted had inspired his thought, stating that ‘[a]ll reality is subjective appearance’ and that ‘before any single piece of knowledge can be received, its form must already be prepared in the mind’.¹⁵⁸ As Geoffrey Winthrop-Young has observed, Uexküll’s representation of Kantian philosophy, here and elsewhere, is somewhat lacking in detail: Uexküll was not primarily concerned with conforming to those distinctions technically fundamental to Kant’s system, for example he did not consistently discriminate between the transcendental and the empirical, or the analytical and the synthetic, in the manner of an orthodox Kantian.¹⁵⁹ In fairness, at least initially, Uexküll did not intend to produce a philosophical rationalization of subjectivity, and he did not claim any particular expertise concerning this topic, rather he hoped to make possible a science attuned to the irreducibility of an organism’s relation to its world. However, as Winthrop-Young also observes, arguably just as interesting as the debt of Uexküll’s epistemology to the philosophical tradition, is the relationship of his biological theories to those media inventions which were helping to transform the makeup of the human Umwelt as the twentieth century began.¹⁶⁰

The networks of concepts which Uexküll strung together, in order to animate and ventriloquize the physiological attributes of organisms, had their counterpart in those telegrams, telephones, phonograms, and cinemas, which had begun to proliferate in conjunction with the growth and self-organisation of modern society.¹⁶¹ Diverted through an ever expanding grid of wires, screens, microphones, and speakers, these means of mechanically reproducing information were together colonising a new kind of Umwelt in their own right. Nevertheless, it is not enough to suppose that Uexküll’s ideas were simply a by-product of his time, an

¹⁵⁷ Jakob von Uexküll, *Theoretical Biology*: pp. 232 – 233.

¹⁵⁸ Jakob von Uexküll, *Theoretical Biology*: pp. xv – xvi.

¹⁵⁹ Geoffrey Winthrop-Young, Afterword to Jakob von Uexküll, *A Foray Into the Worlds of Animals and Humans* [1934], with *A Theory of Meaning* [1940], translated by Joseph D. Neil, introduction by Dorion Sagan (Minneapolis, Minnesota: University of Minnesota Press, 2010): p. 231. Brentari’s critical account of the role of Kantian concepts in Uexküll’s work, including the transcendental, is much more detailed.

¹⁶⁰ Winthrop-Young, Afterword to *A Foray Into the Worlds of Animals and Humans*: pp. 235 – 239.

¹⁶¹ As an early commentator on Uexküll’s work, Herbert Spencer Jennings noticed a reliance on machine-like conceptions of the organism’s workings, which persisted despite Uexküll’s critique of mechanistic explanations of life. Although, for his part Jennings recognized older forms of technology. ‘Main tubes, feeders, reservoirs, valves, etc., are devised and represented by diagrams, till we finally get figures which resemble the plan for a dye-works or a flour mill.’ ‘The Work of J. von Uexküll on the Physiology of Movements and Behavior’, *Journal of Comparative Neurology and Psychology*, Vol. 19, Issue 3 (June 1909), pp. 313-336: p. 326.

example of socially constructed science, and hence no more than the contingent effect of a historical cause. Certainly, new technologies facilitated the attempts of Uexküll and other biologists to model the behaviour and cognition of non-human animals, from both an experimental and conceptual point of view.¹⁶² Yet the invention of these technologies was reciprocally informed by those physiological characteristics of human beings, which, in turn, had been inherited and adapted from the legacy of non-human forms of life. Critically, the biology of human beings, as an addendum to that which orientated the course of life in general, included a propensity for seeking out, assessing, refining, recalling, and passing on signs, a propensity had its roots in those physical processes that had incited matter to organise itself in the first place. Arguably Uexküll's most technologically advanced idea was one of his first, the feedback loop of the *Functionkreis*, and his theories were, in a number of other respects, ill-timed, harking back to an ancient ideal of harmonious nature, as much as they pre-empted a growing emphasis on information and relativity.

Beyond this technological dimension of Uexküll's thought, and no matter the attempts of later theorists of life and mind to develop systematic conceptions of the environment within a more positivistic or materialist framework, a sense of subjectivity, which could not be subsumed in objective analysis, was key to the biologist's understanding of the Umwelt. For Uexküll, regulating every functional cycle, and so leading the way at the centre of each Umwelt, was the subject. It was this subjective aspect of the organism that animated an environment, enriching it with meaning, and converting what would otherwise remain an undifferentiated surrounding, into the lived experience of a world. By virtue of its subjectivity, every animal, from the simplest to the most complex, formed a perfect couple together with its Umwelt. As a law unto itself, even an individual cell could be deemed a subject, since its activity followed a set of prescribed rules which Uexküll insisted were irreducible to any mechanical process. What varied was the degree of complexity this relationship entailed: the simple animal inhabited a simple Umwelt; the multiform animal dwelt within an Umwelt as richly articulated as its own physiology. In either case, it was this subjective core which ensured that the organism as a whole acted in accordance with nature's plan.

The problem that this conviction seemed to entail was that of ever finding empirical evidence of where this spirit of subjectivity might originate. Although Uexküll was happy to attest that the subject 'lies concealed, eternally beyond the reach of knowledge', on occasion he seemed unable to resist the temptation to provide proof of this inexplicable essence of life.

¹⁶² For an account of late nineteenth and early twentieth century attempts to simulate life and model intelligence using machines, prior to the advent of cybernetics, as well as details of the context of research into neurology which influenced Uexküll, see Roberto Cordeschi, *The Discovery of the Artificial: Behaviour, Mind and Machines Before and Beyond Cybernetics*, (Dordrecht; London: Kluwer Academic, 2002).

He veered closest to vitalism when contrasting the mysterious qualities of protoplasm with the functional framework in which this material was contained.¹⁶³ As the remarkable “living” substance enshrined in every cell and apparently capable of spontaneous regeneration, protoplasm seemed to embody a transcendent subjectivity directing life.¹⁶⁴ Through the course of the nineteenth century many scientists had come to see living processes as a consequence of the organising properties of protoplasm, and this trend persisted during the first half of the twentieth century. Unlike those, such as Thomas Huxley, who had viewed protoplasm as verifying the materiality of vital forces, Uexküll pursued the opposite conclusion: the morphogenesis of protoplasm represented evidence of ‘supermechanic properties’ which resisted empirical analysis.¹⁶⁵ The ‘perfect machine’ embodied by the organism’s physiology was created, ruled, and regulated, by the non-material order inaccessibly embedded in.¹⁶⁶ In fact, as genetics would eventually establish, neither account of protoplasm was adequate, although the flaw in both a materialist and neo-vitalist approach to the question of an essence of life runs deeper than a failure to examine the chemical composition of cells in enough detail.

What obscures matters in the analysis of protoplasm, eliding the depth of Uexküll’s own insight, is the identification of the subjective aspect of an organism as a *cause* in a sense already unduly diminished by the prejudices of scientific modernity. The difficulty was not the postulated existence of a biological factor supplementing the sequential execution of a physical cause and material effect, so much as the push to establish the cause of that which, apparently by definition, was without a cause. Understood in these deterministic terms it was inevitable that Uexküll’s reference to an unknowable natural factor must perpetuate a self-defeating pattern of circular reasoning, and make it difficult to avoid the conclusion that, much like the Cartesian cogito, the presence of an irreducible subject was presumed to be relevant before the question of its existence was even asked. Merleau-Ponty memorably compared Uexküll’s conception of the subject to ‘a pure wake without a boat’, a transient sign of absence which, despite the trace of turbulence that it leaves behind, cannot be authentically attributed to any retreating presence.¹⁶⁷ By consolidating a chain of objects within experience without itself becoming an object, Uexküll’s sense of subjectivity was founded on the sign of a disturbance without evincing the involvement of anything other than a phantom culprit. Yet, this apparent

¹⁶³ Jakob von Uexküll, ‘A Stroll Through the Worlds of Animals and Men’ [1934], translated by C. Schiller, in *Instinctive Behaviour: The Development of a Modern Concept*, edited by C. Schiller (London: Methuen, 1957): p. 80.

¹⁶⁴ Jakob von Uexküll, *Theoretical Biology*, translated by D. Mackinnon, (London: K. Paul, Trench, Trubner & co, 1926): p. 114.

¹⁶⁵ Brentari, *Uexküll*: pp. 65 – 70.

¹⁶⁶ Uexküll, *Theoretical Biology* (1926): p. 123.

¹⁶⁷ Maurice Merleau-Ponty, *Nature: Course Notes from the Collège de France*, compiled and with notes by Dominique Séglaard, translated by Robert Vallier (Evanston, Illinois: Northwestern University Press, 2003): p. 176.

lacuna in Uexküll's work is itself instructive, in so far as it subverts the model of a fixed border surrounding a central point of reference, along with the corresponding opposition of a subjective interior to an objective exterior which typifies conventional accounts of the environment. In its place, and with reference to the diverse corporeal means of establishing significance preoccupying those lives that Uexküll sought to open up, a sense of inhabitation and the lived environment is evoked that accentuates the labyrinthine dispersal of meaning in a variety of different directions and forms. What is then left, following the dispersal of subjectivity, is not the undead remains of an idealised ego, but the nexus of those processes of interpretation which proliferate in the wake of this succession.

To reinforce a sense of the semiotic role played by subjectivity in Uexküll's biology, attention should be drawn to a particularly peculiar passage, overlooked by Heidegger and Agamben. As if, in an anthropomorphic misstep, to emphasise the analogical continuity between the animal's relation to its world and events of human significance, Uexküll compares the tick's selective behaviour to that which guides the preferential taste of an individual's palate.

Like a gourmet who picks the raisins out of a cake, the tick has selected butyric acid alone from among the things in her environment. We are not interested in knowing what taste sensations the raisins give the gourmet. We are interested solely in the fact that the raisins become sign stimuli in his world, because they have special biological meaning for him.¹⁶⁸

For Uexküll, the important point stemming from this analogy is that an analysis of the manifold structure uniting Umwelt, organism, and sign, cannot convey the content of a specific meaning from the point of view of its recipient. It can only provide a model for explicating the sequence of events by way of which a stimulus enters and orientates the world of an organism, becoming a sign with its own special biological meaning. However, Uexküll's simile '[l]ike a gourmet' is also interesting for its introduction of an aesthetic dimension into the analysis of the organism's behaviour. The notion that the selective activity of organisms is akin to the discernment that supposedly guides activities connected with taste and by extension art (both its creation and its appreciation) is not unusual in Uexküll's work, but more commonly it is with reference to music that this association is made. Uexküll denies that the taste sensations themselves are relevant, and it would seem necessarily so since these taste sensations must remain inaccessible, locked within another creature's Umwelt. Yet, the persistence of aesthetic metaphors within his work deserves greater scrutiny. Unintentionally, by comparing the behaviour of a tick to the disposition of a kind of aesthete, Uexküll introduced an element of

¹⁶⁸ Jakob von Uexküll, 'A Stroll Through the Worlds of Animals and Men': p. 13.

interpretation, flexibility, and hence indeterminacy into his otherwise rule-bound assessment of the organism's Umwelt.

Though, from a physiologist's point of view a tick's behaviour is unequivocally compulsive, being embedded in reflex rather than a more elaborate and unpredictable form of cognitive decision-making, conceiving of its selective activity *as-if* it were due to taste flags up the chimerical possibility that this tick might have made a different choice. So far as an individual tick's actual relationship with its surroundings is concerned this possibility is almost certainly an illusion (a fact that can be confirmed by laboratory experiments on ticks, as well as with reference to their anatomy): the failure to make the right choice, to either adopt a preference for another kind of acid, or eschew acid altogether, would inevitably result in a failure to reproduce, and so it is debatable whether a tick adopting these maladaptive practices is even worthy of the name. Yet, when this idea is connected with the broader context of ecological and evolutionary change, the association of biological processes with that indeterminacy inherent within aesthetic judgements potentially seems less absurd.

Uexküll's Contested Legacy

What was radical about Uexküll's concept of the Umwelt was that it established a continuity between different forms of life, not just at a physiological level, in terms of the evolution of species, but at a cognitive, or, in fact, semiotic level, through the means by which each and every living organism made sense of its surroundings. Crucially, this continuity was founded on the basis of the contextualised interaction between an organism and its environment; it did not just involve abstracting the idea of human consciousness, and projecting an analogous form of interiority onto the lives of other animals. The split form of the human being – at once abject, as just one objective body among others, and yet valorised, as the sole bearer of a sentient subjective mind – could thereby be genuinely challenged. No longer was the emergence of a subject necessarily predicated on some form of withdrawal or exemption from a world, rather the world itself in conjunction with mind could be conceived of as a dynamic form of sense-making in which physical and mental processes must intermingle, reshaping or redirecting one another. This is not to say that Uexküll understood his own ideas in exactly these terms, and it would be all the more anachronistic to directly identify Uexküll writings with those art installations that emerged later in the twentieth century.

By promoting the notion that all of existence is ultimately subjective, an overly crude interpretation and consequent misunderstanding of Uexküll's theories simply reinforces one aspect of Descartes' split conception of mind and world. Whether animal or human, when erroneously detached from its origins within an environment the essence of subjectivity appears inexplicable and so recedes beyond investigation. Uexküll was no Cartesian, but his scepticism

concerning Darwinian accounts of evolution, together with his neo-Kantian explanation of life's organisation, did not provide an entirely satisfactory account of the development of sentience and purpose on behalf of biological organisms. Summing up this point of view, in his *Theoretisch Biologie*, Uexküll stated that:

There is, then, a non-material order which first gives to matter its structure – a rule of life. This rule becomes apparent only when it is creating the structure, which is formed along strictly individual lines, according to the material properties of the protoplasmic animal concerned.¹⁶⁹

On the one hand, this contention introduces a transcendental justification of life's self-organisation, specifying a structural formation which is not beyond empirical manifestation, but rather presupposed in the rationally ordered appearance and behaviour of the organism. As such, it implies an autonomously generated form of causality, which resists explanation in terms of purely extraneous physical forces as in Newtonian mechanics, but which nonetheless retains a sense of natural processes as empirically explicable.¹⁷⁰ On the other hand, coupling the idea of a 'non-material order' with reference to 'the material properties of the protoplasmic animal' imparts a paradoxically constitutive role to that which has already been defined as incorporeal. It is this suggestion of an organic substance that somehow defies the laws of chemistry and physics which makes it difficult to avoid the impression of a supernatural element or principle guiding life, and it is this hint of an inexplicable ingredient which leaves Uexküll vulnerable to the charge of espousing an unverifiable vitalism. Arguably then, only part of the process of overcoming the assumptions attached to the legacy of Cartesian science can be deduced from Uexküll's theories. To fully avoid a presupposition of biological order and purpose as attaining rational self-determination through effectively unfathomable means, what needs to be teased out in more detail is a sense of the evolutionary reality of those relations which organise living systems.

Together with surreptitiously supporting Classical conceptions of representation, which remained predicated upon the withdrawal of mind from world, aspects of Uexküll's work also promoted an idea of an essential and immutable human nature, which was inexorably divided from that of other animals. This privileging of the human was not necessarily Uexküll's intention. As he demonstrated in *Umwelt und Innenwelt der Tiere*, the image of the Umwelt of each species of animal encapsulating that of simpler creatures, as in a series of ever more

¹⁶⁹ Uexküll, *Theoretical Biology*, (1926): p. 123. Translation modified.

¹⁷⁰ For a philosophical history of this alternative account of causality which diverges from Newtonian mechanics see Alicia Juarrero, *Dynamics in Action: Intentional Behaviour as a Complex System* (Cambridge, MA: MIT Press, 1999): p. 147. Qtd. In Hoffmeyer, *Biosemiotics*: p. 177.

expansive concentric circles, invoked continuity as well as a hierarchy distinguishing different forms of life.¹⁷¹ Unsurprisingly, Uexküll situated human beings at the summit of this hierarchy, with access to a broader and richer Umwelt than any other species. Scientific knowledge represented the frontier of the human Umwelt, surpassing the limitations of bodily perception through the mediation of technology, and approaching an ever more refined objective perspective on the world. Yet, Uexküll also emphasised the diversity of human perspectives, from the astronomer examining stars and planets, visualised over vast distances, to the nuclear physicists studying a sub-atomic universe. Nor did he restrict this plurality of worldviews to scientists, noting, for example that a musician would recognise distinct harmonies, where an acoustician might foreground the spectral characteristics of these sound waves, and a lay listener simply acknowledge a familiar tune.¹⁷²

Despite this promise of a cosmopolitan conception of human experience, some of those who applied Uexküll's theories to humanity would instead fixate on the idea that the biological superiority of human life was tied to a preordained structure. In 1937, the developmental psychologist Eduard Spranger praised the concept of an Umwelt as rectifying the erroneous idea of a milieu, criticising the latter's association with theories of evolution, and advocating the former's influence as substantiating a preformed frame.¹⁷³ Another review written in 1936, by the Hamburg University professor Gustaf Deuchler, had explicitly identified milieu theory with the Bolsheviks, while suggesting Umwelt research reflected the world view of National Socialism.¹⁷⁴ Naturalising the deterministic role of the environment in this manner potentially nurtured a sense that human beings ought to find unity within a racialised national plan, while allowing for the identification of those who deviated from this order as inherently pathological. Although he would eventually seek to distance himself from the Nazi preoccupation with race, Uexküll had humoured comparable views in his *Staatsbiologie* first published in 1920, a text which opposed the pathology of political forms such as democracy and communism, to the

¹⁷¹ 'Und wenn man sich die Tiere als Beobachter denkt, so wird jedesmal die Umwelt des höheren Tieres als die Umgebung des niederen Tieres gelten können, in der es von diesem beobachtet wird. Dem Beobachter stellt sich das niedere Tier zusammen mit seiner Umwelt als seine geschlossene Einheit dar, während die Einheit des höheren Tieres mit seiner Umwelt niemals vom niederen Tiere erfaßt werden kann. Diese Auffassung der Tierreiche erzeugt die Vorstellung von immer größeren Kreisen, die den nächst kleineren umschließen.' Uexküll, *Umwelt und Innenwelt* (1909): p. 252.

¹⁷² Jakob von Uexküll, 'A Stroll Through the Worlds of Animals and Men' [1934]: pp. 76 - 80.

¹⁷³ Jui-Pi Chien, 'Of Animals and Men: A Study of *Umwelt* in Uexküll, Cassirer, and Heidegger', *Concentric: Literary and Cultural Studies* 32.1 (January 2006), pp. 57-79. Spranger's relationship with Nazism was a lot more fractious than Chien acknowledges. Though the quotations Chien takes from Spranger's commentary on Uexküll do demonstrate a racialised interpretation of the biologist's theories, such an interpretation was not characteristic of Spranger's work. Eduard Spranger, '[Editorial remark on] Uexküll's, 'Die neue Umweltlehre: Ein Bindeglied zwischen Natur- und Kulturwissenschaften'' *Die Erziehung, Monatsschrift für den Zusammenhang von Kultur und Erziehung* 13.5 (1937), pp. 199-201.

¹⁷⁴ Anne Harrington, *Reenchanted Science: Holism in German Culture from Wilhelm II to Hitler* (Princeton, New Jersey, and Chichester: Princeton University Press, 1996): p. 69.

healthy biology of a strong monarchical state.¹⁷⁵ As Jonathan Beever and Morten Tønnessen document, a shift from a descriptive to a normative analysis of culture, supposedly justified on the basis of biology, had also been pursued in Uexküll's 1917 essay on 'Darwin und die Englische Moral', and earlier still with the 1915 essay 'Volk und Staat'.¹⁷⁶ Uexküll's ongoing correspondence with the philosopher, Houston Stewart Chamberlain, had provided an impetus to develop these connections between biological and political issues, but in a 1933 letter to Eva Chamberlain, the philosopher's widow, Uexküll denounced the purge of intellectuals and the persecution of Jews, perhaps in an attempt to reason with the Nazi state.¹⁷⁷

Interpretations of Uexküll's biological theories which stress their affinity with racist and fascistic doctrines cannot be divorced from the advantage of historical hindsight, yet, even beyond this line of reasoning, other elements of his work may reinforce, rather than challenge, received ideas concerning the intellectual sovereignty of the human species. Another friend of Uexküll's, the philosopher Ernst Cassirer, offers a good example of this still persistent inclination to uncouple the human mind from the distinctive continuity relating life to an Umwelt. Cassirer stands out here, not because of the weakness of his logic, but because he goes a long way towards accommodating Uexküll's reasoning within his approach to human nature, and for the most part presents a very convincing account of the specificity of the world inhabited by humanity.¹⁷⁸ In the second chapter of *An Essay on Man*, a summation of the comprehensive account of culture developed in his *Philosophy of Symbolic Forms*, first published in 1944, Cassirer asks whether Uexküll's theories are appropriate for a description and characterisation of the human world. Although he concedes that this world must be no exception to the biological rules governing other forms of life, Cassirer nonetheless insists that the Umwelt of man has not only quantitatively enlarged, but qualitatively changed, enabling him alone, as an *animal symbolicum*, to adapt to his environment in an unprecedented manner, securing 'a new dimension of reality'.¹⁷⁹ In the following chapter, 'From Animal Reactions to Human Responses', Cassirer surveys research into animal intelligence. He warns against accepting human culture as a given fact, and finds several examples of intelligence and symbolic processes in animal behaviour, observing that more sophisticated forms of indirect response to

¹⁷⁵ Jakob von Uexküll, *Staatsbiologie (Anatomie – Physiologie – Pathologie des Staates)* (Berlin: Gebrüder Patet, 1920). Harrington, *Reenchanted Science*: pp 59 – 62.

¹⁷⁶ Jonathan Beever & Morten Tønnessen, "'Darwin und die englische Moral': The Moral Consequences of Uexküll's Umwelt Theory', *Biosemiotics* 6 (2013), pp. 437-447. Jakob von Uexküll, 'Darwin and the English Morality', translated by Morten Tønnessen, *Biosemiotics* 6 (2013), pp. 449-471.

¹⁷⁷ Harrington, *Reenchanted Science*: p. 70.

¹⁷⁸ For further analysis of the personal and intellectual relationship between Cassirer and Uexküll see Barend van Heusden, 'Jakob von Uexküll and Ernst Cassirer', *Semiotica* 134, 1/4 (2001), pp. 275-292.

¹⁷⁹ Ernst Cassirer, *An Essay on Man: An Introduction to the Philosophy of Human Culture* (New Haven & London: Yale University Press, 1944): p. 24.

stimuli on behalf of animals are indisputable.¹⁸⁰ All the same, Cassirer recurrently avers that the propositional language of human beings is without parallel in the lives of other organisms. In his consequent concern to set symbols apart, he seems to conflate other kinds of ‘signs’ with ‘signals’; despite disputing Edward Thorndike’s portrayal of animal intelligence as merely reactive, and denying that higher animals may only solve problems mechanically via trial and error, Cassirer’s presentation of both signals and, by implication, non-symbolic signs, as ‘operators’ implies a purely functional role, which elides the significance of the relation between organism and Umwelt as something more than a matter of material circumstance.¹⁸¹

Cassirer was right to distinguish linguistic communication as a peerless attribute of the human species, amounting to a symbolic system which allows for detachment from the corporeal basis of individual expression, and the elaboration of extraordinarily sophisticated forms of conceptual abstraction. It is not just the basic distinction between expressive sounds and their meanings, as governed by convention, which makes this intricacy and flexibility possible, but the structured relations between entire systems of reference, able to encompass both audible and visible elements, which opens up a new means of articulating thought and representing the world.¹⁸² As such, human language is not just a substitute for other forms of communication, such as gesture, it is genuinely original. What can perhaps be disputed is the idea that this particular difference in kind, even in the unique form of articulate language, is inimitable enough to carve out an unbridgeable gap between human culture and the nature of life in general, when compared to the various and no less extensive differences between the Umwelten of other species. The difference between the Umwelt of a human being and that of another primate is surely no more radical than the gulf separating the world as encountered by a paramecium from that experienced by an elephant. What might be lost if excessive due is given to the symbolic systems organising human interactions, particularly as entrenched within the imagined, i.e. world-picturing, perspective of the individual, is a sense of the more primal role of the relationality of signs as a means of collectively inhabiting and transforming an environment.

Cassirer envisaged linguistic thought and communication as a ‘third link’ inserted between the receptor system and the effector system which govern an animal’s response to stimulus, but he fails to ask and so to properly address what, prior to the advent of human language, connects and contextualises the difference between these two systems.¹⁸³ Language and culture are not gifts belatedly granted to humanity, facilitating both intellectual and

¹⁸⁰ Cassirer, *An Essay on Man*: pp. 27 – 28.

¹⁸¹ Cassirer, *An Essay on Man*: pp. 31 – 33.

¹⁸² Hoffmeyer, *Biosemiotics*: p.274. While noting Cassirer’s definition of the human as a symbolic animal, in his account of human language Hoffmeyer refers primarily to Terrence Deacon’s work *The Symbolic Species: The Coevolution of Language and the Brain* (London: Allen Lane, 1997).

¹⁸³ Cassirer, *An Essay on Man*: p. 24.

instrumental mastery over the natural world, but systems of signs that prefigure and compose the emergence of the human mind, as intimately coupled with the Umwelt into which each human being is born. Citing Herder, Cassirer approaches this view, asserting that '[s]peech is not an object, a physical thing for which we may seek a natural or supernatural cause. It is a process, a general function of the human mind.'¹⁸⁴ What is more suspect is Herder's claim, taken up by Cassirer, that, through the reflective thought facilitated by language, man's soul can 'segregate from the whole ocean of sensation', gaining access to an ideal world beyond biological needs and practical interests.¹⁸⁵ On the contrary, the world of human language, however complex, is forever and at every level interlaced with the reality of those signs that are already at work in sensory as well as intellectual experience, and embedded in the genetic inheritance and neurophysiology that structures and situates the logic of these signs. Once again, to foster a more grounded account of the development of human culture a more refined understanding of the biological roots of these semiotic relations is required. As Hoffmeyer suggests, as far back as our distant prehistory, the unavoidable separation of speech from what is spoken about must have unsettled the sense of human beings that they belonged to the world, making precarious the relation between the materiality of an inhabited environment and its intelligibility.¹⁸⁶ Retaining a sense of the reality of signs coupled with that of the independently existing world which orientates their meaning – in other words, maintaining a complete comprehension of the cultural roots of human life – entails repairing rather than further severing the link between Umwelt and organism.

As for art, while there is no clear evidence that Uexküll's theories directly influenced those artists who would seek to radically overhaul art's dependence on traditional aesthetic values, his ideas do bear closer comparison with the work of a poet who approached these conventions in a different manner, and who was in fact a personal friend of Uexküll's.¹⁸⁷ With works like 'Der Panther', 'Archaischer Torso Apollos', and his *Duineser Elegien*, Rainer Maria Rilke devised a poetry that persistently questioned the relation between the interiority of mind and the exteriority of the world, grasping this relation as integral to the existence of art in the first place. Although Rilke maintained a tangential relationship to art movements, preferring to understand his art as a solitary pursuit, it is still possible to connect his work with the influence of Romanticism and Symbolism, as well as the broader context of Modernism which developed through the first half of the twentieth century. As Schwitters example of the Merzbau demonstrates, the inventions of Modernism pre-empted and perhaps helped prompt the

¹⁸⁴ Cassirer, *An Essay on Man*: p. 39.

¹⁸⁵ Cassirer, *An Essay on Man*: p. 40.

¹⁸⁶ Hoffmeyer, *Biosemiotics*: p. 266.

¹⁸⁷ Malte Herwig, 'The Unwitting Muse: Jakob von Uexküll's Theory of Umwelt and Twentieth-century Literature', *Semiotica* 134, 1/4 (2001), pp. 553-592.

proliferation of post-war and contemporary artworks explicitly challenging the boundaries of the gallery and the frame. Rilke's poetry was not formally experimental to the same degree as some of his contemporaries. He did not experiment with typography and lyrical form in the manner of Apollinaire or Mallarmé, the taste for the absurd and the unusual which characterised Dada and Surrealism, and especially the ecstatic celebration of technology that inspired Futurism, would all diverge from his interests. Yet, by exploring the connection between the situated perception of living creatures and the point of view provided by a text, the subject matter of Rilke's poems does approach those difficulties inherent in relating mind to world.

As epitomised by Uexküll's theories, the reorientation of the environment and the organism, from a structure of linear determinations to a system of reciprocal coordination, would prove fundamentally important for the development of the life sciences in the twentieth century. Nevertheless, those of his contemporaries, such as Jacques Loeb and Herbert Spencer Jennings, who commended Uexküll's example in attempting to study organism and environment as an integrated whole, would endeavour to dispense with the vitalism they perceived compromised the concept of an *Umwelt* in favour of a more deterministic perspective. Even as he affirmed the influence of the whole on the parts of the organism, Loeb criticised those, including Driesch and Uexküll, who explained particular processes in physiochemical terms, while presenting their unity as the expression of non-physical agencies.¹⁸⁸ Loeb reverted to a definition of the environment as 'a rather rigid combination of definite forces', and the tropisms which he described as motivating each organism were likewise explicable as determinate mechanisms of cause and effect.¹⁸⁹ Jennings was more circumspect, acknowledging that physico-chemical explanations were at the time still limited, and arguing that an organism must be understood not just synthetically, through assembling its particular material properties, but analytically, by way of its overall functional organisation.¹⁹⁰ Nonetheless, Jennings maintained that an attempt to explain this organisation based on what Uexküll called his *anschaulich* method, rather than empirical verification, was ill-advised, and so dismissed the ambition of proceeding beyond a conventional causal explanation of biology.¹⁹¹ Even Konrad Lorenz – who borrowed extensively from Uexküll's theories in his

¹⁸⁸ Jacques Loeb, *The Organism as a Whole from a Physicochemical Viewpoint* (New York: Putnam's Sons, 1916): pp. 2 – 10.

¹⁸⁹ Jacques Loeb, *The Mechanistic Conception of Life: Biological Essays* (Chicago, Ill: University of Chicago Press, 1912): p. 195.

¹⁹⁰ Herbert Spencer Jennings, 'Diverse Ideals and Divergent Conclusions in the Study of Behavior in Lower Organisms', *The American Journal of Psychology*, Vol. 21, No. 3 (July, 1910), pp. 349-370.

¹⁹¹ Jennings noted Uexküll's aversion to 'anything vague, ill-defined or mystical', and praised his dedication to observation of the living organism in its environment, but he did not pursue the idea that an *Umwelt* might amount to something more than a set of physical conditions. Herbert Spencer Jennings, 'The Work of J. von Uexküll on the Physiology of Movements and Behavior', *Journal of Comparative Neurology and Psychology*, Vol. 19, Issue 3 (June 1909), pp. 313-336.

early works on ethology – would eventually reject any attempt to define an Umwelt as the subjective lived environment unique to a species, in favour of privileging an objective field of research determined by purely mechanistic hypotheses.¹⁹² What was neglected, in these efforts to banish those remnants of vitalism that were perceived to be unscientific, was a complete conception of the Umwelt as a relational setting of mind as well as matter. Perhaps for this reason, the influence and legacy of Uexküll's ideas fractured, and the singular character of his contribution to biological science was no longer widely grasped.

¹⁹² See for example Konrad Lorenz, *The Natural History of the Human Species: An Introduction to Comparative Behavioral Research: The "Russian Manuscript" (1944 – 1948)*, trans. By Robert D. Martin (London: The MIT Press, 1996): pp. 195 – 196. For an account of Lorenz's criticisms of Uexküll throughout his career see Carlo Brentari, 'Konrad Lorenz's Epistemological Criticism Towards Jakob von Uexküll', *Sign System Studies* 37, 3/4 (2009), pp. 637-662.

Pragmatic Parallels

As Canguilhem notes in his account of ‘The Living and its Milieu’, the approach Uexküll pioneered had further parallels in the earlier development of American pragmatism at the end of the nineteenth, which likewise emphasised ‘the role of values in relation to the interests of an action’.¹⁹³ Canguilhem draws attention to John Dewey’s reversal of the relation between organism and milieu: external influences were not simply *imposed* upon living organisms, instead the existence of the organism was predicated on its capacity to *propose* its own orientations, actively adapting to its surroundings.¹⁹⁴ Just as Uexküll would realise, Dewey recognised that the constitutive role of the organism in making sense of an environment indicated not only a physiological explanation of life’s dynamics, but a naturalistic approach to epistemological questions. Yet, in drawing this parallel Canguilhem does not mention any of those other pioneers of pragmatism whose work supported and inspired Dewey’s conclusions. In an autobiographical essay Dewey singled out James’ *Principles of Psychology* for having provided a ‘specifiable philosophical factor’, imbuing his thought with ‘a new direction and quality’, which Dewey explained as combining a critically inclined subjectivism with a progressive biological conception of the psyche.¹⁹⁵ Again the similarities to those ambitions guiding Uexküll’s research are well apparent, though Uexküll would not have approved of the anthropocentric bias connected with the idea of the psyche. Furthermore, although James did assign an important role to the environment of the organism in his *Principles*, this concept retained a predominantly mechanistic function connected with those Lamarckian explanations of evolution which James sought to criticise.¹⁹⁶ In a later essay, broaching a sustained discussion of this topic, James defined the environment in Darwinian terms as a tangible ‘perfectly known thing’, to be contrasted with the ‘molecular’, ‘invisible’, and ‘inaccessible’ causes motivating the organism on the basis of its inherited variation.¹⁹⁷ While taking up the Spencerian view that the unity of mental and bodily life consisted in the adjustment of inner to outer relations, in his struggle to repudiate Spencer’s anachronistic and fatalistic ‘philosophy of force’ James

¹⁹³ Canguilhem, *Knowledge of Life*: p.110.

¹⁹⁴ Canguilhem does not cite a specific text, but this principle can be found throughout Dewey’s work. An early formulation of this theme is developed in ‘The Reflex Arc Concept in Psychology’ in which Dewey criticized the notion that passive stimulation caused awareness and hence an automatic response, as effectively a reiteration of the Cartesian doctrine dividing mental and physical properties. Instead, he argued that the organism actively integrates sensory and motor responses in order to guide itself through an environment. John Dewey, ‘The Reflex Arc Concept in Psychology’, *Psychological Review* 3 (1896), pp. 357-370.

¹⁹⁵ John Dewey, ‘From Absolutism to Experimentalism’ in *Contemporary American Philosophy: Personal Statements*, edited by George P. Adams and W. Pepperell Montague (New York: Macmillan Co., 1930): pp. 24 – 25.

¹⁹⁶ William James, *Principles of Psychology: Volume 2* (London: Macmillan, 1891): pp. 626 – 627.

¹⁹⁷ William James, ‘Great Men and their Environment’ in *The Will to Believe: And Other Essays in Popular Philosophy* (Cambridge, Massachusetts: Harvard University Press, 1979): pp. 242 – 281.

neglected to develop a more robust concept of the environment itself. No matter whether material or social in form, as a site of extraneous conditions James' notion of the environment lacked the distinctive role of Uexküll's Umwelt as a domain integral to the organism's sensibility and agency.

Along with James, Dewey was strongly influenced by Charles Peirce, who in the 1880s had lectured him on mathematical logic and the philosophy of science at John Hopkins University.¹⁹⁸ James had popularised the idea of pragmatism with reference to Peirce through an 1898 address delivered at Berkley on 'Philosophical Conceptions and Practical Consequences'.¹⁹⁹ He cited Peirce's 1878 article 'How to Make Our Ideas Clear' for having introduced the word 'pragmatism' in connection with the assertion that beliefs are really rules for action, and for defining truth on the basis of the behavioural conduct it inspires. James understood this doctrine as continuing an older philosophical trend he affiliated with English philosophers such as David Hume and John Stewart Mill, which involved forsaking metaphysical speculation and abstraction for the sake of clarifying the practical consequences of thought.²⁰⁰ Yet, Peirce would subsequently seem to distance himself from this affiliation, distinguishing his own version of this doctrine as 'pragmaticism', and stressing his debt to Kant and Leibniz, while criticising both Hume and Mill. While Dewey's acknowledgement of the extent of Peirce's influence came later, in works such as his *Logic: The Theory of Inquiry* (1938) and *Knowing and the Known* (1948) it was Peirce, rather than James, who Dewey identified as having laid the groundwork for his approach to philosophy.²⁰¹ Contrary to aspects of James' account of pragmatism, and certainly in opposition to its subsequent reception by figures such as Richard Rorty, Dewey and Peirce ultimately shared a conviction that it was not enough to regard truth as the contingent result of satisfactory consequences; what was needed was an explanation of those ends which motivated satisfaction, and this demanded a much more vigorous interrogation of traditional conceptions of subjectivity, while refining, rather than diminishing or dispensing with, definitions of truth and meaning.²⁰²

¹⁹⁸ For an account of the influence of both William James and Charles Peirce on the early development of Dewey's thought see James Scott Johnston, *John Dewey's Earlier Logical Theory* (Albany: State University of New York Press, 2014): pp. 22 – 27.

¹⁹⁹ William James, 'Philosophical Conceptions and Practical Results' (1898) in *The Heart of William James*, edited by Robert D. Richardson (Cambridge, Mass.: Harvard University Press, 2010).

²⁰⁰ James, 'Philosophical Conceptions and Practical Results': pp. 200 – 202. With a title that lay emphasis on the familiarity of the empiricist doctrine he associated with both Peirce and Dewey, William James developed this theme further in his 1907 lectures on *Pragmatism: A New Name for Some Old Ways of Thinking* (Cambridge, Mass.: Harvard University Press, 1921).

²⁰¹ John Dewey, *Logic: The Theory of Inquiry* (New York: Henry Holt and Co., 1938). John Dewey and Arthur F. Bentley, *Knowing and the Known* (Westport, Connecticut: Greenwood Press, 1975).

²⁰² For a presentation of Peirce's pragmaticism versus the pragmatism of Rorty, see Susan Haack, 'Peirce and Rorty in Conversation' in *Manifesto of a Passionate Moderate* (Chicago: University of Chicago Press, 1998).

