Body, Environment, Technics:
An Ethological Approach to Information

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Submitted in fulfilment of the requirements for the
Degree of PhD in Information Studies

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April 2019

Abstract

In this thesis I describe an ethological approach to the study of information which moves from the traditional ethological binary of body + environment in creating a subjective world, called an Umwelt, to include a third element, technics. In moving from a dyadic to a triadic relationship, I show the fundamental interconnectedness of these three elements of being-in-the-world in the specific grounding context of information and demonstrate how we form and interact with new environments through media, computing and digital technologies, thereby creating meaningful spaces for interactions and information sharing. I begin with an introductory discussion regarding ethology and information. I then examine the nature of our interconnected dwelling in environments through the ethological lens of Jacob von Uexküll's notion of Umwelt, and the cognate fields of cybernetics, biosemiotics and cybersemiotics which he greatly influenced. I use this ethological lens in order to further explore ideas of space, place and dwelling in thinkers such as Heidegger, Westling and Ingold, whose notion of the 'meshwork' (2015) I repurpose for thinking through digital connection. I discuss phenomenological engagement, body development, bodily performance, and the body's integration with technology through the work of Husserl, Merleau-Ponty and Nancy among others. From there I move to technical development, evolution and environments through the philosophical ideas of Ernst Kapp, Ernst Cassirer and Gilbert Simondon. Simondon in particular is of great importance when considering the interlinking of technical and human environments in terms of information studies and digital information environments. This is followed by an exploration of four thematic theoretical lenses: entanglement, rhizome, interface and diffraction through which to bring together and frame the previous research. Finally, I close the main thesis argument with a multimodal media phenomenological account of first-person research in the University of Colorado Boulder's Media Archaeology Lab in order to demonstrate the use of an ethological approach to the study of information, media and computing technologies. Through this research, including photography and text, I demonstrate the phenomenological use of historic technologies to step outside of the reticulated meshwork of technology use and bodily integration, to slow down and listen to the body in strange multimodal mediatic encounters in order to demonstrate how these technologies are integrated within the horizon of experience which is our subjective world. I end with a conclusion that focuses on the ethics of information, technologies, media and being-with.

Acknowledgements

There are so many people to thank who have supported me generally in life and throughout this process. So many people to thank for their generosity. It is somehow difficult to know what to say. To summarise so much giving in such few words. To try and wrap up all those feelings. To put in words all the buoyancy people gifted to you of their own.

My thanks firstly to my primary supervisor, Dr Ian Anderson at the University of Glasgow. He was the first person I reached out to as I applied for the PhD programme and to various funding bodies. He gave me his time and support from the beginning. He wrote many supporting statements throughout the process which gained me entry, money, time, and opportunity. None of it would have been possible without his attention. Also for his considered advice and steering throughout. I realised through this gruelling process that a supervisor is not there to agree with everything you do but to hold the door open to possibilities and to prevent missteps, to frame the bigger picture and say, yes that, but also this. Ian did this admirably and I am grateful to him.

My sincere thanks also to Dr Maria Economou, who helped guide my early thinking. Maria always tried to ground my thoughts in reality, to consider not only the theory but the world in front of me, the objects and networks they form as they are, not as I imagine them to be. Her gift of knowledge and time was greatly appreciated then and now.

Dr Lori Emerson, founder of the Media Archaeology Lab at the University of Colorado Boulder, acted as my third supervisor and mentor. I was privileged to use the MAL as a research fellow, an opportunity which presented me with new ways to consider not only technologies and the world, but also my body and its sensual engagements. Lori was always wonderfully supportive not only of my research but of my half-baked thoughts, helping me to see where the value lay. Her support for my research there and afterwards made a massive difference to my self-belief. It is still making a difference.

My thanks also to Dr William Aspray at the University of Colorado Boulder. I worked for Bill as his research assistant but he was kind enough to let me write with him, and learn from him. I am a better researcher and writer for it.

My thanks to the Scottish Graduate School for Arts & Humanities, and the Arts and Humanities Research Council, for funding my research, including at the Media Archaeology Lab.

My thanks to everyone at the University of Glasgow College of Arts Graduate School Office who supported my studies in countless ways. My thanks also to the Disability Service.

My parents have supported my life in too many ways to number. Knowing they will be proud of me whether I succeed or fail means everything. I cannot thank them enough.

The biggest thanks go to my wife, Mei-Ling. One of the strangest things in life is meeting someone who you decide to travel together with on this odd adventure. Life is never boring with her. She spurs me on. She knows my strengths and weaknesses, and gives me the confidence not only to deal with the latter but to celebrate the former. That is not a trite thing for someone who struggles to believe in themselves. Having someone believe in you is a genuine miracle. I could not have gone through this process without her.

For my three children, I cannot begin to think about how they have changed me and what the gift of their being does to me, how it allows me to think and feel in expansive ways. When I started this process Lorcan was only a year old. Roarke was born a year later. Now they are restless boys with a fierceness of life and magnificent curiosity I greatly admire. The third is due any day now. A bookend to this process. A new life. A new way of being, here in the world. I dedicate this to them.

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PART 1

INTRODUCTION

Chapter 1: Information and Ethology: An Introduction

> No attempt to discover the reality behind the world of appearance, i.e. by neglecting the subject, has ever come to anything, because the subject plays the decisive rôle in constructing the world of appearance, and on the far side of that world there is no world at all (Uexküll, 1926: xv).

The human animal is an informational animal. All organisms rely on information to survive, to thrive, and most importantly to build a co-constitutive world made from the interplay of body, environment and the semiotic signals which convey information as difference. Like any animal, we can discuss human behaviour using an ethological lens. Ethology concerns the behaviour of a species, specifically its behaviour regarding those aspects of an environment necessary to its survival and to which it therefore not only pays attention but from which it constructs an entire world through the physiological interpretation of signs (Uexküll 2010). Like any organism, we can discuss the ways in which humans create meaning by using a biosemiotic approach, the study of biological sign use. Both ethology and biosemiotics fall under the purview of information and its study. Information and life are inextricable. Information, in a profound sense, *is* life. Yet to say that the human animal relies on exosomatic information, technologies, and tools beyond any other is a statement with strong merit. Not only do we use natural information to create our Umwelt, an ethological term used by Jacob von Uexküll (1934;2010) that means 'world around' or 'surrounding world' and describes the ground of our being created from the interplay described above, but we create externally-stored and networked social, cultural and technologically-mediated information and combine it in a swarming profusion of switching information channels supported by myriad technical infrastructures and interfaces. Our worlds are many. Our stories myriad. The human species, in conjunction with the performative body-act and mediatic manipulation of materials and environment, is unique not in creating culture, which all sorts of species do too, but in doing so through so many technologies which have profoundly altered the scope and scale of its Umwelten, of the reach and rapidity of sensual-semiotic environments and the protrusions of body-worlds beyond their immediate surroundings. Humans share and shape culture across time and space, stitching them into a unitary ground of being that combines the near and the far, the familiar and the strange. Technology is the needle, the universe is the fabric, and human bodies are the thread. Information is the patterning that emerges from this

interwovenness.

1.1 Research Questions and Aims

The questions that this thesis asks and answers can be stated simply:

1. How can we create an ethological approach to the study of information and how is information fundamental to any such ethology?
2. What are the particular elements of the human Umwelt and how do they affect our being-in-the-world?
3. What role does technics play in the human Umwelt?
4. What role does phenomenology play in such an ethology?
5. How can this ethological approach be applied to the study of technologies, media, information and being-in-the-world? How can we use such an ethological analysis to discuss our relations which technologies? What role do technologically mediated multimodalities of sense play in phenomenological experience?
6. What are the existential and ethical implications of such an ethological understanding?

These are profound questions with which to wrestle. In attempting to answer them, this thesis presents an ethological approach, centred on the concept of Umwelt, with which to discuss human relationships with technics in general and information technologies in particular, a lens in which *to highlight information as the underlying principle and driver of meaning* from which human subjective worlds arise through technological creation, adaption and use *in* environments and *through* bodies. In defining information at its most fundamental level I follow Gregory Bateson's (2000) definition as being 'a difference which makes a difference.' Information is not solely a tangible 'thing' existing by itself, stored in any particular format, but is generated through signs presenting difference to a recipient existing in a world perfuse with signs. Although information is not a thing solely in itself, neither is it limited only to the bodies of perceivers or exists as a differential percept alone, but is carried as signs using vehicles both natural and cultural, by informational technologies, by natural and technical objects which are part of larger sociotechnical, biological and cultural semiotic systems. Before exploring the sociotechnical implications, the beginning of this story, of information as it relates to human being and doing and making in the world, must be told beginning from the root up. When examining human dwelling, the structure of the foundations must be attended to before appraising the roof. By bringing together the study of ethology and information, the aim of this thesis is to present a more comprehensive understanding of the

interlinked processes by which technologies, bodies and environments create human perceptual worlds, undergirded by an informational fundament necessary for species survival and evolution both biological and cultural.

1.2 Adapting Human Ethology

If technics is the answer, the environment is the problem. Likewise, if technics is the problem, the environment is the answer. Technics and environment are a pair in the same way that the body and the environment together make a world. If Stiegler (1998) argues that technics is prior to the emergence of the human, that it creates and constitutes the basis of the human, then it is not a static technics but the productive relationship between technics and environment. Ernst Wolff (2006) writes that 'technics, religion, language and the human being mutually give birth to one another':

> In order to pass the threshold into humanity (*Homo sapiens*), the biological evolution should be taken over by an *ethological evolution*. The transgression of this frontier is attested to by fossil remains of human action: in particular the accelerated advance in the development of *tools*. Initially the fabrication and use of tools were integrated in the biological development of the species to which it remained parallel and of which it could be considered a mere extension (rather than the product of a mental project or discovery, (GP 106). But when the biological development had in essence reached its point of culmination, the technical development of the species started soaring (Original emphasis).

Human ethological evolution beyond bare biological evolution is driven by technics. I therefore modify the ethological notion of Umwelt, an organism's subjective 'world around' created from the dyadic duologue of body and environment, to a triadic system of body, environment and technics. In doing so, I am pointing to the full subjective integration of the technical into human perceptual worlds. Without technics, the modern human Umwelt is inconceivable. This is not to say that it is only a fundamental trait of the human species alone but that to the human species it represents an existential underpinning of the very notion of humanity and its modes of perception and action. To study the human and its cultural productions, the humanities, therefore, is to study technological relations as the power of the body acting upon the environment through mediating tools, through technics and language. Each of these triadic elements acts upon the others in the creation of the human. The body's engagement with the environment determines the mode of technics in terms of need. The

body uses technics to engage and transform the environment. Environmental forces on the body determine not only physiological but technical evolution. Technics moulded by the environment in turn mould the body, affecting environmental apprehension. All are connected.

An Umwelt is a biosemiotic apparatus of world creation dependent on signs and their transference in a system. It is the fundamental mode of organic interfacing. Organisms use sign systems in feedback loops between body and environment. From such feedback, from the functional circle created by such sign systems, a world emerges. In its dialogue with this world, the body itself is defined and adapted. Information drives evolution. The modelling process is a cyclic construction of a world full of meaning for the organism. In this way it secures its survival. In humans these sign systems also include digital signs and their technological carriers. Technically-mediated information therefore also drives human evolution through this process of hominisation (Wolff 2006). Since these carriers and their interfaces control the information received or disguised, in effect they control the modelling process from which human worlds arise and are sustained, and in turn mould the body to the environment. Obfuscation, manipulation and distortion of subjective worlds are therefore a real danger. Here lie the roots of the modern issue of misinformation and its deleterious effects on the truth-value of informational ecosystems. Ideological vectors control information flows, allowing mediation of perceptions and therefore control of responsive actions and reactions. Natural information is superseded by technical mediation. Ethologically, humans are submerged within a world of technical semiosis in addition to natural and social sign relations.

Husserl's (1970) notion of *Lebenswelt* or 'lifeworld' is both a subjective and an intersubjective phenomenal world that cannot be fully objectified. It is an intertwined I-with-others [*Ineinander*], the world of doxa, of common-sense shared ideas of time, space and causality. Yet the lifeworld does not fully describe or encircle the Umwelt. It is only a part of the larger whole, for where a lifeworld is intersubjective, a communion between human subjects, an Umwelt, despite Uexküll's restrictive soap bubble metaphor, is inter-specific, placed in relation not only to one's fellow humans but to other species and their Umwelten. Sharing an environment, through common signs animals can also partially share other worlds. The Umwelt is the ground of all existence, not only the mundane experience of a lifeworld but the meaning-making of inter-existing species in a universe of riotous difference that

nonetheless is bounded by commonalities and crossings. The confusion or conflation of these terms does less justice to the more radical ethological term. Like Husserl's critique of the invisibility of the lifeworld in the scientific method, the Umwelt is likewise obscured in its totality, including as it does both nature and culture, including not only concepts such as time and space but also the organic senses and technical instruments with which to apprehend such aspects of existence. It includes tools, dwelling places, social institutions, symbolic systems such as languages and religions. It includes artefacts, other people and other organisms. Its primary quality is of this comprehensive interwovenness or entanglement [*Verflechtung*] between the natural world and social and cultural domains, including tools, technologies, and their associated practices. It is the horizon of the world [*Welthorizon*], that which gives it context, makes it mundane, that which makes humans human-in-the-world. As the lifeworld is the human-to-human horizon, the Umwelt is its species grounding. An Umwelt is oriented survival. Where the human *Lebenswelt* is only intraspecies, many Umwelten are also interspecies in the overlapping of signs and their significance.

The Umwelt not only concerns the biological and the natural. Machines have a milieu (Simondon 2017) but not an Umwelt. They have an environment but not a world, not yet. Yet such mechanic milieux are integrated into human Umwelten, interpolated into the functional circle driving hominisation. Technical objects, operating within their own milieux, mediate between bodies and environments. A technical milieu is a crucial addition to the body-environment dyad. Technical forces and technologies cannot be separated from the human Umwelt. From the first stone grasped as a tool to mediate the environment, human being-in-the-world became inescapably triadic. So too for other tool-bearing creatures. The Umwelt, while the ground of being, is experienced as a world of phenomena, ideas, history, culture, background, experience, flesh acting on the world and growing in and with and through the world, through its own powers and the powers of its technical inventions, through tactility and sensual engagement with media. Phenomenal investigations of media and their properties, of informational technologies, must therefore take an ethological approach in order to fully *grasp* the modes of mediation such technical objects perform between a body and its environments. This relationship of ethological mediation is one half of the heart of this thesis. The other lies in information.

The study of information is at the essence of any ethological analysis for one fundamental reason. Information is the carrier of meaning, without which the body and environment

would present to one another in isolation, and into which duality technics would have no entry. Information is the difference engine of any sign system. Body, environment and technics can only mediate one another through information exchange, through the creation and exchange of signs within a system. Without the study of information and its significance, an ethological analysis loses its teeth. Similarly, by providing an ethological analysis of human being, the profundity of the role of information to human being becomes more apparent, not least in the role of information technologies and their powers to mediate a world.

1.3 Information

Information as a study generates many questions. What is information and what does it do? How does it exist naturally? How do humans perceive it and make use of it in their environments? How is digital information different from its analogue counterparts and what ontoepistemological implications does this represent? How do generalising categories of ‘physical’ and ‘digital’ information and information technologies contain within them multiple meanings and modes of bodies, things and signs? How is the human world created through this strange combination of sign, carrier and recipient? What role does the body play? How are the senses and bodily powers extended through informational technologies? How do objects carry, transform, transmit and store information and how do they affect bodies?

Informational objects are neither solely sign nor thing, but a matrix of the two. Whether they appear as one or the other is affected by, among other things, scale. In the interrelations of physical and the digital qualities, whether attributes or forms of information, this is of great importance. Borgmann (1999) discusses the compact disc as a physical object whose microscopic pits and ridges represent a series of zeroes and onesectively. Text, music, picture, video, the information inscribed upon the media is both physical and digital in one. A person may hold the physical item, yet the human eye cannot unaided see the pits and ridges that transmute into digital information. The grooves, too, are beyond the sensitivity of touch, fingers insensate to that degree of modulation.

Sensory input from the environment is turned by the sensory organs and nervous system into a series of electrical signals that determine our perceptions of the world. This is important.

Yet there is more to human environments than primitive physical reductions. The mechanical and moral effects of the environment and their influence, upon how they shape experience and personality, and the ways in which they mould perception, are often ignored when discussing information as an entity abstracted from human life. The uniqueness of a person's cumulative interactions with the environment combined with their unique hereditary makeup allow individuality to be conceived as something as set apart from those physical environmental factors (Wexler 2006: 40). Humans often perceive themselves, in effect, as a kind of bas relief, projected out from, even extruded from, the physical environment, with that environment merely the plain basal layer of being rather than something so thoroughly entangled with the body that together the environment and body should be seen as a organismic totality, as a series of sinuous vines or waveforms. Something, perhaps, more akin to the vividness of Hokusai's *Kirifuri Waterfall at Kurokami Mountain in Shimotsuke* [Figure 1]. Life is biosemiotic both generally and individually and it is in tying our meaning-making to all modes of information and its malleability of form, content and quality, that we can see the importance of this field of knowledge to an ethological analysis of information and associated technologies of transmission.

The older (pre-information-age) usages of the concept of information portend to this much-later biosemiotic conception. As Borgmann notes, Cicero's conception of *informare* centred around the imposition of form upon the mind, while in the medieval conception form and matter were indubitably linked, in*form*ation shaping matter, and matter moulding in*form*ation. Yet matter as structured reality, as *information*, is an all-or-nothing game. Either everything is information or it is not. But what, then, asks Borgmann, distinguishes you or I from an inanimate object? Everything contains structure yet information as meaningful communication exists beyond this bare composition. Information as sign is not the thing in itself, the Kantian *Ding an sich*, but is a carrier of its meaning. It delivers not the thing but the sense of the thing. Reference, he says, rather than presence: "Thus an ecology of things and an economy of signs are crucial to information and to life in a world that is both engaging and perspicacious" (17). If things existed without signs, human life would be restricted to a world of immediacy. A world of signs without things would be a world without presence.

Figure 1

Information, for Borgmann, is a relation between at least four things: "A PERSON is informed by a SIGN about some THING within a certain CONTEXT" (20). Although Borgmann's conception of information as delineated is helpful, terms such as *person* can be exchanged for the more general *recipient* and include non-human animals and machine or other computational actors. It could be argued from a limited perspective that computing technologies are the carriers for the informational signs through which human recipients gain meaningful information, which is certainly true on one scale, but on another scale the machine recipient is receiving countless sign carriers within a context [semiotic environment] meaningful for machines, especially when acting as a device placed within the larger information nodality [intersection] of the internet. By swapping the more specific term for the more general one, information-recipients can be layered in order to show their inherent interconnectedness in terms of density and rhizomatic relation, not only as nodes in a linear chain. Yet as Borgmann notes, there is a fifth element to this conception of information, without which signs are meaningless: intelligence. Intelligence determines the meaning of the sign within a context: "INTELLIGENCE provided, a PERSON is informed by a SIGN about some THING within a certain CONTEXT":

> There is a pleasing symmetry to this relation. At its center is the sign, fulcrum of the economy of information, and on it revolves the relation that mirrors the symmetry of humanity and reality, of intelligence and context, that undergirds every kind of epistemology and was first noted by Aristotle in his celebrated formula: "The soul is somehow everything" (20).

Since potentially we can speak of machine intelligence in this context as an interpretative recipient, does it follow to speak of a machine soul? Or is the conception of information and intelligence as so delineated exclusive of humanity? Or of the animal kingdom? Where lies the line between programming and personhood? When does structure surpass its formality and become self? Perhaps in its plasticity (Malabou 2008), of which machine thinking still remains too rigid to possess a selfhood, although machine plasticity is developing rapidly. Intelligence lies not in processing but in adaptability to environment. This is the fundamental basis of ethological existence and an ethological analysis of information. Yet as will be discussed in Chapter 5, Gilbert Simondon (2017) argues that technical objects have their own milieu and evolutionary trajectories. Plasticity is a relation of all objects in general and organismic physiologies and brains in particular, not only the human brain, which is still

arguably a special case.