If it were not for his already well established influence on biosemiotics the position of Peirce in this thesis might seem misplaced, given that he relatively rarely referred to the ‘environment’ as a distinct concept, and he is not well known for having developed a critical account of this idea. When Peirce did make use of this term it was often with reference to competing versions of evolutionary theory, including those of both Lamarck and Darwin (CP 1.104, 1.397, 2.86, 6.17). Occasionally Peirce also mentioned the ‘environment’ in conjunction with his own concept of the index, as a point of reference common to interlocutors assessing the truth of a proposition (CP 2.318). Most significantly, Peirce promoted the ‘operation of the environment’ in his Lamarckian account of the evolution of mind, with this setting acting as a means of breaking up those mechanistic routines of habit which had grown lethargic, rendering the mind lively, and thereby facilitating originality through ‘exercise’ and the ‘transaction of learning’ (6.301).²⁰³ Although these references do align with an anti-Cartesian correlation of mind with world – in the same context Peirce affirmed both the mind’s continuity, and the belief that all matter is really inveterate mind – they do not attain the same level of specificity as Uexküll’s sense of Umwelt, as a domain at once formed *by* and giving form *to* an organism’s activity. In fact, Peirce’s conception of the role of the environment in evolution, as inciting free-play, is seemingly at odds with Uexküll’s linking of each Umwelt with an ineffable rule of life.

Nonetheless, because Dewey continually situated a critical concept of the environment at the heart of his philosophy, his reception of Peirce’s thought does suggest that a framework for mind akin to Uexküll’s Umwelt may be derived from Peircean principles. Defining ‘Environment and Organism’ in one of his contributions to Paul Monroe’s *Cyclopedia of Education*, Dewey began by stipulating that these terms were strictly correlative, with the process of life encompassing both of these concepts. Although he continued to define the environment in terms of ‘conditions’, these were to be understood as actively entering and directing the functions of living beings, while so far as the larger part of its physical surroundings were concerned the organism may remain impassive.²⁰⁴ Accordingly, in the later version of his *Logic* Dewey stressed that organism and environment were not given as divided entities, bound together only as the mind of a creature strived toward coordination with its physical setting. Rather than being simply situated *in* an environment, life occurred *because* of its interrelation with a specific formulation of a world:

²⁰³ Habit was also a favourite topic of William James, and his detailed treatment of this subject in the fourth chapter of his *Principles*, describing living creatures as ‘bundles of habits’, demonstrates an approach close to that of Peirce. William James, *Principles of Psychology: Volume 1* (London: H. Holt, 1890): pp. 104 – 127.

²⁰⁴ John Dewey, ‘Environment and Organism’ in *A Cyclopedia of Education*, edited by Paul Monroe (New York: The Macmillan Company, 1911): pp. 486 – 487.

In fact, the distinction [between organism and environment] is a practical and a temporal one, arising out of the state of tension in which the organism at a given time, in a given phase of life activity, is set over against the environment as it then and there exists. There is, of course, a natural world [i.e. in Uexküll's terminology, an *Umgebung*] that exists independently of the organism, but this world is *environment* [i.e. Umwelt] only as it enters directly and indirectly into life-functions.²⁰⁵

Through *Knowing and the Known*, authored collaboratively with Dewey, Arthur F. Bentley makes an analogous argument, this time with explicit reference to Peirce, though admittedly in terms of a more anthropocentric focus. According to Bentley, while the majority of logicians, including Rudolf Carnap, Morris R. Cohen, and Ernest Nagel, effectively took for granted the categorical division of 'men', 'things', and 'an intervening interpreting activity', Peirce derived from this 'cosmic pattern' a single continuous process.²⁰⁶ Quoting Peirce's declaration that '[t]he woof and warp of all thought and all research is symbols, and the life of thought and science is inherent in symbols' (CP 2.220), Bentley argued against the assumption that a third principle, created by virtue of the 'talk products or effects of man', was crudely inserted between mind and world.²⁰⁷ Instead, logical thought emerged directly through those symbols and signs that actively participated in the realisation of a world – hence Peirce went on to claim 'that it wrong to say that a good language is important to good thought, merely; for it is of the essence of it' (CP 2.220). As such, the mind of man did not consist in the theoretical 'transmutation' of the living organism into a 'putative 'psyche'', as Bentley put it, rather the life and so the very existence of the organism was itself derived from the practical expression of signs in relation to those things that manifestly composed a shared environment.

In *Knowing and the Known* Dewey and Bentley included a footnote briefly referring to Uexküll's work, together with that of other authors such as Kurt Goldstein and J. H. Woodger, who they understood tacitly supported their 'transactional' approach to knowledge.²⁰⁸ This approach involved thinking through the co-operative unity of the articles of knowledge and the process of knowing, which, in the case of physiology, entailed grasping 'the full living procedure of the organism' rather than simply reducing it to 'minor specialized processes'.²⁰⁹

²⁰⁵ Dewey, *Logic: The Theory of Inquiry*: p. 33.

²⁰⁶ Arthur F. Bentley 'Vagueness in Logic', *Knower and the Known*: pp. 3 – 4.

²⁰⁷ In view of Peirce's self-professed predilection for triadic forms of reasoning, the move to replace a three-realm ('word, idea, and object') structure with a two-realm ('men and things') structure, by Bentley, is likely more confusing than helpful. Yet, the overarching point still stands: irrespective of their philosophical dissection, it is the reciprocal and integral unity of these elements, rather than their presupposed separation, which makes thought possible. Bentley 'Vagueness in Logic', *Knower and the Known*: p. 5.

²⁰⁸ Dewey and Bentley, *Knowing and the Known*: p. 140 nb. 11.

²⁰⁹ Dewey and Bentley, *Knowing and the Known*: p. 125.

More frequently cited was the American psychologist Edward C. Tolman, with Dewey and Bentley admitting the proximity of his stance to their own position on the techniques of inquiry.²¹⁰ Tolman's influential essay, 'The Organism and the Causal Texture of the Environment, co-authored with Egon Brunswik during a stay in Vienna, is highly reminiscent of Uexküll's work, albeit in the form of a new idiom applied to psychology.²¹¹ Yet, notwithstanding the affinity at least indirectly implied by Dewey and Bentley, neither Uexküll nor Peirce made any reference to one another's research in their own writings. Although Dewey lauded Peirce for having linked the inferences of logical inquiry with basic biological function – a connection he found to be lacking in both Hume's doctrine of habit and J. S. Mill's 'propensity' to generalise – it would not be accurate to claim that Peirce thereby anticipated Uexküll's theories.²¹² However insightful, Peirce's understanding of biological organisms was not rooted in the empirical experimental research which Uexküll would go on to conduct. What Peirce's work did offer (which retrospectively may be understood to bridge some of the gaps in Uexküll's thinking), was a more detailed and tractable analysis of those organisational relations, i.e. signs, which composed the relationality of living processes. To this effect, the abstraction inherent within Peirce's system and method represented its strength, since this organic (i.e. self-organising) and plastic (i.e. adaptable) framework could be applied to a variety of contexts and conditions, without being too readily and obscurely embedded in the facticity of the organism's physiology. Peirce was able to advance a formal investigation of the logic of signs as both a consequence and an impetus for the evolutionary emergence of evermore complex forms of mind.

Semiotic Freedom and the Constraints of an Umwelt

Uexküll showed that, as lived, the environment was something more than the outline of a physical context and an accident of nature; in the form of an Umwelt, it was the product of a concerted effort on behalf of a living creature to occupy and inhabit its locality, imbuing this domain with signs. Bringing to the fore the decisive contribution of an organism to the conception of a world derived from its environment discloses the autonomy, agency, or indeed freedom which this relationship makes possible. Freedom in this sense is not synonymous with the human will, but can be understood through the embodied activity of other forms of life. Hoffmeyer's idea of semiotic freedom epitomises this perspective: when opting to swim right instead of left in a gradient of nutrients, even a bacterial cell can be viewed as having made a

²¹⁰ Dewey and Bentley, *Knowing and the Known*: p. 117.

²¹¹ Edward C. Tolman and Egon Brunswik, 'The Organism and the Causal Texture of the Environment', *Psychological Review*, Vol. 42 (1), (January, 1935), pp. 43-77.

²¹² Dewey, *Logic: The Theory of Inquiry*: p. 12.

choice in so far as it interprets a significant feature of its Umwelt.²¹³ This act of interpretation, being in fact based on the determinations of a complicated chemotactical system, is not to be confused with human thought, and the resulting behaviour is not defined by consciousness. Yet, in so far as the bacterium's apprehension of its surroundings results in an orientation that is at once intelligible, but not wholly predictable, the notion of a modicum of 'choice' remains applicable. Hoffmeyer justifies this reference to choice with two further contentions:

(1) Considered as an evolving species the bacterium does in fact have a choice in the sense that it might have evolved differently; and (2) even single bacterial cells are complex systems that exhibit truly unpredictable (chaotic) behaviour and, in fact, mutant cells might behave differently in the same situation.²¹⁴

For Uexküll the transcendental character of life's freedom was dependent on protoplasm; it was an essential property of living organisms, inexplicable in mechanical terms, rather than a consequence of the duration and stochastic character of evolutionary processes. The peculiar consequence of this stance was that a single-celled organism must represent a more radical expression of individual liberty than a mammal: while in the early decades of twentieth century the biochemistry of cellular activity was yet to be revealed in detail, the physiological functions of larger animals could be much more readily explained with reference to efficient causality. Nevertheless, there is an important insight to be taken from Uexküll's assertion that 'an amoeba is less of a machine than a horse'.²¹⁵ As again attested by Hoffmeyer, at one level the formation of eukaryotic cells, in conjunction with the evolution of multi-cellular forms of life, did curtail the freedom and autonomy available to individual prokaryotic cells. Nevertheless, at a higher level of complexity and as a coordinated whole, this sacrifice of one form of freedom made viable a whole host of new possibilities, as embodied in the diversity of animal and plant species.²¹⁶ As such, the Umwelt afforded to a mammal is replete with a much more varied and refined selection of signs than that available to an amoeba, and this animal is able to register and respond to these signs in a more nuanced fashion than its primitive ancestors. In the conjunction between an organism's physiology and the events or objects of interest arising in its environment, it is the scope and variety of signs available to a species which defines the depth and the character of choices it may make. As Hoffmeyer puts it,

²¹³ Jesper Hoffmeyer, 'Semiotic Freedom: An Emerging Force', *Information and the Nature of Reality: From Physics to Metaphysics*, ed. by Paul Davies and Niels Henrik Gregersen (Cambridge: Cambridge University Press, 2010).

²¹⁴ Hoffmeyer, 'Semiotic Freedom: An Emerging Force': p. 163, nb. 5.

²¹⁵ Uexküll, *Umwelt und Innenwelt*: 26.

²¹⁶ Jesper Hoffmeyer, *Signs of Meaning in the Universe*, trans. by Barbara J. Haveland (Bloomington, Indianapolis: Indiana University Press, 1996):

semiotic freedom ranges ‘from pheromones to birdsong and from antibodies to Japanese ceremonies of welcome’ – it channels the expansive gestures of attraction as well as the refined strategies of defence.²¹⁷

While Hoffmeyer’s conception of semiotic freedom helps to emphasise the distance of Uexküll’s theory of the Umwelt from rigidly reductive and deterministic accounts of the environment as a purely physical domain, this should not elide the other more narrowly circumscribed aspect of Uexküll’s theory. At the same time as acting as linking points with the world, securing an environment as a medium for movement and communication, Uexküll observed that the signs derived from an Umwelt served to bar extraneous aspects of the world outside. No less than serving to open up a unique perspective on the world on behalf of a particular form of life, an Umwelt constrains the conditions of this domain, placing many elements of existence beyond immediate accessibility. Since multiple iterations of different functional cycles encompass every possible aspect of a creature’s experience, chaining together every item of perception, along with every instance of behaviour, the scope for experience out of step with the organism’s Umwelt is perpetually curtailed. With cycles devoted to the physical medium through which movement took place, along with food, shelter, the threat of predators, and the attraction of reproductive partners, amounting to some of the most important functions eliciting and directing activity.²¹⁸ In effect, each animal is enclosed within a sphere of interlocking circles, a sphere commensurable with that occupied by individuals of the same species, but utterly inaccessible so far as the immediate experience of other forms of life was concerned. As Uexküll put it, as a summation of its functional cycles the Umwelt of an organism formed an invisible soap bubble, completely surrounding the creature within.²¹⁹ Operating as both barrier and filter, the inner membrane of this bubble acted as a one-sided screen, behind which the depths of infinity were hidden.

Uexküll recognised that human beings tended to virtually cut loose from the Umwelt into which they were born, founding a view of the objective world on the basis of symbolic abstraction, and thereby building up an image of reality which surpassed the immediate experience of their senses.²²⁰ Nonetheless, he also regarded this idea of objectivity as in the end provisional, being predicated upon those basic functional cycles which both compelled and allowed human individuals to negotiate their surroundings. The technologically mediated existence which, already in Uexküll’s time, had come to typify modernity, instituted an especially hubristic idea of the objective, since it tended to detach and distort the distinct

²¹⁷ Hoffmeyer, *Signs of Meaning*: p. 61.

²¹⁸ Jakob von Uexküll, ‘The Theory of Meaning’ [1940], translated by Barry Stone and Herbert Weiner, intro. by Thure von Uexküll, in *Semiotica* (1982) 42, 1: p. 33.

²¹⁹ Uexküll, *Theoretical Biology* (1926): p. 42.

²²⁰ Jakob von Uexküll, ‘The New Concept of Umwelt: A Link Between Science and the Humanities’ (1936) *Semiotica*, 134, 1/4 (2001): pp. 109 – 110.

Umwelten into which individuals were embedded. At base humans were strangers to one another, unable to see past the contingencies colouring their view of reality. With this idea in mind, Uexküll compared the human Umwelt to a theatre:

It is most unfortunate that we can never behold the consciousness-stage of another living being; nothing would be more instructive than to see the world through the schemata of another. But at least let us never forget, as we watch our fellow-men going to and fro around us, that they are treading the boards of our stage, and we theirs. The stages are never identical; in most cases, indeed, they are fundamentally different. And we can never hope to play on the stage of others the role that we play on our own.²²¹

While the occupant of each stage might believe they are immediately encountering the objective features of their environment, in fact these perceptions must conform to the standards set by prefabricated schemata, as in props and scenery derived from the wings and rigging-loft of a theatre. From this point of view, despite the bond organising their proximity, each Umwelt remained inviolable, since the individual it contained could only communicate with its peers by proxy, i.e. in accordance with those prescribed forms which governed its relations.

Besides this somewhat grim depiction of human relations, another metaphor deployed by Uexküll does allow room for a more constructive conception of the role of the Umwelt in guiding and organising the trajectory of life. While proposing that the limits of an Umwelt ensconced each organism within a dividing wall, shutting out all extraneous features of the world, Uexküll also compared these walls to those of a house that the organism had itself constructed.²²² Unlike the image of spontaneously formed bubbles, which, for all their charm, cannot endure any substantial deformation of their outer membrane without bursting, and so evaporating, contained within the idea of a self-built house is the active investment and participation of its occupant, as well as the prospect of extending or remodelling this construction to suit different purposes. From this perspective, the commonplace activity of fashioning a shelter from hazardous aspects of the environment can be seen as more foundational to life than even the most familiar examples of burrows, nests, dens, and hives, might indicate. Even a bacterium is perpetually endeavouring to make itself at home in so far as its movements pursue those facets of an environment conducive to its survival and reproduction.

Further, no less important than the functional attributes of an organism's relation to its environment, as in the aggregation of material promoting growth and the exclusion of that

²²¹ Uexküll, *Theoretical Biology*: p. 97.

²²² Uexküll, *Umwelt und Innenwelt*: p. 212.

which proves noxious, the *significance* of each of these components of an Umwelt must, from the perspective of its inhabitant, be registered from the outset. In this respect, that aspect of a shelter, dwelling, or habitat, which might otherwise be seen as supplementary, if not superfluous, is shown to be paramount. The appearance or form of an inhabited world is not just a side-effect of life's biochemistry, it is this craft of at first parsing and then reassembling the signs of an environment into a composite image which has precipitated both the endurance and the elaboration of life. The German language is perhaps better suited to conveying this point, through a trajectory moving from *Bild*, as in an image, shape, or depiction, to *Bildung*, a form of self-cultivation, habit, and education.²²³ Here, the relevance of the connection between those apparently extraordinary animal activities which resemble art, on the one hand, and, on the other, those human artistic and recreational activities which do not simply picture, but intervene or install themselves within an environment, becomes clearer. These examples are not just exceptional; they are paradigms of the semiotic logic which organises, orientates, and originates life.

The opposable thumbs of primates, and the sustained bipedalism of homnids, helped to distinguish a form of life for which prosthetic and instrumental relations to the environment can proliferate, while also granting new degrees of independence from the sanctuary of these built structures.²²⁴ Perhaps it is this success that has nurtured the delusion that the act of constructing an inhabitable environment principally represents an advanced practice, perfected through human art, architecture, and culture. The same anthropological bias might lead one to dismiss the patterning of an environment as incidental, with the question of decoration amounting only to a contrived afterthought. Yet, for the majority of organisms this process of making oneself at home remains much more firmly anchored within the limits of embodiment. In its pursuit of nutrition, a bacterium is not simply in a state of departure, moving on, as if it were taking up a new position within the Cartesian coordinates of empty space, but in fact shifting and so resettling the textured medium of its Umwelt. Those organisms which from our perspective appear sedentary, from a continuous mat of moss to the arborescence of a tree, are no less involved in figuring out the borders of the world in which they are immersed. From our limited point of view, trees grow up and out towards the light, but the subterranean spread of roots, and the overall filling out of a volume by means of branching, invokes a dimension of life beyond

²²³ This concept was already well-established in Romanticism, especially within Goethe's conception of *Bildung* as 'product and process', though Hegel's use of the word reinscribed a stricter separation of human and non-human life in this idea. See for example, Johann Wolfgang von Goethe, *The Scientific Studies*, edited and translated by D. Miller (Princeton: Princeton University Press, 1995): p. 63.

²²⁴ An extended development of this topic, connecting hominisation with the freeing of hands for gesture and tool-use, is to be found in Bernard Stiegler's work, and especially his interpretation of André Leroi-Gourhan's anthropology. Bernard Stiegler, *Technics and Time: The Fault of Epimetheus*, translated by Richard Beardsworth and George Collins (Stanford: Stanford University Press, 1998).

the static and the vertical. Moss, meanwhile, takes advantage of the shade, layering itself in a cool, dark design of retained moisture, the furnishing of a semiotic niche which amounts to more than happenstance. In each case, what gardeners and horticulturists call ‘habit’, as in the outer shape of the plant, is more radically a form of shaping, a means of coming to terms with the signs of life which are available in a given space and time.

In his attempt to derive a theory of the subject from Canguilhem’s writings on the history of the life sciences, Alain Badiou concludes that the nature of this creature, ‘dissatisfied with meaning and fitted for moving the configurations of its objectivity’, is that of ‘a somewhat *displaced* (*déplacé*) living being’.²²⁵ Taking stock of Canguilhem’s engagement with Uexküll’s conception of life leads to a related, though restructured conclusion. Badiou quotes Canguilhem’s statement that ‘the natural milieu of men is not situated in the universal milieu like a content in its container. A centre is not resolved into its environment’.²²⁶ The echo of Uexküll’s idea of the *Umwelt* is here pronounced, each living being must maintain a partial, but perspicuous presentation of a world to negotiate the more extensive background of the environment, without fading away entirely into this inorganic setting. Yet, Badiou’s inference that the scientific assessment of life must involve an abrupt break with this centring, staging a clash between ‘two absolutes’, the needs of the individual and the ideals of the universal, should be treated with caution. The key to preserving a properly biosemiotic understanding of life’s *Umwelt* is that it cannot and should not be fully translated into the physiochemical, or even sociocultural *milieu* which surrounds and circulates through each form of life. As such, life is displacement, but life is also emplacement, a persistent move to find and make new ways of being at home, a series of strategies which guard against the homesickness inherent in the demands of survival, not only complication and discontinuity, but consolidation.

To accentuate the inseparable relationality of organisms and environments Hoffmeyer repeatedly invokes the image of a pattern woven into a carpet. A woven carpet carries a patterned form which cannot be materially parted from the medium in which this figure is embedded; to ask for the origin of life – the pattern – is then always also to ask for the origin of the environment – the carpet.²²⁷ Yet, as Hoffmeyer goes on to attest, this relation between organism and environment also carries a fundamental asymmetry inscribed in the origins of life. This asymmetry was initiated by the formation of a closed membrane, which, while preserving the autocatalysis of an open-system, also heralded a decisive difference – indeed a difference-making difference – between inside and outside articulating the subjective disposition of the living organism. Maintaining this difference, and so reserving its existence

²²⁵ Alain Badiou, ‘Is There a Theory of the Subject in Georges Canguilhem?’, *Economy and Society*, 27:2-3 (1998), pp. 225-233: p. 233.

²²⁶ Alain Badiou, ‘Is There a Theory of the Subject in Georges Canguilhem?’: pp. 226 – 227.

²²⁷ Hoffmeyer, ‘Semiotic Freedom: An Emerging Force’: p. 162.

against the perturbations of the exterior, involved the elaboration of increasingly complex forms of self-reference on behalf of the organism. But far from signalling a retreat into itself, this asymmetrical condition prompted the ‘never-ending *interest*’ of life in the environment, the world beside itself, beyond its own boundaries. Another way of conveying the chiral dynamic of this asymmetry, as both process and product, is through the idea of persistently pursuing an explorative existence in order to return to and remain at home. Uexküll’s theoretical biology of the Umwelt provided a very advanced account of at least one half of this equation, not only by investigating the organism’s need to construct a meaningful setting for itself, inhabiting the sense of those signs which structured its perception and behaviour, but by understanding the integrity of the organism as a consequence of this enduring formation.

CHAPTER 3.

Transition: Peircean Biosemiotics between Aesthetics and Ecology

The Dispersal of Aesthetics: Unsettling Kant

As Thomas Sebeok remarked, Uexküll and Peirce each thoroughly assimilated the core Kantian principle that “‘raw experience’ is unattainable’. Via biology, Uexküll’s idea of the Umwelt interjected a constitutive aspect of subjectivity into every attempt to apprehend reality. In developing his philosophical logic, Peirce proposed that access to ‘objects’ depended on the contribution of ‘representamens’ and ‘interpretants’ in a structure preceding and complicating the apparent immediacy of sensation. These doctrines demonstrated that ‘experience, to be apprehended, must first be steeped in, strained through, and seasoned by a soup of signs’.²²⁸ Yet, while they may have agreed on the need for a distinctive theoretical antidote to naive realism, the recipes they concocted were not necessarily wholly complimentary.

Uexküll’s *Theoretical Biology* was consciously conceived as an attempt to apply Kantian reasoning to a neglected frontier in the science of life, the domain of those subjective processes, irreducible to physical and chemical laws, which he maintained were the key to explaining the sentient activity of living organisms. As a biologist Uexküll sought to ground these processes empirically, in both the physiological attributes of organisms and the relationships they formed with other objects and individuals. The internal regularity which seemed to govern the minds of animals could only be understood in terms of their activity, and in this respect a Kantian logic based purely on laws derived *a priori* was inadequate, or at least incomplete. All the same, Uexküll stressed the enduring merit of Kant’s work, as having clearly laid out those formal principles which composed the organisation of minds, and, first and foremost, for demonstrating that ‘*All reality is subjective appearance*’ (Uexküll 1926: xv).²²⁹

Peirce’s philosophy, meanwhile, proceeded from a critical revision of Kant’s categories, replacing his twelve concepts of the understanding, with a single trinity which Peirce claimed was sufficient to unify experience. While Peirce affirmed the formative influence of Kant’s philosophy on his own, and credited Kant’s ‘Copernican step’ as having opened up ‘the passage from the nominalistic to the realistic view of reality’, he would go on to include Kant in his charge that ‘all modern philosophy of every sect has been nominalistic’ (CP 1.19). In Kant’s case this lingering attachment to nominalism was especially evident in the idea of the ‘thing in itself’ inaccessible to experience (CP 5.452), but it might also be connected

²²⁸ Thomas A. Sebeok, *A Sign is Just a Sign* (Bloomington: Indiana University Press, 1991): p. 20.

²²⁹ Uexküll, *Theoretical Biology*: p. xv.

with the inadequate understanding of logic and relationality which Peirce associated with German Idealist philosophy more generally.²³⁰

Both Peirce and Uexküll would likely attest that the Kantian notion of the reality of the object, as the product of mental action, was corroborated, not by idealist abstraction, but through scientific or pragmatic experimentation. Where they would perhaps part ways is in the identity and privilege they would assign to the agent of this experimentation, as, in a more contemporary parlance, an observer of observation, able to at once apprehend a world, and conceive of its own paradoxical capacity to take up a perspective on the differentiation of that world. Peirce and Uexküll would agree that knowledge of our environment is mediated and therefore necessarily conditioned, but in a certain respect their sense of the nature and origins of the experience of reality nourishing this knowledge was subtly different. Where Uexküll sought to explain how particular species of organisms proactively construct their reality through sign action, Peirce's philosophy presents sign action itself as a general factor presupposed in an emergent knowledge of reality. From a methodological point of view, for Uexküll the natural factor embedded in the embodied form of an organism took precedence over signs, whereas for Peirce signs themselves had a logical priority over the mind and body of the individual.

With this Kantian framework in mind, one appealing way of understanding the aesthetic experience offered by artworks which disclose the transitional activity of inhabiting an Umwelt is in terms of the sublime. By interrogating their own form, medium, setting, and context, in place of merely picturing or modelling an environment, works of this order convey a sense of the fabric of the lived world as a construction of signs. Life and spirit are not then locked away within either the organism or the artwork, but dispersed and circulated through the ongoing composition of energy and matter that gains intelligibility through semiotic processes. Yet, the message to be gleaned from this effect is not necessarily, as in the Kantian application of this aesthetic concept, that reason and the understanding may supplant the inadequacy of the imagination; this is not proof that 'the mind has a power surpassing any standard of sense'.²³¹ In this respect at least, Kant's critical project is apparently back to front: it is the worldly and mutable standards of sense which cultivate the power of the mind, rather than the other way around. As such, the architectonic ambition of determining the limits of scientific and moral judgement *a priori*, so that they might once and for all be anchored to a centralised subject seems wrong-headed. Even as the intricacy, scope, and ambition of Kant's system is undeniably impressive, employing theoretical deduction to delineate the fixed division and domain of

²³⁰ The precise relation of Peircean to Kantian philosophy may be disputed, though an affinity can be established over and above Peirce's own criticisms of Kant's work. Gabriele Gava's book, *Peirce's Account of Purposefulness: A Kantian Perspective* (New York: Routledge, 2014) provides a thorough validation of one important aspect of this affinity.

²³¹ Kant, *Critique of Judgement*: p. 250.

philosophy, so that it might prove universally congruent with the sovereign state of thought, threatens to concrete over the habits of those myriad forms of life which ground reason by other means. If Kant's philosophy represents an impregnable temple in which the twin pillars of reason and moral freedom can be enshrined, protected from the disturbance of chaotic outside influence, installations, such as Merz's 8-5-3, Schwitters's *Merzbau*, and Mendieta's *Silueta*, might symbolise the profane disintegration of this metaphysical stronghold.

Against this polemic, there is plenty of evidence within Kant's own philosophy that he held a much more sophisticated and dynamic perspective than that which is caricatured here, and certainly an interpretation with greater depth would glean more fertile comparisons with biosemiotic principles from a reading of his work.²³² In a particularly evocative passage of the *Critique of Pure Reason*, Kant suggests that, through incessant philosophical excavations, the ground of truth has been honeycombed by subterranean workings, or more literally mole-tunnels [*allerei Maulwurfsgänge*], dug by reason in its futile search for hidden treasures.²³³ In this case, Kant's philosophy should be praised for bringing the act of thinking and inhabiting a place together, rather than unfairly attacked for seeking security in the process of firming up those boundaries with which reason must contend. All the same, there is some justification for continuing to challenge a cruder 'strawman' version of Kantian thought, so as to better distinguish what is original in the synthesis of Uexküll's idea of the Umwelt with Peirce's doctrine of signs.²³⁴

As a sign of his apparent disdain for all that is inclined to trespass beyond the boundaries of its assigned position, in the *Critique of Judgement* Kant takes music to task for its 'lack of urbanity':

The situation here is almost the same as with the enjoyment [*Ergötzung*] produced by an odour that spreads far. Someone who pulls his perfumed handkerchief from his pocket gives all those next to and around him a treat whether they want it or not.²³⁵

²³² For example, by reassessing the role of immanent teleology in Kant's third critique, arguing for an organism-centred view of the living, rather than reducing purposiveness to a projection of the observer, Weber and Varela have supplied promising precedent for rereading Kant's aesthetics. Andreas Weber and Francisco J. Varela, 'Life after Kant: Natural Purposes and the Autopoietic Foundations of Biological Individuality', *Phenomenology and the Cognitive Sciences* I (2002), pp. 97-125.

²³³ Immanuel Kant, *Critique of Pure Reason*, translated by Norman Kemp Smith (London: Macmillan, 1979): A 319/B 375 – 376.

²³⁴ As Peirce puts it, in the guise of his Pragmatist: 'I have found the combustion of a man of straw one of the best means of stopping my logical chimney from smoking; while your doctrine would seem to debar you from the employment of that useful device' (CP 5.503).

²³⁵ Kant, *Critique of Judgement*: p. 330.

According to this Kantian point of view, unlike visual impressions from which one can avert one's eyes should they cause offence, sound and music may obtrude upon a person's ears unexpectedly, or against their will. This is not just a valid complaint about the intensity of errant odours, and, accordingly, a quite reasonable reaction to the problem of noise pollution. Early on in the introduction to the *Critique of Judgement*, Kant runs through a list of terms relating to the division of land as applied to philosophy, defining 'realm', 'territory', and 'domain' in order to set the text on the right course, and legitimate the legislative powers of reason.²³⁶ The waywardness of music is then not only an imposition on those who seek silence, but a form of sensory experience that threatens to erode the carefully calibrated boundaries of the Copernican subject. Consequently, Kant is also concerned to corroborate an idea of music as a merely 'agreeable' form of art, quickening bodily sensation, yet devoid of any impact on thought.²³⁷ As he goes on to attest, his entire system is predicated on an essential difference between gratification and judgement, since failing to keep these two apart might taint reason with motivations derived from the muddled and conflicted space of natural appearances. In keeping with this standpoint, Kant must criticise Epicurus for 'including intellectual and even practical liking among the gratifications' as 'basically bodily sensation', unwilling to allow that the eschewal of such a distinction between thought and feeling could indicate anything other than an oversight.²³⁸

Kant was prepared to admit that music manifests itself as 'a language of affects', but, perceiving that the aesthetic ideas which music invoked lacked propositional content, corresponding to determinate concepts, he remained dismissive of its consequence beyond 'charm and mental agitation'.²³⁹ This kind of belittling of the significance of music still has currency according to some accounts of evolutionary psychology. Steven Pinker's definition of music as 'auditory cheesecake', an 'agreeable stimuli' of high intensity but devoid of adaptive value, represents a well-known example.²⁴⁰ Unlike Kant, rather than seeking to preserve other forms of aesthetic reasoning from the charge of being emotionally engaging, Pinker is content to demean art in general as a 'pleasure technology'. This denigration of aesthetic experience is predicated on a strict separation of the 'intellectual faculties' of the brain from the 'fitness increments' offered by a 'harsh world'; entertainments, such as narcotics, pornography, music,

²³⁶ Kant, *Critique of Judgement*: p. 174.

²³⁷ Kant, *Critique of Judgement*: pp 328 – 329.

²³⁸ Kant's urge to at once criticise and partially exonerate Epicurus, likely stemmed from his acknowledged debt to the Greek's evolutionary account of the universe. As represented in Lucretius' *De Rerum Natura*, this account dispensed with theological explanations of nature, in favour of a mechanistic approach to knowledge. Kant appreciated the Newtonian connotations of this approach, but he disapproved of another fundamental feature of Epicurean philosophy, namely the affiliation of the so-called swerve of atoms with chance and indeterminacy. Kant, *Critique of Judgement*: p. 331.

²³⁹ Kant, *Critique of Judgement*: 328 – 329.

²⁴⁰ Steven Pinker, *How the Mind Works* (New York: W. W. Norton, 1997): p. 534.

and cheesecake, present the opportunity to short-circuit this divide, artificially reproducing the 'pleasure-giving patterns' of 'healthful environments'.²⁴¹ Along with effacing the marked difference between these forms of pleasure as distinct constellations of signs, what gets erased by Pinker's stereotype of the individual living organism, as effectively a self-contained automaton, is a sense of the social and cultural dimension of human life as the consequence of a shared semiosphere. The fact that music does not conform to the intelligible structure of verbal language, is not cause to junk the notion of sound aspiring towards a communication of thought altogether. As Andrew Bowie has argued, not just against Kant and Pinker, but against musicologists like Peter Kivy, there is something more to be gained by thinking through music than a semblance of pure form, or a one-dimensional relationship to emotion divorced from meaning.²⁴² Metaphorical ideas like harmony and dissonance, noise and rhythm, assume substantial roles in our comprehension of relating both to our surroundings and to one another, and aspects of this same vocabulary can even be found in the background of Kant's philosophy, as a means of establishing identity in the midst of difference.²⁴³

By exposing the space of gallery as a contrivance, Modernist and Contemporary artworks can likewise be seen to deviate from the standards set in Kant's account of taste, potentially promoting the dissolution of this rarefied and rarefying view of aesthetic judgement. Marcel Duchamp's intent of 'burning up all aesthetics or callistics' for the sake of the 'possible', can be taken as a case in point, with the readymade *Fountain*, signed R. Mutt, showing up the limitations of a sense of art fixated only on the beautiful and the sublime, together with the pretensions of genius.²⁴⁴ The object of art is then no longer simply to imitate a world outside, by isolating and reproducing an image in a gesture designed to reflect the action of the mind's eye. Instead, artefacts, feelings and impressions which might be conceived in terms of the everyday, from the banal and the irritating to the curious and the disgusting, intrude upon and disturb an otherwise idealised domain in which truth and beauty can be safely equated, without the threat of alternative iterations of meaning. What's at stake in this challenge to the traditional values associated with art is Kant's strange and oxymoronic, yet stubbornly enduring notion of 'disinterested pleasure'. As Sianne Ngai observes in her *Ugly Feelings*, attempts to suppress elements of the affective dimension of aesthetic experience, both its gratifications and frustrations, may conform with the politically-charged pressure to curtail certain forms of agency.²⁴⁵ As well as the categories of gender and race which Ngai underscores, this censorious

²⁴¹ Pinker, *How the Mind Works*: pp. 524 – 525.

²⁴² Andrew Bowie, *Music, Philosophy, and Modernity* (New York: Cambridge University Press, 2007).

²⁴³ Bowie, *Music, Philosophy, and Modernity*: pp. 79 – 86.

²⁴⁴ Marcel Duchamp, 'Possible', translated by Arturo Schwarz, in *The Essential Writings of Marcel Duchamp* (London: Thames and Hudson, 1975): p. 73.

²⁴⁵ Sianne Ngai, *Ugly Feelings* (Cambridge, Massachusetts: Harvard University Press, 2005).

attitude towards art might facilitate the suppression of the animal and biological inheritance of those signs that comprise the human Umwelt.

Yet, the alternative conception of aesthetic practices induced by the perspective of biosemiotics is not just a shift in emphasis towards the embodied particularity of sense, rather than the universality of the intellectual idea, nor a celebration of the transgressive excess of ugliness and formlessness, in place of beauty and order. These reversals leave a crude form of the Idealist model of the subject, with its unfathomable inner experience, essentially intact, simply affirming, for the sake of being contrary, what Kant was at pains to restrain. Duchamp is supposed to have complained that despite his best efforts to shock gallerists, critics, and collectors, they continued to find his presentation of a urinal beautiful. Perhaps by virtue of the autonomy which Kant promises to art, harbouring an objective value which is not equivalent to either moral law or scientific truth, his principles have endured, with the sublime, especially, retaining relevance as a prototype of other contemporary forms of feeling.²⁴⁶ What is then applicable against Kant, is not just the replacement of one set of aesthetic criteria for another, but an engagement with the site of art, or what Rosalind Krauss has called the 'expanded field'.

For Krauss, the gradual emergence of the expanded field was typified, at the end of the nineteenth century, by the failure of Rodin's *Gates of Hell* and his statue of *Balzac* to coherently act as monuments; rather than representing unique works of genius tied to a fixed setting, the dysfunction of the *Gates* (intended as doors for a museum) and the inaccuracy of *Balzac* (as a depiction of the person it was supposed to memorialise), along with the multiple incomplete editions of each work, disrupted the principles traditionally associated with sculpture:

With these two sculptural projects, I would say, one crosses the threshold of the logic of the monument, entering the space of what could be called its negative condition—a kind of sitelessness, or homelessness, an absolute loss of place.²⁴⁷

According to Krauss, as neither architecture nor landscape, this placeless and self-referential condition of modern sculpture cleared the way for a range of postmodern works produced in the 1960s and 70s, including Robert Smithson's *Mirror Displacements*, Robert Morrison's *Untitled (Mirrored Boxes)*, Mary Miss's *Perimeters/Pavillions/Decoys*, and Alice Aycock's *Maze*. The structuralist approach of Krauss does not lead her to consider this development in terms of the emergence of ecological thought, nor through the philosophical revival of semiotics, but the pertinence of these parallel histories is still discernible. What characterises the works listed, as not just sculptures, but as *environments*, destabilising the distinction

²⁴⁶ Cassirer, for one, begins an assessment of art by affirming the autonomy established by Kant's aesthetics. Cassirer, *An Essay on Man*: p. 137.

²⁴⁷ Rosalind Krauss, 'Sculpture in the Expanded Field', *October* Vol. 8 (Spring, 1979), pp. 30-44: p. 34.

between nature and culture, as well as undermining the sculptural negation of landscape and architecture, is their site-specificity: they resist reduction to objects placed and centred within a circumstantial background, rather, it is by altering the conditions of their presentation in situ, and so deriving form from a new sense of their surroundings that these works gain a transactional wholeness. Contrary to the customary juxtaposition of subject versus object, with a reflective mind grasping its own power over meaning in the autonomous image of the artwork, it is the co-dependency of a living subject and lived world which emerges. Each of these works may be seen to intervene in a setting in such a way that they become signs of both the subject's active role in composing and conceiving of a world, and the reciprocal construction of the subject by the signs with which they are confronted.