The ground state of human being is a matrix of natural information embedded in an environment of things and signs. To read the natural world, Borgmann argues, is to be attuned to it, a pleasurable state due to the coherence and interplay between things and signs. Before exosomatic information technologies, natural signs, such as landmarks, served temporarily as signs before once again becoming solely things, structuring time and space and therefore giving dimensional order to the world. Information and knowledge were likewise coexistent and fully entwined. A hedonic existence.

A person is informed by a sign about some-thing within a context, but what is that process? What inheres in this process of being informed? Gregory Bateson's (2000) famous dictum is that information is *difference which makes a difference*. In 'Form, Substance and Difference' in his *Steps to an Ecology of Mind*, first published in 1972, Bateson asserts that the word 'idea' is synonymous with 'difference.' One may never know a piece of chalk, in his example, as the Kantian *Ding an sich*, the thing in itself, which contains 'an infinite number of potential facts' (459). What a person receives through their senses is a very partial experience of that chalk. The thing itself cannot enter into communication with that person due to this infinitude. Sensory filters reduce it down according to the limits of their channels so that certain facts stand out. This is information. Information is always partial due to the limits of sensory filters. For Bateson, this can be expressed in the fact that, rather than an infinite number of facts about the piece of chalk which could be known, there are, rather, an infinite number of differences between the chalk and the universe. There are differences between the chalk and the sun, between the chalk and a tree or a forest of trees. Between the chalk and every other molecule, between its location and the locations it might have been in. From this infinitude a small number of facts are selected, and these facts equal information. Information at its most basic unit is 'a difference which makes a difference':

> and it is able to make a difference because the neural pathways along which it travels and is continually transformed are themselves provided with energy. The pathways are ready to be triggered. We may even say that the question is already implicit in them (459).

A person is able to recognise information because humans, like other organisms, including

plant life, are wired to register differences through sensual modalities. The form of the information processed about the world is already implicit in the structures of human brains and bodies, in the formation of synapses and nerve endings. Humans receive inputs from the world at an extraordinary rate, millions of differences per second, continually taking in information which is the difference of a changing world from one moment to the next. The question of differences and their register is implicit in the morphological structures of the brain and body.

Technologically-mediated digital information and its infrastructures, however, have allowed the presence of things to become overwhelmed by the ubiquity of signs, a modern condition commonly called *information overload*. Communication technologies have allowed information to become perfuse, to flow through and overwhelm their own material bases. This is why, when talking of information and its storage, it is not of the heavy lifting of information done by server farms and power stations and carbon-based environmental degradation that is discussed but the airiness and weightlessness of the seemingly-illimitable information flows pulsing at restless fingertips. The groundedness of ancestral, of natural, information, became untethered when Claude Shannon and the nascent Information Science field focused on information as signal and semantics, as formal relation, as structure without body: 'Whenever we try to explain or convey something there is structure, more structure, no end of structure' (Borgmann 1999:27). Borgmann quotes the earlier work of Diana Raffman who argues that in music:

> "the structural description fails to capture the *non*structural features of the piece. Intuitively speaking, it fails to capture those dimensions of the musical signal which vary along the continuum." As Raffman goes on to show, however, the nonstructural parts of music are not unstructured; it is just impossible to devise a system of digital signs for them (27-28).

Here is the indication of the limits of digitality. The digital as constituted into bits may represent analogue structure but it is of necessity discrete; broken, that is, into bits. There is always a gap in the digital contiguity where the variance of the physical remains unbroken. So how can this gap be approached, how can the entangled bridges between two apparently different domains be shown?

Yuk Hui engages with the work of Simondon, Husserl and Heidegger in his monograph *On the Existence of Digital Objects* (2016) and his earlier paper 'What is a Digital Object?' (2012). Humans exist in a media-intensive digital milieu, he argues, comprising data and metadata, image, sound and text, and the networks that connect them. These material engagements demand philosophical attention. Digital objects for Hui are objects on the web, a YouTube video, for example, formalised by metadata schemes and ontologies. Interactions with these objects are so pervasive that separating online and offline worlds has become increasingly difficult, to the extent that escaping this digital milieu is virtually impossible. Wherever humans are, it is. Digital objects are not the bits and bytes of information but objects interacted with, while the web is an interface between these objects and human selves, populating a world in which digital objects reveal and conceal both physically and metaphysically. Traditional Western metaphysics states that an object is understood by its essence, and its essence determines its appearance. Scientific knowledge, based on this concordance, supposes an exact relation between consciousness and the thing itself. Husserl's phenomenological method is descriptive and intentional – an agent does not know the thing-in-itself but in its relation to consciousness. Objects are objects of experience and form part of the '*organon* of knowing' (2012. Original emphasis). Since digital objects appear to the senses in different visible forms they can be treated as natural objects engaged by consciousness. Yet digital objects are composed of many different levels. They appear as visible forms, in different colours, as programmes they are text files, below that they are binary codes, and at the level of circuit boards they are voltage-carried signals. Continuing further, they can be talked about as silicon and, even further, particles and their associated energy fields. Yet this reductionism fails to pinpoint what a digital object is. Hui proposes a different approach:

> I want to go back to the digital again, and propose that one fails to see the whole landscape if one simply understands the digital as only a 0 and 1 binary code; rather, one should grasp the digital as a new technique to manage data in comparison with the analogue (2012:387).

Hui's point here is that physical architectures have societal effects, and that such architectures can be used to manage forces and bodies, to actively shape behaviours through data and its technologies. The original meaning of *datum* is 'thing given,' that is, a natural object given to the senses. However, its more recent incarnation is of transmittable computable information,

resulting in a material transformation from the senses, from a natural interaction between human and environment. Without data the digital is invisible. Data must therefore be graspable both by the human mind and computers, resulting in the '*datafication of objects* and the *objectification of data*' (389). Web ontologies create different levels of concreteness and networks articulate and calculate relations. As web ontologies evolve, digital objects are becoming more concrete. Since digital objects are computational objects, they are subsumed to calculation and meaningful only within a network. Networks connected together using standards and protocols and therefore substantiate the digital milieu. Metadata creates digital objects from the flux of data steered by algorithms (Hui 2016:91-92). It is in the relationality of metadata that digital objects are made concrete.

In this flux of concretisation, entanglements with digital objects, information, infrastructures and interfaces can be engaged phenomenologically to create meaningful descriptions. Yet the issues go beyond formalising digital ontologies. Questions must be engaged regarding digital technologies in terms of their meaning *for humans* as sensual-semiotic beings engaged in a duality of physical and digital environments, scaffolded by technologies whose meanings and manifestations must be likewise understood. Here is the essence of our ethological attention to the environment and its modifications and expansions via our technically-mediated bodies.

Information is increasingly born digital and converted to digital forms[1]. The World Wide Web has just turned thirty years old. In technological terms it is still an infant but its effects on how information is shared is profound. The backbone of the Internet as environment-interface-host for digital information is a vast virtual nexus of potentiality and semiotic interleaving, a multimodal, hypertextual interconnectedness that rivals the invention of writing in its burgeoning impact on how humans interact with one another and exchange information, although the current impacts are in many ways still unknowable. Yet the human environment, informationally speaking, is certainly vastly expanded. It is easy to still think of the internet as a kind of decentralised publisher of human information, for humans by humans, when machine-to-machine data and storage is growing much more rapidly. Data produced by the ballooning Internet of Things and automatically produced information flows within the massively distributed hyper-machine assemblages recently created is metastasising

[1] *Digital Intelligence Today* (2013) reported that 90% of the world's information had been created in the previous two years. This, of course, is largely digital information.

beyond common comprehension. Beyond individual control – both in terms of the information consciously created and in the many data points people unwittingly and often unwillingly create.

Whether digital information and its supporting infrastructures represents something entirely new and of a different nature to its analogue counterparts, including the many ways in which it relies for its existence on these physical supports, must be fully explored before any tentative assessment of the importance of this tidal shift. It is a pressing concern at this still relatively early stage of development that this digital field of interaction is paid attention to, especially in terms of library and information science, the humanities digital or otherwise, and in the work of institutional repositories; libraries, archives and museums. New interdisciplinary methods and ideas must be sought to interrogate technologies that are so profoundly becoming entangled in human lives in so many ways. As Danish information theorist Søren Brier notes, over the past twenty years:

> [I]t has…become increasingly obvious that in order to function optimally, LIS must be based on a theory of cognition, information, and communication that bridge technical science, cognitive science, communication science, and linguistics, including the phenomenological, social and cultural aspects of signs (2010: 5).

Brier is here talking about information storage and retrieval, which in terms of ordering and making sense of the overwhelming increase in digital documentation daily created is of paramount importance lest life gets swamped under petabytes of data. The library and information science sector is not a silo, and an approach that combines these fields must be broadened to include other cultural players and memory institutions, not least archives.

Yet the challenge to the play-set of objectivity must be met, here as much as elsewhere, both in terms of information and ideology, two closely interrelated concepts, as will be demonstrated later in Chapter 6. Despite the challenges to the object-subject dichotomy and the fetish of the objective world as that which is most real and apparent and given in the sense of data which are neutral, thus of most value in knowing the universe and existence, empirical objectivism remains the standard view of the world as ground of being. The subjective lifeworld, the Uexküllian Umwelt, perceptual first-hand experience that comprises the richness of life and relationships with others, with animals, with plant life, with the

worlds we co-create through informational interplay qua meaning, these are seen as somehow secondary to objecthood, and measurement, and verification through the instrumentation of life through scientific information technologies:

> The archivistic, archaeological, and necrophilic methods on which the scientific imperative was founded – the building of arguments on the basis of empirical evidence, a systematizable given, and an observable object – in this case, language – are an embarrassment when applied to modern or contemporary phenomena. These methods show that the capitalist mode of production has stratified language into idiolects and divided it into self-contained , isolated islands – heteroclite spaces existing in different temporal modes (as relics or projections), and oblivious of one another (Kristeva 1984).