In line with a comparable logic, though this time intervening directly within the space of the gallery, Merz's 8-5-3 interrupts the tradition of aesthetics by setting the scene for the desertion of the prefabricated subject, working through its replacement by way of a much more remarkable lesson about the participation of subjectivity in an ongoing catalysis of signs. Recalling Goethe's claim that 'architecture is frozen music', by putting together a 'marvellous sound' in broken glass, stakes, and bundles of branches, 8-5-3 allows the dynamic of sense-making to repose in the form of a structure for living.²⁴⁸ The absence of an identifiable resident does not undermine this structure. As Uexküll's research into the lives of lower animals shows, processes of gaining or losing meaning take place in the world without the inexorable convenience of a singularly privileged point of reference. Nodes of significance proliferate, as do boundaries of irrelevance or noise, and the chance of life's externalisation depends on defending against or developing these diverse avenues. Even when silenced, and reprised metaphorically in a play of light against cut glass, the pattern of inter-related tensions propagated by music overwhelms the separation of interior and exterior, opening up an incarnation of the environment as always on the verge of being imbued with meaning: do we inhabit music or does music inhabit us?

²⁴⁸ The identity of the first author to affiliate architecture with frozen music is difficult to track. Michael Bright records four variations on this idea: the most familiar to be found in Friedrich von Schelling's *Philosophie der Kunst* (1802-3); a claim on the same idea is attributed to Goethe in *Conversations of Goethe with Eckermann and Soret* (1829); a seemingly satirical complaint of having forgotten the originator of this notion is recorded in Lord Byron's *Journals* (1813); and a comparison of a monument with 'continual and stationary music' in Madam de Staël's *Corrine* (1807). Michael Bright, *Cities Built to Music: Aesthetic Theories of the Victorian Gothic Revival* (Columbus: Ohio State University Press, 1984): p. 82.

From Castles in the Air to Ecological Minds

In a passage quoted by Canguilhem, Michel Serres – another philosopher whose work bears comparison with biosemiotics – presents an apt deposition of the prospective flaw in Kant’s reasoning. Serres mocks ‘the foolish project of describing what is going on inside the knowing subject’:

Who told you? What did you see? Tell me where to go to see it. The conditional is a counterfactual. The conditions of possibility are here and there, not inside this fairy castle, this utopia. It was Kant and the critical project which Marx set on its feet, established at last on an identifiable earth. Marxism is an example of a successful criticism which precludes dreams of Prince Charming.²⁴⁹

Serres presents the inadequacy of Kant’s conception of the subject here in terms of Marx’s intervention within philosophy, but a parallel criticism may be derived from a complimentary reading of Peirce and Uexküll. While Uexküll is not explicitly mentioned, his tick can be readily understood as a prototype of Serres’ *Parasite*, and, through its devotion to the excluded and included third, as both mediation and interruption, this text has a distinctly Peircean flavour.²⁵⁰ The above lines of Serres were originally to be found in an essay on the Italian artist, Vittore Carpaccio. In Carpaccio’s paintings Serres discovers a cartography, or practice of space, which he perceives to be the antithesis of ‘the old Kantian myth’ of a transcendental subject. Instead, these paintings are found to exemplify the constitution of art, music, and meaning-making in general, as a process of negotiating positions, putting things in place, as well as removing, or transplanting them from elsewhere. On this basis Serres redefines aesthetics in terms of two principles: Firstly, the insight that aesthetics is an issue of topology, i.e. it depends on the composition of an inhabited area, a composition that is the product of contiguous physical and mental processes. Secondly, the conviction that aesthetics is inextricably tied up with semiotics, i.e. aesthetic experience was sustained through the ongoing interpretation and dissemination of what Serres calls an ‘alphabet of forms’.²⁵¹

²⁴⁹ Michel Serres, *Esthétiques sur Carpaccio* (Paris: Hermann, 1975): pp. 86 – 88, qtd. in Georges Ganguilhem, *Ideology & Rationality in the History of the Life Sciences*, translated by Arthur Goldhammer (Cambridge, Massachusetts: MIT Press, 1988): p. 23, nb. 44. An alternative translation of the original can be found in Michel Serres, ‘Peter-Stephen Isomorphisms, 2’, translated by H. B. Von Ohlen, from *Diacritics*, Vol. 5, No. 3 (Autumn, 1975): p. 43.

²⁵⁰ Michel Serres, *The Parasite*, translated by Lawrence R. Schehr (Minneapolis; London: University of Minnesota Press, 2007).

²⁵¹ Michel Serres, ‘Peter-Stephen Isomorphisms, 2’, in *Diacritics*: p. 43.

Although he did not take the implications of his thought in the direction of a critique of political economy, Peirce's own inversions of Kant do bear some comparison with that attributed to Marx. Like Marx, Peirce found that the conditions of possibility were not locked away inside the subject, but pervaded the reality of the world. In Peirce's case this realisation stemmed from a phenomenological discovery that the beginnings of perception did not initially appear in bits, as in the parts and pieces of an idea which the mind must then assemble. In fact, the world of appearance first emerged as a continuous whole, which the act of thinking then analysed into pertinent sections, i.e. signs (CP 1.384). As Roberta Kevelson explains, this corrects the Kantian doctrine that a verbal synthesis must precede every analysis, since the postverbal perspective of the mind mistakes the articles of thought (as in Uexküll's terms the *Merkzeichen* and *Wirkzeichen* of the Umwelt) for a presentation of reality in itself.²⁵² As opposed to taking up the Kantian question of their possibility *a priori* and likewise repudiating the distinction between the phenomenal and the noumenal, Peirce asked how synthetic judgements were possible at all because he comprehended that the original synthesis sought by philosophers was a fiction (CP 5.348).²⁵³ Thought was not made possible by the synthetic power of a mind or god subtracted from the world, rather it was the tendency of the world to gain in continuity, to take habits, and so to evolve intelligible forms in conjunction with the intelligence to grasp them, which gave rise to those objects defining truth and meaning. After all, the grounds of validity were not to be discovered through introspection alone, but through that socially mediated consensus which Peirce called 'critical common-sensism'.²⁵⁴

Marx maintained that human beings were, to the fullest extent, 'directly natural being[s] [...] *corporeal*, living, real, sensuous, objective beings with natural powers' – their appetites and aspirations were embedded within the material empirical world which they inhabited, and from which their own motivations were originally derived.²⁵⁵ This meant that the so-called soul of the human was not cloistered away within either the unfathomable mind of a purely intellectual subject, pre-equipped with immaculate faculties. Rather, for Marx, human beings were materially engaged with *real, sensuous objects*, as both the source of sustaining life for the sake of expression, and the actual means by which this expression of life

²⁵² Roberta Kevelson, *Peirce and the Mark of the Gryphon* (London: Macmillan Press, 1999): p. 5.

²⁵³ Kevelson, *Peirce and the Mark of the Gryphon*: pp. 174, 191 – 192. Gava would reject this anti-Kantian interpretation, arguing instead that the model of aesthetic enjoyment, regulative ideas, and synthetic judgements, developed in the third *Critique* closely parallels Peirce's own conclusions. Gava, *Peirce's Account of Purposefulness*.

²⁵⁴ This argument reappears throughout Peirce's work, e.g. 'I am happy to think that you do not yourself sincerely judge all the sages of human nature to have been conscious liars who from time immemorial have testified to their conviction that man possess no infallible introspective power into the secrets of his own heart, to know just what he believes and what he doubts. The denial of such a power is one of the clauses of critical common-sensism' (C.P. 5.498).

²⁵⁵ Karl Marx, 'Critique of Hegel's Philosophy in General' (1844), in *Early Writings* (New York: Vintage, 1974): p. 390.

could be externally posited and communicated. The conditions of knowledge, along with ideas like truth, beauty, and the good, were not nailed to a single absolute point, but mutable and dispersed, mixed up with those myriad metabolic processes which shaped and re-shaped the world; counterfactual in the sense that they represented possibilities played out in reality. As an example of this, the provisional or unsettled order of things, Marx emphasised hunger: without sustenance, a ‘natural need’ which may or may not be satisfied, ideas like truth had no meaning. The alternative of being with or without food, or indeed sufficient money to purchase food, takes priority over the fantasy that some supernatural being may exist indifferent to such exigencies, happy to do no more than know that it is right. In *The Parasite*, Serres reiterated the same lesson with reference to both Descartes and financial capital:

The real doubt is poverty. Radical doubt to the extreme is misery. Descartes cheated; he should have gone out, a new Francis of Assisi, and gotten rid of his goods. Descartes cheated; he didn’t throw ducats into the stream. He never lost the world since he kept his money. The true, radical Cartesian is the cynic. Descartes never risked losing his “I,” since he never risked his money. [...] A rich fool is rich; a poor fool is a fool. A rich “I” is rich; a poor “I” is an “I”.²⁵⁶

Peirce expressed this point differently, but with the same basic message: ‘There must be a real and living doubt and without this all discussion is idle’ (CP 5.370 – 376). A feeling of agitation, rather than an abstract philosophical question, for Peirce the ‘irritation’ of doubt prompted ‘an uneasy and dissatisfied state’ along with a struggle to return to the ‘satisfaction’ of belief. Beliefs, meanwhile, were not held indifferently, but, acting as a means of guiding desires and shaping actions, were clung to tenaciously. Explicitly invoking the biological embodiment of these dispositions, Peirce compared doubt with:

[T]her irritation of a nerve and the reflex action produced thereby; while for the analogue of belief, in the nervous system, we must look to what are called nervous associations – for example, to that habit of the nerves in consequence of which the smell of a peach will make the mouth water. (CP 5.373)

These arguments were made in an early article, ‘The Fixation of Belief’, published in 1877, which, along with ‘How to Make our Ideas Clear’ (1878), laid the groundwork for Peirce

²⁵⁶ Serres, *The Parasite*: p. 229.

pragmaticism by incorporating the logic of experimental life-science into philosophy.²⁵⁷ Two critical points buttressed this groundwork: firstly, the recognition of embodied habits of mind as the bedrock of belief, leading from the premises of feelings and impulses to logically constrained conclusions; and secondly, the need to trial and settle the fallible habits of mind by engaging with a community of inquirers. This social engagement did not imply a weak relativism, according to which a belief was contingently valid, purely through the stubborn tenacity of the individual, the authority of an institution, or the fashionable opinions of a particular group. All these factors might contribute to belief, but what was integral to the evolving truth of the underlying habits of mind was the sense of an independent *reality*, an external permanency surpassing individual attitudes, which compelled each individual to establish consensus together with a community – without this collective and enduringly fallible conception of real things Peirce wagered that the physiological dissatisfaction enervating doubt would be meaningless and unthinkable (CP 5.384).

Along with their shared resistance to a Kantian aesthetics which would too hastily sever sense and thought, an unconventional means of framing the affinity between Marxian and Peircean philosophy is by way of another discipline which emerged thanks to advances in the scientific study of life. Although neither Marx nor Peirce would mention ecology in their own writings, and the methods and theories of this discipline were far from fully formed in their own lifetimes, in certain critical respects each developed a standpoint on the link between knowledge and life that foreshadowed an ecological understanding of complex systems. Traditionally, Marxism has more often been regarded as a version of humanism, which seeks to affirm and ultimately complete man's endeavour to control and exploit natural phenomena for his own purposes, thereby instrumentalising an environment which would otherwise remain stubbornly at odds with human flourishing. Nevertheless, a number of commentators have made the same link between Marx and ecology espoused, prompting the possibility of something like an ecological turn within Marxist thought.²⁵⁸ Supporting this affiliation, a key concept within Marx's critique was the idea of a 'social metabolism' or *Stoffwechsel*, derived from the work of German physiologists, which foregrounded processes of material exchange and regulatory

²⁵⁷ For further discussion of the part played by these articles in the development of Peirce's thought see Carl R. Hausman, *Charles S. Peirce's Evolutionary Philosophy* (New York: Cambridge University Press, 1997): pp. 21 – 37.

²⁵⁸ Several texts might be cited here. A comprehensive account of this link can be found in John Bellamy Foster's *Marx's Ecology: Materialism and Nature* (New York: Monthly Review Press, 2000). Even while criticising aspects of Bellamy Foster's position, and of environmentalism more generally, David Harvey has acknowledged the importance of a link between contemporary Marxism and ecology, in, for example *Justice, Nature and the Geography of Difference* (Oxford : Blackwell, 1996). Finally John Goodbun has also commented upon the increasing relevance of this connection in his article 'Gregory Bateson's Ecological Aesthetics - an addendum to Urban Political Ecology' in *field*, 4: 1 (2011).

action.²⁵⁹ No less pertinent, was the epistemology of sensation, which Marx derived from Feuerbach's critique of Hegel, and which he further advanced in terms of the political and economic tensions that affected the collective existence of living organisms. Consequently, Marx's proto-ecology not only focussed upon the exchange of energy and materials which supported and curtailed the course of life, equally it drew attention to the elaboration of sensations and ideas which informed those appearances enabling both individuals and communities to make sense of, and reconstruct their surroundings. As Marx wrote, of another thinker fundamental to the development of his own ideas: 'the pure form of the world of appearance is time [...] Epicurus was the first to grasp appearance as appearance, that is, as alienation of the essence, activating itself in its reality as such an alienation.'²⁶⁰

Like Marx, Peirce was partly influenced by Epicurus, in his case recognising that a modicum of unpredictability – in Epicurean terms, the swerve of atoms in the clinamen – was a necessary corrective to a mechanistic determinism which perceived only brute reaction.²⁶¹ As Timo Maran has highlighted, there is evidently an intuitive resemblance between Peirce's portrayal of semiosis as a process of dynamic growth and those transitional processes which contribute to the natural history of an ecosystem.²⁶² Where natural ecology charts connections between environments and organisms, via the succession of generations, food chains, and the cycling of chemical substances, Peircean semiotics traces the passage of signs linking objects and interpretants, by way of those feelings, habits, and inferences of mind which serve to harbour these vectors of reference. As with Marx, a key factor justifying an ecologically inclined re-appropriation of Peirce stems from the philosopher's appreciation of the value of evolution in explaining patterns of natural development. This appreciation extended not just to Darwin's theory of natural selection, which Peirce greatly admired for emphasising the role of 'fortuitous variation', or what he called Tychism, in establishing physical laws. It also stretched to the principle of habit-taking, which Peirce associated with Lamarck's account of evolution through the transmission of acquired characteristics (CP 6.299). And further, to his own notion of Agapism, a power of sympathy which Peirce held impelled the evolutionary development of ideas through mutual attraction and collaboration (CP 6.307). Both Tychism and Agapism represented essential compliments to the mechanical necessity, or Anancism, which Peirce perceived was already unduly privileged by many of Darwin's followers, in their emphasis on competitive struggle, fitness, and adaptation as the primary motors of evolutionary change.

²⁵⁹ Bellamy Foster, *Marx's Ecology: Materialism and Nature*: pp. 157 – 163.

²⁶⁰ Karl Marx quoted in Bellamy Foster, *Marx's Ecology: Materialism and Nature*: p. 55.

²⁶¹ For discussion of the influence of Epicurus on Peirce see Max H. Fisch, 'Peirce's Arisbe: The Greek Influence in His Later Philosophy' *Transactions of the Charles S. Peirce Society*, Vol. 7, No. 4 (Fall, 1971), pp. 187-210.

²⁶² Timo Maran, 'Towards an Integrated Methodology of Ecossemiotics: The Concept of Nature-text', *Sign Systems Studies*, 35, 1/2 (2007): p. 270.

Offering a sentiment that seems to foreshadow something of Uexküll's ecology, Peirce proposed that in nurturing ideas '[t]he movement of love is circular, at one and the same impulse projecting creations into independency and drawing them into harmony' (CP 6.288).

Nonetheless, there is at least one issue on which Marx and Peirce would seem to have parted ways. In *The German Ideology*, authored together with Frederick Engels, Marx distinguished humans from other animals on a number of grounds. To begin with Marx and Engels observed that humans distinguished themselves from other animals 'as soon as they began to *produce* their means of subsistence', but this 'mode of life' remains 'conditioned by their physical organisation'.²⁶³ In so far as this differentiated human beings through their capacity to transform their surroundings, rather than through an essential attribute which transcends the semiotic reality of life this definition seems reasonable. Another distinction, introduced subsequently, is potentially more questionable. On the basis that language alone 'is practical consciousness', Marx and Engels deny that animals are able to form relationships: 'the animal does not enter into "*relations*" with anything, it does not enter into relation at all'.²⁶⁴ They justify this divide by separating the self-conscious organisation of society from the 'sheep-like' 'herd consciousness' which retains consciousness of nature only in terms of its immediate sensual environment, and with limited connection to other person. The problem that this ideal of grounding relations solely in a socially-mediated consciousness potentially incites is the elision of the biological (and hence semiotic) inheritance of human society and culture, as embodied in the cohabitation of a shared environment. In their later work, Marx and Engels continued to emphasise the historical production of the human, without presupposing an incontrovertible divide from nature.²⁶⁵ Yet, in denying animals the capacity to form relations, the early writing of Marx and Engels recalls a philosophical tradition of severing the link between humanity and nature with both Cartesian and Hegelian roots.

As far as Hegel was concerned the ontological divide between human life and that of other animals was beyond dispute: 'Spirit is thought in general and the human being is distinguished from the animal by thought'.²⁶⁶ Animals are dispatched, together with sense-

²⁶³ Karl Marx and Frederick Engels, *The German Ideology* (London: Lawrence and Wishart, 1999): p. 42.

²⁶⁴ Marx and Engels, *The German Ideology*: pp. 50 – 51.

²⁶⁵ Louis Althusser's influential and controversial reading of Marx suggests that, in 1845 just prior to writing *The German Ideology*, he broke with ideological humanism, developing a critique on the basis of the unconscious lived relation between men and their world. If this is true then the denial of relations to animals must surely be understood as a consequence of false-consciousness, rather than distinguishing the reality of human nature. See 'Marx and Humanism' in *For Marx*, translated by Ben Brewster (London: Verso, 1990). Paul Cobley notes the parallels between Althusserian anti-humanism and the development of biosemiotics by Sebeok in 'Semioethics, Voluntarism and Anti-Humanism', *New Formations* 62 (Autumn 2007): pp. 80 – 81.

²⁶⁶ G. W. F. Hegel, *Elements of the Philosophy of Right*, translated by H. B. Nisbet (Cambridge: Cambridge University Press, 2002): p. 35.

certainty, before the end of the first section of the *Phenomenology of Spirit*, on the basis of an inability to access experience of universals. With surely some intended irony, Hegel does not deny animals ‘wisdom’: ‘for they do not just stand idly in front of sensuous things as if these possessed intrinsic being, but, despairing of their reality, and completely assured of their nothingness, they fall to without ceremony and eat them up.’²⁶⁷ In other words, without any prospect of knowledge beyond the immediacy of sensation the only viable course of action is instinctive consumption, and this compulsion is said by Hegel to characterise Nature as a whole, at least at this stage of the dialectic. This is not the last time that either animals, plants, or non-human life more generally will appear in the *Phenomenology*, but it does expose a facet of Hegel’s attitude towards animals, effectively debasing them as unthinking eating machines, and recalling Descartes’ characterisation of animals as little more than clockwork-like mechanisms.²⁶⁸ Since animals could only access their surroundings through their senses, representation of ideas (*Vorstellung*) was judged by Hegel to be inaccessible to animals, and their activity, impelled solely by something inward, was said to be purely instinctive; accordingly, rationality (along with desire, will, and freedom) remained impossible for animal life.²⁶⁹

In keeping with his account of the organism as the organised form of life, Hegel’s notion of sensation (*Empfindung*) is not entirely one-dimensional: he divides sensation into an inner aspect of ‘abstract feeling or self-containment’ and an outer movement of ‘irritation’. Irritation stands in opposition to the ‘being-with-oneself’ of sensibility as a ‘moment of difference’; a third factor in this schema is the nervous system, which, through its internal organisation, mediates between sensibility and irritation guiding the course of each.²⁷⁰ Accordingly, at once influenced and sometimes misled by the scientific literature of his day, Hegel did conceive of living beings as organic unities, and understood that an organic, sensitive body must be the enabling condition of subjectivity and self-determining thought.²⁷¹ In this respect, he had a deeper appreciation of the link between embodiment and the mind than is sometimes admitted, advancing beyond both his Cartesian and Kantian precursors.

²⁶⁷ G. W. F. Hegel, *Phenomenology of Spirit*, trans. by A. V. Miller (Oxford: Oxford University Press, 1977): p. 65.

²⁶⁸ René Descartes, *Discourse on the Method*, trans. by Ian Maclean (Oxford: Oxford University Press, 2006): pp. 46 – 48. René Descartes, ‘To Princess Elizabeth, December 1646’ in *The Philosophical Writings of Descartes: Volume 3, The Correspondence* (Cambridge: Cambridge University Press, 1991): p. 304.

²⁶⁹ Hegel, *Elements of the Philosophy of Right*: p. 36.

²⁷⁰ Hegel, *Elements of the Philosophy of Right*: p. 286.

²⁷¹ Hegel’s theory of the organism reappeared throughout his writings, and was notably influenced both by Kant, and by Albrecht von Haller’s ideas on physiology. In this way he advanced Kant’s example in the vein of Romantic *Naturphilosophie*, while also pre-empting certain aspects of Uexküll’s theory of the *Funktionkreis*, as discussed in previous chapters. Jon Stewart, *The Unity of Hegel’s “Phenomenology of Spirit”: A Systematic Interpretation* (Evanston: Northwestern University Press, 2011): pp. 193 – 194.

However, Hegel also remained attached to an essentially Hobbesian view of what he called the ‘animal-state’ of ‘natural humanity’ as consisting of ‘savagery and self-seeking, of dependence and fear’.²⁷² Implicit in this characterisation of the ‘unfreedom’ of natural humanity is the assumption that, however ignorant and therefore innocent, animal nature must remain degenerate, while human nature includes the possibility (though not the guarantee) of a level of moral refinement. All of those terms, which, along with *Geist* itself, may be associated with the dynamic development of culture, including *Bildung* (development, education, or culture), *Gewohnheit* (habit or custom), and *Stittlichkeit* (the customary or ethical life), are, in Hegel’s system, unreachable from the point of view of animal life, unless imposed through husbandry. The problem here is not so much a dispute concerning whether animals can autonomously possess certain virtues or rights, like freedom and morality, since it may be granted that such debates have genuine meaning only in the sphere of human society. What is lacking in Hegel’s philosophy of spirit is any constructive account of the original development and differentiation of animal life *prior* to the advent of the human intellect.

Despite his dedication to elucidating the means by which human consciousness developed through history, Hegel demonstrated a marked lack of interest in the question of what guides and motivates the emergence of natural phenomena. Although Charles Darwin’s theory of natural selection was not published in Hegel’s lifetime, an idea of the mutability of species had long since been proposed, and Lamarck’s theory of the gradual development of higher organisms was familiar to Hegel.²⁷³ Nevertheless, he was openly contemptuous of the idea that animals might develop through evolution, and found the notion that they might adapt to occupy new environments particularly difficult to take seriously. In the introduction to his *Philosophy of Nature* Hegel declared that: ‘it is a completely empty thought to represent species as developing successively, one after the other, in time. [...] The land animal did not develop *naturally* out of the aquatic animal, nor did it fly into the air on leaving the water, nor did perhaps the bird again fall back to earth.’²⁷⁴ A mistaken, though arguably justified response to the lack of evidence available at the time, Hegel’s refusal to take the evolution of species seriously was equally in keeping with his sense of the logic of nature as at once eternal and therefore timeless, as well as spontaneously universal. Forgoing any acceptance of natural evolution also allowed Hegel to preserve a conception of human freedom as essentially self-perpetuating, and therefore (via the mediation of the juridical and political state) able to rid

²⁷² G. W. F. Hegel, *Lectures on the Philosophy of Religion: The Consummate Religion*, trans. by R.F. Brown, P.C. Hodgson, and J.M. Stewart, with the assistance of H.S. Harris (Oxford: Clarendon Press, 2007): pp. 93 – 94.

²⁷³ Stephen Houlgate, *An Introduction to Hegel, Freedom, Truth and History* (Oxford: Blackwell, 2005): pp. 173 – 174.

²⁷⁴ G. W. F. Hegel, *Hegel's Philosophy of Nature: Being Part Two of the 'Encyclopaedia of the Philosophical Sciences'* (1830), trans. by A. V. Miller (Oxford: Clarendon Press, 2004): pp. 20 – 21.

itself of those regressive tendencies which he identified with humanity's more primitive condition. Yet, this split between the ahistorical condition of non-human life, and the progressive presentation of human freedom, left him unable to conceive of any constructive precedent for sociality and co-operation in the natural world.

As Wendy Wheeler notes, Hegel's philosophy was among the first to systemically present the evolution of consciousness and human culture as intrinsically intertwined, and as progressing through a indefatigably capricious route.²⁷⁵ While Peirce's philosophical project certainly bears comparison with that of Hegel in this capacity, his sense of the development of rationality was crucially different in so far as he understood thought, not as a departure from the natural conditions of life, but as explicitly connected with those biological and ecological processes which informed the behaviour of non-human and human organisms alike.

A decapitated frog almost reasons. The habit that is in his cerebellum serves as a major premiss. The excitation of a drop of acid is his minor premiss. And his conclusion is the act of wiping it away. All that is of any value in the operation of ratiocination is there, except only one thing. What he lacks is the power of preparatory meditation. (CP 6.286)

Almost, but not quite: together with lacking an independent life, the decapitated frog lacks the 'preparatory mediation' which will enable it to react to signals from its surroundings as signs. Implicit in Peirce's argument here is the realisation that a *living* frog must respond to its surroundings, not just through blind mechanical law, but through the 'law of mind' which perpetuated the formation of new habits. Just like Uexküll, Peirce was not able to explain exactly how living organisms acquired the capacity to recognise and respond to environmental occurrences intelligently, instead resorting to speculation about the properties of protoplasm, but whereas Uexküll proposed a transcendental 'rule of life' as the inexplicable root of each Umwelt, Peirce presented a capacity for progressive change as differentiating organic from inorganic matter.²⁷⁶ As such, intelligence was not the result of feeling alone, but a consequence of conduct, a tendency to act in a certain way, and more than this, the visceral potential for acting differently. To this end Peirce affirmed the constructive promise of the imagination, taking daydreaming as an example, which might also serve to qualify Serres' Marxian critique of Kant:

²⁷⁵ Wheeler, *The Whole Creature*: p. 25.

²⁷⁶ 'There are many circumstances which lead us to believe that habit-taking is intimately connected with nutrition. Protoplasm grows: and that not as a crystal in a supersaturated or highly concentrated solution grows, by simply attracting matter like itself. It grows by chemically transforming other substances into its own chemical kind' (CP 6.283).

People who build castles in the air do not, for the most part, accomplish much, it is true; but every man who does accomplish great things is given to building elaborate castles in the air and then painfully copying them on solid ground. (CP 6.286)

This example of imaginative fantasy may seem to characterise the human mind alone, but just as Peirce suggested that the rules of cognition derived from habits could either be congenital or acquired through learning (CP 2.711), so the potential for developing new habits could be perpetuated either by evolution, as in the emergence of new species of organisms, or via play, as in creative engagement with the possibilities of thought. This meant that the ‘preparatory meditation’ lacking in a dead frog, was not necessarily a form of conscious contemplation, or even the property of an individual organism alone, but a receptivity to grasping continuity through change, communicated at an unconscious level, and spanning the lives of a community.

To accentuate the contrast between Peirce’s perspective on the cooperative evolution of life and thought, versus that which had also emerged in the nineteenth century to distinguish human enterprise and culture, another quotation of Marx is helpful:

We presuppose labour in a form in which it is an exclusively human characteristic. A spider conducts operations which resemble those of the weaver, and a bee would put many a human architect to shame by the construction of its honeycomb cells. But what distinguishes the worst architect from the best of bees is that the architect builds the cell in his mind before he constructs it in wax. At the end of every labour process, a result emerges which had already existed ideally. Man not only effects a change of form in the materials of nature; he also realises [*virwirklicht*] his own purpose in those materials.²⁷⁷

In his *Prefigurements of Art*, Sebeok also picked up on Marx’s distinction here, as an example of what he called a ‘Sophistic devaluation of nature’.²⁷⁸ While critically building on Marx’s example by further distinguishing between *animal laborans* – ‘the servant of nature’ – and *homo faber* – ‘lord and master of the whole earth’ – according to Sebeok, Hannah Arendt effectively adopted the same parochial viewpoint as Marx, whereupon the artefacts produced by animals in their engagement with an environment are degraded into mechanistic means, and

²⁷⁷ Karl Marx, *Capital: A Critique of Political Economy: Volume 1*, translated by Ben Fowkes (London: Penguin Books, 1990): pp. 283 – 284.

²⁷⁸ Sebeok, *Prefigurements of Art*: p. 44.

stripped of their aesthetic and economic value.²⁷⁹ In his 'Prolegomena to an Apology for Pragmaticism' Peirce made plain his understanding of the decisive part played by 'thought' in developing the intelligibility of the world, along with his opposition to an anthropocentrism which would deny the rationality already embodied in material forms.

Thought is not necessarily connected with a brain. It appears in the work of bees, of crystals, and throughout the purely physical world; and one can no more deny that it is really there, than that the colors, the shapes, etc., of objects are really there. Consistently adhere to that unwarrantable denial, and you will be driven to some form of idealistic nominalism akin to Fichte's. Not only is thought in the organic world, but it develops there. But as there cannot be a General without Instances embodying it, so there cannot be thought without Signs. (CP 4.552).²⁸⁰

Peirce connected this conception of the efficacy of thought as extended beyond the brains of individual persons with what he called a 'quasi-mind'. As Peirce explained to Victoria Welby, the generality of abstract concepts such as 'Right' and 'Truth' was not reducible to its embodiment within the brains of particular individuals, nor to its applicability in particular cases, but by its active communication as a *sign* which could encompass all these instances without having its meaning exhausted.²⁸¹ Similarly, a thought, as conducted by signs, could not be entirely isolated *within* an individual mind, nor necessarily attributed to a single thinking brain, but was nonetheless determined by the quasi-mind with which it was externally connected. Leaving aside Peirce's more problematic reference to crystals, beehives represent an especially pertinent example of a quasi-mind, both as an illustration of animal architecture prefiguring art, and as constructions which support the profound role of semiotic communication in the development of complex systems. In this case, the application of Peirce's semiotics brings the two disciplines discussed above into correspondence, resetting the scope of each in terms of the efficacy of signs: ecology, as the science of those systems of relations linking organisms together with the external resources of their environments, and aesthetics, as a means of analysing the unconscious value-judgements attached to feelings and sensations.

Again, it is not so much Peirce himself, as his student John Dewey who made this merging of ecology and aesthetics more explicit; Dewey's *Art as Experience*, first published in 1934, offers what must be one of the earliest and most vigorous explorations of this line of

²⁷⁹ Sebeok, *Prefigurements of Art*: pp. 44 – 45. Hannah Arendt, *The Human Condition* (Chicago: University of Chicago Press, 1958): p. 39.

²⁸⁰ Charles Peirce, 'Prolegomena to an Apology for Pragmaticism' [1906].

²⁸¹ Charles Peirce, *Charles S. Peirce's Letters to Lady Welby* (New Haven: Published by Whitlock's for the Graduate Philosophy Club of Yale University, 1953).

reasoning. By writing about art as an extension or refinement of the inherent richness to be found within perception and embodied action, Dewey opens up the aesthetic to a plurality of activities that are not so often privileged. As such, no less relevant to this subject than those singular creations venerated as works of genius are the everyday experiences in which anyone with the requisite skills can become absorbed. The insight into space and shape accompanying the skilled gestures of a sculptor should not necessarily be isolated from the know-how and craft of a carpenter. The refined understanding of melody and delight in sound that inspires a composer of classical music need not be set against the athleticism and commitment to competition that motivates a tennis player. Less formally still, someone skipping stones across the water, selecting projectiles of the best shape and size to suit this purpose, balancing their own strength against the weight of each, and adjusting their posture and aim in order to achieve the most satisfying result, is drawn into the same play of tension and resolution which, in different forms, nourishes the creation and enjoyment of works of art. Whether performed with expertise or ineptitude, all of these experiences depend upon a sensorium mediating interaction with a world of events and things. It is the individual's ongoing adaptation to this world that fuels aesthetic experience, as they overcome and transform those obstacles that impede upon the satisfaction of their needs and desires. Aesthetics then deals with those malleable material conditions that comprise the multifaceted experience of being alive, encompassing the spectrum of the senses that bestow access to our surroundings, along with the corresponding capacity to manipulate and mould the substance of our impressions.

As Dewey observes, identifying the origins of art with the conditions of life promotes the recognition that the evolutionary ground of aesthetic experience is not confined to humans alone. The adaptation of the live creature depends upon its capacity to make sense of its surroundings and make its mark on its environment: to grasp experience as the ongoing fulfilment of this struggle is to apprehend 'art in germ':

Art is thus prefigured in the very processes of living. A bird builds its nest and a beaver its dam when internal organic pressures cooperate with external materials so that the former are fulfilled and the latter are transformed in a satisfying culmination. We may hesitate to apply the word "art" since we doubt the presence of directive intent. But all deliberation, all conscious intent, grows out of things once performed organically through the interplay of natural energies.²⁸²

Already in thickening the category of the aesthetic, and so directing attention towards the physiological basis of experience, the potential for an alliance with ecology seems less

²⁸² John Dewey, *Art as Experience* (New York: Perigee Books, 2005): p. 25.

inaccessible. In the *Knowing and the Known*, Dewey and Bentley identified the ‘descriptive spadework of the ecologies’ with their ‘transdermally transactional’ conception of the bond between an organism and its habitat.²⁸³ As in the comparable enfolding of art and artist, player and play, work and worker, or indeed inhabitant and inhabitation, apprehending the mutual evolution of the organism, as a form of life, and an Umwelt, as a form of environment, can lessen the stress on isolated individuals, and instead inspire sympathy for ‘the full system of growth and change’.

Apnid Semantics

Late in the second part of Samuel Beckett’s novel Jacques Moran’s thoughts turn back towards his bees. Having given up his pursuit of the eponymous Molloy, and on the verge of returning home, Moran confesses:

I wish to say that I often thought of my bees, more often than of my hens, and God knows I thought often of my hens. And I thought above all of their dance, for my bees danced oh not as men dance, to amuse themselves, but in a different way. I alone of all mankind knew this, to the best of my belief. I had investigated this phenomenon very fully. The dance was best to be observed among the bees returning to the hive, laden more or less with nectar, and it involved a great variety of figures and rhythms. These evolutions I finally interpreted as a system of signals by means of which incoming bees, satisfied or dissatisfied with their plunder, informed the outgoing bees in what direction to go, and in what not to go. But the outgoing bees danced too. It was no doubt their way of saying I understand, or, Don’t worry about me. But away from the hive, and busily at work, the bees did not dance. Here their watchword seemed to be, Every man for himself, assuming bees to be capable of such notions.²⁸⁴

This moment marks an ongoing metamorphosis within Moran’s character, an evolution of his own. Having murdered a stranger, and lost track of his son, the cruel, priggish and, scornful Moran – fussing perversely over matters of routine, sanitation, and duty – has given way to another – a solitary man wracked with doubt, preoccupied by theological questions, and in thrall of a nature he knows he cannot comprehend. Through the process of this evolution, the beginning – Molloy’s beginning as writer and wanderer – is made to once again resonate in the end: the identity of each begins to blur and the twin protagonists converge, as if reciprocally

²⁸³ Dewey and Bentley, *Knowing and the Known*: pp. 125 – 128.

²⁸⁴ Samuel Beckett, *Three Novels: Molloy, Malone Dies, The Unnameable*, translation by Patrick Bowles in collaboration with the author (New York: Grove Press, 1991): p. 162.

narrating one another's lives. Of course, this change is not so absolute or simple; potentially the later Moran already inhabits the earlier, even if initially he does not represent himself as such. A more pressing constant, affecting each, is the bodily existence which Moran – much like Molloy, Murphy, Watt, and the rest – must endure, its aches, pains, and urges. But for the reader, momentarily at least, a new kind of tenderness is introduced with reference to the bees: 'And all during this long journey home, when I racked my mind for a little joy in store, the thought of my bees and their dance was the nearest thing to comfort.'²⁸⁵

Eventually Moran will discover that, abandoned, his bees have died in his absence, their remains crumbling in his fingers, leaving no more than 'A little dust of annulets and wings'. 'Yes, now I may make an end' Moran decides. There is no redemption in the transformations undergone by Beckett's characters, the reality of loss and degradation is as insurmountable as it is comic, but this is not to say that these voices do not find themselves in the world in different ways. It would be unfortunate, in interpreting Beckett's characters, to make that error the consequences of which Moran wishes to spare his bees, that is to ascribe to them our own angers, fears, desires, and even bodies, for the sake of absolution, but this danger ought not to prevent someone from sharing their interests. Moran's attention to bees is far from trivial. Though mistaken in imagining that he alone has discovered this phenomenon, Moran is right to identify their dance with a system of signals, and right too to surmise that the figures and rhythms of which it consists serve to provide directions to other members of the hive. In the interpretation of this dance, or rather in the recognition of its ultimate resistance to interpretation, lies a problem tangled deep in the ancient roots of modernity. What does it mean to possess a language?

Honey bees dance to inform fellow members of a hive of the location of a source of those materials vital to the sustenance of a colony. Publishing his 'Über die "Sprache" der Bienen' in 1923, it was in the first decades of the twentieth century that the ethologist Karl von Frisch began to make decisive steps towards decoding the foraging dance of bees. However, as von Frisch records in his Nobel Lecture, it was not until twenty years later (not long before Beckett began work on *Molloy*) that he appreciated another fundamental aspect of the dance.²⁸⁶ Von Frisch distinguished between two categories of dancing behaviour: the first, the round dance, invited fellow workers to explore the immediate vicinity of the hive, to gather resources close by; the second, the figure-of-eight tail-wagging dance, sent bees out greater distances, but more than this, its pace contained information about distance, and its orientation relative to the

²⁸⁵ Samuel Beckett, *Molloy*: p. 163.

²⁸⁶ Karl von Frisch, 'Decoding the Language of the Bee: Nobel Prize Lecture' (1973), available at <http://www.nobelprize.org/nobel_prizes/medicine/laureates/1973/frisch-lecture.pdf>.

sun conveyed the direction of a food-source.²⁸⁷ Here then was evidence that, however limited, animals other than humans, invertebrates no less, made use of a semiotic system in order to communicate. The dance of bees may not be equivalent to a fully-articulate language, but it does serve to demonstrate that the ecological pressures of natural selection may generate intelligent social interaction, without the need for those substantial brains and nuanced vocalisations that human beings tend to hold dear. It is worth reflecting on why the collective behaviour of bees continues to prove so fascinating. The answer to this question concerns not just the gestural communication employed by bees, but several other aspects of their behaviour, what, in our anthropomorphic way, we might identify as their architectural, economic, and, by implication, political activities. Again the presence of bees in cultural history is extensive, still, to begin to address this question it will serve my purpose to concentrate on Aristotle's attitude to the behaviour of this social insect.

Long before von Frisch began his investigations it had been observed that bees must employ some system of communication to coordinate their collective behaviour. Whilst a food source located nearby a beehive could remain undiscovered for a prolonged period of time, once found, a more distant source would rapidly be visited by many different bees, suggesting that the message must be passed on somehow. Often attributed to Aristotle, this evidence is actually only indirectly implied in the *Historia Animalium* as part of a lengthy discussion of the habits of bees, containing a typical mixture of facts, fictions, and uncertainties, derived from apiculture as well as folklore.²⁸⁸ Yet Aristotle does make a singularly important reference to bees in another text, in what must be one of the most discussed passages in the history of philosophy.

In his *Politics*, having famously identified man as a *zōōn politikon*, Aristotle adds that human beings are necessarily *more* political than other gregarious animals, including, explicitly, bees.²⁸⁹ Occasionally this definition of the political is said to include herd animals, and indeed any creature that tends to congregate in groups, but this generalisation misses the point, particularly since bees are singled out as being in special need of separation from humans. In the *Historia Animalium* social creatures, in addition to being gregarious as opposed to solitary, are defined as sharing the same common object. Men, bees, wasps, ants, and cranes are thereby associated, since their behaviour is in principle devoted to the creation, preservation, and cultivation of a single communal construct, be it nest, hive, or city.²⁹⁰ Likewise, in the *Politics*, it is on the existence of a single complete community, the city-state or polis, that the

²⁸⁷ Karl von Frisch, *The Dance Language and Orientation of Bees*, translated by Leigh E. Chadwick (Cambridge, Massachusetts; London: Harvard University Press, 1993).

²⁸⁸ Aristotle, *The Complete Works of Aristotle: Volume 1: History of Animals*: 623b5 – 627b24.

²⁸⁹ Aristotle, *The Complete Works of Aristotle: Volume 2: Politics*: 1253a8 – 1253a18.

²⁹⁰ Aristotle, *The Complete Works of Aristotle: Volume 1: History of Animals*: 487b32 – 488a24.

sociality of human beings is founded. The echo of the ancient affinity between bees and humans is to be found in the vocabulary describing the many different chemicals involved in maintaining a hive and manufacturing honey. Along with bee-brood, beeswax, nectar, honeydew, and pollen, honeybees make use of *propolis* in the construction of their hives, a sticky resinous compound, extracted from trees and plants.

Aristotle's claim that human beings are more political than other creatures rests on a second definition: *anthropos zoon logon echon*, man is that creature which possesses the rationality of language.²⁹¹ Crucially, the *logos* possessed by human beings, a word sometimes translated as speech, and sometimes as reason, is to be distinguished from mere voice. Voice, as in the capacity for expressing pain or other emotions, by crying, howling, barking etc., is of course viscerally demonstrated by many different animals, and in certain respects can be taken to epitomise that which Aristotle considered bestial (i.e. the inability to separate emotion and instinct from intelligent thought). Logos, by contrast, denotes a faculty for articulating distinctions. Through logos, not only are pleasure and pain opposed, but the just can be differentiated from the unjust, and the virtuous separated from the sinful, in such a way that, supposedly, the animal impulses of the individual can be subsumed beneath more abstract conceptualisations of a universal or 'higher' good.

In this sense, the human polis is not only divided once, in terms of those who do or do not belong within this domain, but twice, and as such countless more times, via the continuous valuation of those who are already its members. In fact, as itself a text, from the outset Aristotle's *Politics* is predicated on the human capacity to make generalised distinctions. Without offering much in the way of justification, Aristotle can distinguish between the mastery of male citizens and the subservience of slaves, women, and animals, as if this hierarchy is self-evident and indisputable purely on the basis of having already been observed in the original formation of the polis. Through the logos of language the same teleological and effectively tautological account of natural origins is applied to the family and the state. Accordingly, the foresight and intelligence of a human and inherently masculine mind is opposed to the submission of a passive, feminine, and animal body. Versions of this distinction have survived right up until the present day, as has the equivalent of the Aristotelian claim that although, when perfected, the human is potentially the best of all animals, when isolated from the law and the jurisdiction of the nation state, humans are the most savage and unholy of all creatures, as if somehow more 'animal' than animals themselves.

With this account of the human and the political in mind, it is interesting to consider what Aristotle would have made of twentieth-century observations about the communication of bees. Admittedly, taken in an isolated sense, and on the basis of a comparison with human

²⁹¹ Aristotle, *The Complete Works of Aristotle: Volume 2: Politics*: 1253a8 – 1253a18.

language, the answer is likely not very much. Although bees show signs of symbolic expression, the limitations of their vocabulary, and the fact that the significance of their dances depends on a direct figural relationship with that which it represents, dictates that these insects are incapable of making the kinds of generalised distinctions which Aristotle privileges. Bees cannot invent the equivalent of new words with the same sort of flexibility as human beings, nor can they narrate their own history and keep an archive of changes in their language, beyond that record which is already embedded in their DNA.

Yet, viewed from a different perspective, the eloquent dancing of bees does serve to undermine some of those prejudices epitomised by Aristotle's take on the political. After Darwin, and hence understood in evolutionary terms, as well as with reference to biosemiotics, what proves profound is not just the sophisticated structure of honeybee communication as it currently stands, but the dynamic emergence of this system through a stochastic recursive process. Through gradually enhanced receptivity to initially unplanned and coincidental elements of their environment, along with a reciprocal intensification of particular patterns within the behaviour of bees, the round dance, the waggle dance, and the tremble dance must have been selected on the basis of a genetic advantage. As a means of flourishing, contingent and haphazard movements became weighted with exigency, moulded through incremental steps so as to chart and bear the legible trace of a colony's local environment. The evolution of bee communication offers a striking example of 'meaning' – for lack of a better word – entering the world, without any precedent other than recurrent iterations of that constrained indeterminacy which underlies biological and ecological development. As such it provides a useful contrast to the teleological bias of Aristotle, in which the final end of things is determinately presupposed in their natural origins.

Taking an evolutionary perspective on the genealogy of bees also helps to cast doubt on the Aristotelian claim that language represents the self-evident source of man's intellectual sovereignty. Why, in the first place, should we regard the subjective intentionality and inner-awareness associated with spoken language as the sole paradigm of intelligence? Arguably Aristotle is especially anxious to distinguish bees, because he realises that, superficially at least, they may appear more virtuous than human beings. Ostensibly bees act selflessly on behalf of the group, the hive, and their 'queen', without the troublesome tendency to deviate from the norm which seems to afflict so many members of human society. What better way to avoid this unfavourable comparison than to deny bees, along with other animals, the capacity to dispute their own purpose? By resisting the urge to treat individual bees as if they were the equivalent of human individuals, and, likewise, by recognising that the tensions affecting the inter-relations of these insects developed on a time scale irreducible to our self-conscious introspection, the routine of depriving other beings of the capacity for thought can be disrupted. Thought, here, does not stand for the sequential recollection of an isolated monologue, it is the

capacity, through sustained endeavour, to creatively experiment and engineer, inventing hypotheses, problems, and solutions that could not exist without the part played by chance and accident in the perpetual ordering and disordering of things.

In his *Insectopedia*, with reference to bees, along with many other insects and invertebrates, the anthropologist Hugh Raffles has persuasively made a parallel argument.²⁹² Rather than starting out from the limitations we perceive prevent other creatures from living up to our expectations, why not emphasise and hence empathise with those idiosyncratic forms of knowledge and meaning that non-human beings have established in their own right. Precisely in defiance of the kind of inward-looking city-state that Aristotle, for all his brilliance, fails to imagine human beings can ever happily escape from, this argument is not merely a matter of observing the spectacle of “nature”, that mythical domain beyond the boundaries of culture, at once venerated as a lost paradise, and condemned as a site of perpetual conflict. Rather, this argument is *political* in the fraught sense of unsettling those stubborn boundaries that are persistently taken to demarcate the proper, and the feasible, when it comes to conceiving of the possibilities of living well.

Beckett, as much as any writer, understood that the stuff of thought and language did not amount to an ideal, immaterial evocation of how things ought to be, thought and language were as fallible, as fleshy, as easily flustered or fumbled as any other aspect of our bodily existence. It is apt then, that much like von Frisch, Moran can detect a source of sense and significance, beyond his own knowledge, encrypted in the miniature and mortal bodies of bees.

In spite of all the pains I have lavished on these problems, I was more than ever stupefied by the complexity of this innumerable dance, involving doubtless other determinants of which I had not the slightest idea. And I said, with rapture, Here is something I can study all my life, and never understand.²⁹³

It is tempting to conclude here with Moran’s affirmation of the bee’s mystery, but to accept this sentiment uncritically would not be in keeping with the project of this thesis. Contrary to Moran, who perhaps underestimates his own perceptivity, thanks to the investigations of von Frisch and his successors we can claim with a degree of assurance that we do understand or at least comprehend elements of the bee’s dance, even if, as Uexküll would emphasise, we will never experience its significance first hand, given the perspective of a wholly distinct Umwelt.

²⁹² Hugh Raffles, *Insectopedia* (New York: Pantheon Books, 2010).

²⁹³ Samuel Beckett, *Molloy*: p. 163.

PART II. Abducting thought

CHAPTER 4.

Uexküll's Ecology: Biosemiotics and the Musical Imaginary

Meaning is the guiding star that biology must follow.

Jakob von Uexküll, 'The Theory of Meaning'.²⁹⁴

Feelings for whom? O you the transformation
Of feelings into what? -: into audible landscape.
You stranger: music. You heart-space
Grown out of us. The deepest space in us,
Which, rising above us, forces its way out,-

Rainer Maria Rilke, 'To Music', translated by Stephen Mitchell.²⁹⁵

How can one define the rapport between, say, a bee and a flower? Or, then again, how can the interplay between a spider and a fly be effectively conceptualised, in all of its complexity? As different as these two questions might be, the intertwined fields of biology and ecology seek to propose answers for each, in such a way that not only can one example of these encounters be described (be it that between bee and flower, or that between spider and fly), but general principles derived that might apply universally across all the many and various interactions that constitute earthly life.

For these twin forms of knowledge, relationality is key. Yet the question of how best to convey the poignancy of these relations, without effacing their specificity, remains a fraught subject. The object of this chapter is to begin to engage with at least one means of reframing the relations that preoccupy biology and ecology, and to do so by way of a third category substantiating the link with aesthetics which I have been already been developing. I will approach this theme via Jakob von Uexküll's controversial attempts to explain living processes with reference to terminology drawn from music. Born in Estonia in 1864, up until to his death in 1944, Uexküll dedicated most of his life to devising a revolutionary approach to biology that would treat the organism holistically, without abstractly severing the relations upon which its

²⁹⁴ Jakob von Uexküll, 'The Theory of Meaning' in *Semiotica* (1982) 42, 1: pp. 25 – 82.

²⁹⁵ Rainer Maria Rilke, *The Selected Poetry of Rainer Maria Rilke*, translated and edited by Stephen Mitchell (London: Picador, 1982).

existence depended. Musical metaphor supplied a rich resource for realising this project, to the extent that many of Uexküll's later ideas became deeply integrated with connected conceptual associations, such as harmony, melody, and the affectivity of tone.

In some ways Uexküll's comprehension of music seems conventional and narrow; his knowledge and experience of this art form appear restricted when contrasted with the diversity of forms of music and sound that might otherwise be addressed in this context. In her history of holistic biology in Germany – citing a letter of evaluation written by the Protector of the University of Hamburg – Anne Harrington recounts Uexküll's failure, in 1913, to obtain a directorship at the Berlin-based Kaiser Wilhelm Institute, purportedly as a consequence of his 'wild and unsound' theorising.²⁹⁶ No matter these concerns, what cannot be denied is the potency of Uexküll's influence within the history of ideas, an influence that testifies to the prescience and inventiveness of his work. Even accepting its shortcomings, there is certainly enough that remains enigmatic and unresolved within Uexküll's writing to sustain a productive analysis of its theoretical implications. As an overture to pursuing this task more directly, however, it will prove worthwhile to first convey some broader sense of the general state of biology and ecology as they might be synoptically characterised.

So as to attain a comprehension of the vast and intensive networks of relations with which they are concerned, biology and ecology – along with the many sub-disciplines which frame the objects of their investigations (anatomy, physiology, morphology, embryology, genetics etc) – are together involved in deploying a formidable array of techniques in order to secure knowledge of these phenomena. In turn, the methodological tools of which these techniques consist tend to be derived and justified by means of other hierarchically conceived disciplines, leading from ecology and biology to chemistry, to physics, and finally mathematics. Taken all together, one might not be deemed a fool for speculating that the knowledge produced by these means can, in theory at least, add up to the whole story. But can this story be told in a wholly consistent manner?

From the perspective of a deterministic and reductive science, as flourished within the twentieth century, the answer would be yes: in principle every biological phenomenon may, and therefore *would*, be translated into the equations of mechanics and the functions of statistics, so long as the laws which governed these phenomena became transparent. Arising from a series of public lectures given in 1943 on the theme of life's physical basis, Erwin Schrödinger's phrasing of the question helped set the standard for this ambition: 'How can the events *in space and time* which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?'²⁹⁷ As a science, biology seemed beholden to a

²⁹⁶ Harrington, *Reenchanted Science*: p. 34.

²⁹⁷ Ernst Schrödinger, *What Is Life? with Mind and Matter & Autobiographical Sketches* (Cambridge: Cambridge University Press, 2001): p. 3.

mathematical physics yet to come: following the consensus established by the modern evolutionary synthesis of the 1940s, and the triumphs of molecular biology and population genetics – notably the discovery of the structure of DNA, made public in the same year as Schrödinger’s presentation – the central objective of this goal no longer appeared so remote. By the end of the century, however, there was still much to suggest that things were not quite so simple, and more than a few biologists remained dubious as to whether their field could be so elegantly circumscribed.²⁹⁸ As well respected a biologist as Ernst Mayr was also able to attest to this doubt, declaring that since ‘strictly universal laws are virtually absent’ from biology, while ‘pluralism, probabilism, and purely qualitative as well as historical phenomena abound’ the mathematically formulated logic of the Newtonian paradigm remained inappropriate.²⁹⁹ Similarly, Mayr noted that the enormous and disparate range of possible inclusion courted by ecology made its proper subject matter both elusive and controversial.³⁰⁰ Needless to say – and in spite of the optimism of some scientists on this front – seamlessly fitting human beings into the ecological-biological picture looked to be an intractable if not hopeless undertaking.

The persistent fallibility of the dominant scientific paradigm today lends credence to the niggling intuition that, for all the erudition and purported inclusivity of the methods outlined above, something is lost. More critically, perhaps what goes missing is the very thing which most intimately marks the uniqueness of those relations which the life sciences claim to elucidate. What about the actual experience of these relations and their significance for the life forms involved? What about the affective tension these relations entail in marking the conjunction of life with sense and meaning?

While admittedly indulging in a high quotient of anthropomorphism here, well beyond the purview of scientific reason, it is worth speculating about the connotations of these questions for the examples already given. Since the compulsion of the bee to seek out the flower and collect its nectar is so insistent, it may not seem altogether inappropriate to describe its activity as in some way passionate.³⁰¹ Since the spider’s web represents no mere contingency

²⁹⁸ *Not in our Genes: Biology, Ideology and Human Nature* (New York: Pantheon Books, 1984) collects essays by the scientists Steven Rose, Richard Lewontin and Leon J. Kamin, criticising the overestimation of reductionism and determinism that they perceived blighted both sociobiology and gene-centrism. Two of the best known representatives of the opposite point of view are E. O. Wilson and Richard Dawkins, with the former’s *Sociobiology: The New Synthesis* (Cambridge: Belknap Press of Harvard University Press, 1975) and the latter’s *The Selfish Gene* (Oxford: Oxford University Press, 1976) both being subject to the censure of Rose et al. Dawkin’s review of *Not in our Genes* – damning for not entirely unwarranted reasons – is also worth mentioning (Richard Dawkins, ‘Sociobiology: the debate continues’, in *New Scientist*, 24th January 1985). For a more philosophical discussion of the epistemological problems confronting biology see John Dupré’s *The Disorder of Things*.

²⁹⁹ Ernst Mayr, *This is Biology: The Science of the Living World* (Cambridge, Massachusetts, and London: Harvard University Press, 1997): pp. 48 – 49.

³⁰⁰ Mayr, *This is Biology*: pp. 207, 224.

³⁰¹ Marcel Proust provides an excellent example of the aesthetic association of flowers with passion in the opening scene of Sodom and Gomorrah, comparing the courtship of two men to the fertilisation

for the fly, but a bar against its instinctive behaviour, and, eventually, the termination of its very existence, it is possible to imaginatively attribute a degree of agency to the insect, and similarly a measure of suffering or frustration. No matter that, in practice, this attribution is altogether incomparable with any human equivalent. These projections of emotion onto insects may bring to mind a scepticism akin to Dana Phillips' assertion that "experience," no matter how dressed up it may be in theory, tends to be an anti-intellectual idea'.³⁰² Yet, the more serious issue underlying what may well seem like vague and absurdly fanciful concerns is that of value. The relations which biology and ecology are engaged in unravelling are not only objects of scientific analysis, but real linkages with fundamental, that is life or death, ramifications for the organisms they enmesh. Once the hypotheses which ecologists and biologists propagate are directed toward the relations of human organisms, the question of their inherent value becomes considerably more pressing, and especially urgent, if we accept Mayr's conclusion, echoing numerous environmentalists, ecologists and political activists, that 'the problem of the future of humankind is ultimately an ecological problem'.³⁰³

It is at this point that an ecocritical perspective might intervene. As should now be well known, in an attempt to do some justice to those cultural and ideological factors that scientists may ordinarily overlook, ecocritics excavate and scrutinise those ideas, assumptions and prejudices which together make up our sense of the environment. Partly because conjecture about the intrinsic significance of biological and ecological relations can quickly become singularly and inescapably poetic, ecocriticism does not simply dwell upon conclusions taken from science, but equally finds its reference points within literature; it was, after all, in connection with this domain that the movement first originated. Since these beginnings, which, not coincidentally, attained a more cohesive and concerted form towards the end of the last century, ecocriticism has readily expanded its focus to encompass other mediums, including theatre, painting, television, cinema, and site-specific art. Although not to be omitted from this list, music remains to some degree a special case, in so far as it does not respond all that well to the kinds of tools that are applied to evaluate the meaning of written or visual texts. When stripped of the lyrical or conceptual paraphernalia with which they are supplemented, individual musical works are, in most cases, not overtly representational. Consequently, more effort may be required in order to arrive at an idea of how a particular piece of music may denote a particular version of the natural world. That said, the difficulty of critically interpreting the content of music is, at the same time, a boon when it comes to formally analogising certain

of an orchid. *In Search of Lost Time: Volume IV: Sodom and Gomorrah*, translated by C. K. Scott Moncrieff and Terence Kilmartin, revised by D. J. Enright (London: Chatto & Windus, 1992): pp. 1 – 44.

³⁰² Dana Phillips, *The Truth of Ecology: Nature, Culture, and Literature in America* (New York: Oxford University Press, 2003): p. 217.

³⁰³ Mayr, *This is Biology*: p. 226.

sensuous and affective characteristics of the relations between living things and their environment. The structure of music, in a general sense, seems to exemplify those qualities of relationality which biological and ecological science might mistakenly occlude. It was so as to make this immanent lived dimension of organisms palpable to his readers that Uexküll frequently had recourse to musical metaphors, and it is on this side of his thought, which not only the biological but the ecological aspects of his work can be most profoundly discerned.

Imagining the Umwelt

As authored by a biologist who was exceptionally sensitive to the potential deficiencies of his own discipline, Uexküll's work supplies a valuable case-study for ecocriticism. Writing at a time before many of the ecological principles so far outlined were properly refined, Uexküll was dismayed by the rigidly reductive view of nature already taken by many of his contemporaries. In principle at least, for these scientists the question of feeling, and so of the organism's own internal sense or mindfulness, was largely beside the point, what mattered were the causal mechanisms that guided, regulated and maintained the creature's behaviour, and hence underlay all questions of affectivity or meaning. The "organic physicists", as they called themselves, epitomized this approach, insisting in their 1847 manifesto that there was no call for reference to any occurrence within living processes beyond those akin to the common physical-chemical forces of attraction and repulsion inherent in matter.³⁰⁴ It was partly as an alternative to this trend that Uexküll had devised his theoretical biology, which he maintained redressed the neglect of his peers, analysing organisms not simply in terms of their physiological functionality, but rather through the species-specific subjective world or Umwelt within which each and every life form was embedded.

To describe and explain the closure of the organism together with its environment, Uexküll refined a new vocabulary. He observed that, due to the *Bauplan* (building-plan) which informed the development and constitution of their physiologies, organisms would only ever be able to encounter those stimuli which their particular sense-organs could discern. Therefore, the world or Umwelt upon which their behaviour depended was not that of the objective surroundings with which we usually equate the environment, but rather a pre-determined and selectively orientated framework, which, of necessity, filtered out irrelevant phenomena. Uexküll labelled the stimuli encountered in this way as *Merkzeichen* (perceptual signs). These elementary sensations were organised and projected back into the emergent Umwelt as *Merkmal* (perceptual cues), enabling the organism to determine significant objects in line with

³⁰⁴ Harrington, *Reenchanting Science*: p. 7.

a schema once again rooted in its physiology. While the first portion of this sequence accounted for the sensory and perceptual dimension of an organism's behaviour, on the other reciprocating side of the *Funktionkreis*, instinctive impulses corresponding to *Werkzeichen* (functional or effector signs manifesting manipulable qualities) became the basis upon which *Werkmal* (effector cues), establishing the functional properties of objects, could be contrived and acted upon. As Uexküll saw it, in its totality, this patterning of stimuli and impulses enabled the organism to react to its situation at any given moment, and thereby pursue, as far as possible, those activities which sustained and elaborated its life. Much more simply put, the bee obviously does not perceive the same world as us, nor is its behaviour guided by the same principles, but this is no reason to eliminate altogether the meaning which these features of its existence embody: on the contrary, in Uexküll's account, the sense of the signs that make up this world is paramount. Consequently, the 'reductionism' and 'determinism' proper to biology do not depend only upon omitting all but those events self-evident in terms of mathematics and physics.

As Uexküll admitted, his theoretical attempts to model the activity of living beings did not necessarily accurately represent the inner-workings of organisms; they were rather, as he once professed, 'fictional schemas'.³⁰⁵ Nor were these models intended to replace or eclipse the more traditional objects and methods of biological study. When he first began to develop his ideas, Uexküll still maintained that physiology remained at the core of his discipline, and was adamant that he was not interested in unchecked psychological speculation. Instead, his own contributions were aimed at securing a lasting basis upon which biology could support and integrate its discoveries, without them dissolving into the generalisations of other disciplines.³⁰⁶ In view of this speculative approach to science, it is unsurprising that Uexküll was motivated to fortify his ideas with more metaphorical language. Uexküll was by no means the first to notice that comparisons could be made between certain traits of living organisms and those structures that rendered sound musical. As a foundational concept within biology, 'organ' etymologically associates music and life at their root, with the definition of this word, in each context, having derived from the Ancient Greek *Organon*, meaning 'instrument' or 'tool'. Descartes, Leibniz and Pascal all picked up on this connection, and, as such, the association of life with music seemed to cut across the dispute between vitalists and mechanists which dominated the pre-history of biological thought, bringing to attention the prominence of organisation in both animals and plants.³⁰⁷

³⁰⁵ Harrington, *Reenchanted Science*: p. 40.

³⁰⁶ Jakob von Uexküll, *Environment [Umwelt] and Inner World of Animals* [1909], translated by Chauncey J. Mellor and Doris Gove, excerpts in *Foundations of Comparative Ethology*, edited by Gordon M. Burghardt (New York: Van Nostrand Reinhold, 1985): pp. 222 – 224.

³⁰⁷ Georges Canguilhem, *A Vital Rationalist: Selected Writings from Georges Canguilhem*, translated by Arthur Goldhammer (New York: Zone Books, 1994): p. 81.

Possibly surprisingly, despite prefiguring his analysis of self-organising (i.e. living) being, with an analysis of aesthetic principles, Kant did not discern any special affinity between the organism and musical phenomena in his *Critique of Judgement*. Kant's preference was to identify music with an inferior form of artifice, pleasing, even soothing, but, since its effect was primarily somatic, without any deeper connection to the rational forces guiding nature and morality. In any case, a number of those German philosophers associated with Romanticism, and strongly influenced by Kant, did continue to play upon the idea of life as a kind of musical spirit, and tended to treat nature as a whole, thematically, as if it were unified by the same harmonic principle. For these writers then – including Friedrich Schelling, Novalis, and Arthur Schopenhauer – the invocation of music had not only a metaphoric value, but acted as a concrete manifestation of the interconnectedness of things. By the time Hermann von Helmholtz and the other organic physicists had arrived on the scene, this kind of natural philosophy was openly dismissed by some scientists as irrational: the chemist Justus von Liebig would go so far as to denounce it as 'the pestilence, the Black Death, of the nineteenth century'.³⁰⁸

Kant's legacy had by no means waned, yet it was not the third critique of judgement, but the first critique of pure reason, stipulating that science must limit itself to mechanistic modes of explanation, which supplied the *raison d'être* for these scientists. In this context, and that of a *fin de siècle* Germany struggling with the social impact of industrial revolution, Uexküll, along with those scientists with similar agendas, such as Hans Driesch, Rudolf Magnus and Karl Ernst von Baer, together sought to once again stress Kant's later contention that living processes defied the machine model of causality.³⁰⁹ Both Uexküll and Baer also returned to music as a fertile source of metaphor and analogy, the latter's usage of 'melody' as a means of explaining patterns within development, perhaps providing the impetus for Uexküll's own efforts to enrich biology with musical terminology.³¹⁰

Uexküll's Symphony of Meaning

The most sophisticated expression of Uexküll's practice of merging biological theory with musicological tropes occurs in one of his late texts. His *Bedeutungslehre*, first published in 1940 and translated into English as 'The Theory of Meaning', also began to make more explicit those semiotic principles which had long been latent within his biology.³¹¹ According to the

³⁰⁸ Harrington, *Reenchanted Science*: pp. 7 – 8.

³⁰⁹ Harrington, *Reenchanted Science*: pp. xvi – xvii.

³¹⁰ Frederick Stjernfelt, 'A Natural Symphony? To What Extent is Uexküll's *Bedeutungslehre* Actual For the Semiotics of Our Time' in *Semiotica* 134, 1/4 (2001): p. 80.

³¹¹ Despite the appearance of a new translation of Jakob von Uexküll's *Bedeutungslehre* by Joseph D. O'Neil, I have continued to take quotations from Barry Stone and Herbert Weiner's version, primarily

line of reasoning Uexküll develops in this text, that which circumscribes the organism's accord with the signifying elements of its Umwelt, and so too governs its relations with other organisms, is, in effect, equivalent to the underlying connective structure which allows music to be appreciated.

Just as an organism apprehends signs in conjunction with the jointly composed Umwelt with which it is coupled, musical notes are dependent upon the relational quality of resonance, engendered by the vibrating body which acts as the source of a sound, and appropriated via the ensuing oscillations by means of which this sound is heard. If they are to consist of more than isolated monotonous drones, it is only when additional notes are introduced, either simultaneously overlapping, or succeeding one another in turn, that musical phrases begin to properly develop, and it is from this basis that harmony and melody, polyphony and counterpoint, and many of the other constituent elements of musical experience can be derived. Likewise, at least two factors form a unit wherever biological life is to be found: the organised body of the subject, and the complementary medium with which the function and sensitivity of this body's organs are correlated.³¹² When this initial pairing is transposed into the intricate network of other couplings with which it intersects, including the dyadic meaning factors occupying other organisms, then the symphonic complexity of an ecologically composed environment begins to emerge:

The relationships of living things can then be translated into a musical idiom; and we may speak about the perceptual and effector tones of various animal subjects that are joined to each other in counterpoint. Only then can one arrive at nature's score.

[...]

Meaning in nature's score serves as a connecting link, or rather as a bridge, and takes the place of harmony in a musical score; it joins two of nature's factors.³¹³

To take, once more, the example of a bee's response to a flower, in the Umwelt of the insect the distinguishing features of the blossom are not reduced to rudimentary shapes and colours, as if the animal inhabited an abstractly simplified version of our own world. Instead these forms establish enticing meaning-carriers resonant with significance. Conversely, the plant in flower has absolutely no means of perceiving directly anything approaching the form of its partner. Yet, as a vector of pollination, this foreign entity is a no less significant vehicle. Becoming, as

because of its affinity with a biosemiotic reading of the text as established by Thure von Uexküll's introduction.

³¹² Uexküll, 'The Theory of Meaning': pp. 52 – 53.

³¹³ Uexküll, 'The Theory of Meaning': pp. 62 – 64.

it were, two distinct instruments, Uexküll observed that together these organisms contributed to a kind of duet, the meaning-factor that orientated each yielding a tone in counterpoint to those properties which, reciprocally, conducted the performance of the other player: 'In every instance a very intimate meaning rule joins the animal and its medium; they are united in a duet, in which the two partners' properties are contrapuntally made for each other'.³¹⁴ It is as if the sustained triadic chord of the flower, striking key notes of shape, colour and scent, were, fleetingly, to be accompanied by a more mobile refrain (that of the bee) playing out a sequence along the same scale, with the moment of this melody potentially anticipating the resurgence of another chord elsewhere, hence enabling the whole movement to begin again.

Without being able to offer any sufficient explanation as to how, Uexküll astutely concluded that flower and bee must be somehow made for one another, their convergence the product of a predetermined affinity, and their physiologies co-adapted in such way that each may be said to be a sign of the other's likeness: the flower 'bee-like', the bee 'flower-like'.³¹⁵ In place of an empirical account of how this kinship could arise prior to any direct interaction, Uexküll once again turned to music in order to envisage the conditions on which it might depend. This time using the example of a 'fly-like' spider's web, Uexküll surmised that since such structures are fabricated in advance of any contact with that which they are contrived to ensnare, they cannot be considered to represent any physical manifestation of a fly's image. Yet, a web does appear tailor-made for catching flies or similar: the size of the mesh in keeping with the dimensions of these insects, sufficiently strong so as not to break, though yielding so as to facilitate entanglement, and finely spun enough to remain imperceptible from the point of view of a fly's eye. For this reason, Uexküll proposed that the development of the spider, and hence that of the web it fabricates, must somehow be attuned to the development of the fly *a priori*, as if the physiology of each were based upon an archetype that existed beyond their actual materialisation. To make practical sense of this otherwise mystifying precedence Uexküll claimed that

[T]he sequence in which form develops is 'scored' or programmed. Indeed, this program is not perceived by the senses, but it determines the material world. It also governs the spatial and temporal growth, as well as the properties, of cell-matter.³¹⁶

In other words, the development of organisms was prescribed in the same manner as the musical notes of a composition can be silently recorded in advance of their actual performance. Behind natural events, the programs or archetypes that controlled individual development were linked

³¹⁴ Uexküll, 'The Theory of Meaning': p. 54.

³¹⁵ Uexküll, 'The Theory of Meaning': p. 65.

³¹⁶ Uexküll, 'The Theory of Meaning': p. 43.

together by a comprehensive ‘meaning-plan’, just as the many instruments contributing to an orchestra’s recital are guided by the notated score of a single composition. Uexküll went even further with this idea, proposing that by directing ‘form-shaping melodies’ the genes which enabled individual organisms of the same species to be reconstructed could be metaphorically mapped onto the equivalent of a piano keyboard:

A particular individual obtains a very small amount of matter from his parents in the form of a germ-cell, itself capable of division, and a keyboard composed of genes. With each cell division these genes are distributed in the same number to the daughter cells. This keyboard is played upon by the form-shaping melodies like the keys of a piano, in order to produce the development of form. Each gene that is set into action acts as a differential stimulus to the protoplasm of its cells to build structures.³¹⁷

Crucially, however, no less important than the pre-programmed arrangement of organisms was the singular difference that they each individually embodied. Counterpoint was a vital concept within Uexküll’s theory of biological meaning precisely for this reason, epitomising the mode through which independence could become the foundation of interdependence, and thus demonstrating how the closed unit of an Umwelt could be understood to interlock with others, both those with which it shared a basic structure, as well as those of a different, yet compatible configuration. By opening up this logic, music acts as a means of figuratively externalising that which would otherwise remain inaccessibly internal, portraying the qualitative and contextualised character of life’s subjectivity, as well as the quantitative composure of interaction between organisms. The prescribed, hermetic character of every Umwelt helps to answer a question which Jakob’s son, Thure von Uexküll (himself an important biosemiotician) puts forward in his introduction to the English translation of ‘The Theory of Meaning’. Given his emphasis on signs and meaning, why did Uexküll choose music, rather than language, as his primary source of metaphor?

The most obvious answer to this question stems from the fact that Uexküll was unaware of the near contemporaneous developments in linguistics and semiotics, made by Peirce and Saussure. But this is not the only viable reason: arguably, the particular suitability of music for modelling biological signification rests upon the perceived immediacy of this aesthetic form. Within the experience of music, form and content ostensibly begin, rather than end up in a condition of coincidence. Though poetry or other forms of artistic practice may attain a comparable state, in most cases it is principally by means of abstraction, and a subversion of representation, that this effect is achieved. Whereas the grammar that orders speech and writing

³¹⁷ Uexküll, ‘The Theory of Meaning’: p. 71.

is in need of an extrinsic learnt system of denotation to become communicable, the original impetus of musical sensitivity seems to bypass the need for a distinct structure of coded reference (as would match up words or pictures). At least in ‘The Theory of Meaning’, Uexküll does not directly reflect on this matter in any detail, but this omission itself might be taken to suggest that the biologist’s preconception of music was more or less idealised, harbouring the assumption that, if sufficiently well composed, musical works spontaneously testified to a nature and aesthetic universality that needed no further scrutiny.

In actual fact this intuitive feeling that our sense of music is essentially internal to the relations of which it is composed, as opposed to depending upon any supplementary mediating structure, may well be an illusion. Different cultures or communities may become accustomed to very different standards of harmony, or may not possess any overarching concept of ‘music’ whatsoever, and it is difficult if not impossible to separate these socio-cultural factors from the actual experience of musical listening.³¹⁸ Even though the perception of tonal differences has a neurological basis, this bears out, rather than diminishes, the brain’s role in supplementing the physiological mechanism of hearing with a marked anticipation of harmony. What should be emphasised, then, is not the efficacy of music understood as an absolute, but another feature of this phenomenon. Possibly for good reason, our dealings with language tend to privilege the substantive aspect of sense-making, i.e. the capacity of objects of reference to exist independently of the prepositions and conjunctions which orientate their significance. By contrast what we call music – I would like to tentatively propose – is much more overtly encountered via the medial movement of relations which are perceived to organise sound. Relative to its own pitch, timbre and duration; the sounds which precede, supersede, and accompany it; as well as to the rhythm which denotes its departure and arrival; a note is always on its way elsewhere. It is in this relational capacity that a musical note is immediately heard as such, just as elementary signs, in Uexküll’s sense, do not derivatively represent the environment, but are the direct manifestation of the energetic coupling of organism and Umwelt which they render intrinsically meaningful.

As a friend of Uexküll, the poet Rainer Maria Rilke, put it, music invokes ‘*Sprache wo Sprachen enden*’, a ‘language where language all language ends’; in its own right it signifies nothing other than its own differential capacity to signify, while, at the same time, imbuing this significance with affect.³¹⁹ Unlike language, music cannot claim to definitively interpret itself; it can only offer further variations on a theme. This capacity to be at once reticent and

³¹⁸ For an example of the extent to which conceptions of music can diverge from western standards, while still supplying an important means of structuring human relations to their natural and cultural environment, see Henry Stobart, ‘Flourishing Horns and Enchanted Tubers: Music and Potatoes in Highland Bolivia’, *British Journal of Ethnomusicology*, Vol. 3 (1994), pp. 35-48.

³¹⁹ Rainer Maria Rilke, ‘To Music’ in *The Selected Poetry of Rainer Maria Rilke*: p. 147.

expressive suggests the proper way to appreciate the biological signs which Uexküll analyses; that is as self-referential impulses, charged with significance, the full sense of which is embedded within a horizon of meaning accessible to a particular individual or species alone. These signs should not then be immediately confused with those symbols of which human communication comprises; they may become forms of communication and abstraction (just as different tones may become symbolically encoded), but their foundations always lie within the *Umwelt* which they serve to articulate. In keeping with both music and language, it is only when these elemental signs are joined together with others, cohering by means of an underlying system that frames their substitution and correlation, that their full and more composite meaning opens up. Only when this process of induction has placed signs in assemblage with one another, converting them from disparate stimuli into composite objects, can the analogue of a representational model be envisaged.

Citing Edmund Leach, Thure von Uexküll mentions another reason why music makes a fitting model for biosemiosis: through the convergence of harmony and melody the rules of paradigmatic association (as in metaphor) and those of the syntagmatic chain (as in metonymy) are, in effect, united within a single dynamic.³²⁰ Perhaps an easier way to understand this point is to recognise that in music the synchronic and diachronic axes of meaning are simultaneously manifestly active: those notes that sound at the same time perpetually impinge upon those that follow one another in sequence. While these axes are equally essential to language, so far as speech is concerned, the synchronic axis must exert its influence unconsciously, if confusion, akin to that of multiple voices talking at the same time, is to be avoided. Within the *Umwelt* of an organism, signs manifest themselves concurrently as well as consecutively, just as a single instrument can play notes in parallel, as well as in series. Much like a soloist rejoining an ensemble, merging rhythmic repetition with tonal variety, and thereby finding a place within the whole, when this vibrant fusion of spatio-temporal signs is reinserted into the ecosystem upon which its meaning verges, the breadth and depth of Jakob von Uexküll's ecological vision, or rather audition, becomes apparent.