The design of digital tools, technologies and systems of calculation have been yoked to an ideological trap. Physical and digital informational infrastructures have been falsely dichotomised because it suits extractive ideologies premised on the capitalist mode under which the modern white, masculine sciences grew and matured, that is, the dialectical back and forth between Donna Haraway's so-called 'modest witnesses' (Haraway 1997. See Chapter 6 for a detailed discussion) to the exclusion of other voices. To construct the connected ontology and epistemology of a thing is to be able to mine it, whether raw silicon or data. Digital information and architectures, arising from computational methods, are utilised under the flag of objectification and reality-branding. The sciences, labouring still under the power structures of the masculinist modest witness reified continually under discursive capitalism and its gatekeeping publishing models, are mostly concerned with inductive process and its results not with what as a field they mean or mean to mean and how that meaning is manipulated and how they are situated within discourses of the real.

Yet there exist means by which other modes of knowing and being, using the transdisciplinary field of information, can recoup the sciences as information-gathering epistemologies on their own terms and bring together the subject-object intertwining to better repair the rent between them. Information bridges this gap. The body lays itself down within it. The vivacity of life stitches it together. A biocultural understanding of the human animal and its informational Umwelt, its modes of discourse and power-structuring linguistic reality, its tool use and technological evolution, its cultural creation of worlds and recouping of difference, shows how the divide can be drawn into a unitary ground. The task is not to value

either one over the other, but to show the entanglements of matter and meaning united in the human Umwelt that have hitherto been subverted by powerful interests, purposely disentangled, hidden, misled and monetised. Likewise, to fight back against the continual pressure of centripetal forces that seek to separate the human and its existential meaning from the animal world and the environment, to make of the earth and its horizons a Heideggerian standing reserve (Heidegger 2013) wherein all dwelling is subsumed under human appropriation. There are fundamental ethical, ontological and epistemological issues that must be addressed as we rush headlong into a future of intertwining physical and digital existences, as analogue and digital technologies and networks are combined with, even spliced with bodies and body-worlds that not only use informational prostheses but become, in their networked states, prosthetised. In an age of near-ubiquitous computing, culture is being redefined. In our increasingly post-industrial, hyperconnected Western society that offloads the material work and environmental damages to other countries, the line between software and self is arguably receding.[2] We are fast becoming, if not the fully-fledged cyborgs of popular culture, cyborgian in the meshing of lifeworlds and computational technologies, witnesses not only to the rise of the virtual but to the deterioration of the artificial and wrongheaded separation of the subject-object intertwining. As Donna Haraway writes:

> The implosion of the technical, organic, political, economic, oneiric, and textual that is evident in the material-semiotic practices in late-twentieth-century technoscience informs my practice of figuration. Cyborg figures – such as the end-of-the-millennium seed, chip, gene, database, bomb, fetus, brain, and ecosystem – are the offspring of implosions of subjects and objects and of the natural and artificial (Haraway, 1997: 12).

Haraway argues in her [in]famous *Cyborg Manifesto* (2016a; originally published 1985) that the gulf between the animal and the human has by now been thoroughly breached. Regarding the differences which were once proclaimed as constituting human uniqueness, whether tool use or language, cognition or social behaviour, none make a convincing case for a strict demarcation between animal kind and human kind as co-evolved species:

> The transcendent authorization of interpretation is lost, and with it the ontology

[2] In 2014 OFCOM (2014) reported that 83% of adults go online using any device in any location, a number which increases to 98% among 16-24s and 25-34s. These numbers will doubtless increase.

> grounding "Western" epistemology. But the alternative is not cynicism or faithlessness, that is, some version of abstract existence, like the accounts of technological determinism destroying "man" by the "machine" or "meaningful political action" by the "text." Who cyborgs will be is a radical question; the answers are a matter of survival (2016).

The ground of certainty is lost and humans are free. Free to remake the self in the playful union of flesh and technology. Yet this freedom is dizzying, when the ground yawns beneath unsteady feet and becomes indistinct, blurred through motion. As the noosphere becomes interleaved with digital environments and technology becomes more closely interfused with bodies, the need to firmly establish the self philosophically in order to remain *grounded*[3] becomes more pressing by the minute. In this manner, the philosophical precedes the technical:

> The distinction between digital and analogue representation is philosophical before it is technical…The difference is not fully explicable in a *quantitative* manner (e.g., I see things better with my virtual reality goggles on), because it has a *qualitative* aspect (I see a different reality)—the Kantian critique of naive realism remains crucial today (Nusselder 2009:47).

Nusselder argues that digitisation as a technical process is philosophically useful because it shows how reality does not exist as an objective realm but that things and objects are framed and organised by technologies. Technologies therefore can show how humans perceive these things subjectively.

A conceptual reconciliation must occur between what are often mistakenly thought of as an almost free-floating, nebulous digital realm – a milieu too often unmoored from the ethical and moral *civitas* for precisely this reason – and the physical infrastructure from which our reticulated HTML topoi emerge. From modems, mice and microchips to the undersea cables and power substations humming with electrical energies and mental semiosis reconfigured into bits, reconstructed into sense-translatable data via laptops, tablets and phones, this informational transfiguration occurs through a galvanism invisible only because unsought for

[3] 'In metaphysics reflection is accomplished concerning the essence of what is and a decision takes place regarding the essence of truth. Metaphysics grounds an age, in that through a specific interpretation of what is and through a specific comprehension of truth it gives to that age the basis upon which it is essentially formed (Heidegger, 2013:115).

by eyes unused to looking beyond the veil of machine-executed code.

But such sleight of hand, where the digital technologies and information are separated from their physical bases through powerful but seemingly innocuous metaphorical misdirection, has its roots in very particular historical circumstances concerning the rise of digital computing and its subsequent ideological appropriation by Silicon Valley cyberutopians (Turner 2006), the effects of which are becoming increasingly pernicious. Vilem Flusser notes that '*Utopia* means groundlessness, the absence of a point of reference' (2011:3). Discourses which attempt to argue for the groundlessness of digital information must be resisted in order to hunt for grounded meaning in the terrain of transdisciplinary fields of study concerning digitality and our being-in-the-world, to seek to anchor the self in a world which continually says*, look, we are floating. We are free.* While all the time it is illusion and our legs are in concrete.

By refocusing bodily attention to include the physical entanglements from which this environing emerges[4] – a complex cyberinfrastructure with myriad silicon chips, scanning lenses, screens and other extensional peripheries as its worldly base– and on tactile interfaces sensually encountered, this free-floating metaphor can be grounded in order to more easily sight this partly noumenal no-place[5], a multiversional multispace perceived partly as a giddily unbound e-utopia but which is in fact an outgrowth of physical and our psychical realities; realities which are, in truth, always conjoined, co-dependent and autopoietic, emergent from the interplay between body, brain and environment.

Physical and digital informational and technical domains are entirely entwined and must be approached as such, from within this intertwining. When seeking the ground for a new knowledge that embraces all existents, then, it is important to examine the ways in which they interconnect, in the joining nature of such entanglement. Thus, 'it would be naïve to seek solidity in a heaven of ideas or in a *ground* (*fond)* of meaning – it is neither above nor

[4] What Heidegger (2013:6) would call the *causa materialis* (the material technology is made from) and the *causa formalis* (the form technology takes), rather than the *causa finalis* (the ends to which it is put) and the *causa efficiens* (the toolmaker, or manufacturer in modern terms).

[5] 'Interface metaphors represent data objects that do not have a phenomenal existence. They are, to speak in Kantian terms, of the noumenal dimension. Information design transforms the data objects into something visible or understandable, something meaningful: objects of representation. And this transformation is not completely "objective," because the digitized real world does not possess in itself a structure or form according to which it should appear. For what is the true form of a data object? Is it the way it appears on your computer display, or on mine? And what is the true representation of cyberspace?' (Nusselder, 2009:16).

beneath the appearances, but at their joints; it is the tie that secretly connects an experience to its variants' (Merleau-Ponty 1968: 116).[6]

An ethological analysis, taking into account the body, the environment, technology, and the myriad networks endlessly forming between these actors, is key to this. Whether physical or digital signs, information is accessed, still, by physical interface, by sensual-semiotic interaction with media that bodies touch, that they can see and hear. Through this physical apprehension phenomenal human worlds are formed. Media therefore forms minds. But how does an added layer of multimodal virtuality affect navigations beyond the physical spaces people inhabit? Is there a difference in kind between the lines of flight manifesting from the brain-body-book rhizome that traverses the semiotic-imaginary, and the brain-body-GUI rhizome that traverses both physical and virtual topographies? How does the movement of a finger that traces rough words on a paper page differ from that which glides across a tempered glass screen? Are digital technologies radically different or merely an extension of previous media technologies that allow bodies to interface with information? How do digital networks facilitate the greater flow of information and how does this rapid scaling up of informational capacity affect modes and means of interaction? What is the relationship between actual and virtual realities? Where lie the reticulated technical forces of technocapitalism that use digital environments and data to bracket and mould not only available actions and conduct but the potentialities of meaning with which different realities may be envisioned?

There is much hot air expanding the endlessly ballooning hype of 'the digital' as a panacea – a prefix that now penetrates almost all industries whether warranted or not. Yet the endless pronouncements on digital information and its effects for good or ill are a shadow to the power struggles circulating beneath the level of these discourses. Techno-utopianism too easily comes from letting our ideas of digital information, environments and technologies remain untethered to both contingent and persistent realities, of viewing networks and their

[6] Further down he continues: Along this route at least, it is indeed certain that we gain access to objectivity, not by penetrating into an In Itself, but disclosing, rectifying each by the other, the exterior datum and the internal double of it that we possess insofar as we are sensible-sentients (*sentants-sensibles*), archetypes and variables of humanity and of life, that is, insofar as we are within life, within human being and within Being, and insofar as it is in us as well, and insofar as we live and know not halfway between opaque facts and limpid ideas, but at the point of intersection and overlapping where families of facts inscribe their generality, their kinship, group themselves about the dimensions and the site of our own existence. This environment of brute existence and essence is not something mysterious: we never quit it, we have no other environment' (116-117).

utilities as a totalising form of utopian disruption to political, economic and social lives that will ultimately benefit human beings on an equal plane, when in fact networks and their technologies have often been [ab]used to advance privilege, consolidate power, and entrench the cash nexus which subverts subjectivities for profit. Silicon Valley historian Fred Turner pops this particular balloon at the beginning of his book on cybercultures and personal computing when he writes:

> For all the utopian claims surrounding the emergence of the Internet, there is nothing about a computer or a computer network that necessarily requires that it level organizational structures, render the individual more psychologically whole, or drive the establishment of intimate, though geographically distributed, communities (2006: 3).

As is becoming increasingly apparent from the overwhelming dominance of the commercial web and its merchant giants, capital seeks to use our interwebbed on/offline lives to intrude upon and dominate not only our social and cultural arenas but our very identities both as individuals and as social actors ensconced in a multitude of shifting relationships. *Amazon.com* is not a shopping website. Ethologically speaking, it is a domain of cultural control, shaping its shoppers to become the consumer that their media-influenced desires, managed through external conditioning, require. Amazon Prime as a cultural practice determines their needs, literally priming the psyche to be the docile ideal customer of late-stage technocapitalism. By taking away the frictions of purchase and exchange in a massively concentrated milieu of circulating goods, desires are channelled to conform to the lifestyle position in society dictates. It has the power to influence worlds. Through desire, the soft fascism of late-stage capitalism reaches one of its apotheoses. The other lays in hard control. The digital-technological means of civil surveillance and control of bodies through datafication and data trading (Zuboff 2018) via ‘the Internet, the recently *civilianized* military network’ (Virilio, 2005: 12. Original italics) is an issue just as pressing in ostensibly benign liberal democracies as more repressive regimes that are less subtle in their heavy-handed authoritarianism. Deleuze frames this in terms of capitalist cooption:

> This is no longer a capitalism for production but for the product, which is to say, for being sold or marketed…and the factory has given way to the corporation. The family, the school, the army, the factory are no longer the distinct analogical spaces that converge towards an owner – state or private power – but coded figures –

> deformable and transformable – of a single corporation that now has only stockholders (Deleuze 1992:6).

That new networks, whether railroad, telegraph or internet, will always lead to the advancement of the intellectual good life is an assumption which in the past has been repeatedly questioned, and one we must continue to approach critically. As Pierre-Joseph Proudhon wrote in 1855 in *Reforms to be Adopted in the Operation of Railroads*, here quoted by Armand Mattelart:

> Ideas are circulated not by coaches but by writers, political discussion, the free press…The length of railway lines in operation in France has tripled. Since then we have not seen the slightest idea circulate (16: 2000).

The body-world exists in myriad fluid networks; physical, informational, social, technological, interpersonal, intersubjective. The world is composed of organic and non-organic bundles of matter, of actants and agents, interlinked, trans-corporeal, chemical-mineral, subject-object nodes of perceptive being. Differences which make a difference. This multicellular system is enmeshed with objects, so-called massively distributed 'hyperobjects' (Morton 2013), endlessly shifting scaffolding structures, and subjects trying to make sense of it all. It includes weather patterns, weaver ants, computer programmes, billion-year-old-rocks, algorithms, mantis shrimps, transistors, maps digital and physical, [e]books and [e]libraries, street and sky. Buildings of brick, stone, wood, and concrete. Arterial roads. Bacteria, germs, viruses. Insects. Ungulates. You and I. It is composed of communication networks and the infrastructure that supports such networks. Minerals dug from the earth. The mounds of debris and rotting rubbish piled back on to it. The sand on the soles of shoes and the dirt beneath fingernails. The air people breathe. The water they drink. The waste flushed and thrown away without thought of its destination. The trees workers shade under, the oxygen that they breathe, and the crops planted and reaped that sustain them and others. The oceans, the lands and the atmosphere, and every set of relata beneath the sun and stars.

From this inconceivably dense entanglement new dialogues emerge, new manners of utterance, new speakers and listeners, now greatly spurred by the slippage of ontological friction allowed by digital communications (Floridi, 2013). It is in the interrelatedness of overlapping Umwelten (Uexküll, 1934; 2010), worlds-as-perceived, that any examination of

new forms of discourse carried by media technologies must begin. Once this is established the focus can move upwards to include not only technological objects and human sensual-semiotic interactions with them, but the human-human, human-object and object-object discourses that they facilitate.

Physical and digital information, objects and media exist as a ‘meshwork’ (Ingold 2015), an entanglement essential to the continued existence of online and otherwise silicon-mediated lives but one with an obviously unequal power relation. The digital domain is a dependent superstructure, and without a proper philosophical examination of the physical base which it lies upon, or hovers over, or clouds around, without any examination of these conditions of emergence, then this world remains unpinned and nebulous to those realities to which in truth it is fully enmeshed. Humans live in multiple, enfolded realities. Consciousness pervades the world. Yet culture, which is thankfully no longer attributed solely to the human animal, distributes consciousness, allowing the foam of neurocultural intersections to become parallel and enduring. But in order to fully understand this entanglement humans must get beyond their excess of human-centricity. As cultural heritages are remixed through technological rupture, it becomes necessary to examine what new forms of play are now made possible through emancipated reproducibility and disintermediated access to the great wealth of shared archives and museum storehouses.

While easy to get overexcited at these possibilities, it does no harm to remain fully tethered by those socioeconomic and political considerations previously mentioned. As the biosemiotic bases for networked interactions are examined, it must be remembered that, as human actions, behaviours and thoughts are mediated through what Mikhail Bakhtin (1981) calls the heteroglossic nexus of discourse and so inherently ideological, so too are the fissiparous realms of our interactions, whether the marketplaces of old or the online fora of today. Once the biosemiotic bases of human-animal-plant dwelling [and the greater entanglement with non-biological nonhumans] is established, the frame may be shifted upwards to include technological objects and sensual interactions with them, the human and non-human interrelations that they allow, and the networks that connect one with another. It will also be possible to more fully map out those qualities of objects that are ostensibly physical or digital, and in what manner these overlap.

But where to begin with such a task? How can we begin to map an ethological analysis of

human being?

At the foundation of things, physical existence itself; the many interwoven human worlds and those of our earthly companions. Animal interrelations, and human relations with them, may be as important in many ways to any media analysis as our human-to-human or human-to-machine, or even machine-to-machine, equivalents. As Jussi Parikka writes:

> An animal has to find a common tune with its environment, and a technology has to work through rhythmic relations with other force fields such as politics and economics. In this context, sensations, percepts, and affects become the primary vectors through which entities are co-created at the same time as their environmental relations (2010: xiv).

The tuning of animal with environment is a vital way of relooking at human relationships with technology, and how humans use technology not only to couple with the world but to actively design new environments and shape old ones for inhabitation. Before committing to an exploration of the technological world through the lens of human and object relations, any discussion must first look closely at how flora and fauna, and ourselves as the most intrusive, geologically disruptive megafauna, interact with environmental phenomena in feedback loops to *create* the world through the structural coupling of sensual input and material bodies.

Similarly, an examination of the wider entanglements of form, of matter and meaning, of which the universe is composed will allow a closer mapping of the figuration of human subject-object bindings and destabilise the species-ego, to see human selves as enmeshed in thicker realities than had previously been thought possible and the inherent instability of such seeming subject congruence. By viewing the differential vectors of animal-world becoming and how wildly different body dynamics allow access to differential perceptions, the radical alterities created by the human-technology interface that extend, distort and revitalise plastic modes of being can be more thoroughly examined and critiqued.

Gaps exist in the understanding of the interrelatedness of bodies, environments, technologies and information, and of the many intertwinings within them, that must be addressed before working up to more complex considerations. It gaps that this research works to consciously narrow by building bridges, knotting lines and stringing webs between disparate but relatable

methodologies and viewpoints. Indeed, much of the work has been done other than this critical interlinking of sympathetic ideas and concepts. Many of the writers discussed are connected through formal and informal lines of acknowledgement and influence, in the relations of ideas that interweave and knot around themes. A thesis such as this is a webbed structure to accentuate these links, to give the lines between them a greater solidity, and so form the initial mapping of a rhizome that will expand outwards while knotting ever inwards, creating a meshwork in the manner of what Donna Haraway (2016b) calls 'tentacular thinking.'

As previously stated, the philosophical precedes the technical, but in starting at a base level and working upwards and outwards, the philosophical will highlight the technical, the technical will highlight the social, the social will highlight the philosophical, and so on, shuttling forwards and backwards, in and out, around and around in recursive figure 8s. Matter and meaning are indissolubly connected. The intention of this thesis is to highlight the interconnectedness between matter, meaning, knowledge and being, to show how human physical existence is intimately interwoven with other existents, whether alive or not, and the technological apparatuses that scaffolds modern lives.

It explores how 'information technologies' – a hugely reductive but useful operative shorthand covering a mass of technologies and networks and ideological and linguistic concepts and interactions between people and other people and machines – are intertwined and enmeshed with the physical environment and phenomenal worlds. It will examine how modes of different interfaces – technological apparatuses or binary-coded objects or techno-ideological discursive practices – affect the manner of informational interactions, the inhabitation of virtualised spaces, and the performativity of online identities. It will further argue that, following Karen Barad (2007), any greater or altered interconnectedness via body-environment Umwelt relations facilitated by informational technological communications must be viewed and examined in ethico-onto-epistemological terms, and what ramifications this may have for ideas of the good life, on or offline. Similarly, the effects these technologies may have on senses of identity must be examined, whether the ostensible separation of the physical and digital contributes to a fractured sense of self, or whether, approaching a cyborgian congealing of bodies with technologies, such interactions and unions create a more embracive selfhood in which the physical and digital are intertwined in the flesh.