The potency of Uexküll's musical imagination consisted in making plain the resonant intermingling of bodies that populate an ecosystem, while, at the same time, retaining an equally pronounced awareness that these individuals are not conglomerated within an indifferent biomass, but constitute a divergent association of heterogeneous meanings. As already acknowledged, for all its vivacity, there is much that remains questionable about this account. Uexküll's use of language derived from musicology was occasionally inconsistent and idiosyncratic, reflecting the sometimes unavoidable gaps within his biological understanding. Also unsatisfactory is Uexküll's restricted notion of what can properly be thought of as music:

³²⁰ Thure von Uexküll, introduction to 'The Theory of Meaning': p. 23. nb. 13.

that is predominately classical and Western, as demonstrated by the composers that he mentions, Mahler, Beethoven and Bach. Alongside these limitations, the ecology that might be inferred from Uexküll's work is in some respects conservative and naive, at times looking more theologically inspired than scientifically grounded, and perhaps for this reason unduly normative.

At one telling moment in the text Uexküll contrasts the technically superior whole created by a 'real' symphonic orchestra, with the 'cacophony' produced by a clown orchestra.³²¹ His point here is that whereas classical instruments properly complement one another thanks to their equally tempered tones, the instruments improvised by clowns – 'combs, cowbells, and the like' – are in fact intended for other purposes, and so can really do no more than make noise. Put more bluntly, in the symphonic work of art, design is implied at every level, from the construction of classical instruments, to that of the completed score, as that which guarantees conformity with the laws of harmony. Though Uexküll did accept the fossil evidence for evolution, and so did not argue explicitly for the irrefutable existence of an intelligent designer, he does eventually suggest that, since they all belong to the same composition, every Umwelt may have been successively composed by one and the same God.³²² In an earlier essay, published in 1937, Uexküll had been overt about the detrimental consequences of banishing God from knowledge, bemoaning the fact that, unable to reach the ear of any deity: 'the music of the spheres [...] dissolved into nothing and became a mechanical movement', just as 'stripped of any meaningful design [...] Man himself became an accidental product with purely mechanical, aimlessly functioning physical processes'.³²³

Given a disregard for the traditional conventions of music, a propensity to improvise and to salvage sound from unlikely sources, along with, decisively, an openness to indeterminacy, the clowns' cacophony is arguably a more suitable candidate for emulating ecological phenomena than the comparatively inflexible symphonic orchestration which Uexküll favoured. In the eyes of a contemporary biologist the ability to adapt and rework a score for the sake of a new and unforeseen purpose is probably no less interesting than fidelity to the original order of notes. Though it is hard to resist anachronistically identifying Uexküll's notion of 'nature's score' with a contemporary comprehension of the genome, the structure of DNA was not yet fully established within his lifetime, and so the mechanism of genetic inheritance was not entirely understood. Uexküll's scepticism towards the chance component of Darwin's theory of evolution by natural selection was not then altogether unwarranted. Many recent commentators have defended Uexküll on this count, noting that his emphasis on

³²¹ Uexküll, 'The Theory of Meaning': p. 65.

³²² Uexküll, 'The Theory of Meaning': pp. 69 – 70.

³²³ Jakob von Uexküll, 'The New Concept of the Umwelt: A Link Between Science and the Humanities' in *Semiotica* 134, 1/4 (2001): pp. 114 – 115.

developmental morphology and hence the priority of ontogeny is in some ways congruent with twenty-first century theories of evolution. For instance, Kull's account of Uexküll's 'post-modern evolutionism' and Brett Buchanan's *Onto-Ethologies* have both demonstrated that Uexküll's theory of evolution can be viewed much more favourably if it is understood alongside the critique of Darwinism sustained by Karl Ernst von Baer and Hans Dreisch.³²⁴ Frederick Stjernfelt contends that though Uexküll's work 'contains many acute critical corrections to our days' neo-Darwinian orthodoxy in biology' it is 'at the same time [...] marred with an essentialist vitalism' and 'a bizarre brand of creationism'.³²⁵ Consequently, Stjernfelt maintains that the positive traits of Uexküll's biology must be distinguished from those that remain irrational and act as a potential hindrance to the refinement of biosemiotics. There certainly remain moments when Uexküll's hostility towards materialism and his insistence that nature is *Planmäßigkeit* (i.e. has the innate tendency of developing in conformity with a plan) veers too close to a mystical portrayal of life's vicissitudes to be deemed practically applicable.

Especially problematic are Uexküll's political leanings, which were both partly inspired by, and also impacted upon his biology. Again, sensitivity to historical context helps avert the need for a wholesale condemnation of all of Uexküll's ideas on this basis, but this does not mean that the more dubious facets of his thought should be passed over in silence. In his correspondence with the Anglo-German race philosopher, Houston Stewart Chamberlain (which continued up until Chamberlain's death in 1927) Uexküll indulged fantasies of spiritual and racial purity, a dialogue culminating in the publication of his *Staatsbiologie* in 1920, which compared the state to an organism, vulnerable to parasitic corruption and the 'disease of technology'.³²⁶ By the time Uexküll had published his *Bedeutungslehre* in 1940 he had broken with the Nazi regime in Germany, uncomfortable with the level of intervention within intellectual life they perpetuated. All the same, even this text retains evidence of a problematic outlook on socio-biology: Uexküll expresses disdain for Herbert Spencer's notion of the 'survival of the fittest', but replaces it with the no less disturbing principle of the 'survival of the normal', claiming that the elimination of all 'unhealthy and less resistant individuals' occurs for the sake of the 'balance of nature'.³²⁷ To Uexküll's credit this recommendation arises following a brief reflection on the fate of the Barbary fig cactus, following its introduction to Australia, demonstrating a genuine ecological awareness, in a practical, as well as a theoretical

³²⁴ Kalevi Kull, 'Uexküll and the Post-modern Evolutionism', in *Sign System Studies* 32, 1/2 (2004): pp. 99 – 114. Brett Buchanan, *Onto-Ethologies*: pp. 8 – 11.

³²⁵ Frederick Stjernfelt, 'A Natural Symphony? To What Extent is Uexküll's *Bedeutungslehre* Actual For the Semiotics of Our Time' in *Semiotica* 134, 1/4 (2001): pp. 79 – 80.

³²⁶ Harrington, *Reenchanted Science*: pp. 56 – 63.

³²⁷ Uexküll, 'The Theory of Meaning': pp. 61 – 63.

sense.³²⁸ However, if it is to be of any significance today, Uexküll's ecology must still be understood in accordance with its faults, no less than its assets.

A Musical Amoeba

To conclude this chapter, one last example from Uexküll's 'Theory of Meaning' will give some indication as to how a juxtaposition of how the aesthetics represented by music and the ecological understanding granted by biosemiotics might be taken further. More than once in his published works Uexküll remarked upon the seemingly atypical behaviour of cellular slime-moulds. Distinctively, unlike most multi-cellular organisms, slime-moulds do not fuel their early development by means of a yolk or placenta. Instead, their life cycle consists of two stages. Initially slime-moulds are made up of populations of free-living amoebae, which feed independently of one another upon bacteria. When sustenance becomes scarce these amoebae respond collectively, swarming together and aggregating, orientating themselves in response to light, heat, and external gasses, in order to form fungus-like fruiting bodies. In this latter stage the amoebae divide into two groups. One fraction become large stalk cells, building a cylindrical cellulose sheath, and dying, like those cells forming the pith of a vascular plant. Meanwhile, the other amoebae, at the summit or pistil of this structure, become spores which can easily be dispersed by passing insects and other invertebrates, and thereby secure a new source of food.³²⁹

For Uexküll, the collaboration characterising the habits of these amoebae supported the idea that an extraneous melodic principle must emerge so as to bind their activity into one. Because no overall sentience could be proven to govern the motion of effectively autonomous cells, it made more sense to imagine that, like 'living bells, each producing a different tone', each amoeba originally possessed its own Umwelt, along with a corresponding 'chime' or 'ego-quality' marking its singular self-orientated conduct.³³⁰ Conceding that 'originally, all embryos of living organisms consisted of independent cells of protoplasm that obeyed only the

³²⁸ Uexküll refers to the rampant spread of the prickly pear cactus through inland eastern Australia. The cactus had originally been introduced by early settlers, partly deliberately as a means of fencing off land. Between 1880 and 1940 the Australian government strived to halt the rapid propagation of this pest which was doing enormous damage to farming and grazing land. The cactus proved extremely resistant to most conventional means of destroying weeds, and in fact the dissemination of pesticides by aircraft served only to cause other plants to perish, ultimately perpetuating the uncontrollable spread of cacti. Finally, in 1927, a species of moth was discovered, the caterpillar of which voraciously fed on the cactus, eventually bringing about the curtailment of the infestation by the end of the 1930s. Donald B. Freeman, 'Prickly Pear Menace in Eastern Australia 1880 – 1940' in *Geographical Review* 82(4) (1992): pp. 413 – 429.

³²⁹ John Tyler Bonner, *The Social Amoebae: The Biology of Cellular Slime Moulds* (Princetown: Oxford University Press, 2009).

³³⁰ Uexküll, 'The Theory of Meaning': p. 34.

melodious induction of their ego-qualities', the possibility of a 'unified melody' emerging from the symphonic sounding together of individuals helped Uexküll explain how other multi-cellular organisms could interpolate numerous constituents into a singular coherent and inclusive Umwelt.³³¹ Following through the implications of Uexküll's logic, during the second movement of the slime-mould's life-cycle, a new, now symphonic meaning-rule can be said to arise from the decrease in food supplies, allowing the formally distinct cells to coalesce and react in chorus with one another, together heading towards the final crescendo of their dispersal.

Though their behavioural development is still not entirely understood, the attractant which stimulates the aggregation of slime-moulds has now been identified as being, for most species, cyclic AMP, a chemical also important in animal endocrinology.³³² However, knowledge of this fact need not compel us to dispense with Uexküll's more poetic explanation. Rather, it bolsters his version of events with a biosemiotic foundation, bearing out the fundamental role that semiosis plays in the aetiology of all forms of life.

Tempting as it might be to interpret the life-history of the slime-mould as an allegory, indicative of the need for cooperation in the face of ecological crisis, such a gesture is overly simplistic. The division affecting the second stage of this organism's life-cycle could just as easily be taken as evidence that the many should sacrifice themselves on behalf of the few, simply by virtue of the contingency of their position. True, the union of cells does help to demonstrate that through the threat of a catastrophic transformation of their surroundings individuals may become, not only associated, but, in effect, attached, acquiring the inexorable condition of a joint world or Umwelt, as opposed to a passively shared environment. Yet the exit-strategy in which the life of the slime-mould culminates is far from adequate when re-contextualised in terms of the pressure of humanity upon global climate and resources. Instead, what might be deemed most profound about this example relates to a subject that Uexküll himself dismisses, even as it can still be thought through with reference to musicology.

From an evolutionary perspective, the slime-mould's variable morphology, as akin to that of an intermediate link between organisms that remain as single cells and those that develop irreversibly into multi-cellular beings, is obviously of interest. The question that persists is that of how, in the first place, an altogether independent amoeba, ancestor of the slime-mould, managed to interpret the scarcity of food as a signal to send another message to its neighbours, motivating them to respond in kind, congregate, and meld together? The short answer is by an exploitation of accident: the force of selective pressure must have converted what were originally chance occurrences and coincidences into new structures of behaviour, precisely the kind of solution that Uexküll was reluctant to accept. Still, if these events are translated into a

³³¹ Uexküll, 'The Theory of Meaning': pp. 35 – 36.

³³² Hoffmeyer, *Biosemiotics*: pp. 219 – 220.

language that both distinguishes and complements the symphonic principle that stands for the slime-mould's development, then a different conception of their significance surfaces. For an amoeba unable to respond productively to a substance such as cyclic AMP the presence of this chemical cannot exist as a positive sign within its Umwelt, rather it amounts to *noise*, an unwanted distraction from the melodic meaning-rule which it otherwise pursues. Conversely, through the process of its evolution, and by its association with the hazard of a dwindling food supply, the slime-mould invests this noise with value, creating a feedback loop that adapts an originally discordant event into the basis of its collaborative polyphony. Comparable ideas have long been at work in cybernetics, systems and information theory, which have all recognised the function of noise within the transfer, distribution, and ordering of communication. However, as Hoffmeyer insists, the signs of which biosemiosis consists cannot be reduced to purely probabilistic information, since their semantic relationality is inextricable from the constraints of context in which they are situated.³³³ Similarly, from the point of view of music, a noise is something more than a symptom of randomness; its inclusion within the framework of an aesthetic field of meaning connotes a decisive change in its quality.

This, finally, is the point at which I want to complete my analysis. Not with the 'invisible hand' by means of which Uexküll imagined 'nature plays its symphony of meaning', but with a sense of the potential of organisms to collectively improvise, and invent new criteria for meaning.³³⁴ Recalling the versatile, unconventional creativity of the clown orchestra, the merit of enhancing ecology with musicological metaphor lies not only in the affirmation of harmony, but equally in a confrontation with dissonance.

³³³ Hoffmeyer, *Biosemiotics*: pp 58 – 62.

³³⁴ Uexküll, 'The Theory of Meaning': p. 78.

CHAPTER 5.

The Sign of the Sphinx: On Peirce's Semiotic

In going on to deal with Peirce's philosophy here, two overlapping aims are in sight. Firstly, to advocate Peirce's semiotics as an alternative to the predominantly Saussurean approach to culture that has previously prevailed within the humanities. Secondly, to make clearer the general thrust of Peirce's thought, elucidating the structure of signs as he perceived them, and exploring their efficacy as it applies to the firstness of icons, the secondness of indexicals, and the thirdness by way of which symbols are disposed to grow.

A key characteristic of Peirce's thought is his attachment to the number three. This inclination applied not only to the three main categories of signs which Peirce identified, but was patent in the triads of interrelated concepts which are to be found throughout his philosophy. The addition of abduction, to the more familiar categories of deductive and inductive reasoning offers another example of Peirce's habit of thinking in threes, as does the structure he associated with the embodied operation of signs, comprising, object, interpretant, and the vehicle of the sign itself. Wary of being accused of 'triadomania', an irrational bias towards trichotomies, Peirce was cautious in claiming that this predilection originated in anything more than personal preference, conceding that 'different numbers have always found their champions', others favouring two (Peter Rasmus), four (Pythagoras), five (Sir Thomas Browne) and so on (CP 1.355). At the same time, Peirce was anxious to distinguish his thought from that of probably the best known exponent of a tripartite approach to reason, namely George Wilhelm Hegel. Nevertheless, in his attempt to 'go down to the very essence of things' (CP 1.355), Peirce's triadic percussivity (as he called it) worked to create a rhythmic pattern of interlocking ideas, verging on the fractal in its intricacy, and perpetuating conceptual parallels and symmetries at a variety of levels.

Alongside Peirce's logic and semiotics, the role played by the converging fields of the ecological and the aesthetic is harder to clarify. With several notable exceptions, neither of these disciplines is commonly connected with Peirce's philosophy, since, ostensibly, neither is especially prominent within his own writings. Yet, together, they offer a unique and creative angle on Peirce's writing, both helping to make clear what is most original in his work. Aesthetics, did explicitly occupy a key position in Peirce's architectonic, but he rarely examined it as a discipline in its own right, at least not in its ordinary sense. He was disdainful about the focus placed on judgements of beauty and taste that had dominated the development of the subject, claiming:

[I]nstead of a silly science of Esthetics, that tries to bring us enjoyment of sensuous beauty, - by which I mean all beauty that appeals to our five senses, - that which ought to be fostered is meditation, ponderings, day-dreams (under due control), concerning ideals – oh, no, no, no! “ideals” is far too cold a word! I mean rather passionate admiring aspirations after an inward state that anybody may hope to attain or approach, but of whatever more specific complexion may enchant the dreamer.³³⁵

Elsewhere, Peirce confessed that, ‘like most logicians’, his scrutiny of this branch of philosophy had been cursory, and his limited knowledge meant he had neglected to do justice to the subject (CP 2.197). Nonetheless, Peirce grouped aesthetics, along with ethics and, somewhat surprisingly, logic itself, within the normative sciences, observing that each of these disciplines was concerned with the conformity of things to ends. Together the normative disciplines formed a kind of hierarchy, crowned by logic, with each in turn dependent on its antecedent, plus ‘a special superadded element’, motivating those laws which study aimed to establish. The position of aesthetics at the base of this hierarchy was neither entirely subordinate, nor absolutely foundational. Where ethics concerned those ends determined by action, and logic those ends conforming to truth, aesthetics concerned embodied ‘qualities of feelings’ (CP 5.129).

To appreciate how mere ‘qualities of feeling’ could be transformed into end-directed ideals involves a much more thorough knowledge of Peirce’s system than has so far been provided. Following this path requires one to trace the steps proceeding from an iconic to an indexical and a symbolic logic, as well an understanding of the basic attributes of the sign that made such a passage possible. The ‘ideals’ borne by aesthetics could be deemed ‘objectively admirable without any ulterior motives’, incorporating not just beauty, but disgust, arousal, empathy, irritation, and so on. The perceived immediacy of these ideals inspired particular kinds of behaviours, beliefs, or thoughts, without reference to their rationality. Without this level of visceral sentiment, neither ethical judgements, aimed at moderating wilful conduct, nor logical judgements, designed to discern the conditions of rationality, would make any kind of sense.

As for ecology, this discipline was not directly mentioned by Peirce in any of his philosophical writings, unsurprisingly given it had not yet become a fully-fledged science. Yet Peirce did repeatedly refer to several of those associated with the beginnings of this field in the second half of the 19th century, including Darwin, Lamarck, Ralph Waldo Emerson, and even Ernst Haeckel. Of these figures, the influence of Darwin is the most evident within Peirce’s

³³⁵ Charles Sanders Peirce, ‘A Sketch of Logical Critics’, in *The Essential Peirce: Selected Philosophical Writings: Vol. 2, 1893-1913*, edited by the Peirce Edition Project (Bloomington, Indianapolis; London: Indiana University Press, 1998): p. 460.

work, and the success of his theory of natural selection was obviously a decisive factor inspiring Peirce's own confidence in the power of evolutionary processes. Peirce went so far as to claim 'my opinion is only Darwinism analyzed, generalized, and brought into the realm of Ontology', though, as this venture into the vicinity of speculative philosophy already suggests, Peirce's take on evolution did not conform to those norms prevailing in more orthodox accounts of Darwinism.³³⁶ Even while well appreciating the explanatory power of Darwin's theory, he was wary of its ideological implications, noting the convenience of an account of species development that might valorise ruthless greed, individualism, and incessant competition, when compared with contemporaneous politico-economical views of progress.

In his 'Evolutionary Love', and in remarks scattered throughout other essays, Peirce humoured alternative modes of evolution, opposing *tychasticism*, evolution by fortuitous variation, and *anacasticism*, evolution by sheer mechanical force, to *agapasticism*, evolution by creative love (CP 6.302).

Herbert Spencer and many other evolutionists hold that the operation of chance is an important factor in the development of self-consciousness. But they all admit other primordial elements, the conservation of energy and the like, to be necessary factors. Whereas my principle is that ... [*chance*] holds a place in Nature independent of every accident of matter.³³⁷

Aside from his ongoing concern with evolutionary science, and the bibliographical references this involved, Peirce did not explore those matters ordinarily connected with ecology in any detail. As an extension of his interest in psychology, he frequently speculated about the workings of the living organism, musing on the physiology of the nervous system and the then mysterious molecular makeup of protoplasm, but mentioned the usual focus of ecological discourse, namely the environment, only in passing. Yet, a markedly ecological mode of thinking can be found at another level in Peirce's philosophy, his deep investiture in the vicissitudes of formal logic.

On a par with semiotics, Peirce always made logical principles a point of departure directing his meditations, and concentrated much of his intellectual labour on the development of this discipline in its own right. Logic, in a narrow sense, determined the conditions of reference which directed the significance of signs, and hence truth; in a broader sense logic organised the general laws of thought and the means by which signs were born from other signs

³³⁶ Charles Peirce, 'Design and Chance', in *The Essential Peirce: Selected Philosophical Writings: Vol.1, (1867-1893)*, edited by the Peirce Edition Project (Bloomington, Indianapolis; London: Indiana University Press, 1992): p. 222.

³³⁷ Charles Peirce, 'Design and Chance' in *The Essential Peirce: Volume 1*: p. 222.

(CP: 2.93). For Peirce, logic was both the offspring of semiotic processes, and the source of those principles which guided the course of these processes. This meant that Peirce did not believe the rules governing logic stemmed from pre-existing universals grounded in immutable laws, but were rather embodied products of natural tendencies that themselves propagated laws.³³⁸ Just as living species and individual organisms were not natural kinds in the sense of eternal God-given forms, but rather inventions of evolution, so those regularities described by logical analysis emerged out of often unpredictable complexes of energies, forces, and signs. As Peirce had argued in ‘The Order of Nature’ with reference to inductive reasoning, the world could neither be entirely ordered, nor pure chance.³³⁹ Order and chance operated in conjunction with one another, in this way being mutually opposed to stasis. It was as a consequence of an ongoing conciliation between unplanned variation and those recurrent constraints which induced selection that the ensemble of things gained cogency. Formal logic imparted a means of mapping this process, just as the biological systems of a living organism embodied a means of mapping its environment.

Whereas inductive reasoning involved a predictive approach to charting events, deductive logic did so in retrospect, neither depended on a uniformly sacrosanct nature to attain validity. Playing on those unprecedented interactions that haphazardly took place throughout existence, abductive logic opened up the difference between these two forms of inference, entailing that this mapping was not just a transcendental process of abstract representation, but a dynamic and *lived* means of navigating and diagramming the world. In other words, through the abductive logic of signs, the medium of the world was not just outlined or transcribed, it was at once carved out and inhabited, being inscribed with sense and meaning, as well as being defined in terms of what was not yet permitted, or known. Like those amoebae that associated in the form of a slime-mould, or those bees that began to dance, the abductive chance of new meanings continuously contributed to the ever-changing order of things.

What then made Peirce’s investigations not just logical, but potentially *ecological*, was firstly his persistent appeal to the importance of *relations* to the study of logic, and secondly, perhaps less obviously, the significance of the concept of *context* which can be extrapolated from his work. With reference to ecology the pivotal role afforded to relations is well signposted. Many ideas about ecosystems stress that living organisms cannot be understood in isolation, neither from each other, nor from their inorganic surroundings. For instance, a web is often envisaged connecting even those individuals who have no direct interaction within a network of co-dependency, as resources are transformed and exchanged both competitively and collaboratively. What is sometimes missed, so far as this interconnectedness is concerned, and

³³⁸ Charles Peirce, ‘What Makes a Reasoning Sound’ in *The Essential Peirce: Volume 2*: pp. 256 – 257.

³³⁹ Charles Peirce, ‘The Order of Nature’ in *The Essential Peirce: Volume 1*: pp. 170 – 174.

what comes to the fore in Peirce's work, is that relations are not solely joined together homogeneously, as in a holistic unity in which every part contributes equally to the whole. In line with the disjunction between the organism's interior and its exterior environment, it is the combined action of selection and asymmetry, yielding fluctuating patterns of dependence and independence, which makes the autocatalysis of ecological relations possible.³⁴⁰ The enhanced rational potential of the new systems of formal logic that Peirce, Frege and their successors began to explore at the turn of the twentieth century, set the scene for grasping this recursive complexity.

In contrast to Uexküll who, like many biologists of his day, remained unconvinced by evolutionary explanations of life based on natural selection, Peirce was an advocate of Darwin's theories. As he understood it, evolution, the idea that the complexity of indeterminacy begets order, applied not only to living beings, but to the dynamic development of the universe as a whole. Just as Darwin viewed the development of language in humans as stemming from an instinctive tendency to acquire an art, Peirce conceived of learnt linguistic signs as the product of an evolutionary process, born of the inherent tendency of nature to take on habits. As he put it: 'Symbols grow. They come into being by development out of other signs, particularly from likenesses or from mixed signs' (CP 2.302). Peirce's metaphysical logic might appear incongruous, if not contradictory, when placed alongside Darwin's positivism. However, the conception of life's dynamic and recursive self-generation, which both of their theories gave rise to, included nature and culture within the same continuity, linking them in terms of the common-world from which both were descended, and towards which the meaning of each was directed.

Beyond Linguistic Dualism

A sign, as we are in the habit of supposing, is a symbol that stands for something other than itself. Asked to point out a sign we might glibly gesture towards a notice at the side of a road instructing a driver to adjust their speed, or warning of some latent threat otherwise invisible. If, for whatever reason, we happened to find ourselves within an Egyptian pyramid, the hieroglyphics engraved into the walls of the sarcophagus would represent an array of signs, each of which contributed to an overall system of signification, the written language of the ancient Egyptians. Alternatively, if we were in the business of divination, the arrangement of a dead goat's entrails, or the course of a bird's flight path through the air, could be interpreted as portents of the future, and so represent yet another kind of sign. What remains critical in all of these examples is the separation between signs themselves, as codified messages, and the

³⁴⁰ Ulanowicz, *A Third Window*: p. 77.

objects or things that they refer to. Confusing these categories inspires disorientation and bewilderment. Mistaking the silhouette depicting a running deer for the actual animal renders this sign useless, if not dangerous. If the image of a hieroglyph was assumed to always depict its direct meaning, as opposed to marking distinct letters and syllables, then the language of the ancients would seem a gibberish, fixated with horned snakes, dung beetles, and detached body parts. As for those signs of future events which interest seers, soothsayers, and fortune tellers, without the opportunity to exploit the gap between contingent features of the present and the imminence of an event yet to come prophecy would be manifestly impossible.

Those familiar with some key trends within twentieth century philosophy and linguistics may have a more specific understanding of what is at work in these distinctions. As famously articulated in 1916 by Saussure, in his *Cours de Linguistique Générale*, the separation of signifier and signified, along with the declared ‘arbitrariness of the sign’, have often been considered a benchmark for the understanding of human psychology and sociality.³⁴¹ In actual fact, interest in the sign’s double-character was aroused long before Saussure provided his gloss on this fact, and the idea of the sign itself was older still. In Europe, the ancient concept of the sign arose out of the medical conception of a symptom, the outward bodily or behavioural manifestation of otherwise hidden inner pathologies, as denoted by the Greek word *semeion*. Then again, the belief in a veil separating truth from appearances, can be found in the mythologies and philosophies of cultures across the globe.

In the modern era, signs began to be more often conflated, firstly with the attributes of mental processes, and secondly with those tokens which made up language, while the importance of natural signs, as neither manmade nor linguistic, was increasingly sidelined.³⁴² The Port-Royal logic, published in 1662 and often cited as a foundational text in the history of semiotics, not only contained a clear statement of the duality of signs such as maps, specifying that ‘the sign includes two ideas, one of the thing which represents, the other of the thing represented’, it did also include some discussion of natural signs.³⁴³ However, in keeping with their previous work on grammar, the focus of the authors was on those signs which were attached to words, and it was in this domain that they centred the questions which would be treated by their logic:

³⁴¹ Ferdinand de Saussure, *Course in General Linguistics*, translated by Wade Baskin (New York: Columbia University Press, 2011): pp. 65 – 70.

³⁴² For much more comprehensive account of the place of the sign in the history of ideas, see Deely’s *Ages of Understanding*.

³⁴³ Antoine Arnauld and Pierre Nicole, *Logic, or, The Art of Thinking: Containing, besides common rules, several new observations appropriate for forming judgment*, translated by Jill Vance Buroker (Cambridge: Cambridge University Press, 2003): p. 35.

[W]ithout any introduction or ceremony, we will say about a portrait of Caesar that it is Caesar, and about a map of Italy that it is Italy.

There is no need, then, to examine the rule permitting us to affirm the things signified of their signs except in the case of conventional signs, which do not indicate by any obvious connection in which sense these propositions are to be understood.³⁴⁴

Human language, with its built-in capacity to abstract from the immediacy of situations, to record, recall, and revise the patterning of objects, events, and concepts, and thereby, so to speak, disclose the world, put our species in a unique position with respect to all other forms of life.

Saussure's decisive contribution to the scientific understanding of language was to demonstrate that the various instances of enunciation that actually made up human speech could be usefully isolated from the network of relations which defined meaning. Language, when considered in and of itself, could be seen to consist solely of synchrony and structure, an atemporal framework of associations and oppositions which exceeded the voice of individuals, and must be internalised to be put into practice.³⁴⁵ Conversely, the diachronic aspect of language could be treated separately, preserving the structure of meaning from both the historical movement through which different terms entered into the lexicon of particular dialects, and those transitory propositions which put words and sentences to work in communication. Necessarily, of the examples given above, the structuralist division between the synchronic and the diachronic axes of language applies effectively only to hieroglyphics. Neither road signs, nor oracular signs, belong to a broader system of prescriptively inter-related units in quite the same manner. The starkest evidence of this difference consists in the fact that the morpheme which a single hieroglyph denotes need bear no trace of the figurative aspect of the sign. The sound signified by a horned snake does not depend on the specific characteristics of the serpent, except in so far as they distinguish this sign from its counterparts; it can therefore easily be replaced with a group of letters. Furthermore, particular hieroglyphs do not necessarily form complete signs autonomously; it is the sequential juxtaposition of graphemes and phonemes, in the form of whole words and sentences, which constitutes the grammar of meaning. At the same time as certain words are written or read, spoken or heard, a set of alternative phonetic and syntactical elements is held in reserve, as a background of negative differences, against which the positivity of what is immediately said can be exposed.

Saussure did accept that language must be part of a more general science of signs, and that other kinds of practices, customs, and rites, might be beneficially examined via the

³⁴⁴ Antoine Arnauld and Pierre Nicole, *Logic, or, The Art of Thinking*: p. 120.

³⁴⁵ Saussure, *Course in General Linguistics*: pp. 79 – 100.

framework of this future semiology. However, by presupposing that this task would initially be the job of psychologists and sociologists, omitting those not aligned with the human sciences, and reserving the special nature of language, ‘a well defined area in the mass of anthropological facts’, for the study of linguists, Saussure disqualified any in depth consideration of natural or non-human signs.³⁴⁶ Though it took another fifty years before Saussure’s work would gain a well-known following, and though a very long list of other thinkers had a substantial impact on the later development of this trend, at its outset in the 1950s, French Structuralism presupposed that language supplied a superior means for elucidating other semiological problems. Divided once in the direction of signifier and signified, and then again via its synchronic and diachronic axis, in principle language came first, even when it was not directly the subject of discussion.

With the advent of what became known as post-structuralism, the philosophical basis of Saussure’s system was subjected to more intense scrutiny. For some, such as Jacques Lacan, this entailed a more vigorous defence of the idea that, through language, human existence defied the logic applied to other beings, even as this unique position involved an irreducible degree of alienation and alterity. For others, including Jacques Derrida, Jean-Francois Lyotard, and Michel Foucault, the tradition that had given rise to Saussure’s linguistics, deserved to be disassembled, exposing the paradoxes that underlay any attempt to render things meaningful on the basis of the sign’s identity or presence, and relentlessly criticising the anthropocentrism that flourished within this tradition. The largely hidden history of Peircean or ‘pragmatic’ style thought as a factor contributing to the fruition of French Post-structuralism is yet to be written, and might be found valuable, particularly in so far as those departing from Saussurian Structuralism became involved in problems thrown up by cybernetics, systems, information, and complexity theory.

For the sake of providing evidence of a persistent bias towards language amongst those who theorise culture, a bias which potentially erases many of those modalities of the sign at work in the generation of meaning, it will be helpful to flag-up just one example. One way of reiterating the ontological divide supposedly expressed solely by human language rests on making a corresponding distinction between human communication, and those parallel varieties of interaction exhibited by other organisms, most obviously animals. In his *Écrits*, Jacques Lacan, inspired as much by Saussure, as by Freud, repeatedly articulates a demarcation between the symbolic discourse of humans, and the behaviour of other animals. Lacan’s essay on ‘The Mirror Stage’ is devoted to the transition, at the ‘juncture of nature and culture’, from the ‘*specific immaturity of birth* in man’ towards the formation of the symbolic *I*, contrasting, as a testament to this process, the response of human infants to their own image compared with the

³⁴⁶ Saussure, *Course in General Linguistics*: pp. 15 – 17.

reaction of other creatures.³⁴⁷ In ‘Function and Field of Speech and Language’, to show ‘the inadequacy of the conception of language as a sign’, Lacan distinguishes the coding system which allows bees to pass on information to one another, from the flexible and performative aspects of language.³⁴⁸ Where humans are deemed capable of conceiving and apprehending semantic distinctions, animals are said to be restricted to the semiotic, capable only of *recognising* signs, not of *understanding* their significance in any genuine sense. While an animal may either instinctively react to particular signs, or on some occasions be trained to do so, it cannot independently and spontaneously employ these signs to construct new meanings.

Leaving aside the value of Saussure’s specific contribution to linguistics, the problem lies in those assumptions and inferences which are sometimes made on the basis of this account of semiological structure. Separating out the historical dimension of language aligned with the etymology of meaning, as well as the temporal character of actual communication, serves to denature the bond which at once adjoins and opposes signs to things. It is the apparent artificiality and contingency of this bond, a barrier between signifier and signified which itself seems to resist signification, which reinforces the suspicion that human life is somehow set apart from the world in a manner that escapes explanation in terms of natural processes. Saussure himself had little to say as to whether and how language made humans unique, still less as to the metaphysical implications of such, but this did not prevent later linguists and philosophers from arguing for the exclusivity of human culture on the basis of equivalent ideas about linguistic discourse.³⁴⁹ From a Peircean and biosemiotic point of view, the issue here is neither the linguistic study of language as a singularly sophisticated form of communication, nor the anthropological study of the special features of human beings; it is the jump from these considerations towards the contention that either language or voice must mark a definitive ontological divide in the fabric of reality, and so be accepted as an unsurpassable standard for assessing the multiplicity of ways in which sense and signification emerge, which deserves to be challenged. No less narrow-minded is the presumption that the disembodied Saussurean signifier, bloodless and spineless – doubly divorced from the material dimension of things, as well as those processes which compose the evolution of meaning – should be thought of as the ideal and/or exclusive representative of signs.

One of the first things that is striking about Peirce’s conception of the ‘semeiotic’ is that these things he calls signs do not conduct themselves in the manner we might ordinarily

³⁴⁷ Jacques Lacan, *Écrits: A Selection*, translated by Alan Sheridan (London: Routledge, 2001): pp. 3 – 8.

³⁴⁸ Jacques Lacan, *Écrits*: p. 92.

³⁴⁹ At one point in the *Cours*, in a peculiarly Peircean moment, Saussure denies that the two-sided linguistic unit can be adequately compared with the division between body and soul attributed to the human person. Instead, Saussure suggests, ‘[a] better choice would be a chemical compound like water, a combination of hydrogen and oxygen; taken separately, neither element has any of the properties of water’. Saussure, *Course in General Linguistics*: p 103.

expect. In a move that departs sharply from the conflation of signs with linguistic signifiers, Peirce did not begin by collecting the things of the world on one side, and the representative role of language on the other. This was not to say that signs were altogether equivalent to things, but without signs things would remain unthinkable, since ‘every thought is a sign’ (5.470). This meant that the reality of thought and the reality of things was at root inextricably relational: a sense of the independence of reality did not connote an inconceivable realm of things in themselves, but was warranted by the dependence of things on signs to gain cogency in thought. As Peirce professed not only words and sentences, but ‘pictures, symptoms, [...] books, libraries, signals, orders of command, microscopes, legislative representatives, musical concertos, performances of these’ all could be classed as signs, and this list alone was far from comprehensive. For Peirce ‘to study anything, - mathematics, ethics, metaphysics, gravitation, thermodynamics, optics, chemistry, comparative anatomy, astronomy, psychology, phonetics, economic, the history of science, whist, men and women, wine, meteorology’ entailed ‘a study of semeiotic’.³⁵⁰

Rather than the more familiar two-part model of the sign, consisting of signifier and signified, Peirce introduced a three-fold division, distinguishing between, firstly, the referent, secondly, the interpretant, and thirdly, the object itself. This tripartite incarnation of the sign is not exclusively exemplified by the symbol, a sign in which the bond between referent and object is arbitrary and thus the interpretant rests upon a social or cultural convention. Equally, it encompasses what Peirce identified as the two other principal kinds of signs, both of which can readily be identified with aesthetic effects. Alongside the symbol, Peirce distinguished between the icon, a sign that concretely figures its object through a qualitative ‘likeness’, and the indexical, a sign that explicitly points out its own meaning, connecting object and referent in the body of this distinction, thereby establishing a correspondence in fact. With reference to icons Peirce wrote: ‘An icon is a sign which stands for an object because as a thing perceived it excites an idea naturally allied to the idea that object excites.’³⁵¹ His definition thus applied not only to visual images, but also auditory, olfactory, and other sensuous impressions, discernible as signs so long as their form or quality retained some proportional significance in connection with their object. With reference to indexicals Peirce wrote: ‘Such is a guidepost, which points down the road to be taken, or a relative pronoun, which is placed just after the name of the thing intended to be denoted, or a vocative exclamation, [such] as “Hi! there,” which acts upon the nerves of the person addressed and forces his [or her] attention.’³⁵²

³⁵⁰ Charles Peirce, ‘December 23, 1908’, *Semiotic and Significs: The Correspondence between Charles S. Peirce and Victoria Lady Welby*, edited by Charles S. Hardwick (Bloomington; London: Indiana University Press, 1977): pp. 85 – 86.

³⁵¹ Charles Peirce, ‘What is a Sign?’ in *The Essential Peirce: Vol. 2*, p. 13.

³⁵² Charles Peirce, ‘What is a Sign?’ in *The Essential Peirce: Vol. 2*, p. 5.

According to biosemiotics, examples of all three types of sign, along with their numerous sub-divisions and combinations, occur throughout the multitude of forms of life that populate both nature and culture. An Umwelt amounts to a mobile network of signs because, as a complex of indicators denoting various attributes of perception, and a framework discriminating between what can and cannot be acted upon, it is hard-wired into the organism with which it is coupled. Admittedly, the fact that life forms exist not only as isolated individuals, but as collectives or communities, considerably complicates matters, but this reinforces, rather than diminishes the importance of signs within living systems, recasting the image of the Umwelt from a solitary sphere into a multifaceted foam, a manifold of bubbles bonded by the signs from which each particular configuration of the world is composed.