Although it covers many philosophical issues, it is not a work of hard philosophy on the digital such as Yuk Hui's excellent *On the Existence of Digital Objects* (2016), despite covering some of the same ground. It is a book I recommend for a more detailed philosophical analysis of many of the issues regarding digital ontology. In making use of ethological concepts such as Umwelt, neither does this thesis attempt to move completely past the human to examine media through the radically non-human in the way that, for example Jussi Parikka's *Insect Media* (2010) does, despite, again, covering some of the same ground. My intention is to build a broader conceptual bricolage of transdisciplinary secondary literature focused on human-technology relations encompassing the body, the environment and information flows that leads up to a first-person account of ethological, mediatic interactions conducted in the Media Archaeology Lab at the University of Colorado Boulder. This will be undergirded by an embracive description and definition of information and being within the triadic interplay of body, environment and technology from which human worlds, from which human meaning, emerge.

In defining broadly how humans exist in self-created perceptual worlds cohabiting a riotous world with other existents, I show how personal existence, how personal experience, can be used to highlight the power structures inherent in media and information technologies, and how the personal must always be returned in order to understand one's own unique being in the world, to share it but also to shade it from the glare of prying observers other than those who we gift it to. It is not a blueprint but a demonstration of possibilities that an ethological framework and methodology presents when conducting a phenomenology of media use. Don Ihde writes:

> Ecology is also relativistic, but in a more concrete and biological sense. It is the study of organisms *in relation* to their environments, *within* some specific ecological system. In short, the organism is studied in relation to its field, however simple or complex. Here again is also an analogue to a figure/ground model. The figure (organism) inter-relates with its ground (environment), and the study of this interaction is ecology. Phenomenology, particularly with respect to its existentialization of bodily existence, is a kind of philosophical ecology. But it is an ecology with one difference: The "organism" which is to be studied is not and cannot be studied "from outside" or from above because, in this case, *we are it*. The human ecology which is phenomenology is thus doubly, or existentially, relativistic (1990:25. Original emphasis).

Language is important. It defines reality. Ethological description focuses on the species level and yet as a subject I write from within that species here described. In this thesis, when I sometimes say *we*, then, I am attempting to speak about and from within a species, without subsuming one person's experience within the other or subjugating any one self to another. *We* as a common species ethologically speaking, with all the multitudinous differences contained within that demarcation. 'We are it,' as Ihde says. *We* also as belonging to animalkind. While writing from a personal point of view, it is also important, with the myriad caveats that such speaking entails, to write from a species point of view. Ethological discourse exists at the species level, but to say that any whale ethologist would therefore have to erase linguistic commonalities alongside tokens of communal being on the level of whale species is incorrect. Life and its meaning are inherently intersubjective and it is impossible to speak intersubjectively while denying plural pronouns in the pretence of a disembodied modest witness that effaces any subjectivity whether pluralised or individual. This does not mean that I alone speak for the species but as a member of that species am taking the liberty of talking to the plurality of that *specific* experience extrapolated without being universalised, which I gather from my own experience intertwined with the many other voices and viewpoints I absorb and consider and talk through, without claiming authority over. Or mastery over, in all the senses such language evokes. When I say *we* it is undoubtedly a significant liberty I take. But it is one I expect you to take also, as is your right. If it is done with care, liberty is also given and strengthened in solidarity. Your body and being in the world is your own. Your abilities or disabilities, your flesh and skin, your habits and gestures, your relationships with others human and non-human are not mine. Your struggles might be greater, or just different. I cannot speak for your particular race, gender, sex, abilities, skin, flesh, your style of being, about your being in the world as you are or were or hope to be. We cannot speak *for* one another but, respectfully and carefully, on the species level we can speak *about* one another without erasing the differences and difficulties and joys of our individual lives and identities. We speak not to differences but to commonalities, no matter the dangers such speaking presents. Each body-world is its own but it shares common interwoven environments, common languages, common technologies, a commons of being which is a biological heritage even as culturally and individually differences are beautifully diverse. We can sing together and hope for harmony in the intertwining of melodies. To recognise one another as if dipping headlights on a lonely road at midnight.

1.4 Structure

In the introduction above I have briefly laid out the parameters of the discussions to follow, the tracing of entangled lines moving towards an embracive ethological analysis. Chapter 2 introduces Jacob von Uexküll's development of the notion of Umwelt in the early twentieth century from his research on animal behaviour. The idea of the Umwelt has rippled through many areas of thinking beyond its biological origins, has filtered explicitly through the works of notable philosophers such as Heidegger and Merleau-Ponty, implicitly through the development of cybernetic thinking, and resulted in a new branch of semiotics called biosemiotics which has reconfigured how we conceive of life itself. The importance of this meaningful world-building will be discussed in terms of both human and animal worlds in order to set up later discussions for how technics and information technologies scaffold, influence and distort our Umwelten. It will discuss the development of cybernetics from closed systems to environmentally-open ones and how this has been developed by Soren Brier into what he calls 'cybersemiotics,' a consolidation of Uexküll's Umwelt and biosemiotics with second-order cybernetics. It will also discuss the idea of extended or profound embodiment (Clark 2011), which contends that the environment itself is looped into our extended cognition, that the environment is an outward loop of our cognitive functioning and takes on some of the distributed load of our informational processing.

Chapter 3 discusses the body as a phenomenological existent and as a thing in the world. For Husserl the lifeworld [*Lebenswelt*], our perceived existence and all that is contains and categorises, is derived through bodily perceptions. For Merleau-Ponty, the body and its ways of being-in-the-world demanded care and attention. To write of the body, animalhood, and the environment in the way he does shows both a empathetically ethical and ardently aesthetical appreciation for life in its manifold varieties. Moving from a discussion of themes in *Phenomenology of Perception* (1994) to *Nature* (2003) to *The Visible and the Invisible* (1968), we see the movement in Merleau-Ponty to his radical ideas of *flesh* and *chiasm*.

Chapter 4 considers dwelling in regards to Heidegger's conception in regards to human structures and the meanings they create as they alter the natural landscape. Heidegger places an abyss of meaningful dwelling between ourselves and our animal cohabitants. Following Louise Westling (2014), I argue that animal dwelling is as meaningful to animals themselves as ours is to us. As well as discussing Jeff Malpas (2017) on Heidegger and dwelling, I also

discuss Malpas's (2012) analysis of space and place.

Chapter 5 discusses the differing perspectives of technical evolution offered by the work of Ernst Cassirer (2013), Ernst Kapp (2018) and Gilbert Simondon (2017). To understand the human Umwelt, it is necessary to discuss the process of technical development and the technical milieu through the coevolution of the human and the technical. Kapp pioneered the philosophy of organ projection in the late eighteen-hundreds, which argues that tools are the afterimage of the organism, of its organs projected out into the world. For Ernst Cassirer writing in the early twentieth century, technicity combines knowledge, culture and metaphysics in a unitary domain. Yet the philosophy of technicity has not kept pace with the rapid evolution of technologies. Humans actively form the world through language and tools. Different languages speak a different reality, languages form a reality for the speaker determined by the linguistic structures inherent in it. Tools do likewise by shaping reality in different ways. Tool use allows the will to subject the world to itself, to mediate nature through action, creating distance between the subject and the objective world.

For Simondon, a gap exists between our use of technical objects and our understanding. Technical objects are not simply artificial beings but exist in a technical milieu which is the ground of being for the evolution of other technical objects through successive cycles of concretisation. Technical evolution partially mimics the natural processes of biological evolution, yet it also differs in important ways. One of Simondon's key terms in the latter half of *On the Mode of Existence of Technical Objects* (2017) is reticulation, which is a lattice or mesh pattern. The magical world is one where key-points of place and meaning formed a lattice with one another, a network of interlinked places of power and significance. These key-points are 'points of contact and of mutual, mixed reality, places of exchange and communication because they are formed from a knot between the two realities' (178). This is a key statement, I argue, allowing us to think about the knotted nature of physical and digital information, of the meshwork of significant places and moments existing both virtually and on physical servers, infrastructures, networks of human relation and electrical semiosis, composed of symbols and structures, technical ensembles and human beings who form powerful connections in places both on and offline, through interfaces, programmes, and bodies.

Part of the intention here is to show how and where the ontoepistemologies of human, animal

and mediatic informational technologies collide with the political power structures which determine categorisations of the world and of the worth of such categories. The philosophical, like the personal, *is* the political. The history of technics and technologies, digital or otherwise, and their effects on people and on the world, cannot be disentangled from their material bases. With this in mind, Chapter 6 sets out four methodological and thematic viewpoints: *diffraction*, *entanglement*, *interface* and *rhizome*. These thematic lenses help shape how the characteristics of information, infrastructures and interfaces are perceived and connected. The purpose here is to frame not only the elucidation of the issues through the richness of other writers but to show a theoretical insight into the ideas and ideologies that have personally shaped me as an author and my journey beyond this thesis process. Neither ourselves nor our theses are intellectually born *ab initio*. There is always a beginning before the beginning. In terms of the ideas that mould us and our thought processes, our viewing platforms of the world, it is turtles all the way down. Our individual Umwelt is a world of ideas as much as it is a world of perception. To move away from presenting ideas in the forms and formalities of a modest witness, academic discourses must move back to the personal in order to disrupt the contours of the genre whenever possible. Genre is a delimiting power struggle over who gets to speak, and what may be said, and in what style. Style defines the possible. Chapter 6, then, is both a methodological framing and an unframing, a chance to bring forward the plays of power under which all discourse is pinned to the floor and the ways in which information technologies enable this. It is a bricolage of the personal manifested through conceptual arousal, of an ideological alertness to power, and also a process of disassembly of the apparently natural.

Chapter 7 presents an account of research conducted at the Media Archaeology Lab at the University of Colorado Boulder. Seeking to understand the ways in which the body and its phenomenological engagement with technologies is created, I undertook research at the MAL in order to make strange my technological encounters and mediatic intertwining using an phenomeno-ethological framework. To further achieve this aim I used a digital camera combined with a manual Nikon lens, which required manual manipulation and made the auto-functions of the digital camera moot/mute.

The Media Archaeology Lab, I found, is a place to *make strange*, to invite difference and critical space into, to force open a gap between technologies and bodily engagements in techno-phenomenological encounters. The aim was not to focus necessarily on, for example,

the content of computer programs, but how the technologies framed bodily interactions in different ways, how their designs evolved or are evolving to necessitate particular interactions physical and mental, how different materials felt, were moulded into shapes that mimicked and mirrored the human body, the different sounds different keyboards made, how each technology even smelled differently depending on material and age and history. How the upsurge of my phenomenality engaged with different technological framings. The account of my time there is necessarily impressionistic because my aim was to interrogate the sensual-semiotic engagement of my body and mind and memory, the flux of the interweaving components of the self that is me, Christopher. It therefore forms a first-person ethological account. By extrapolating from this first-person research, I then attempt to demonstrate the ethological interlinking of objects and subjects in the reticulated mesh of technics, flesh and meaning.

1.5 Methodology

This project could have been configured in multiple ways in terms of researching, writing, recording through media. The intention at first was to combine literature research with expert interviews, of people in digital and information fields, in order to gather an ethnography of digital information work in cognate fields. Yet each time I approached this method, I found myself retreating. I felt that I did not well-enough understand my own relations with digital technologies, with information infrastructures, with computing systems. I hesitated.

Conducting research using a transdisciplinary entanglement of fields felt right both methodologically and philosophically. Webs of related thoughts were everywhere. Disciplines discipline. They create barrier between disciplines in order to order knowledge, to retain control, to be concise. They allow mastery but also provide limitations. My methods of reading and thinking have never been constrained to any particular subject. My mind, like my body, is a rover. Whether this leads to shallowness of understanding, I do not know. Interlinking is crucial, no matter the limitations, which I also recognise. I will never master continental philosophy or the history of computing or theoretical biology in the same way as someone who restricts their focus to one of those. But knowledge is built in different ways. There is deep focus and there is the roving kind, the kind that skips and pulls at threads, follows pathways others have trodden only to veer off into connections not yet considered, whipping up the dust. Many of the writers selected are also rovers, who tie together the

strings of thought from different fields and disciplines. Connectivity is a natural mode that is constrained by disciplinary regimens, no less in academia than other discourses. In attempting to bridge disciplines, I follow others who have tried the same.

So partly my mind naturally began pulling together threads. Yet also I felt the need for some practical aspect, to tie floating thoughts to the world. I gratefully received this advice from others more experienced than myself when I doubted what I was doing or where I was going. Life conspired, with lots of valuable assistance and kindness, to make me a fellow at the Media Archaeology Lab in Boulder, Colorado. This was a place where I could reimagine the bodily connections I form with technologies. This was a place where I could make my body and its technical engagements once-more strange, beyond the habitude of our naturalised attitudes towards technology, which veer towards invisibility through the designed steering of interfaces. Lori Emerson, founder of the MAL, makes this clear in *Reading Writing Interfaces: From the Digital to the Bookbound*:

> The MAL is, then, a kind of thinking device that enables us to tinker and to track writing-as-tinkering in early works of digital literature; providing access to the utterly unique material specificity of these computers, their interfaces, their platforms, and their software also makes it possible to defamiliarize or make visible for critique contemporary invisible interfaces and platforms (2014:xvi).

Here was an opportunity not only to defamiliarise interfaces and platforms, but to defamiliarise the platform of my body and its sensual-semiotic interfaces of skin and sight and sound. Here I could think on the machine-body rhizome that I was forming and reforming. I could reflect on the past-present motility of the body as it presses into the future. I decided early on that I did not want to present only words here. I wanted to capture images and to do so through a literal lens that was from a similar era as the MAL's holdings, a lens that was not controlled by automatic functions and so forced my body to pay more attention. The lens functioned as a literalised metaphor of mediation, creating a further critical distance in terms of physiological action and phenomenological perception. I trained this lens on the machines and their peripherals, paying attention to the orientations of physical interface technologies such as screens, keyboards, speakers and mice.

I recorded my impressions, percepts, thoughts and feelings as best I could, creating an impressionistic account. Here and there parts were tidied up afterwards where the sense was

lost, but mostly they are true to what was written in or shortly after visiting the lab. These accounts are important to include because they offer cuts into the formal academic language and its stylised structures that preclude the possibilities of certain styles of thought and feeling. Words in any one style will not capture a full reality. They will present information within the contours of possibility such styles define. I therefore found that a mixture of styles, of linguistic registers, allowed a more complete picture, a fuller account of what was attempted, of the experience.

This project therefore is a mixture of media within a proscribed medium. Over all media the body sits behind, above and below, a world straining to be seen through the veil of words.

PART 2:
BODY

Chapter 2: Uexküll's Radical Biology

2.1 Strolling with Uexküll

Descended from Baltic nobility of Germanic origin, Jakob von Uexküll lived a peaceful childhood on his small family estate in rural southwest Estonia, where he spent much of his time observing the local fauna (Brentari 2015). A student of natural sciences and then physiology at the University of Dorpat (now Tartu), researcher at various institutions such as the University of Heidelberg and the Naples Zoological Station, it was not until 1925 at the University of Hamburg where he finally found a permanent home for his research. Here he established the *Institut für Umweltforschung* [Institute for Environmental Research] from the humble beginnings of the aquarium at the Zoological Gardens. This represented greater stability for the itinerant Uexküll, whose family lands had been confiscated during the Russian revolution and his wealth in Russian bonds made worthless. It was the 1926 translation of *Theoretical Biology* that introduced the term Umwelt in a biological context to an English-speaking audience for the first time. Uexküll followed this in 1934 with his most successful and developed work, *A Foray into the World of Animals and Humans* (1934, 2010). Dismissed from his position at the university in 1936 with a small pension, Uexküll ultimately moved to Capri for his failing health, where he died in 1944.

Uexküll, whilst little known in the mainstream of critical thought, has had a great and lasting impact not only in scientific fields, and in the development of biosemiotics, but also upon continental philosophy. Thinkers such as Martin Heidegger, Maurice Merleau-Ponty and Gilles Deleuze[17] have found kinship in Uexküll through his ideas of how animals perceive, interact with, and actively create the world or, more correctly, *worlds* (Agamben 2004; Buchannan 2008). I follow their threads as I follow Uexküll. This radical and radicalising notion of the Umwelt – *um-welt*: literally, surrounding world – an animal's self-created perceptual world which comes into being through a process of what is now more commonly thought of by biosemioticians as semiotic interaction, has developed into and helped spawn a number of different specialisms, including biosemiotics and zoosemiotics. Despite Uexküll's

[17] 'Uexküll's investigations into the animal environment are contemporary with both quantum physics and the artistic avant-gardes. And like them, they express the unreserved abandonment of every anthropocentric perspective in the life sciences and the radical dehumanization of the image of nature (and so it should come as no surprise that they strongly influenced both Heidegger, the philosopher of the twentieth century who more than any other strove to separate man from the living being, and Gilles Deleuze, who sought to think the animal in an absolutely nonanthropomorphic way)' (Agamben, 2004:39-40).

lack of mainstream recognition, his important influence on more instantly recognizable cultural theorists has been noted, and the impact of his work covers a range of studies and disciplines. As Buchannan (2008) points out, the questions that Uexküll raises have been compelling to many, the baton of his work taken up by some of our most original thinkers. Uexküll's work is a challenge to those who would seek not only to understand human behaviour and the environments both natural and artificial we inhabit and create, but the very constitution of the world itself through semiotic meaning-making.

But as profound as his ethological understanding may be, Buchanan argues that Uexküll leaves the role of the body open. For Buchannan, 'it is within this interaction between body and environment that animal behavior [sic] reveals its ontological dimensions' (2008:3). Traditional Western thought conceives the body as proxy to the animal. Yet Uexküll's profound work, I argue, is a major step in understanding not only the role of the body in human inhabitation but in the co-evolution of both simple and complex tools which allow meaningful interactions and modifications to our environments. While rescuing animal biological understanding from a mechanical worldview, at the same time he opened the scope of human-animal understanding that ultimately leads to a reconciliation between human and machine symbiosis under the aegis of a symbolic cohesion of the body and sensorial tool adaptation. From this understanding of the expansion of the human Umwelt, we can discuss the profound changes wrought by information communication technologies and digital media.

2.2 The Animal Umwelt

Imagine for a moment, asked Uexküll gently of his reader, in *A Foray*, that you are strolling in a flower-strewn meadow on a sunny day. Here is a bucolic grassland filled with all sorts of life from insects to birds, to grazing cows and sheep, each surrounded by and existing within its own perceptual soap bubble. Stepping inside this bubble, through a transformative act of imagination, reveals to us a world with particular meaning for each specific animal subject, but also allows us to conceive of the phenomenological worlds that surround us too. He writes:

> Only when this fact is clearly grasped shall we recognize the soap bubble which encloses each of us as well. Then we shall also see all our fellow men in their

> individual soap bubbles, which intersect each other smoothly, because they are built of subjective perceptual *signs*. There is no space independent of subjects. If we still cling to the fiction of an all-encompassing universal space, we do so only because this conventional fable facilitates mutual communication (Uexküll, 1934:29. My emphasis).

From this point of view, the subject actively creates its own *Lebenswelt*,[18] lifeworld or living space, the place in the world, situated in the body, in which it exists and all meaningful action occurs. This 'out-there' of the world, the ground environment devoid of meaning, or *Umgebung* in Uexküllian terminology, combined with the subject's *Innenwelt*, or inner-world, creates the totality of subjective existence which Uexküll terms the Umwelt.[19] Each animal has its own non-reducible Umwelt, and these separate yet overlapping Umwelten, through their being-in-the-world, intersect and interact with one another through biosemiotic communication, through signs and codes exchanged both endo- and exo-semiotically – that is, within and between, inside and outside, bodies.