As for speech, the place within biosemiotics of linguistic signs, such as those with which I now write, is of a special interest. So far as is known, no socially instituted system of signs as sophisticated, comprehensive, articulate or expressive as language exists outside of the human species.³⁵³ For this reason the faculty of language is often thought to uniquely define the human form of life, as that which at once identifies our nature, whilst also allowing us to self-consciously speculate about a realm beyond this aspect of our being. Uexküll commented upon the curious capacity of humans to abstract and objectify the nature of their surroundings. A human being could therefore at least simulate detachment from their own Umwelt, subtracting their own person from the centre of this world, cutting loose space and time and thereby surveying existence independently of the life that immanently gives it meaning.³⁵⁴ Language, as a symbolic code, seems likely to denote the most effective means of performing this anthropological disappearing act, positing the possibility of a conscious consensus beyond the subjective perspective of individuals, even as it deserts its place of origin. Undoubtedly, to resolve their practices into culture, scientists and artists are equally indebted to this effect, as are those who seek to criticise either field. Since words are exchangeable independently of their source, to speak or write is to be where one is not, invoking a perspective that supports both the objectivity valued by science, as in its commitment to impartiality, as well as the subjectivity at work in other discourses, able to perpetually displace personal passions into a social realm.

Nevertheless, as Peirce demonstrated, the pragmatics of linguistics is inextricably rooted in signs that do not relinquish their implicit fixity so easily. Without the pointedness of the index discourse would be bereft of a subject, unable to indicate a state of affairs and direct itself towards any kind of meaning. Without this propensity for connecting phenomena distant in time and space every professed constant within objective knowledge disintegrates: the laws of causality, for example, on which both science and experience depend, become

³⁵³ Deacon, *The Symbolic Species*.

³⁵⁴ Jakob von Uexküll, 'The New Concept of Umwelt: A Link Between Science and the Humanities'.

incomprehensible. Similarly, without icons, the compliment of the empirical object, reasoning proves unworkable, since to infer that where certain relations subsist others are to be found demands both presentation and observation. Finally, it is the symbolic dimension that bestows upon signs their generality and allows them to convey judgements. For Peirce, however, symbols were not divorced from the corporeal condition of the mind. As mental associations they were dependent on habit, and hence, like any other sign, were embedded in the general rules to which organisms became subjected. As Peirce put it, the prevailing 'living character' of the symbolic sign as a 'complex whole' was nourished by the use of all three kinds of signs in reasoning:

[W]e may liken the indices we use in reasoning to the hard parts of the body, and the likenesses we use to the blood: the one holds us stiffly up to the realities, the other with its swift changes supplies the nutriment for the main body of thought.³⁵⁵

What was important was not the detached essence of signs as immaterial forms of displaced reference, but their interceding existence as connected with actual objects. In important respects difference remained integral to the means by which signs were held to assert their significance, but where others would take for granted the fissure between signifier and signified within the composite entity of the sign, Peirce instead emphasised the distinctiveness of that passage through which a given object could contribute to an interpretation. Whereas, from a Saussurean point of view, semiological difference was fixed within the divided unity that braced the identity of linguistic signs, Peirce's semeiotic pursued the development of difference in the diverse and dynamic relations between entities which signs served to establish and elaborate. Far from envisaging a world which depended on the transcendent conception of human consciousness in order to take shape, Peirce contemplated a reality in which sense emerged from physical interactions; it was this sense of the nature of signs which, late in life, led him to affirm:

[T]he entire universe -- not merely the universe of existents, but all that wider universe, embracing the universe of existents as a part, the universe which we are all accustomed to refer to as "the truth" -- [...] this universe is perfused with signs, if it is not composed exclusively of signs. (CP 5.448)

The word 'if' here is worth stressing; the broad sense of signs which the above sentence invokes, and which was at the heart of Peirce's semeiotic, was not necessarily an immediately

³⁵⁵ Charles Peirce, 'What is a Sign?' in *The Essential Peirce: Volume 2*: p. 10.

known and fully explicable fact. Instead, Peirce struggled to articulate this idea throughout his life, repeatedly reshaping the concepts and categories which contributed to his understanding of semeiotics in accordance with the evolution of this thought, always with the awareness in mind that ongoing empirical and scientific study would test the mettle of his conclusions. As exemplified in natural evolution and thermodynamics, uncertainty, in its many manifestations, played a pivotal role in Peirce's philosophy, both as a key ingredient of knowledge, and as a formative force in the shaping of things. This sensitivity to the significance of indeterminacy and generality was reflected in Peirce's own methodology.³⁵⁶ As a consequence of such, Peirce was not always able to make his ideas clear to his peers, and often a mismatch can be perceived between the writings which he published, and those collected privately in notebooks, letters, and drafts. In both contexts, Peirce provided plenty of definitions of signs, and while, certainly, the basic concepts he alluded to remained consistent, these definitions varied considerably in scope. So, while remembering that, as Peirce once put it, 'A sign is any sort of thing' (1903? MS 800), it is first perspicuous to examine the behaviour of signs in the situation with which we are most familiar, within the province of individual minds.³⁵⁷ In keeping with this psychological view of signs, Peirce offered the following:

A sign, or *representamen*, is something which stands to somebody in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. (2.228)

Already, the notion of the sign as a 'representamen' might seem to contradict the avowedly non-representational perspective with which I have tried to affiliate Peirce's philosophy. But once it is understood that, for Peirce, the word 'representamen' did not primarily refer to a process of internally copying and reflecting upon the external features of one's surroundings, his use of this term no longer seems so incongruous. Even in the early period of his philosophy, when Peirce went so far as to claim 'our whole world – that which we can comprehend – is a world of representations' this did not involve the reproduction of a pictorial presentation of things. Peirce denied that he used 'representation' as a translation for *Vorstellung*, the Kantian word for mental contents which stood for objects unknowable in

³⁵⁶ Dinda L. Gorrée also remarks that Peirce's fallibilism – his acceptance that all human knowledge, including his own, was subject to error – encouraged frequent use of adverbs associated with vagueness, such as 'almost', 'all but', 'virtual', as well as the important prefix 'quasi-'. *Semiotics and the Problem of Translation: With Special Reference to the Semiotics of Charles S. Peirce* (Amsterdam: Rodopi, 1994): p. 145.

³⁵⁷ Charles Peirce quoted in Dinda L. Gorrée, *On Translating Signs: Exploring text and Semio-translation* (Amsterdam: Rodopi, 2004): p. 60.

themselves.³⁵⁸ Instead, Peircean representation hinged on the displacement of a particular facet of the world's significance into a new context. It was the capacity of the sign to somehow stand *for* something *as* something *to* someone (or, as we shall see, again, *to something*) which determined its representational role. Signs were not subordinated to an overarching mimetic purpose, and bracketed by the transcendental conditions of human perception, rather they intervened substantially in the constitution of the mind, mediating between the qualities of a thing and the correlations it provoked via those mental and hence physiological constraints which gave shape to meaning.

More telling than Peirce's references to representation is the word which he introduced to denote the generative destination of signs. In Peirce's terminology the 'interpretant' was aligned with the context in which signs were allotted a meaning beyond that of the initial object of reference. It was the interpretant which ensured a sign must manifest itself *as* something and *to* someone. Taking into account the tie between 'quality', 'relation' and 'representation', later more memorably renamed 'object', 'sign', and 'interpretant', one common and convenient way to differentiate between Saussure's take on the sign and that of Peirce, is to observe that where the linguist's model was essentially dichotomous and so effectively linear, in keeping with his favoured threes Peirce's analysis implies a triadic structure of relations, adding an extra dimension to the sign's function. In place of signifier and signified, Peirce plotted the sign in the tack from object to interpretant: a sign was 'something, A, which denotes some fact or object, B, to some interpretant thought, C' (CP 1:346).

When associated with human discourse and the subjective self-awareness that this implies, the interpretant can be most readily understood as a particular instance of interpretation, yet the conflation of these two terms is potentially misleading, and to properly comprehend Peirce's semiotic they must be held apart. The interpretation of a fable, for example, would involve several instances, as the signs involved must be connected not only with the particular things or concepts to which they refer, but also understood in terms of their place in an overall narrative. Since, traditionally, a fable represents some moral truth allegorically, it too indirectly signifies something other than the story it tells, and so connotes yet another level of interpretation. If these various dimensions of interpretation are associated with questions concerning the meaning of a fable, with all that entails, then, by contrast, the interpretants of the fable would mark specific answers to these questions. From a certain point of view it is of little consequence how provisional or erroneous these answers happen to be, so long as they open up the destination of a sign, enabling it to assert itself beyond reference to the object which is its source. Knowing that a group of letters *denotes* a particular word is

³⁵⁸ Thomas Lloyd Short, *Peirce's Theory of Signs* (Cambridge: Cambridge University Press, 2007): pp 28 – 29.

effectively of no use in itself, nor is it sufficient to know what objects or concepts words label; it is the *connotations* of word and signs emerging in context which creates a horizon of meaning beyond self-reference:

A man denotes whatever is the object of his attention at the moment; he connotes whatever he knows or feels of this object, and is the incarnation of this form or intelligible species; his interpretant is the future memory of this cognition, his future self, or another person he addresses, or a sentence he writes, or a child he gets." (CP 7.591)

In a letter to William James, Peirce offered a statement about Shakespeare's most famous character as an example of the application of interpretants. To understand the claim that 'Hamlet was mad' a notion of what signifies a loss of sanity is needed, all the better if this can be explained in line with Shakespeare's own use of the term, and with reference to the plot that supports this suggestion.³⁵⁹ However, as Peirce informed James, these 'collateral observations' were *not* identical to the specific interpretant connected with a statement about Hamlet. Rather, the interpretant was that which assembled all the related pre-requisites for understanding or misunderstanding a statement about Hamlet into a singular form of significance. The interpretant was not coextensive with theoretical arguments for or against Hamlet's madness, but marked the actual occasion of an individual's sense of that madness. Whereas an interpretation might refer to any or all of the many and various details connected with a particular meaning, irrespective of their destination, the interpretant was the consequence of these details contextualised, experienced, and put into practice. Another example makes this point more concisely: given the command "Ground arms" the interpretant includes and effectively terminates in the action of striking rifles against the ground, a movement and sound confirming to the drill officer that his order has been obeyed.³⁶⁰

Indispensable to a proper understanding of the interpretant is an awareness that this concept applied not only to those symbolic signs grounded in convention, such as the letters and words of language, equally those signs that earlier writers had sidelined as 'natural' incorporated interpretants. In some examples the need for 'interpretants' in connection with natural signs is quite obvious: the perception of the colour blue, for instance, is not the same as the realisation that this may be a sign of the sky, or noting that a flag flies in a certain direction is not necessarily synonymous with knowing where the wind is coming from. Traditionally the mediate knowledge employed to make sense of such phenomena has been associated with

³⁵⁹ Charles Peirce, 'Excerpts from Letters to William James: 26 February 1909' in in *The Essential Peirce: Volume 2*: pp. 492 – 497.

³⁶⁰ Charles Peirce, 'Pragmatism' in *The Essential Peirce: Volume 2*: p. 430.

concepts and ideas governed by the mind alone, and thereby divorced from the palpable physical impact of signs. According to this view, having perceived and thereby acquired signs from its surroundings the mind decides on their significance through a power all of its own, remote from the means by which signs manifest and disseminate themselves. By contrast a Peircean perspective conceives of the action of the mind and the properties of signs as indispensable to one another. Reclaiming this work of intellectual mediation as an integral part of semiotics is then another step towards reconciling the internal contents of mental processes and the external world of material phenomena. However, the examples given so far do not go quite far enough in attesting to what Peirce understood by the ‘interpretant’. Most problematically they do not necessarily challenge the notion that natural signs must be translated into mental language before being interpreted, and the consequent fantasy that only human beings are capable of rationality. To escape this prejudice it is necessary to pursue evidence of the interpretant in a different direction, and in so doing the part played by aesthetic thought in Peirce’s semiotics becomes increasingly plain.

In his letter to James, Peirce proposed a genre painting as yet another example of an interpretant in action.³⁶¹ The interpretant in this case did not depend on understanding the subject of the painting, for instance appreciating the style of dress it depicted; these attributes belonged together with the collateral information which facilitated knowledge of the work, as did familiarity with the techniques employed, art-historical knowledge about the genre itself, and whatever other information might affect the sensibility of the spectator. Much more distinctly, though in another sense more ambiguously, the interpretant of the genre-painting was aligned with what Peirce called ‘the quality of the sympathetic element of the situation [...] – a something you probably never did so clearly realize before’. Though Peirce makes no mention of it, it is not difficult to detect an echo of that ‘Je ne sais quoi?’ which Leibniz had much earlier associated with the discrimination of artists. It was the aesthetic experience of the painting, as raw or as nuanced as could be envisaged, which manifested the existence of an interpretant, a meaning latent in the feeling which the painting stimulated and the attitude which it inspired. The same sort of vague yet vivid intuitive impression might also be attached to the question of Hamlet’s madness, an interpretant arising as the product of actually witnessing the play, instead of being derived from the methodical account of a literary critic. This was not to say that a sign could always be appreciated spontaneously, as if independently of any context, on the contrary contextual circumstances served to inform and so shape the implications of an interpretant. Nor was a sign always affiliated with a judgement of taste, as Peirce’s antipathy to this kind of thinking confirms. Instead, by emphasising the aesthetic aspect of the interpretant

³⁶¹ Charles Peirce, ‘Excerpts from Letters to William James: 26 February 1909’ in in *The Essential Peirce: Volume 2*: p. 494.

he demonstrated that neither linguistic explication nor deliberate reflection were an essential part of the sign's semantic efficacy. Apparently paradoxically, the mediation upon which the reception of the sign depends is itself immediate, embedded in the immanent effects it has on its recipient.

Thinking back to those earlier examples of blue equated with sky, and a flag orientated in the wind, we ought to register that an understanding of these so-called natural signs does not depend on a laborious and linear association of conceptual elements. Once learnt, knowledge of this order is often tacit, assumed unconsciously, entering concentrated awareness only subsequently if at all. Though they may be broken into logical or psychological steps (and though this logic is indispensable to the learning or growth of signs), the interpretants which these signs go on to induce may be just as congruent with a sympathetic quality as the contemplation of a painting; it is only in retrospect, and with reference to their consequences that such signs prove worthy of a different kind of cognitive attention, hence the status of the interpretant as a 'future memory'.

To make the same point from the opposite direction, the connection between sign and object may be far more complex than an interpretant suggests: knowing the direction of the wind is not tantamount to a precise sense of the mass of a flag's fabric and its calculable reaction to a force of displaced air, though such factors are presupposed in this sign having meaning. Still less is insight into the chemical constitution of the atmosphere and the refractive properties of sunlight indispensable to recognising a blue sky.

Peirce attempted to account for these kinds of differences in the meaning invoked by signs, and the various underlying conditions inducing this effect, by distinguishing between several different aspects of the interpretant, and at least two modes of existence associated with the object of a sign. On the side of the object, Peirce distinguished between what he called the 'immediate object' of a sign, as in that which palpably manifested itself, and the 'real' or 'dynamic' object. To understand this distinction, it should be observed that Peirce did not conflate objects with individual things as if they were distinct substances existing independently; objects were inseparable from their displacement via the vessel of signs into the catchment of interpretants, and none of these elements made sense in isolation. The 'dynamical object' did not mean 'something out of the mind' in a transcendental sense, rather it meant 'something forced upon the mind in perception, but including more than perception reveals'.³⁶² In other words, the capacity of something to signify was predicated on that which was not accounted for in the reception of the sign. The same sort of logic dictates that sensation precludes a complete and constant awareness of the organ which supplies sense data; tinnitus

³⁶² Charles Peirce, 'A Draft Letter to Lady Welby' [1906], *Semiotic and Significs*: p. 197.

and the retinal blind spot can be cited as oblique evidence of this fact, and Peirce too mentioned the latter.³⁶³

An interpretant could be *emotional* - provoking feeling - or *energetic* - provoking action. Only a *logical* interpretant need include conjecture as to the *how* and *why* bridging sign and object, deriving a general proposition from their inter-relation that could be consciously contemplated and tested. In addition to these three, the *dynamic* interpretant – marking the actual effect of a sign via the action of a mind – and the *final* interpretant – consisting in the criteria upon which, all things considered, a mind ought to have acted - were together preceded by an *immediate* interpretant. Somewhat mysteriously, and apparently contradicting himself, Peirce claimed that the immediate interpretant indicated the potential of sign and object to produce a significance prior to it being acted upon, a quality that seemed to correspond to that ambiguous threshold interposed between a sign first being encountered and its actual effect.

In another letter, for James' benefit Peirce took a question asked by his wife to act as an example of the immediate interpretant: "What sort of a day is it?" Before acquiring those perceptions that might provide an answer, verifying that these perceptions do indeed represent the quality of the weather, and deciding why this information might be significant from his wife's point of view, the question itself implied an interpretant in the very act of being stated as such, i.e. as something that demanded a response (CP 8.314). Peirce admitted that the distinctions he sought in defining the interpretant remained somewhat muddled, and recorded his regret that he did not have the opportunity to investigate this idea adequately.

Some of the examples Peirce gives of his 'very extended sense' of representation attest well to the *active* participation of signs in the rendering of things: 'a barrister *represents* his client to the judge and jury whom he influences' or, even more dramatically, an act of murder 'represents' the relation between a murderer and their victim (CP 1.553). This practical dimension of signs, inextricable from meaning, was also discernable in Peirce's pragmatism. Peirce summed up this doctrine in the following maxim:

Consider what effects, that might *conceivably* have practical bearings, you *conceive* the objects of your *conception* to have. Then, your *conception* of those effects is the whole of your *conception* of the object. (5.438)

The problem, then, was not, as representation tends to imply, that of matching up the contents of mental imagery with the surrounding world. It was that of distinguishing and tracking the different forms of significance which contributed to both sensory and intellectual impressions,

³⁶³ Charles Peirce, 'Questions Concerning Certain Faculties Claimed for Man' in *The Essential Peirce: Volume 1*: p. 15.

in terms of their actual effects. The individual's mind could be seen as a confluence of these distinct vectors of *re*-presentation, vectors which carried and converted information about the world into new forms.

It will not be possible to cover every facet of Peirce's vast philosophical project here, nor settle every score stemming from those controversies and uncertainties which run throughout his thought. Instead, I can only hope to survey the structure of its main principles, providing some analysis of relevant texts, with a view to establishing the synergy between the ecological and the aesthetic, which I contend underpins the cultural significance of biosemiotics. With these limitations in mind it is worth highlighting a divide discernable within Peirce's thought, which has represented a troublesome problem for many critics and commentators. On the one hand, Peirce provides a logical and naturalistic account of sign relations, which, though it remained incomplete, and was subject to several adjustments throughout his lifetime, is patently grounded in empirical and phenomenological observation. On the other hand, Peirce frequently pursued metaphysical and cosmological speculations, which, superficially, do not seem to be based upon any verifiable form of knowledge; instead, they veer towards the kind of transcendental idealism, if not outright mysticism, which he explicitly sought to escape. The problem for readers of Peirce is how to either reconcile or absolve themselves of the alleged discrepancy between these two poles. Hence, some have denied that the more speculative passages of Peirce's reasoning are worth taking seriously, while others have either sidestepped or simply avoided discussing the broader implications and more controversial claims to be found at the frontiers of his philosophy.

The most common means of salvaging Peirce's semiotics, either playing down the repercussions of his evolutionary cosmology, or jettisoning it completely, is to maintain that signs, or at least linguistic symbols, are the privileged domain of human beings. Presupposing this caesura in the natural order allows the veracity of Peirce's analysis of signs to be considered largely independently of his metaphysical claims. In certain cases, animals, as organisms endowed with sentience, may demonstrate a limited faculty for processing the more rudimentary kinds of signs. But still, the superiority of human beings is prioritised, as is the assumption that signs are contained in the minds of individual persons. No matter whether the efficacy of a particular sign is grounded solely in material stimuli, or in the conventions and abstractions which characterise human culture, it belongs to a particular subject as a feature of its intentions, and its subsequent exchange rests on this starting point. The snag in this strategy is that Peirce himself denied that signs were confined to individual minds alone. This denial included, but was not limited to, the acknowledgement of non-human semiosis; more than this, Peirce aspired to reveal the action of signs beyond individual psychology, as a mode of thought and significance inherent within the development of natural forms:

The action of a sign generally takes place between two parties, the *utterer* and the *interpreter*. They need not be persons; for a chameleon and many kinds of insects and even plants make their living by uttering signs, and lying signs at that. Who is the utterer of signs of the weather, which are not remarkably veracious, always? However every sign certainly conveys something of the general nature of thought, if not from a mind, yet from some repository of ideas, or significant forms, and if not to a person, yet to something capable of somehow “catching on” [...] that is of receiving not merely a physical, nor even a psychical dose of energy, but a significant meaning.³⁶⁴

The use of misleading or fallacious signs by non-human organisms is noteworthy, because it suggests that they are somehow involved in a form of symbolic logic, and so are not necessarily restricted to those more direct and simplistic signs with which we might more readily associate reflex, sensory perception, and other animal faculties. As is made obvious by the inclusion of plants within those beings that act as a source of signs, conscious awareness was not an essential aspect of semeiotic expression. Peirce wrote elsewhere that ‘It is the instincts, the sentiments, that make the substance of the soul. Cognition is only its surface, its locus of contact with what is external to it’;³⁶⁵ this, the concealed life of signs, infiltrated the unconscious of humans, as well as that of other creatures. Likely most jarring for the anthropocentrism of common-sense, however, is the proposal that changes in the weather may too constitute signs, and that, in such cases, the ‘catching on’ of significance is sufficient to convey a mode of meaning which moves in the direction of thought.

Taken out of context these claims about the action of signs – impersonal, non-human, and non-living – are hard to accept. The notion that natural forms are capable of articulating meaning, without the mediation of specific persons, challenges our sense of the sovereignty of human communication, while seemingly projecting subjectivity, sentiment, and reason, onto the objectivity of dead and dumb matter. Peirce’s rhetorical question about the utterances of the weather recalls those doctrines, ancient and modern, which have considered an innate power of signification to be inscribed within all things manifesting their otherwise hidden qualities. In his *De Rerum Natura* Paracelsus included a chapter on the signatures of natural things, stating that ‘nothing is without a sign since nature does not release anything in which it has not marked what is to be found within that thing’.³⁶⁶ Later the Romantics too disseminated comparable ideas about pansemiosis, with Novalis maintaining that ‘the universe speaks’ and that ‘all things

³⁶⁴ Charles Peirce, MS 318 [1907], quoted in John Deely, *Four Ages of Understanding*: p. 629.

³⁶⁵ Charles Peirce, ‘Philosophy and the Conduct of Life’ in *The Essential Peirce: Volume 2*: p. 31.

³⁶⁶ Giorgio Agamben, *The Signature of All Things: On Method*, translated by Luca D’Isanto with Kevin Attell (New York: Zone, 2009): p. 33.

are mutually symptoms of each other'.³⁶⁷ Where Peirce's fusion of signs and things differs decisively from that of these precursors is in his distinctive account of the evolutionary process through which semeiotic phenomena develop; it is the idiosyncrasy of this account which necessitates due attention be paid to the cosmogonic aspect of his philosophy, and it is here, via the evolution of signs, that ecology and aesthetics may again meet.

Nevertheless, even those who do insist that the integrity of Peirce's thought extends to his more speculative and radical formulations, should concede that the philosopher was not always capable of explaining precisely how particular forms of signification developed. Bearing in mind the state of biology at the time, Peirce could not have known the manner by which semiotic processes made the evolution of life possible. Darwin's theory of natural selection explained how it was species evolved, but it did not provide a complete account of the means; he could not describe the genetic mechanism which enabled genealogies to at once sustain and adjust themselves to changes in their situ, replicating and recalling information across generations. Without an effective criterion for distinguishing between the complex configurations of semiosis attained by living organisms, and those governing other natural forms, it is understandable that Peirce's critics could perceive no other alternative than either a belief in some form of pansemiosis, or the acceptance that meaning was the exclusive privilege of those endowed with self-conscious intention mediated by language. Small wonder then that Peirce eventually despaired of demonstrating that signs relations could subsist without reference to persons. In a famous or perhaps infamous letter to Lady Victoria Welby he wrote:

I define a Sign as anything which is so determined by something else called its Object, and so determines an effect upon a person, which effect I call its Interpretant, that the latter is thereby mediately determined by the former. My insertion of "upon a person" is a sop to Cerebrus, because I despair of making my own broader conception understood.³⁶⁸

Following this apparent admission of defeat, Peirce still did not discard the idea of non-human interpretants altogether. Instead he continued to oscillate between two positions, sometimes hinting at a life of signs beyond anthropological and even biological structures, sometimes seeming to deny that signs were meaningful beyond their anchorage in human consciousness.

With respect to the image of the environment latent within Peirce philosophy, it is his conceptualisation of the mind as the vessel of evolutionary ideas that proves most revealing,

³⁶⁷ Winfried Nöth, *Handbook of Semiotics* (Bloomington, Indianapolis: Indiana University Press, 1995): p. 32.

³⁶⁸ Charles Peirce, 'Excerpts from Letters to Lady Welby: 23 December 1908' in *The Essential Peirce: Volume 2*: p. 478.

and here both his affinity with Uexküll, and his possible differences become more pronounced. In a critical reconfiguration of what might be deemed our common sense understanding of experience, Peirce did not locate the mind, as a purely spiritual point of view, on the one side, and the world, as material nature, on the other. Rather than being something shut up in a skull which was then surrounded on all sides by the outer limits of the environment, the mind was itself open, externalised in the form of those intelligible patterns which characterised natural development. Consciousness and the inward aspect of feeling were not the essential attributes of mind; this misunderstanding arose from the fact that biological organisms, especially those endowed with a nervous system, tended to exemplify the possession of a mind (CP 7.364). Additionally, matter was not wholly indifferent or mindless; it was ‘nothing but mind that had such indurated habits as to cause it to act with a peculiarly high degree of mechanical regularity (CP 6.277). As these premises suggest, for Peirce the mind was not absolutely individual. Instead, it articulated the lively reality of generality, conveying the logic of relations between individuals, rather than being confined to any particular substance or body.

Peirce’s idea of mind can be affiliated with a number of other inter-related concepts within his system. The mind was informed by Thirdness, as the predictive mediate relation between Firstness, which stood for the singular quality of a possibility, and Secondness, which invoked the particular force of an action (CP 1.537; CP 5.469). As the recipient of a sign, and the means by which its relation to an object was represented, the mind situated the interpretant, thereby producing a mental or physical effect, as in a feeling, exertion, or the notion of another sign (CP 2.493–4). By allocating a triadic structure to signs, Peirce moved beyond a simplistic dualism connecting the thing to a corresponding signifier, and avoided polarising the mental aspect of signs and the physical objects to which they referred. His semiotics called attention to the diverse means by which information may be transported from a particular thing into a new context, emphasising the pragmatic generation of significance that this process of displacement entailed. In effect, as the site of an interpretant introducing collateral information in order to determine the identity of a sign, a mind or quasi-mind acted as a localised instantiation of the environment.

Although human beings maintained specialised access to signs, this did not mean that those minds involved in semiosis were exclusively human. Peirce was frequently evasive when it came to discussing this issue of non-human signs. For good reasons, partly connected with his interest in formal logic, he tended to concentrate on sign usage by or between persons. Nevertheless Peirce provided plenty of hints within his writings justifying an account of semiotics substantially opposed to anthropocentrism. For Peirce, signs not only passively rendered the world legible on behalf of an observer, through the complex patterns informing their growth they were actively involved in the generation of a world. As the embodiment of signs and a process orientating the development of everything, from bee hives to crystals,

thought, Peirce argued, was in evidence throughout the purely physical world (CP 4.511); signs must therefore play an active role in the formation of nature as well as knowledge. A plant which extracted nourishment from sunlight, and the animal which set out to eat this plant, even the weather system which added fresh water to the mix, in so far as they contributed to intelligible relations, all of these incidents already implied the production and interaction of signs. The presence of a bystander able to picture and pass on news of these events was not primary, rather in its own right every fact preserved or predicted by way of a sign contributed to a process of ecological evolution.

Integral to the growth, which Peirce claimed was a primordial element of the universe (CP 6.157), was the fact that the interpretant of a sign could in turn become another significant object, with its own potential for engendering semiotic relations. Successively, every representation might become the basis of another representation in an endless series (CP 1.339). Abstraction, as the process by which a thought-sign became the object of another thought-sign (CP 4.549), was not just the business of scientific investigation; for Peirce it also represented the means by which reality acquired complexity. Like an organic tissue of interwoven strands, signs grew. And, by recursively articulating and deciphering their own significance, signs evolved along with the universe itself, introducing new patterns, habits, and laws into existence.

The Sign of the Sphinx

Between 1887 and 1888, in what would prove to be one of a series of decisive turning points in the development of his philosophy, Charles Peirce worked on a text entitled ‘A Guess at the Riddle’, an unfinished sketch of a book which set out to unify his speculations, laying the foundations for an architectonic system in the tradition of Aristotle and Hegel. ‘A Guess’ traced the implications of Peirce’s three categories, as interrelated conceptual elements, examining their efficacy within several different domains of knowledge.

Peirce proposed that these elements, otherwise known as firstness, secondness, and thirdness, not only denoted fundamental phenomenological categories, they also corresponded to those tendencies of nature directly participating in the evolutionary development of the universe. The ‘First’, as the immediacy of being simply in itself, encompassed everything ‘original, spontaneous, and free’. Since this category precluded any kind of differentiation or synthesis, it also denoted the rawness of unadulterated feeling, a ‘vivid, conscious, and evanescent’ state of existence, preceding any effort at description or representation.³⁶⁹ Though it took penultimate place in the sequence of Peirce’s logic, considered on its own terms the ‘Second’ represented ‘the absolute last’. Secondness could thereby be equated with those facts

³⁶⁹ Charles Peirce, ‘A Guess at the Riddle’ in *The Essential Peirce: Volume 1*: p. 248.

that consisted in any kind of determinacy, whether this meant being dependent or independent of that to which they were related. Whereas the first was ‘so tender’ that it could not be touched without being spoiled, and the second was ‘eminently hard and tangible’, the ‘Third’ split the difference between these two extremes.³⁷⁰ Acting as a bridge between the first and the last, and in this way occupying a dimension between absolute finitude on the one hand, and boundless freedom on the other, the third synthesised the opposed influence of the first and the second within a generative process interjecting change into the world.³⁷¹ First was ‘Chance’, second ‘Law’, and third was ‘Habit’.

The notion that a triadic system of principles rationalised change had long been at work within Peirce’s thought. In his senior year at Harvard, following a realisation that logic must be supported by aesthetics, Peirce had intensely studied the work of Friedrich Schiller.³⁷² In his letters *On the Aesthetic Education of Man* Schiller had identified three impulses contributing to human reason. Two of these, the drive towards diversity and transience or *Stofftrieb*, and the opposed *Formtrieb* or drive for “form” and permanence, supposedly conformed to Kant’s dualism in the *Critique of Judgement*, representing the sublime conflict between material nature and human reason. *Spielttrieb*, a third aesthetic tendency introduced by Schiller, mediated between these drives by way of play, thereby making possible the reconciliation of sense and reason for both the individual and society. Peirce’s continuing debt to Schiller can be found in that other name he gave to the apprehension of firstness, as a premonition of thirdness, and the associated logical principle of abduction: namely, the ‘play of musement’. However, by the time Peirce came to write *A Guess* something radical had changed, and the three elements he analysed were certainly not equivalent to those of Schiller’s aesthetics.

Although Peirce’s projected solution to the riddle of the Sphinx was explicitly predicated on his trichotomic logic – ‘the art of making three-fold divisions’ as he put it³⁷³ – read independently of other works the question to which these principles were actually addressed remains somewhat obscure, and so the answer that he had begun to devise is hard to pin down. Beginning with mathematics and logic, Peirce felt able to freely run the gamut across a wide range of disciplines, including psychology, biology, and physics, with a plan to apply the same style of reasoning to sociology and theology. After surveying numerous examples, knitting together diverse formulations drawn from geometry, poetry, the statistics of card games, the physiology of cells, and the chemical analysis of molecules, he was comfortable repeating his assertion that ‘three elements are active in the world, first, chance; second, law;

³⁷⁰ Charles Peirce, ‘A Guess at the Riddle’ in *The Essential Peirce: Volume 1*: p. 249.

³⁷¹ Charles Peirce, ‘A Guess at the Riddle’ in *The Essential Peirce: Volume 1*: pp. 249 – 250.

³⁷² Brent, *Charles Sanders Peirce*: pp. 53 – 54.

³⁷³ Charles Peirce, ‘Trichotomic’ in *The Essential Peirce: Volume 1*: p. 280.

and third, habit-taking' concluding that '[s]uch is our guess of the secret of the Sphinx'.³⁷⁴ Yet, this declaration alone does not make the Sphinx's riddle any less enigmatic, and so it might be no surprise to hear that Peirce never completed a volume as comprehensive as that which he had anticipated in writing *A Guess*. Nevertheless, to appreciate what was urgent enough in Peirce's thinking for him to claim *A Guess* would be 'one of the births of time', it is worth looking more closely at the sources of the dilemma which he believed he was in a unique position to settle.

Peirce had derived his fascination with the Sphinx's riddle from a poem by Ralph Waldo Emerson. Published in 1846 within Emerson's newly collected *Poems*, 'The Sphinx' narrates the encounter between a blithely sanguine poet and the brooding beast of legend. The most well-known version of the Sphinx's riddle is that which was supposedly posed to challenge Oedipus: 'What walks on four legs in the morning, two legs at noon, and three legs in the evening?'. Emerson's Sphinx too is interested in the transience of mortality, '[t]he fate of the man-child, the meaning of man', which could well represent the solution to the traditional riddle, but her account of the mystery of humanity is very different. The Sphinx contrasts the infirmity and angst of man, his 'sadness and madness', with the unalienated life of other animals, united together with the wholeness of nature '[b]y one song enchanted'. Refusing to be disheartened by this dirge on his melancholic existence, the poet defies the Sphinx, and invites her to continue her 'pleasant songs', identifying love and joy with the restlessness and self-consciousness of the human spirit. Realising her riddle has already been solved, and admitting that man is in fact 'the unanswered question', to which 'time is the false reply', the Sphinx dissolves into the background, merging into a multitude of phenomena, and concluding 'through a thousand voices':

"Who telleth one of my meanings
Is master of all I am."

In the fourth chapter of his book *Nature*, Emerson had framed the problem he believed the Sphinx symbolised in a much more straightforward manner, noting that:

This relation between the mind and matter is not fancied by some poet, but stands in the will of God, and so is free to be known by all men.³⁷⁵

³⁷⁴ ³⁷⁴ Charles Peirce, 'A Guess at the Riddle' in *The Essential Peirce: Volume 1*: p. 277.

³⁷⁵ Ralph Waldo Emerson, 'Nature' in *Emerson on Transcendentalism* (New York: Continuum, 2003): p. 20.

The problem then was understanding what made possible the transition between the materiality of nature and human consciousness. As Emerson professed, the same issue had long preoccupied philosophers:

From the era of the Egyptians and the Brahmins to that of Pythagoras, of Plato, of Bacon, of Leibnitz, of Swedenborg. There sits the Sphinx at the roadside, and from age to age, as each prophet comes by, he tries his fortune at reading her riddle.³⁷⁶

In accordance with his idealism, Emerson's own interpretation of this problem depended on the recognition that natural facts could only be articulated in language and in thought because they, in turn, conformed with spiritual facts, facts which pre-existed as necessary ideas in the mind of God. Beauty, the grace and harmony of both nature itself and of art as an inflection of nature, testified to this divine logic.³⁷⁷ Likewise language, as a means of interpreting and revealing unconscious truth, made knowledge accessible of the God-given harmony uniting the ideas of the soul with the objects of the world.³⁷⁸ Yet Emerson's account of the bond between matter and mind does not conform with the logic that Peirce had developed in *A Guess*.³⁷⁹ Nor does it explain why Peirce favoured one stanza of 'The Sphinx' in particular, selecting these four lines as an epigraph to sit beneath the title of his planned book:

The old Sphinx bit her thick lip, –
Said, "Who taught thee me to name?
I am thy spirit, yoke-fellow,
Of thine eye I am eyebeam."

A more enlightening clue as to what lies behind Peirce's own interpretation of the Sphinx's riddle is to be found in yet another account of the same problem. As mentioned earlier, both Peirce and Emerson were influenced by Hegel, who referred to the Sphinx as an example in his lectures on aesthetics and on history. According to Hegel the Sphinx was the 'Symbol of the Symbolic itself' (Hegel : 360 – 361), and it is in this incarnation, as the living embodiment

³⁷⁶ Ralph Waldo Emerson, 'Nature' in *Emerson on Transcendentalism*: p. 21.

³⁷⁷ Emerson, 'Nature': pp. 14 – 15.

³⁷⁸ Emerson, 'Nature': pp. 21 – 22.

³⁷⁹ Not long after drafting *A Guess* Peirce disassociated himself from transcendentalism. Having been brought up in Concord, Cambridge, Peirce felt he had acquired some 'cultured bacali' through his personal acquaintance with Emerson, Hodge, and their friends. Yet, he also wrote that he was 'not conscious of having contracted any of that virus' of 'Schelling-fashioned idealism' with which he identified the more mystical currents of Emerson's philosophy. Charles Peirce, 'A Guess at the Riddle' in *The Essential Peirce: Volume 1*: pp. 312 – 313.

of a sign, that the Sphinx seems most significant from a Peircean point of view, emblematic of the very thing which would go on to take centre stage in Peirce's philosophy.³⁸⁰ Yet, for Hegel the Sphinx could only represent a transitory moment in the journey of *Geist* towards absolute knowledge, specifically the shift from Ancient Egyptian culture toward that of the Ancient Greeks. The chimerical form of the Sphinx, uniting an animal body with a human head, represented an imperfect state of being caught midway between the natural and the spiritual, invoking a failure to fully subject sensuous materiality to conscious design. The Greek negation of Egyptian culture corresponded to Oedipus' answer to the Sphinx, dispelling the riddle of the symbolic through the affirmation of man and the dictum 'Know thyself'. Accordingly, the Sphinx represented a deficiency in the very nature of the symbol: symbols always retained an obscure element that could not be clearly articulated. Unless transcended via religion, the 'ideal', and the self-knowledge of man, that which the symbol bound together would split apart, bifurcating into the abstract independence of God on the one hand, and the concrete existence of the world on the other (Hegel: 372 – 373).³⁸¹ In this respect Hegel's conception of the Sphinx was much closer to that of Emerson, than that of Peirce. Where Emerson and Hegel saw the Sphinx's defeat as a symbol of human transcendence and putative mastery over signs, Peirce effectively inverted this schema.

For Peirce then, the resolution of the Sphinx's riddle lay not in its sublimation, but in the realisation that human beings themselves were a species of signs, the offshoot, rather than the arbiter of semiotic processes. Firstness moved toward Secondness, with Thirdness interpolating the difference between the two. Signs and symbols, as an extension of the third category, could not be deemed the subsidiaries of a pre-calibrated order, with its ends in the mind of God or man, rather they were the result of the innate tendency of nature to take on habits:

[I]n the beginning – infinitely remote – there was a chaos of unpersonalized feeling, which being without connection or regularity would probably be without existence. This feeling, sporting here and there in pure arbitrariness would have started the germ of a generalizing tendency. Its other sportings would be evanescent, but this would have a growing virtue. Thus, the tendency to habit would be started: and from this, with the other principles of evolution all the regularities of the universe would be evolved. (CP 6:33)

³⁸⁰ G. W. F. Hegel, *Aesthetics: Lectures on Fine Art* (Oxford: Clarendon, 1975): p. 360.

³⁸¹ Hegel, *Aesthetics: Lectures on Fine Art*: pp. 372 – 373.

According to Peirce's cosmogonic philosophy this same logic pervaded the whole of nature, and it was this 'generalizing tendency' that, through habit, bred signs from signs, opening up unprecedented transformations in the process. For Peirce, signs did not exist as an overlay coating objects in a convenient set of supplementary labels and instructions for use. There can be no slim transparency inserted between the mind and the world since each of these realms is already involved in the rendering of the other. Instead, signs were directly implicated in the changing shape of things. The development of nature could not be traced back to a fixed determinate origin, but instead consisted of diverse and capricious vectors of growth, gaining regular form only through interaction with one another. Conceiving of the beginnings of the universe in this manner supported two conclusions which went against the current of modern philosophical and scientific tradition: the first, that natural laws were not eternal or transcendent because they too were subject to an ongoing process of evolution. And the second, that those cognitive processes emerging in the human mind were ultimately of the same substance as those composing the rest of nature. In the transition between these two conclusions, and so, in the relation between habit and significance was sown the thread that unravelled the Sphinx's riddle.

As it happens, signs themselves are not much mentioned in 'A Guess', but since this text was a proposal for a book yet to be written, rather than a final draft, the relatively scarce attention they receive ought not to be misconstrued. The contents page specifies that a discussion of the three main kinds of signs would begin the second chapter of 'A Guess', and in Peirce's subsequent philosophical writings the subject of signs continued to take an integral role in his attempts to systematically unify his ideas.

Peirce had begun to develop his doctrine of signs as early as the 1860s, with his first attempt at making a comprehensive statement of this doctrine published in a series of three articles, in the *Journal of Speculative Philosophy*, between 1868 and 1869.³⁸² In the second of these articles, 'Some Consequences of Four Incapacities', he attempted to devise an alternative to the Cartesian instigation of modern philosophy, beginning by unpicking a number of those faculties which Descartes had presupposed belonged to man. Peirce claimed that 'some absolutely inexplicable, unanalyzable ultimate' must be accepted in order to begin thinking, 'in short something resulting from mediation itself not susceptible to mediation'.³⁸³ The kernel of this inexplicable fact was not the imaginary persistence of self-consciousness in the face of all-consuming doubt, but, on the contrary, included the substance of those prejudices and needs which might never be extinguished, no matter the intellectual ambition of the philosopher. As Peirce plainly put it 'we have no power of thinking without signs'.³⁸⁴ The very idea of something inexplicable could not elide this fact, and so any reasoning about fundamentals was,

³⁸² Thomas Lloyd Short, *Peirce's Theory of Signs*: p. 32.

³⁸³ Charles Peirce, 'Some Consequence of Four Incapacities' in *The Essential Peirce: Volume 1*: p. 29

³⁸⁴ Charles Peirce, 'Some Consequence of Four Incapacities' in *The Essential Peirce: Volume 1*: p. 30.

Peirce claimed, necessarily committed to reasoning from signs. Nonetheless, such a doctrine was not to be accepted *a priori* as a self-evident certainty, but traced derivatively in terms of its consequences. Since, for Peirce, signs were not just labels or descriptors, but logically constrained attributes of thought, tracing their consequences meant founding each cognition upon the basis of previous cognitions, no mere intuition would suffice. Pursuing these principles suggested that a thought made up of signs substantiated ‘the nature of reality in general’ and it was this consideration that had led Peirce to the conclusion:

‘[T]he fact that every thought is a sign, taken in conjunction with the fact that life is a train of thought, proves that man is a sign; so, that every thought is an *external* sign, proves that man is an external sign. That is to say, the man and the external sign are identical, in the same sense in which the words *homo* and man are identical. Thus my language is the sum total of myself; for the man is the thought.’³⁸⁵

Read in the context of its original formulation it is difficult to distinguish this statement of Peirce’s philosophy from idealism. Especially misleading is the emphasis on language, since this elides all of those phenomena which Peirce interpreted as signs that were not reducible to linguistic conception, reinforcing the idea of a world known only through mental processes. Despite already being committed to realism, as opposed to nominalism, and so arguing that ideas about universals corresponded to an actuality of things, as opposed to merely denoting a means of articulating particularities, Peirce had not developed an adequate account of how these entities came into being through material processes. Accepting the existence of an abstract object such as ‘Man’ was not sufficient, what needed to be explained was how the human, as a sign, came to exist in the first place.

Long ago, in the *Journal of Speculative Philosophy* (Vol. II, p. 156), I pointed out that a person is nothing but a symbol involving a general idea; but my views were then, too nominalistic to enable me to see that every general idea has the unified living feeling of a person. (6.270)

Looking back at Emerson’s poem, we can imagine that Peirce read something into the text which had remained hidden even for its author. Contrary to all those – from Hegel to Heidegger – who have regarded human awareness of mortality as the price paid for a lofty position within the great chain of being, Emerson’s poet sees past this morbid trade-off between freedom and self-alienation. Like that of the Sphinx herself, the life of the poet is as much

³⁸⁵ Charles Peirce, ‘Some Consequence of Four Incapacities’ in *The Essential Peirce: Volume 1*: p. 54.

animal as human, lived as much in the extended dynamic of the environment, as it is held incarnate within the animate interior of the organism. For this reason, the poet perceives no special secret beyond the incessant striving which characterises existence, accepting the proliferation of paradoxes that this restlessness entails. The Sphinx's question 'Who taught me thee to name?', and her indignant assertion 'I am the spirit', conveys that she, as sign, embodies both the expression of human consciousness, as well as its sensuous source. In humouring the Sphinx, the poet has already understood that he and this hybrid creature are yoked together, bound by that nexus of semiotic relations which is woven in an ongoing process of evolution, and which differentiates the articulate awareness of living beings. Returning to Emerson's gloss on the riddle of the Sphinx, for Peirce at least, the issue is not the antonymic divide between the subjective mind and objective matter. Attempting to traverse this gap alone is a hapless task, futile precisely because relationality is at work everywhere; the dissolution of the Sphinx into 'a thousand natures' makes apparent the ubiquity of significance in this sense. No individual form of absolute knowledge can subsume the plurality of meanings that composes the world and makes possible experience, no matter which side of the epistemic divide is privileged.

CHAPTER 6.

Life's Labour Abducted: On Peirce's Methodeutic

The flowering moments of the mind
Drop half their petals in our speech.

‘To My Readers’, Oliver Wendell Holmes.³⁸⁶

[S]uddenly, while we are poring over our digest of the facts and are endeavoring to set them into order, it occurs to us that if we were to assume something to be true that we do not know to be true, these facts would arrange themselves luminously. That is *abduction*.

Charles Peirce, ‘Harvard Lectures on Pragmatism, a Deleted Passage’.³⁸⁷

Of all the many vocations in which Charles Peirce engaged over the course of his lifetime he neither identified with, nor claimed any mastery over writing.³⁸⁸ Late in life, when his articles for *The Monist* and the *Nation* had become one of his only independent sources of income, Peirce went so far as to declare: ‘One of the most extreme and lamentable of my incapacities is my incapacity for linguistic expression’.³⁸⁹ What then makes this assertion seem peculiar is the considerable volume of writings Peirce ultimately produced, continuing to doggedly work on all kinds of texts, for publication and for lectures, as well as privately, even when enduring periods of intense hardship.

Son of Benjamin Peirce, a charismatic and highly successful mathematician, from the moment of his birth, in 1839, Charles was singled out by his father as a future philosopher and nascent genius.³⁹⁰ As it would turn out, Peirce’s intellectual career was not met with the kind

³⁸⁶ Oliver Wendell Holmes, Sr., ‘To My Readers’, *Poems* (Boston: Ticknor, Reed & Fields, 1849): III – IV.

³⁸⁷ Charles Peirce, *Pragmatism as a Principle and Method of Right Thinking: The 1903 Harvard Lectures on Pragmatism*, edited by Patricia Ann Turrissi (Albany: State University of New York Press, 1997): p. 282.

³⁸⁸ In recounting details from Peirce’s life here I have made extensive use of Joseph Brent’s biography of Peirce, *Charles Sanders Peirce: A Life* (Bloomington & Indianapolis: Indiana University Press, 1993). For further information I have made use of the various introductions to *The Essential Peirce: Selected Philosophical Writings: Volumes 1 & 2*, the *Collected Papers of Charles Sanders Peirce: Volumes 1 – 8*, and to the eight editions of *The Writings of Charles Peirce* published so far. More details of these texts are included in my bibliography. To a lesser extent I have referred to Kenneth Laine Ketner’s partially fictional biography, *His Glassy Essence: An Autobiography of Charles Sanders Peirce* (Nashville & London: Vanderbilt University Press, 1998).

³⁸⁹ Charles Peirce, MS 632, quoted in Brent, *Charles Sanders Peirce: A Life*: p. 43.

³⁹⁰ ‘[O]ur new born philosopher [...] [t]he first proof of his genius which he exhibited to the world consisted in sounding most lustily, a wonderful acoustic instrument [...] A sure omen of his coming,

of rewards than this early praise might promise, at least not in a manner that was clear-cut. After achieving relatively mediocre success in formal education, Peirce embarked upon a scientific career. Thanks largely to his father's influence, he was employed in experimental research by the United States Coast Survey and the Harvard Observatory. These were prestigious institutions, but the experimental research in which Peirce was engaged, proved repetitive, strenuous, and time-consuming, and he frequently found himself at odds with his colleagues and employers. Though in this, the first half of his life, Peirce met a number of distinguished scientists and philosophers, several of whom, including William James, took a genuine interest in his work, Peirce remained unable to gain a permanent Professorship. Consequently, he was not entirely free to pursue the theoretical investigations for which he retained most passion. In 1879, at the age of 40, Peirce did at last manage to secure a part-time lectureship in the Department of Mathematics at the newly opened John Hopkins University, and as the recollections of his students demonstrate, the teaching he performed over the next five years, though unconventional, was also pioneering and highly inspirational.³⁹¹ However, towards the turn of the century, Peirce would lose not only this position, but all paid employment directly associated with the academic establishment, ending up effectively bankrupt and a near recluse, dependent on the charity of friends and family for his survival.

The reasons for this decline were complex, stemming from a mixture of other's vendettas and Peirce's own self-destructive pride, as well as his unorthodox beliefs and controversial personal life, a life beset by mental and physical illness, rumours of drug abuse, extravagant tastes, and violent relationships. Yet, beyond the tragedy of an individual ostracised by the academic establishment and financially ruined, whether by virtue of his own flaws, or thanks to the prejudices of others, the necessary diversity of Peirce's interests and occupations became a valuable factor in the development of his thought. Along with those endeavours for which he received some kind of professional recognition – bringing together physics, chemistry, astronomy, geodesy, meteorology, philosophy of scientific method, mathematics, and formal logic – Peirce cultivated a wide range of other intellectual and personal interests,

almost come, celebrity?' Letter from Benjamin Peirce to Sarah Mills Peirce, 10th September 1839, qtd. in Brent, *Charles Sanders Peirce*: pp. 36 – 37.

³⁹¹ A number of Peirce's students later recalled favourably the lectures and seminars of their eccentric professor. During this period, Peirce, in collaboration with his students, edited and published *Studies of Logic by Members of the John Hopkins University*, an expansive and pioneering work, very much engaged with the then current state of symbolic logic. Among those who studied with Peirce, were John Dewey, Fabian Franklin, Benjamin Ives Gilman, Joseph Jastrow, Christine Ladd Franklin, Thorstein Veblen, and Allan Marquand, all of whom would go on to gain intellectual reputations in their own right. Brent, *Charles Sanders Peirce*: pp. 128 – 133; Nathan House, intro. to *The Writings of Charles S. Peirce (1879 – 1884): Volume. 4*, edited by Christian Kloesel et al. (Bloomington: Indiana University Press, 1980-2000); Max H. Fisch 'Peirce at the John Hopkins' in *Peirce, Semeiotic, and Pragmatism*, edited by Kenneth Laine Ketner and Christian J.W. Kloesel (Bloomington: Indiana University Press, 1986).

ranging from experimental psychology, physiology, medicine, evolutionary science, and cosmology, to the occult, literature (especially Shakespeare and Edgar Allen Poe), horticulture, amateur dramatics, conjuring and card tricks. Testament to Peirce's encyclopaedic approach to learning are the 5,000 or so definitions he contributed to the *Century Dictionary* as editor of Metaphysics and Logic.³⁹² Similarly, the numerous anonymous book reviews that Peirce had printed in the *Nation*, along with those that appeared in the *New York Evening Post*, embraced a vast array of topics.³⁹³ Though he would never have described himself as a cultural theorist – the idea or even the need for such a specialism had not yet been fostered – Peirce's passion for tracking concepts into and across multiple disciplines, thereby forging positive links between art, religion, the human and the natural sciences, offers an original and intriguing glimpse of what the study of culture could mean.

Peirce, it seems, was the archetypal polymath, but his attraction to such diverse pursuits went beyond a fondness for surveying and archiving knowledge. Perhaps all the more impressive is the list of inventions and techniques which Peirce actively contributed to various fields. Peirce was among the first to use light waves as a unit of measure, he invented the quincuncial projection of the sphere, proposed an original design for a computer operating via circuits of electrical switches, and helped perfect the measurement of gravity by means of pendulums. It was in mathematical logic especially that Peirce made some decisive and ground-breaking interventions, several of which were only properly appreciated long after his death. At around the same time as Gottlob Frege, and building on George Boole's algebra, Peirce made a number of those steps which would lead to the advent of modern logic, notably introducing a system of quantifiers and bound-variables that served to move the formalisation of logic beyond the Aristotelian tradition.³⁹⁴ Other innovations included pre-empting the

³⁹² In his role as an editor for *The Century Dictionary*, Peirce composed entries on such terms as 'cosmogony', 'evolution', and 'deanthropomorphisation', concepts which had a part to play in his own theoretical work. Together with Ladd-Franklin, he went on to contribute to the *Dictionary of Philosophy and Psychology*, edited by James Mark Baldwin (New York; London: Macmillan, 1901). Nevertheless, Peirce did not reduce science to the classification of ideas, arguing, rather, that dictionary definitions neglected certain steps in the evolution of meaning, and observing that '[m]ere knowledge, though it be systemized, may be a dead memory' (CP 6.428). Perhaps in an attempt to combat this neglect, Peirce once proposed that he would produce an alternative to *Roget's Thesaurus*, a book which he very much admired. Peirce's *Logotheca*, as it was to be titled, would move from the simplest to the most complex of concepts, tracing their development by way of those pragmatic and semeiotic principles which he had developed elsewhere. Though attracting some initial interest, this project was eventually deemed infeasible by the publisher Brent, *Charles Sanders Peirce*: 237 – 238).

³⁹³ Many of Peirce's reviews are collected in *Charles Sanders Peirce: Contributions to the Nation: Vol. I - III*, compiled and annotated by Kenneth Laine Ketner and James Edward Cook (Lubbock, Texas: Texas Tech, 1975 – 1979).

³⁹⁴ The priority of Frege's versus Peirce's work in heralding the advent of modern logic remains a subject of some controversy. Irving H. Anellis, 'How Peircean was the "Fregean" Revolution in Logic' accessed via 'The Peirce Gateway: Peirce Related Papers' <<http://www.cspeirce.com/menu/library/aboutcsp/anellis/csp-frege-revolu.pdf>>.

Scheffer stroke, also known as the NAND, or not-and gate, by at least thirty years; helping to develop the concept of a logical lattice; and developing a means of representing logical procedures diagrammatically that surpassed the earlier models of Leonhard Euler and John Venn. What makes Peirce's attitude to logic relevant to those working without a technical investment in this specialisation is his life-long effort to integrate this field with his study of signs, the means by which individuals, human or otherwise, interact with their surroundings, and, by extension, one another. It is in this respect that the unorthodox course of Peirce's intellectual career can be seen as a distinct advantage, allowing him to escape the dry abstraction of many of his contemporaries, and to establish an 'extreme realism' in place of their nominalism. Peirce created an image of the universe in which the vicissitudes of logic permeated through all walks of life, not as an obscure set of laws or forces remotely controlling reality, but as a complex, dynamic, and constructive mode of patterning, inseparable from the emerging actuality of things.

As for writing, the common inclination to equate rational thought with an aptitude for language, subsuming in particular the usage of signs, this again makes Peirce's professed incompetence worth noting. Following his death in 1914, Peirce would leave behind a small library's worth of writings, totalling over 80,000 manuscript pages. Nevertheless, at the age of 69, in a letter to the mathematician Cassius J. Keyser, having bemoaned his 'incapacity for linguistic expression', Peirce went on:

I am not naturally a writer, but as far from being so as any man. If I have ever written anything well, it was because the ideas were exerting a tremendous tension, - almost to the bursting point. Moreover, I write much better when I have a definite proposition to prove. It should also not be intricate; for otherwise my mental left-handedness makes me express myself in a way that to a normal mind seems almost inconceivably awkward.³⁹⁵

This self-denigration was in keeping with Peirce's sometimes ambivalent assessments of his own abilities. Peirce was able to lament the hopelessness of his 'emotional slush' on one occasion, and to purport that he fell short of deserving any good at all, on another, while, on others still, confidently affirming his 'bold, originating genius'.³⁹⁶ Given that the majority of Peirce's work remained unpublished, and often unfinished, despite numerous attempts to remedy this state of affairs, it is unsurprising that he should despair of his own attraction to the written-word, though why 'left-handedness' should be held responsible is much harder to

³⁹⁵ Charles Peirce, MS 632, qtd. in Brent, *Charles Sanders Peirce*: p. 43.

³⁹⁶ Brent, *Charles Sanders Peirce*: pp. 279, 294, 314.

credit. Still, there was potentially something more than either resignation or a desire for exoneration motivating this sentiment. Another quotation of Peirce, a statement also made in his late sixties, and again recorded by Brent, divulges a conviction that, regardless of any individual's linguistic talents, the intelligible world was not shrouded in language alone, nor, for that matter, restricted to human beings:

Looking out of my window this lovely spring morning I see an azalea in full bloom. No, no! I do not see. *That* is a proposition, a sentence, a fact; but what I perceive is not proposition, sentence, fact, but only an image, which I make intelligible in part by means of a statement of fact. This statement is abstract; but what I see is concrete. I perform an abduction when I [do so much] as express in a sentence anything I see. The truth is that the whole fabric of our knowledge is one matted felt of pure hypothesis confirmed and refined by induction. Not the smallest advance can be made in knowledge beyond the stage of vacant staring, without making an abduction at every step.

When a chicken first emerges from the shell, it does not try fifty random ways of appeasing its hunger, but within five minutes is picking up food, choosing as it picks, and picking what it aims to pick. That is not reasoning, because (it is not done deliberately; but in every respect but that), it is just like abductive inference.³⁹⁷

Just as Peirce himself had found work and interest in a multiplicity of practices exceeding his life in print, so the logic of the universe, opening up experience, was not immediately tied down to the dictation of language. The sight of an azalea might be recorded in a proposition, but a written or spoken phrase could not capture everything that was incorporated in this image. The visual component of the image could not be invoked in words except derivatively, just as the flower itself maintained all sorts of attributes independently of both their description and their visibility. Yet, as Peirce would always insist, this was not to say that the essence of the azalea was absolutely incognisable, or even that there was such a thing as the essential idea of an azalea existing wholly in isolation.

Far from it, Peirce's point was that, as a *sign*, the fact or fiction, perception, presentation, and possibility of an azalea in full bloom amounted to a composite entity, a drawn out thread in the fabric of knowledge. This thread could be cut at either end, leaving, on the one hand, a flower with a reality all of its own, embedded in the ecosystem in which it participated.

³⁹⁷ Charles Sanders Peirce, 'The Proper Treatment of Hypotheses: a Preliminary Chapter, toward an Examination of Hume's Argument against Miracles, in its Logic and in its History' [1901] (MS 692), in *Historical Perspectives on Peirce's Logic of Science: A History of Science: Vol II*, edited by Carolyn Eisele (Berlin: Mouton Publishers, 1985): pp 899 – 900.

Or, on the other, the detached sense and reference of a sentence, an abstraction that while helping to establish a particular instance of the generality of azaleas, stripped the phrase of its original context. Yet, what was more crucial than either of the extremities of this thread was that transition which led a single feature to be seized from a background of other details, and acted upon. A single articulate utterance aimed at registering a visual impression of azaleas could not possibly independently encompass the embodied processes which enabled this remark to be made, let alone the countless years of evolution which had led to the development of a species capable of communicating and comprehending remarks of this kind. As Peirce professed:

[T]he sum of it all is that our logically controlled thoughts compose a small part of the mind, the mere blossom of a vast complexus, which we may call the instinctive mind, in which man will not say that he has *faith*, because that implies the conceivability of distrust, but upon which he builds as the very fact to which the whole business of his logic to be true. (CP 5.212)

This ‘instinctive’ and largely unconscious mind was, for Peirce, the locus of a continuity between mind and nature, extending not only into the convoluted recesses of the brain and nervous system, but back in time, embroiled in a process of evolution informing the emerging behaviour of animals, plants, even paramecia, as well as the narratological habits of verbose apes. It was thanks to this process that a phenomenal manifestation could be converted into a set of symbols, a process that left a more or less integrated trail in its wake, enabling so-called nature, allegedly independent and intractable, to enter into discourse. And it was here that abduction came into play, mediating between the perceived and the perceptual judgement, undercutting the gap between an actual azalea and its denotation on a page, shedding the petals of this blossom in the feat of making their trace linger elsewhere.

As Peirce wrote in his review of William James’ *The Principles of Psychology*, this time questioning the presumptuousness of our sense of self, ‘[t]he agility of the tongue is shown in its insisting that the world depends upon it’ (CP 8.82). In cahoots with the individual ego, language, either spoken or written, could do a good job of laying claim to autonomy, and at the same time feign to tell the whole story about what went on in the world. In reality the vivacity of things and thoughts was much more multifarious than paraphrase in either poetry or prose could ever portray. In this sense, Peirce’s feeling of awkwardness when it came to writing was perhaps not only a perception of a failing, but an inkling of those discrepancies that were inherent within language, intimating a tendency within existence that would always overwhelm the borders of inscribed text.

As I intend to convey in this final chapter, the logic of abduction, a decisive concept in Peirce's work, involved a kind of crease or tuck in the ostensible ordering of things that resisted equation with the atomised grammar of purely linguistic exercises. So called, Peirce's idea of abduction first appeared in 1896 as an acknowledged mistranslation of Aristotle's *apagôgê*, and a third fundamental form of reasoning, following on from *synagôgê* or *anagôgê* (i.e. deduction), and *epagôgê* (i.e. induction), with these three further supplemented by *paradeigma* (i.e. analogy) (A Letter to Calderoni, CP 8.209, 1905).³⁹⁸ Along with the common definition of an illegal act – 'leading away or carrying off a person; more especially the taking or carrying away of a wife, a child, a ward, or a voter by fraud, persuasion, or open violence' – Peirce's entry in the *Century Dictionary* defines 'abduction' as 'a syllogism of which the major premise is evident or known, while the minor, though not evident, is as credible as or more credible than the conclusion'.³⁹⁹ However, in a number of different guises, the mark of this notion can be found employed in a unique capacity throughout Peirce's work, and roughly the same principle began to impose an influence early on in his writings; Peirce's considerations of this subject would develop well beyond the narrow frame of its dictionary definition and Aristotelian origins.

Put simply, as a method for approaching truth abduction involves making hypothetical inferences without either the reassuring inevitability that characterises deductive syllogisms, or the benefit of recurrent experience that makes possible inductive reasoning. In some subtle and profound sense every abduction involves a leap of faith, though, as the example of noting the existence of azaleas suggests, frequently this leap may not be experienced as such, being affiliated with otherwise quotidian acts of cognition. Adding to its intrigue, Peirce would often associate the same type of thinking with grand intellectual leaps, such as Johann Kepler's mathematical inferences about planetary orbits, and Dimitri Mendeleev invention of the periodic table.⁴⁰⁰ Various, and all the while making adjustments to its conditions and implications, Peirce discussed the same idea by the names of 'retroduction', 'hypothesis', 'presumption', 'explanation', and even simply as 'guessing'. And, elsewhere in his writings, Peirce introduced what he called 'the Play of Musement', an informal mode of contemplation which seemed to help inspire those logical leaps achieved by abductive reasoning. Other formulations, related to abduction, though in their own way technically distinct, can be found

³⁹⁸ Peirce is referring to Giulio Pacio's 16th century translation of Aristotle's *Prior Analytics*, one of those works grouped together by commentators as the *Organon*, or instrument of reasoning, in other words those texts representing Aristotle's account of the laws of logic, together with the methodology that these laws entailed.

³⁹⁹ *The Century Dictionary*, prepared under the superintendence of W. D. Whitney, revised and enlarged under the superintendence of Benjamin E. Smith (New York: Century Company, 1911), Volume I.: p 9.

⁴⁰⁰ 'Minute Logic', CP 2.96. Peirce, *Pragmatism as a Principle and Method of Right Thinking*: 282.

in the early idea of ‘precision’ as well as the later limit-case of ‘hypostatic abstraction’ – a procedure for ascending from first-order to second-order logic, in other words, moving from assertions about the identity of individuals to the predication of properties. Here then was an idea, or rather a sustained theme, that withstood being tied down to one single name alone.

As a precursor of abduction, and as, in certain respects, a more accessible method of thinking, it is helpful to describe the ‘the Play of Musement’ so as to gain some insight into abduction. According to Peirce, by ridding oneself of all ascribable rules and any preconceived purpose, this ‘agreeable occupation of mind’, and ‘lively exercise of one’s powers’, facilitated a free association of impressions, ideas, and beliefs. For the sake of encouraging such thinking, Peirce recommended giving over five to six percent of one’s time, and ‘passively [...] drinking in the impression of some nook’. Thereby, Peirce advised, a more attentive level of observation would be induced, and eventually participation in ‘the lively give and take of communion between self and self’ (CP 6.458-9, 1908). As such, this ‘Play’ laid a precedent for the somewhat more singularly focused action of abduction. Importantly, Peirce counselled that this mode of impassioned reverie was ‘not a conversation in words alone, but [...] illustrated, like a lecture, with diagrams and with experiments’ (CP 6.460–1, 1908). To these scientific schemes, obviously favoured by Peirce, all manner of other non-linguistic exercises might be added, from artistic gestures to routine physical tasks, melodic and rhythmic improvisations for example, or something as simple as pruning a bush. As, in their own way, practical means of recreationally experimenting with ordinarily unrelated ideas, all of these ventures might provide fruit for abductive reasoning, supplying some flavour of unexpected connections, which could then be distilled into a particular hypothetical inference. All the same, Musement itself retained significance in its own right, without any guarantee of inventing explanations, and if either the rigor of scientific study, or the rules of logical analysis were recruited to the cause, then the fertile aimlessness of this activity would be compromised. In this manner, Peirce wrote:

‘[T]hose problems that at first blush appear utterly insoluble receive, in that very circumstance, as Edgar Poe remarked in his “The murders in the Rue Morgue” their smoothly fitting keys.’

As for abduction itself, sometimes the sundry properties which Peirce attributes to this concept are so diverse as to seem only spuriously related, but, as we shall see, this irregularity evinces an unpredictability vital to the dissemination of abductive thought. What does remain consistent is the notion of some form of logical inference, which, in embodying a transition from the concrete to the abstract, and maintaining the continuous reality of each of these extremes, depended upon an elusive premise. Neither certain, nor necessarily probable, nor even evident as likely, the source and destination of the abductive premise arose and asserted

itself in a way that was eminently tricky to isolate. Retrospectively, abduction set the scene for the better known aspect of Peirce's contribution to the study of culture: his doctrine of signs.

Before beginning the explication of abduction itself, it is worth digressing to compare Peirce's philosophical attitude towards logic with that of another central figure in the history of this subject. As mentioned, Peirce and Frege both came up with systems of logical quantification at roughly the same time. Put simply, and without any reference to the distinct formal systems of notation that these authors employed, the importance of this achievement was that it allowed logicians to construct inferences capturing different collections of individuals, as well as the properties of individuals, beyond the basic constants of 'is', 'not', 'and', 'or' and 'if...then'. By binding the variables to which their formulations referred, and having them range over distinct domains of discourse, logicians could explore the subtleties of terms like "some" and "all", terms that were previously indistinguishable. At a stroke this innovation crossed the boundaries of traditional logic: Kant's contention that formal logic was effectively complete, since nothing genuinely substantial had, or indeed could be added to Aristotle's account of this discipline, was decisively overturned.⁴⁰¹

Originally neither Peirce nor Frege seemed to fully appreciate the relevance of the introduction of bound-variables into their work. It was not until later in the twentieth century that the implications of logical quantification began to be properly elaborated. In Peirce's case this oversight was unsurprising, given the direction from which he approached the topic, and the difficulties he encountered. Peirce strived to formalise the logic of relations algebraically, and to this end began to introduce the equivalent of quantifiers in an 1870 paper entitled 'Description of a notation for the logic of relatives, resulting from an amplification of the conceptions of Boole's calculus of logic' (CP 3.45). He would continue to struggle with this topic throughout his life, obviously perceiving that it possessed significance beyond the scope of traditional logic, but never quite determining the full extent of its importance. With his 'existential graphs' Peirce approached and developed the topic of relations diagrammatically, but again he failed to supply a system of axioms adequate for the establishment of modern logic. A letter Peirce wrote to J. M. Hantz of Northwestern University in 1887 attests well to the weight he placed on his findings in this area, at the same time hinting at a more general understanding of logic affiliated to biological and ecological processes:

It is my fate to be supposed an extreme partisan of formal logic, and so I began. But the study of the logic of relations has converted me from that error. Formal logic centers its whole attention on the least important part of reasoning, a part so mechanical that it

⁴⁰¹ '[S]ince Aristotle [logic] has not [been] required to retrace a single step. [...] It is remarkable also that to the present day this logic has not been able to advance a single step, and is thus to all appearances a closed and completed body of doctrine.' Kant, *Critique of Pure Reason*: b viii.

may be performed by a machine, and fancies that is all there is in the mental process. For my part, I hold that reasoning is the observation of relations, mainly by means of diagrams and the like. It is a living process.⁴⁰²

As for Frege, though his own publications were initially overlooked by the majority of logicians, his work became widely known thanks to Bertrand Russell and Alfred North Whitehead's extensive use of his ideas in their *Principia Mathematica*, first published in 1910, along with the writings of his many other admirers, including Peano, Wittgenstein, Carnap, and Tarski. With his *Begriffsschrift* (1879) Frege aimed to develop a formal language modelled on the pure thought of arithmetic, and took the first steps towards developing a system of logic comprehensive enough to secure a foundation for mathematics. It was this project which led him to develop a predicate logic which necessarily included a method for quantifying variables. In turn, the intense interest in finding a way of reducing mathematics to logic in first few decades of the twentieth century ensured that Frege's commitment to this undertaking would continue to gain importance. This project would eventually prove impossible to complete, a fact suggested by Russell's paradox, and finally confirmed by Gödel's proof of the incompleteness of elementary arithmetic. Nevertheless, the rigor and clarity of Frege's work on logic, and the innovations it produced, including quantified variables, ensured that the influence of his thought remained strong.

As far as Frege was concerned logic was objective: the laws of logic were independent of what an individual might happen to think, and truth itself must be distinguished from what was held to be true. To this effect, Frege made his position clear at the outset of his *Die Grundlagen der Arithmetik*, committing himself to always separating the psychological from the logical and the subjective from the objective.⁴⁰³ In enforcing this view Frege sought to preserve his work from what he perceived to be the 'corrupting incursion of psychology into logic', a malaise that he felt compromised the work of many of his contemporaries. As mentioned, the rejuvenation of logic in the nineteenth century was partly thanks to Georges Boole's *An Investigation on the Laws of Thought*, a text which attempted to represent the classic Aristotelian account of legitimate reasoning algebraically. Though indebted to Boole's work, Frege was suspicious of the expression 'laws of thought', popular at the time, complaining that it seduced readers into supposing that these laws governed thinking in the same way that the

⁴⁰² Charles Peirce qtd. in Nathan Houser, intro. to *The Writings of Charles S. Peirce (1886 – 1890): Volume 6*, edited by the Peirce Edition Project (Bloomington: Indiana University Press, 1980-2000).

⁴⁰³ Gottlob Frege, introduction to *The Foundations of Arithmetic*, translated by J L Austin, in *Logicism and the Philosophy of Language: Selections from Frege and Russell*, edited by Arthur Sullivan (Toronto, Ontario: Broadview Press, 2003): p. 140.

laws of nature governed events in the external world.⁴⁰⁴ Against this notion, Frege insisted that logic was prescriptive, rather than descriptive. Logic was intended to stipulate how one *ought* to reason, rather than offering a model of how reasoning invariably took place. Consequently, any account of logic which tried to equate the study of this subject with mental processes was misleading. Empirical and naturalistic accounts of rationality, as emerging from the perceptions of the living individual, led to relativism, the illusion that truth was contingently dependent on the beliefs and desires of the individual, as opposed to being self-sufficient. As Frege put it:

If people consider, instead of things themselves, only their subjective *simulacra*, their ideas of them, then naturally all the more delicate distinctions within the subject matter are lost, and others appear in their place that are logically completely worthless.⁴⁰⁵

Out of Frege's understanding of logic as an objective ordering of the truth arose a question: if the truths invoked by logical relations were strictly independent of both empirical and psychological factors, how was it that they could be accessed at all? In a shorter essay Frege offers an answer to this philosophical question. Justifying why he thought an improved artificial language was indispensable to logic, he wrote:

Our attention is directed by nature to the outside. The vivacity of sense-impressions surpasses that of memory-images to such an extent that, at first, sense-impressions determine almost by themselves the course of our ideas, as is the case in animals. And we would scarcely ever be able to escape this dependency if the outer world were not to some degree dependent on us.

Even most animals, through their ability to move about, have an influence on their sense-impressions: They can flee some, seek others. And they can even effect changes in things. Now humans have this ability to a much greater degree; but nevertheless, the course of our ideas would still not gain its full freedom from this ability alone: It would still be limited to that which our hand can fashion, our voice intone, without the great invention of symbols, which call to mind that which is absent, invisible, perhaps even beyond the senses.⁴⁰⁶

⁴⁰⁴ Gottlob Frege, *The Basic Laws of Arithmetic: Exposition of the System*, translated by Montgomery Furth (Berkeley; Los Angeles: University of California Press, 1964): p. 12 – 13.

⁴⁰⁵ Frege, *The Basic Laws of Arithmetic*: p 12.

⁴⁰⁶ Frege, 'On the Scientific Justification of a Conceptual Notation', translated by Terrell Ward Bynum, in *Logicism and the Philosophy of Language: Selections from Frege and Russell*, edited by Arthur Sullivan (Peterborough, Ont. : Broadview Press, c2003): p. 119.

For Frege symbolic language acted as a kind of universal medium in which rational thought took place, but which, critically, was not at the same level as those natural and more or less chaotic processes which affected the materiality of things. Since animals and other beings are excluded from this higher medium their behaviour or development could not be regarded as truly logical; they lacked the tools to rationalise their behaviour.

At one level Peirce's perspective on logic does not seem so very far away from that of Frege. For Peirce, like Frege, logic was unquestionably normative, and hence the study of this subject was aimed at distinguishing what ought to be, from what ought not to be. Accordingly, logic was art as well as science, a utilitarian practice which served to compose and refine the work of reasoning. All the same, logic remained primarily theoretical, concerned not so much with the achievement of particular aims in line with determinate restrictions, as with analysing and providing definitions of the ideal. Much like Frege, Peirce's priority was establishing a means of improving the scope and purchase of logical inferences, and thereby advancing scientific endeavour as a whole. As such Peirce also believed the science of psychology should be based on logic, rather than the other way around. But beyond these shared attitudes the outlook of these two logicians diverges in a number of important ways. An important paper by the philosopher Jaakko Hintikka, 'On the Development of the Model-Theoretic Viewpoint in Logical Theory', contrasts a universalist tradition within modern logic, as dominating its development from Frege to Russell, Whitehead, and beyond, with what he calls the model-theoretic tradition, comprising, among others, Boole, Schröder, and Gödel, Carnap's later work, and aspects of Tarski's theory of logical truth.⁴⁰⁷ Where the universalists conceived of language (in both its formally interpreted and natural forms) as a universal medium in which individuals were effectively trapped, the model-theoretic tradition conceived of language as a calculus, and as such a more dynamic means of mapping truth in terms of variable degrees of information. According to Hintikka, Peirce was a key figure in the history of the model-theoretic point of view. Whereas Frege saw logic as a set of more or less expansive containers encompassing the truth, Platonically isolated from the otherwise haphazard scheme of things, Peirce's mature understanding of logic implied a guide for travelling through the empirical world, elaborating an ever more nuanced trail of signs in its wake. And in this manner it suggested a method for not only acquiring and judging knowledge, but for generating novel ideas.

Despite pre-empting some of its most valuable advances, Peirce's semiotics did not lead thought down the same avenue as the linguistic turn which would dominate much of twentieth-century philosophy. A deeper familiarity with Peirce's philosophy adds some significant qualifications to this point. Peirce certainly did not denounce language wholesale,

⁴⁰⁷ Jaakko Hintikka, 'On the Development of the Model-Theoretic Viewpoint in Logical Theory', in *Synthese*, volume 77, Number 1 (1988): pp 1 – 36.

and was very well aware of its indispensability when it came to communicating scientific and philosophical ideas. In 'The Ethics of Terminology' he wrote that good language was not merely important to good thought, but 'of the essence of it'. Bearing in mind that in the same essay Peirce identified 'symbols' as the 'woof and warp of all thought and all research', essential 'language' here need not be limited to those phrases employed in speech or prose, but might just as well refer to the articulations composing mathematics and formal logic, or indeed other kinds of coding (CP 2.220). Even more essential was Peirce's conviction that 'abstraction' did not represent an immaterial departure from some base-level reality, nor, conversely, were the objects of sense-impressions subordinated to some ideal or absolute form of knowledge; such dogmas would amount to impositions upon what Peirce believed blossomed in his perception of azaleas.

Instead of resorting to either materialism or idealism to account for his experience, and most resolutely of all, eschewing the 'dualism which performs its analyses with an axe', Peirce was committed to exposing how the reality of the azalea and the reality of his impressions of such could grow out of the same continuity (CP 7.570). This way of thinking, for which Peirce chose the name 'synechism', did not dispose of mind and matter by dividing them into 'into unrelated chunks of being'. At the same time, Peirce's synechism did not distil the relation between observer and observed into one or other sort of ultimate totality: Peirce did not subscribe to panpsychism, if this entailed that every aspect of existence was equally steeped in consciousness, and he certainly did not seek to eliminate the sensuous qualities which coloured his perceptions. Rather than opt for any of these extremes, Peirce pursued the notion that mind and matter, the rational and the actual, were coextensive.

In itself, Peirce's awareness of something undermining the purported hegemony of linguistic and hence nominalistic representation was neither new or surprising. The problem of matching up those concepts occupying human consciousness with the actual objects comprising existence had been posed in the earliest days of philosophical and scientific thought, and resolved only to be re-stated countless times. From Plato's myth of the cave, to Descartes' doubt, Locke's primary and secondary qualities, Kant's transcendental idealism, and Hegel's *Geist*, each of these doctrines depended upon putting knowledge of reality in jeopardy in some way, only to establish a foundation for thought on different terms. In Peirce's own era this ancient project was in the process of being rejuvenated and revised with the advent of experimental and scientific psychology.

To take three relevant examples, all of which were more or less familiar to Peirce: Hermann von Helmholtz had performed experiments on the propagation speed of nervous stimuli, measuring the time it took for someone to react physically to a weak electric shock. The results of these tests were surprisingly constant, producing a mean of between 0.12 and 0.20 seconds, and thereby indicating that the passage of thought, as embodied in neurological

processes of perceiving and willing, possessed a distinct duration.⁴⁰⁸ Gustave Theodor Fechner's research into psychophysics had established a mathematical ratio verifying a quantifiable link between the intensity of sensation and the physical properties of the world.⁴⁰⁹ Finally, Pierre Paul Broca had isolated a portion of the brain responsible for speech by surveying the physical damage done to those exhibiting symptoms of aphasia.⁴¹⁰ These and other advances helped to corroborate empirically that thought was extended spatio-temporally, and could, in principle, be studied practically, instead of being assessed solely by way of philosophical argument. These discoveries did not signal an entirely fresh start. Those philosophers mentioned above retained some influence, having each supplemented the understanding of the mind in different ways. And, in any case, the identification of the brain and nervous system with mental processes had been long since asserted. What was new, however, was a more pronounced appreciation that mental phenomena belonged to the same continuum as those facts perceived and posited outside of individual minds. It was in this capacity that Peirce's philosophical take on the science of his time involved not just a new set of answers to old problems but a new style of questioning.

Interestingly enough, given his own research into psycho-physiology, when it came to clarifying 'the laws of mind' Peirce continued to put the greater part of his confidence in 'the complicated process of "introspection"' (CP 7.463). Though the supposition that psychical phenomena were regulated by mechanical laws made for a 'good "working hypothesis"', taken dogmatically, as a statement about the material nature of things, it too readily assumed that physical facts immediately possessed greater transparency and intelligibility than their mentally derived counterparts. Peirce stressed how little was as yet understood about the action of the nervous system at the end of the nineteenth century. As an alternative, he put forward his own founding assumption that the genuine unity of mental and natural phenomena involved 'a difference of degree' (CP 7.463). Understanding the complications of thought necessitated neither a reduction to ever more simplified mechanisms, nor a conviction that, in its emergence, the mind transcended the laws of physics. Peirce reaffirmed that both mind and matter depended upon the same elements, and as such intermingled. In other words, he moved beyond the antinomy whereby either phenomenal experience was affirmed as irreducible, at the expense of

⁴⁰⁸ See H Schmidgen, 'Of frogs and men: the origins of psychophysiological time experiments, 1850-1865' in *Endeavour*, 2002 Dec; 26(4): pp. 142 – 148. Peirce does not directly mention the topic of neurological propagation speed, though he did cite 'the sublime discovery of the conservation of energy

by Helmholtz in 1847' (CP 6.297), and also deemed Helmholtz's 'corpuscularian' metaphysics of mechanical force a viable, if not altogether complete, explanatory system (CP 5.79).

⁴⁰⁹ 'There is a general law of sensibility, called Fechner's psychophysical law. It is that the intensity of any sensation is proportional to the logarithm of the external force which produces it' (CP 2.676).

⁴¹⁰ '[W]hen Broca's convolution is much diseased we always find the use of language is greatly affected' (CP 6.520).

any practical account of its development, or then again side-lined as an illusory side-effect, for the sake of preserving the explanatory power of empirical study of mechanical cause and effects. In effect these two were false alternatives, since ultimately both perspectives left thought, and by extension human communication and culture, inexplicable in anything but their own terms.

Logical analysis applied to mental phenomena shows that there is but one law of mind, namely, that ideas tend to spread continuously and to affect certain others which stand to them in a peculiar relation of affectability. In this spreading they lose intensity, and especially the power of affecting others, but gain generality and become welded with other ideas (CP 6.104).

What then makes Peirce's version of events stand-out, and at least approach a departure from the self-perpetuating tradition of epistemological and ontological anxiety, is the particular emphasis he puts on the *transition* from things to images to words. Here and elsewhere, Peirce did not prioritise the severance of facts from the things which inspired their statement, pointlessly presupposing their rapprochement via a set of theoretical caveats qualified in reflection. Instead, he draws attention to the means by which information about a thing is carried from one place to another, and converted into those different kinds of ideas which nourish thought and engender truth. As he explained:

Perfect readiness to assimilate new associations implies perfect readiness to drop old ones. It is the plasticity of childhood, which if a man is going to become a teacher, or an exponent of a fixed idea, or a mechanic at any immovable trade, or a settled man in any respect it is just in so far best that he should outgrow. But so far as a man is to be a learner, a *philo*-sopher, it is most essential that he should preserve; and to do so he has to battle against a natural law of growth. To be a philosopher, or a scientific man, you must be as a little child, with all the sincerity and simple-mindedness of the child's vision, with all the plasticity of the child's mental habits.⁴¹¹

Supposedly with 'deep regret' that he could not adopt this, 'the best way to be stationary', in opposition to those 'who believe in anchoring words to fixed meanings' Peirce believed 'in mooring words by certain applications and letting them change their meaning as

⁴¹¹ Charles Peirce, *Reasoning and the Logic of Things: The Cambridge Conferences of 1898*, edited by Kenneth Lane Ketner (Cambridge, Massachusetts: Harvard University Press, 1992): p. 192.

our conception of the things to which we have applied them progress'.⁴¹² From this point of view, Peirce's identification of logic as normative should not be misunderstood, and associated with the "normal" in a banal sense of always conservatively conforming to type. For Peirce, as a means of acquiring knowledge grounded in physical and experimental processes, science was itself a 'living and growing body of truth', rather than a static hoard of confirmed or repudiated doctrines (CP 6.428). As well as representing one of the logical structures that underpinned those perceptual inferences indispensable to everyday experience, *abduction* was also one of the names Peirce gave to the act of displacement which made scientific thought possible, a movement that not only traversed spatial distances, but also entailed change over time. Anticipating the mathematical theory of communication later developed by Claude Shannon, in one text, Peirce envisaged an "'area'" that served to define and quantize information, establishing its situation 'between two imaginary extremes': first, a 'state in which no fact can be known, but only the meaning of the terms' and, second, a state in which information about things is so comprehensive as to be equivalent to 'the very substances themselves' (CP 2.409 – 419).

Representing an empirical store of topologies and textures which are irreducible to their written statement, Peirce's frequent use of figures of speech related to fabrics to evoke the connectivity of thought and signs serves to accentuate the dimensionality of abductive logic. Traversing and so transgressing the partition between arrangements of words and images of things, abduction was sown within a complex and intricately knitted cloth, embroidered with many more layers, pleats, and folds than either language or perception could ever independently unravel. Crucially, this style of thinking was prone to imprecision, vagueness, and ambiguity, constituting a muddled web of ideas analogous to the haphazardly interlocking fibres that made up felt. Despite always being committed to as much lucidity as he could muster, and quick to express intolerance when it came to mistakes in the reasoning of others, Peirce perceived that 'rents' within 'the fabric of scientific knowledge' were commonplace (CP 1.116). As such, unlike the pristine substitution of thoughts for words, abduction entailed a crumpling of corners, a fraying of seams, and a wearing of edges. The inevitability of confusion and corrosion inherent in abductive logic defied both the organised demarcation of thoughts into lines that might define writing, as well as what may otherwise be deemed the implicit goal of scientific prose, that of having the last word.

Yet, for all of the capriciousness of abduction, as an essential ingredient of reality its consequence was not unrefined accident, and in this respect it is not so much the chaotic mesh of felt, as the more precisely delineated quality of woven material which commands attention.

⁴¹² Charles Peirce, *The Writings of Charles S. Peirce (1857– 1866): Volume 1*, edited by Max H. Fisch (Bloomington: Indiana University Press, 1982): p. 58.

Just as the same sort of movements that tangle, also disentangle, extricating the errant strand from in and amongst a snarl of interchangeable threads, abduction promised clarity as well as confusion. Peirce would not have put so much faith in the idea of abduction, as a valid alternative to deductive and inductive reasoning, if it had not provided a genuine means of approaching truth. After all, it was, he insisted, ‘the substance of his central achievement’, and, as Brent records, a belief on which from 1901 onwards ‘he worked, with increasing passion and desperation, for the rest of his life’.⁴¹³ Thinking abductively contributes substantially to the creative process by which ideas are differentiated and gain an enduring form. In another variation on the metaphor linking abductive reasoning with textiles, the motion that tangles and unties may also knot, stitch, or weave yarn and fibre into fabric of a different fashion, tidying up loose ends, repairing rags, or preparing fresh cloth. Here language and writing reappears, though this time as just one panel in a patchwork of different practices.

As its name suggests, understood modestly, abduction simply involves taking something from one place, and introducing it to another, switching or shuttling what once thrived elsewhere into a new and hitherto untried context. To continue to extend the metaphor, abduction guides the needle and thread through the mesh of wool or fabric and back out again elsewhere, binding things and signs together in the pattern of its own displacement. It was perhaps this principle of experimentation, of always finding somewhere different to fit his thoughts, which led Peirce to pursue his hypotheses into such a broad array of disciplines. Though, then again, Peirce’s involvement in the complications which were part and parcel of abductive reasoning may help to explain why such a celebrated logician could consistently fall short of putting his thoughts in order, leaving his most ambitious plans for presenting a comprehensive account of his philosophical system unfulfilled. Understandably, Peirce himself deeply regretted the loose ends which proliferated in his published work, and felt sharply the injustice which had led to his dire financial situation. In a lecture of 1903, already alluding to his own mortality, he referred to ‘a rich vein which remains unpublished’ beneath the ‘scattered out-croppings’ that had appeared in print.⁴¹⁴ With not some small sense of bitterness, Peirce left the difficult task of unifying the fragments of his system to posterity, revealing little confidence that others might succeed in fulfilling the promise which he himself had not had the chance to realise.

⁴¹³ Brent, *Charles Sanders Peirce*: p.72.

⁴¹⁴ Ominously, Peirce continued: ‘if anybody supposes I shall regret missing the fame that might attach to the name of C. S. Peirce, - a name that won’t be mine much longer, - I shall only say he can indulge that fancy without my taking the trouble to contradict him. I have reached that age when I think of my home as being on the other side rather than on this uninteresting planet.’ Charles Sanders Peirce, *Pragmatism as a Principle and Method of Right Thinking: The 1903 Harvard Lectures on Pragmatism*, edited by Patricia Ann Turrissi (Albany: State University of New York Press, 1997): p. 126.

Since Peirce's death many attempts have been made to excavate the hidden aspects of his system, and establish a philosophical architecture, cohering over and above the shifting terminology, unsettled references, and numerous fault-lines which characterised the development of the author's thought. Despite the reservations of their originator, as themselves acts of abduction these attempts to systemise and render Peirce's work consistent constitute a valuable resource in their own right, serving to explicate connections and illuminate concepts which might otherwise remain lost, submerged in what William James characterised as the 'Cimmerian darkness' of Peirce's mode of thought.⁴¹⁵ Moreover, the very diversity and, in some cases, apparent incommensurability of these texts attests to the expansiveness of this philosophy's application. Appropriately, not only logicians, philosophers, and semioticians have sought to shed light on a Peircean approach to thinking, so too have those involved with more obviously practical disciplines, including law, translation, education, and of course biology. In each case Peirce's classifications need to be understood anew, so, in order to determine a means of proceeding, it is less a self-contained set of guidelines that gets deployed, than a mutable, protean, itinerant doctrine, which adjusts itself to a different setting, and in this way gains clarity.

Nevertheless, there is also something to be said for what remains irrevocably obscure and vestigial in the archive of Peirce's intellectual history. In the conclusion to his survey of the development of Peirce's philosophy, Murray G. Murphey compares the many manuscripts Peirce left behind to the 'ruins of a once great structure', only to dismiss this impression of a 'grand design' as an illusion, 'a castle in the air'.⁴¹⁶ Perhaps these ruins of a system that never was held a different kind of promise, the possibility of escaping the philosophical fixation with the architectonic, thereby relinquishing the ambition to fit everything into a readymade and overarching framework.⁴¹⁷ The digressive disarray of Peirce's writings harbour an unruliness that is difficult to separate from the many misfortunes and distractions that tormented their author, but this entanglement also indicates a way of life, and a way of thought, belying the metaphysical fantasy of a prefabricated domain, impregnable, and so indifferent to the accidents

⁴¹⁵ Brent, *Charles Sanders Peirce*: p. 21.

⁴¹⁶ Murray G. Murphey, *The Development of Peirce's Philosophy* (Cambridge, MA: Harvard University Press, 1961): p. 407.

⁴¹⁷ Like two philosophical greats of the next century – namely Heidegger and Wittgenstein – Peirce invested heavily, emotionally, intellectually, and financially, in a building. In collaboration with his wife, Juliette, in 1888 Peirce began renovating a farmhouse in Pennsylvania. Peirce named the farmhouse, and surrounding estate of around 2,000 acres, 'Arisbe', after a colony of the Ancient Greek city-state of Miletus, a place mentioned in Homer's *Illiad*, associated with hospitality, as well as the beginnings of science, cosmology, and philosophy. Peirce described his 'ultimate aim to set going an institution for the pursuit of pure science & philosophy which shall be self-supporting', though as it turned this project contributed to his subsequent financial ruin. Brent, *Charles Sanders Peirce*: pp. 189 – 192. Max H. Fisch, 'Peirce's Arisbe: The Greek Influence in His Later Philosophy', in *Peirce, Semeiotic, and Pragmatism*.

which actually comprise existence. Arguably, it is in the erratic orientation and fuzziness of Peirce's ideas that the logic of abduction is most overt.

Once again, Joseph Brent picks up on this theme, and, in a quotation from an article published by Peirce in *Popular Science Monthly*, retrieves an apt testimony to the part played by happenstance in the advance of Peirce's thought, especially via the idea of abductive guessing. Locating a 'great reservoir' of ideas in the spoils of his intellectual inaccuracy, Peirce here compared his perseverance to that of 'a wasp in a bottle', and celebrated 'the happy accident that I early hit upon a METHOD of thinking, which any intelligent person could master'. 'P.S.', Peirce added:

I have [been] always unceasingly exercising my power of *learning new tricks* – to keep myself in possession of the childish *trait* as long as possible. That is an immense thing.⁴¹⁸

Like a wasp in a bottle, Peirce struggled frantically to escape from the impositions which curtailed the development of his concepts, but, at the same time, the erratic and compulsive character of this urge to take flight, butting up against the limits of what he could achieve, contributed decisively to the inventions of his method. Peirce repeatedly insisted on what he considered to be the first rule of reason: 'Do not block the road of inquiry'.⁴¹⁹ Yet unlike Wittgenstein's philosophy of language, Peirce's semeiotic logic does not ultimately 'shew the fly the way out of the fly-bottle', since, misconstrued, this aim perpetuates the hope that the insect might rid itself of oxygen as well its confinement, as in the equivalent of a philosophical idea deemed to transcend the transience of its frame.

According to Peirce's philosophy, being both born of and bearing signs, logical formulations were not held within the mind, as if collected in a special container, separated from what went on elsewhere, rather they worked their way through existence as a whole. Peirce did not just think *about* abduction, he was himself subject to its motions, and his conduct depended on the destiny of this principle. Peirce's thought and by extension his own self were the product of abductive inference: the locus of a cluster of signs that had made their way into an area of inter-relation, assembling in flux only to lead their host elsewhere. Furthermore, Peirce was not alone in being absorbed into the oblique and errant swerves of hypotheses. Reaffirming both the relevance of biosemiotics, and the prospect of a logic beyond language, the next example with which Peirce compared his own perception of azaleas, demonstrates that

⁴¹⁸ Brent, *Charles Sanders Peirce*: p.324.

⁴¹⁹ Variations on this sentiment can be found throughout Peirce's writings, e.g. CP 1.135, CP 1.153, CP 4.31, CP 6.273, and CP 6.64.

the significance of the conjectural process informing abductive rationality need not be restricted to human comprehension alone:

When a chicken first emerges from the shell, it does not try fifty random ways of appeasing its hunger, but within five minutes is picking up food, choosing as it picks, and picking what it aims to pick. That is not reasoning, because (it is not done deliberately; but in every respect but that), it is just like abductive inference.⁴²⁰

As was often the case when it came to discussing the influence of rational principles outside of the more familiar realm of human interaction, Peirce is here tentative when attributing the equivalent of a logical construction to an animal. To some the necessity of distinguishing deliberate reasoning, and hence human intentionality, from those impulses motivating the behaviour of other organisms might make any kind of comparison inconceivable.

But no matter where the line is drawn between a planned, calculated action, and an instinctive response, the similarities remain instructive. Just like the person converting an impression of azaleas into a proposition, the chicken must make the jump from noticing grains of corn to acting on the basis of this limited information, choosing in so doing. Both forms of conduct are, in a sense, acts of articulation, behaviours in which the reception of possibilities, in the form of sense impressions, induces a specific set of distinct movements that are not directly deducible from their source. The image of an azalea does not contain the word which denotes this flower, nor does a grain of corn contain an order to peck. Both actions are also ‘instinctive’ in so far as a physiological basis underlies their occurrence, though with the added caveat that Peirce inhabits a linguistic as well as a perceptual environment, and as such engages in a further degree of selection unavailable, not only to new-born chickens, but also human infants insufficiently exposed to language. Once again, this last qualification introduces the problem of distinguishing between instinctive innate behaviours and learnt deliberate actions, though this time they are not so obviously separated. In both cases it is the existence of an environment containing a range of alternatives that supports the idea of ‘choice’, opening up the tautologies invested in this notion.⁴²¹ Somehow a singular selection must be made from within and amongst a scheme of relations, no matter that in one case these choices must be

⁴²⁰ Charles Sanders Peirce, (MS 692), in *Historical Perspectives on Peirce's Logic of Science: A History of Science: Vol II*: pp 899 – 900.

⁴²¹ Peirce does not fully explain why or how a chicken ‘picking what it aims to pick’ can be said to be making a choice, without necessarily demonstrating the equivalent of a human decision. What seems important here is, on the one hand, the circularity of this statement, in which the identification of an act of choosing is derived from the fact that a selection has already taken place, and, on the other, our powerful inclination to attribute agency to the behaviour of other individuals, even when we might otherwise deny that any such freedom is really in play.

recognised without delay, and in the other derived much more gradually from a community of interlocutors.

Like Peirce himself, at once served by and serving the wayward course of his hypotheses, the newly born-bird does not just employ abduction to make sense of its surroundings, it is the living result and embodiment of this process. Like that of all organisms, the ontogeny of the hatchling is the product of unfolding a collection of semiotic instructions, which, having originated in a different time and place, are exposed to a new set of circumstances.

Understood more technically and as itself an explanatory method for approaching truth, Peirce determined that abduction involved making hypothetical inferences without either the reassurance to be found in deduction, or the benefit of experience that provisionally permitted inductive reasoning. Thereby assessing neither the deductively probable, nor the inductively likely, but rather that which was merely plausible or possible, abduction took stock of an idea which was to be tested in a given situation for effectively the very first time, gauging the prospects of a possibility as just that: the meaningful chance that something might turn out to be the case. Translating this notion into a familiar example, where induction might teach us that all men are mortal, and where deduction would lead us to conclude that, therefore, Socrates will one day die, abduction could be connected with that first, immemorial, and in some ways baffling moment, where we recognise that this other person has a mind like our own, that ourselves and Socrates are together human. Elsewhere, in a discarded draft of a lecture, identifying abduction as the ‘maxim of pragmatism’, Peirce recounted a first-hand experience of this mode of thinking for the benefit of his audience:

A mass of facts is before us. We go through them. We examine them. We find them a confused snarl, an impenetrable jungle. We are unable to hold them in our minds. We endeavor to set them down upon paper; but they seem so multiplex intricate that we can neither satisfy ourselves that what we have set down represents the facts, nor can we get any clear idea of what it is that we have set down. But suddenly, while we are poring over our digest of the facts and are endeavoring to set them into order, it occurs to us that if we were to assume something to be true that we do not know to be true, these facts would arrange themselves luminously. That is abduction.⁴²²

⁴²² Charles Peirce, *Pragmatism as a Principle and Method of Right Thinking: The 1903 Harvard Lectures on Pragmatism*, edited by Patricia Ann Turrissi (Albany: State University of New York Press, 1997): p. 282.

Here it is worth recalling the ‘tremendous tension’ which led Peirce to find himself writing in defiance of the strain and awkwardness this involved: proving a proposition was not only a question of formal, syntactical, and statistical clarification (though these were obviously mediums in which Peirce excelled), it may also involve an emotional and perhaps subconscious commitment to a nascent and initially nebulous intuition. Characterised in this way, as a luminous flash of inspiration, abduction might be deemed akin to a mystical communion with some esoteric form of knowledge; in certain respects such a characterisation is not entirely at odds with Peirce’s investment in this idea. Yet, though from one perspective always unprecedented and eccentric, and although Peirce did consider the religious or spiritual implications of this idea, abduction did not amount to supernatural epiphany. For one thing Peirce was well aware that this form of reasoning was not the God-given truth, but ‘extremely fallible’ and prone to error, even as paradoxically he also promoted its ‘trustworthiness’. If the many intellectual achievements documented above were to be offered as examples of the success of abduction, then so should Peirce’s disastrous business ventures: abduction then could be judged ‘trustworthy’ only in so far as its results were beyond anticipation, and its pull proved itself irresistible. To put it another way abduction could be relied upon to lead one astray; whether this proved injurious or beneficial was another question. The other element that distinguishes acts of abduction from purely exceptional events of revelation is again to be found in the example of the azaleas. Abduction was not simply a rare occurrence, nor limited to moments of scientific discovery, but ‘ubiquitous’, a selective play of potential perpetuating every act of perception, and effective, more or less surreptitiously, within all kinds of behaviour:

It is the most obtrusive character of nature. It is so obvious, that you will hardly know at first what it is I mean. It is curious how certain facts escape us because they are so pervading and ubiquitous; just as the ancients imagined the music of the spheres was not heard because it was heard all the time. But will not somebody kindly tell the rest of the audience what is the most marked and obtrusive character of nature? Of course, I mean the variety of nature. (CP 1.159)

CONCLUSION.

The Telos of the Human and the Symbolic Differentiation of the Self

Having opened this thesis with an optimistic example, finding a sign of the extended continuity of mind and world in Mario Merz's 8-5-3, it seems appropriate to close with a more pessimistically inclined reference to another work of art. Joseph Cornell's *Habitat Group for a Shooting Gallery*, created in 1943, is riddled with more than bullets. Amongst an assemblage of blotches of paint, snippets of drawings, fragments of dead vegetation, feathers, numbered labels, and crumpled text, the glass-fronted shadow box contains a group of paper cut-outs of parrots and parakeets. The cockatoo at the centre of the box appears to have been shot, the plumage of its head stained with red, and the glass of the box itself punctured and fractured with the trace of this trauma.

The situation of these birds, in a cramped and hostile habitat, might be seen to accentuate the contrast between their domestic existence as caged pets, versus the natural richness of their customary environment. Yet, despite the non-human aspect of the inhabitants of this enclosed space, many of the signs which accompany them are distinctly anthropological, as is the historical and biographical context that must inform an attempt to get to grips with the meaning of this work. Cornell never left New York, his home city, though, by all accounts, the network of artists he had as friends was extensive. With the advent of the Second World War Cornell's cosmopolitan imagination, and his romantic sense of the European art-world, must have received a sharp shock. As the art-critic Kay Larson describes Cornell's art, its power 'lies in the gap between an image and its verbal associations, a sort of silence of the intellect in which the emotional force of objects blares out' – in the case of this particular *Habitat Group* 'the message is anxiety'.⁴²³ Alongside the parrots, shards of French text and images of parkland and architecture invoke an idyllic Paris of a different age. Similarly, the parrots themselves appear as avatars of communication, symbolising intelligence, and the spread of ideas beyond national boundaries. In his cultural history of the diverse associations attached to parrots, Paul Carter explains both their appeal, and their uncannier aspect, as follows:

The success of parrot [sic] in colonising our global network of shared significations invites us to redefine the boundaries of society and the media. It suggests that our mechanisms of communication (from simple face-to-face speech, to the telephone and the Internet) are parrot-like, and that in sifting the information they furnish us solely

⁴²³ Kay Larson, 'The Cage of Anxiety', *New York Magazine* (Nov. 24, 1980), pp. 62 & 67.

for detachable messages, we miss the most important, and obvious, fact: that they model a sustainable ecology of social relations, and that this discourse is not even a collective human artefact, but finds its larger echo in the signifying sensory cosmos of the natural world.⁴²⁴

In short, the reiterations of parrots remind us that ‘our systems of communication originate outside ourselves’.⁴²⁵ As has been the defining claim of this thesis, here is yet more evidence that human beings not only make, and make use of, but are themselves made by semiotic relations formed in conjunction with their Umwelt. This time however, it is not principally the creative constructive potential of the life of signs which is on display. Instead, Cornell offers a glimpse of the violence that may shatter relationships, violence induced by the same emerging complexity that supports the global reach of signs. Trapped within the frame of a sealed container, unable to intervene in the world beyond the boundaries of their immediate existence, these parrots become sitting ducks. The world has been globalised not just by technologies of transport, energy generation, and telecommunication, but, through the dissemination of language, finance, and ideas, that is by a symbolic means of generalising with a reach beyond any other earthly form of life. For an animal that, just like any other, must learn to find itself at home in circumstances that are not always conducive to its survival, Cornell’s *Shooting Gallery* presents a fable concerning what may happen if, on the one hand, habits become stultified, while, on the other, the implications of signs are scattered beyond the grasp those who ought to share in their meaning. In accordance with Peirce’s idea of a critical common-sense, as well as Uexküll’s account of the role of an Umwelt in conditioning the subjectivity of life, all that may serve to prevent too wide a gap opening up between a longing for sensual security, and a desire to take abductive risks, is a more rigorous conception of the reality that at once underlies and lies beyond the immediacy of our fleeting impressions.

Culture is not just ordinary, it is ecological, memorialising the transformations of the environment which contextualises all forms of life. The aesthetic is not just a standard of human sensibility, it epitomises the selective and creative logic which can be found to animate living creatures throughout nature. Tying these claims together, the interpretation of signs is not a faculty of abstraction supported by human consciousness alone; it stands for the generative potential of a relational logic binding all kinds of living systems together, enabling new forms of knowledge to emerge and grow, along with corresponding practices of expression and communication, all of which may transform the structure of the world in their wake. Ultimately, verifying the reality of these grand claims will take more than a reading of Uexküll and Peirce,

⁴²⁴ Paul Carter, *Parrot* (London: Reaktion Books, 2006): p. 136.

⁴²⁵ Carter, *Parrot*: p. 135.

but to close this conclusion it is worth indicating some further avenues, as formulated by biosemiotics, for developing the interpretation of each, reaching beyond the arguments I have so far offered in this thesis. In each case, the Kantian conception of a teleological purposiveness, apparently guiding living-organisms as well as aesthetic judgements, turns out to have a more profound application than was previously accredited

As Hoffmeyer argues in his essay on Uexküll's concept of *Planmässigkeit*, rather than conceiving of nature's accordance with a plan such that a vital force or transcendent spirit must be deemed responsible for directing the activity of organisms, it is a revision of Aristotelian teleology which clarifies this conception of purposiveness within nature.⁴²⁶ In place of an efficient cause, as in the immediate and physical agent of change upon which positivistic science tends to be fixated, the Aristotelian notion of a final cause better describes the potential inscribed within the function cycles that make up an Umwelt. Final causation does not explain events in terms of a desire or compulsion for particular ends, rather it denotes a more general outcome that may be brought about in a variety of ways:

[F]inal causes, as Aristotle conceived them, are types of outcomes. As such they are potentialities, whether or not actualized, as for instance an acorn, whose 'destination' it is to grow into an oak, not into a birch or a salamander — but which, as is well known, most often doesn't grow at all.⁴²⁷

The potential for an acorn to become an oak does not just depend on the inner capacity of the germinating seed for organised growth, it also pertains to a whole host of other factors, and accidents, including the habits of other organisms within the same environment. In other words, the final cause of the acorn entails an entire ecology of different relations, and is, as Hoffmeyer puts it, 'irreducibly bound to the whole biosemiotics setting [...] a product of endless diversifications of holistic patterns'.⁴²⁸

By associating the sequencing of functional cycles with the metaphor of a melody – an organised structure that exceeded the here and now of physics – Uexküll applied a version of teleological reasoning to the behaviour of living organisms.⁴²⁹ The teleological circle which connects the first note of a refrain to the intonation of the last involves a duration that is at once irreducible and articulate. Just as the performance of a melody may always be subject to slight variations, a functional cycle was not necessarily wholly opposed to indeterminacy, nor was the possibility of acquiring new habits irrevocably ruled out. From a teleological point of view,

⁴²⁶ Jesper Hoffmeyer, 'Uexküllian *Planmässigkeit*', *Sign System Studies* 31, 1/2 (2004), pp. 73–97.

⁴²⁷ Hoffmeyer, 'Uexküllian *Planmässigkeit*': p. 76.

⁴²⁸ Hoffmeyer, 'Uexküllian *Planmässigkeit*': p. 86.

⁴²⁹ Stjernfelt, 'A Natural Symphony?': pp. 87 – 88.

the intimate bond between the organism and its environment, which seemed to stem from subjectivity, should not be seen as an isolated unit, but rather as the product of patterned relations *between* things. While abstracted from the context of their actual interactions each coupled Umwelt and organism would appear impervious to its counterparts, but reframed within the semiosphere, as the condition of their evolution, a more complete picture of the relationality of ecosemiotics becomes apparent.

If teleology helps to lead the way out of a restricted conception of Uexküll's Umwelt, towards a more open interpretation of his ecology, then re-orientating the sense of agency within Peirce's semiotics must involve a further consideration of the subjective self. Despite his persistent disdain for subjectivity, there is evidence that Peirce, particularly in his later writings, was concerned to appreciate the importance of the idea of the self for his philosophy. Vincent Colapietro has made a particularly strong case for the role of the self in Peirce's work, arguing that though, initially, he saw the self solely as a sign in the process of development, Peirce eventually advanced this notion to include a vision of the person as an autonomous agent of reason.⁴³⁰ Peirce's 1885 revision of his categories, which Murphey claims was necessary to evade the risk of infinite regression, involved a move back towards a more Kantian conception of transcendental experience, helping to establish a decisive role for subjective selfhood.⁴³¹ Ivan Mladenov suggests that Peirce's irritation with any direct discussion of subjectivity stemmed from his commitment to a more fluid, dynamic, and itinerant understanding of this concept, out of step with prevailing attitudes towards the identity of the human mind.⁴³²

Just like the mind to which it served to lend specificity, the Peircean self was neither wholly individual, nor defined purely by consciousness. Yet, at the same time, the self personified an aspect of felt Firstness which was singularly ineffable, and which therefore could not be swallowed up entirely by its social relationships.⁴³³ In dialogue with both its own history and the community of which it was a member, the Peircean self could not be adequately defined by the self-interested motives of the ego.⁴³⁴ Poised in a process of interference between 'I' and the 'Other', the individual and the community, the subject could never fully coincide with itself; it depended on ignorance and error in order to distinguish its own existence (CP 5.235). Accordingly, to maintain integrity the self must retain a level of self-control, very much like

⁴³⁰ Vincent M. Colapietro, *Peirce's Approach to the Self: A Semiotic Perspective on Human Subjectivity* (Albany: State University of New York Press, 1989).

⁴³¹ Murphey, *The Development of Peirce's Philosophy*: p. 303.

⁴³² Ivan Mladenov, *Conceptualizing Metaphors: On Charles Peirce's Marginalia* (London: Routledge, 2006): p. 107.

⁴³³ Colapietro, *Peirce's Approach to the Self*: p. 74.

⁴³⁴ Colapietro, *Peirce's Approach to the Self*: p. 96.

the cybernetic guidance system established by Uexküll's functional cycle, consolidating, not just a provisional private sphere, but the trajectory of a communicative agent.⁴³⁵

In his anthropological study of the relations between the Runa people of Ecuador's Upper Amazon, and the forest in which they dwell, Eduardo Kohn has expanded Peirce's notion of the self still further:

The semiotic quality of life – the fact that the forms that life takes are the product of how living selves represent the world around them – structures the tropical ecosystem. Although all life is semiotic, this semiotic quality is amplified and made more apparent in the tropical forest, with its unparalleled kind and quantities of living selves. [...]

The worlds that selves represent are not just made up of things. They are also, in large part, made up of other semiotic selves. For this reason I have come to refer to the web of living thoughts in and around the forests of Ávila as an ecology of selves.⁴³⁶

As Kohn recognises, and the Runa ably demonstrate, together with the community that nurtures its representation, the ecology of selves encompasses a myriad of non-human or more than human beings. This enhanced sense of the self, as a confluence of diverse representations, extends to include non-human creatures, as well as the forest as a whole, along with imaginary and mythological beings, such as the spirits of the dead, animal-human hybrids, and even racial abstractions. For Kohn, drawing on both Peirce and Uexküll's example, doing justice to the culture of this community entails charting the ways in which language is nested within broader forms of representation, and accepting that signs cannot be fully circumscribed by the symbolic.⁴³⁷ While in the main accepting Kohn's point here, to conclude I will briefly return to Peirce's account of the symbol in order to highlight another aspect of this concept which is sometimes overlooked in its association with linguistic signs. Without the scope to develop this idea in full, my contention is that, as a cipher for the biological basis of selfhood, a re-examination of the symbol helps to qualify the attention to subjectivity which has long been the focus of cultural theory outside of anthropology.

Understood as selves living organisms do not just access their surroundings via the interpretation of signs, if we consider their existence in terms of a frame they too begin to resemble living symbols. With respect to humans alone this notion translates into the familiar idea that our self-recognition consists of language, but when applied more generally to the

⁴³⁵ Colapietro, *Peirce's Approach to the Self*: p. 79.

⁴³⁶ Eduardo Kohn, *How Forests Think: Toward an Anthropology beyond the Human* (Berkeley: 2013, University of California Press): p. 78.

⁴³⁷ Kohn, *How Forests Think*: p. 15.

corporeal development and genetic evolution of biological beings it leads to a more striking conclusion. As is well known a symbol is a special sort of sign in that its interpretant maintains its significance without intrinsic reference to the object it is deemed to stand for. Unlike a sign indicating a direction or representing a quality, a symbol asserts its meaning via an act of self-reference, distinguishing not only the object which it denotes, but also the medium through which its identity is expressed. Along similar lines, Peirce asserted that between the logical *subject*, containing the whole or part of the index (i.e. an instance of reference), and the logical *predicate*, which incorporated the icon (i.e. a particular quality), the *symbol* acted as the *copula*, embodying the relation which at once distinguished and identified these two components of a proposition.⁴³⁸

Effectively, via the general rule determining its significance, an interpretant is already recursively embedded in the body of a symbol, and this potential for self-reference requires the introduction of yet another interpretant in order to be activated. Once again, along with Peirce's semiotics, Uexküll's function cycle comes to mind, this time as a model for a situated teleology of self-discovery. In the case of linguistic symbols, a socially mediated convention at once guarantees the reference of a word, and differentiates its identity, contrasting the character of this sign with other symbols of the same language. Yet, when the same logic is applied to an organism it embodies a more complex series of acquired dispositions and habits, each of which maintains a life in contradistinction to the external setting on which its survival depends. From this perspective at least, an organism is a living symbol of the habitat it serves to frame. And, as a frame of nature, a habitat reciprocally differentiates both the individual organism and the Umwelt which it inhabits.

Conceived then as a symbol, a living sign of the ecological dynamic which supports its existence, the human animal should be considered not merely as the author or arbitrator of signs, but as the product of an ongoing process of semiosis which complicates its instrumental ambitions. Crucially, as Kohn demonstrates, fully appreciating this process depends upon escaping the provincial domain of language, and contending with the fact that the symbolic realm is entangled with various non-symbolic forms of meaning. Only in this sense, more or less at odds with a frame, can human beings continue to sincerely narrate their own evolution, thinking through a significance that at once clarifies and exceeds fixed relations. It is in a new critical confrontation with the hybrid body of the symbolic-self, as well that texture of non-symbolic signs with which its existence is interwoven, that the humanities can start to face up to the challenge of a contemporary ecosemiotics. That is to begin reconstructing the reality of subjective agency on the threshold of a communal environment, without allowing this figure to

⁴³⁸ Peirce, 'Of Reasoning in General' in *The Essential Peirce: Volume 2*: p. 20.

either become trapped in a self-referential circle curtailing its aspirations, or to go missing in the labyrinth of its own relations.

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