Attempting to recoup the perceptual worlds of animals and their inherent subjectivity from a mechanist perspective dominant in 19th and early 20th century scientific understanding which viewed them as soulless automatons, Uexküll attempted to explain how the perceptual and effectual worlds of internal and external stimuli and response connect in a functional circle (*Funktionskreis*), the closed loop of which create an animal's Umwelt:

> The mechanists have pieced together the sensory and motor organs of animals, like so many parts of a machine, ignoring their real functions of perceiving and acting, and have even gone on to mechanize man himself…We no longer regard animals as mere machines, but as subjects whose essential activity consists of perceiving and acting. We thus unlock the gates that lead to other realms, for all that a subject perceives becomes his perceptual world, and all that he does, his effector world (1934:6).

This connects phenomenological experience, the 'sense world' or *Merkwelt*, with how the animal responds to that perceptual world, triggering the 'effect world' or *Wirkwelt*, thus

[18] cf. Husserl 2006.

[19] 'Strictly speaking "Um-welt" means the "world around" in which animals and humans live. It can be translated in French by "Milieu." However, for von Uexküll it includes the world of things in the environment, the perceived world, the signals emitted by both the subject and the things, and the actions that can be performed by each species. Above all, it includes the significance or meaning of things for each animal, in that they are potentially participating in the survival and social relations of the animal' (Berthoz, 2009:18).

showing not only why the animal responds to stimuli, but how the subjective world of the animal is created and sustained. Organisms do not respond directly to their environments, they respond to their perception of those environments, a crucial distinction (Macinnes and Di Paulo 2005:13). The umwelt is constructed from these subjective perceptions. The functional circle is constructed by this causal circularity in which the organism continually interacts with its environment to create its world.

To demonstrate the functional circle at work, Uexküll uses the example of the simple tick.[20]

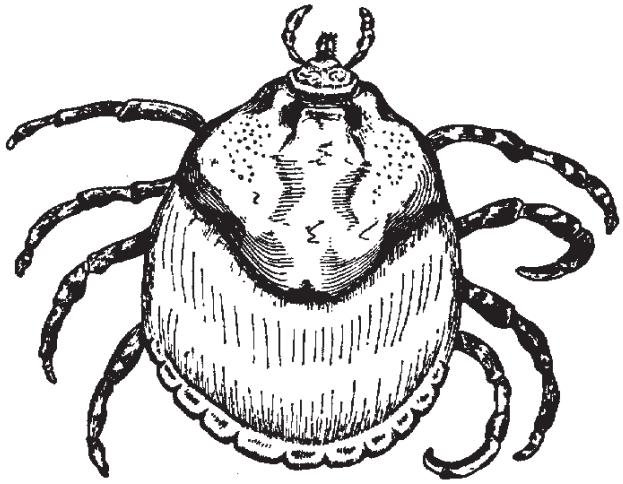

FIG. 1
Tick

Figure 3

Atop a tree branch, waiting for the right stimulus, the female tick can lie in wait for eighteen years. Although blind and deaf, it has found its way to the branches after copulation through a general sensitivity to light, and waits for the smell of butyric acid given off from mammalian skin glands in order to launch itself from the tree. If it lands on something warm, it uses its sense of touch to find a patch of hair-free skin in order to burrow down and pump itself full

[20] 'Uexküll also wanted to distance himself from a physiological and structural understanding of the bodies of animals. Such a mechanistic way of understanding interactions of the bodies and lives of animals did not capture the active, individuating ways of living in the world. So instead of seeing animals as mechanistic structures and machines, Uexküll adopted the idea that the simpler animals are, the more potential there is for undifferentiated openness in them. Hence, for Uexküll amoebas were less machines than horses, as the latter are more structurated animals in terms of their development' (Parikka 2010:65).

of blood. Lacking any sense of taste, experiments have shown that the tick will drink any liquid of the correct temperature. All that remains of the tick's life is to drop onto the ground to lay its eggs and then die.

The three functional circles produced by the stimuli of butyric acid, collision upon a target and warmth of skin are effected one after another, each, in Uexküll's terminology, extinguishing the previous perception mark and activating the succeeding effect mark, so that one careful action follows the next in an ordered sequence. These actions, he says, are no doubt reflexive, elicited by particular chemical or physical stimuli, but to say so does not solve the problem of why those three, out of all the hundreds it could possibly respond to, become meaning-bearers for the tick:

> Out of the vast world which surrounds the tick, three stimuli shine forth from the dark like beacons, and serve as guides to lead her unerringly to her goal. To accomplish this, the tick, besides her body with its receptors and effectors, has been given three receptor signs, which she can use as sign stimuli. And these perceptual clues prescribe the course of her action so rigidly that she is only able to produce corresponding specific effector cues.
>
> The whole rich world around the tick shrinks and changes into a scanty framework consisting, in essence, of three receptor cues and three effector cues – her *Umwelt*. But the very poverty of this world guarantees the unfailing certainty of her actions, and security is more important than wealth (1934:11/12).

By relying upon three certain stimuli, the tick ensures that it will be able to reproduce and so continue the cycle of death and rebirth. A seemingly impoverished world guarantees that it has a world at all. As Uexküll notes, while the tick may lie in wait eighteen years,[21] we humans cannot wait so long in stasis, each series of our moments, so he writes, being an eighteenth of a second long. That the tick can wait for such a long period uninterrupted must mean it is in a period akin to sleep or hibernation. The changeable duration of a moment,

[21] Agamben rightly questions Uexküll's reasoning on this point when he writes: 'Uexküll informs us that in the laboratory in Rostock, a tick was kept alive for eighteen years without nourishment, that is, in a condition of absolute isolation from its environment. He gives no explanation of this peculiar fact, and limits himself to supposing that in that "period of waiting" the tick lies in "a sleep-like state similar to the one we experience every night." He then draws the sole conclusion that "without a living subject, time cannot exist." But what becomes of the tick and its world in this state of suspension that lasts eighteen years? How is it possible for a living being that consists entirely in its relationship with the environment to survive in absolute deprivation of that environment? And what sense does it make to speak of "waiting" without time and without world?' (Agamben 2004:47).

being different in each animal, leads to a profound discovery with deep implications:

> What have we gained by this knowledge? Something very significant. Time, which frames all events, seemed to us to be the only objectively consistent factor, compared to the variegated changes of its contents, but now we see that the subject controls the time of its environment. While we said before, "There can be no living subject without time," now we shall have to say, "Without a living subject, there can be no time."
>
> …the same is true of space: Without a living subject there can be neither space nor time. With this observation, biology has once and for all connected with Kant's philosophy, which biology will now utilize through the natural sciences by emphasizing the decisive role of the subject (2010: 52).

This is the foundation stone of Uexküll's philosophically daring ethology; that the subject actively creates its own world and endows it with meaning through the lens of its own perspective and embodiment. Uexküll's Kantian heritage is apparent. Rather than assuming a world accurately mirrored by sensing organs in order to objectively perceive it, Kant asked whether the world as perceived was not, in fact, conforming to human cognitive architectures which actively constructed the world it assumes to be an objective representation. This world as created is limited and partial in a different manner for each species. Each organism has its own suitedness to the environment it evolves in but the aspects of environment it finds pertinent to its survival will be perceived over those it does not, its senses adapted to those aspects of the physical world crucial to its living. This suitedness:

> takes the bodily form of cognitive faculties, such as our own senses, or the often quite different sensory modalities discovered in other lifeforms [so that] those aspects and only those aspects of the physical environment which are proportioned to those modalities become 'objectified', that is to say, made present not merely physically but cognitively as well (Deeley 2001).

When a person looks upon a meadow it is their minds that form the mental picture, that create the world around them, and these representations, infused with the stochastic irradiation of memory, are as distinct for the individual as for the multitude of creatures inhabiting those biomes. The child who picks the flower does not see it in the same way as the cow who chews it or the ant who uses it as a bridge (Uexküll 2010:145).

> The fluttering birds, the squirrels leaping from branch to branch, or the cows that browse in the meadows – all remain permanently surrounded by their soap bubbles, which define their own space. Only when this fact is clearly grasped shall we recognize the soap bubble which encloses each of us as well. Then we shall also see all our fellow men in their individual soap bubbles, which intersect each other smoothly, because they are built of subjective perceptual *signs*. There is no space independent of subjects. If we still cling to the fiction of an all-encompassing universal space, we do so only because this conventional fable facilitates mutual communication (Uexküll 1934:29. My emphasis).

As he goes on to note, the confident yet misplaced conviction that there exists one time and one space for all subjects – as if time and space were solely objective quantities, a singular plenum in which all existents resided – was in his time being questioned by physicists,[22] and could, he thought, be demonstrably falsified by showing how humans dwell in three different types of space alone which interpenetrate but also slightly contradict one another; effect space, tactile space and visual space. To give a brief example of effect space, closing the eyes and moving the limbs we can trace kinaesthetically our effect space, the paths and directional steps in which we may move our extremities, controlled by the coordinate system. Close your eyes now and move your hand from left to right in front of your face and you will gain an immediate sense of the coordinate systems overlaying all bodily movement, tracking the shift from one frame to the other.

It is this coordinate system that provides 'a firm scaffolding that guarantees the order of the effect space' (2010: 56). The triumvirate of these three spaces demonstrates how humans orient themselves in terms of direction and place, and how the body and mind are firmly intermeshed and intralocated within the world and one another. Not only this, this three-dimensionality that inheres in one's perception of effect space is linked to the three semicircular canals located in the inner ear, and those animals which share the canals perceive space in this very same tri-dimensional way.

[22] 'Needless to say, Uexküll was here repeating the same realizations introduced in physics, modern art (e.g., cubism), and philosophy. He was not the only writer rethinking time and space through the nonhuman, and actually these ideas resonated with many of the emerging ideas in philosophy as well. Indeed, through various philosophies of process and radical empiricism, the world of experience was opened up much beyond the human being. Kantian transcendental philosophy of experience was extended to the world of animals and things as well' (Parikka, 2010:64-65).

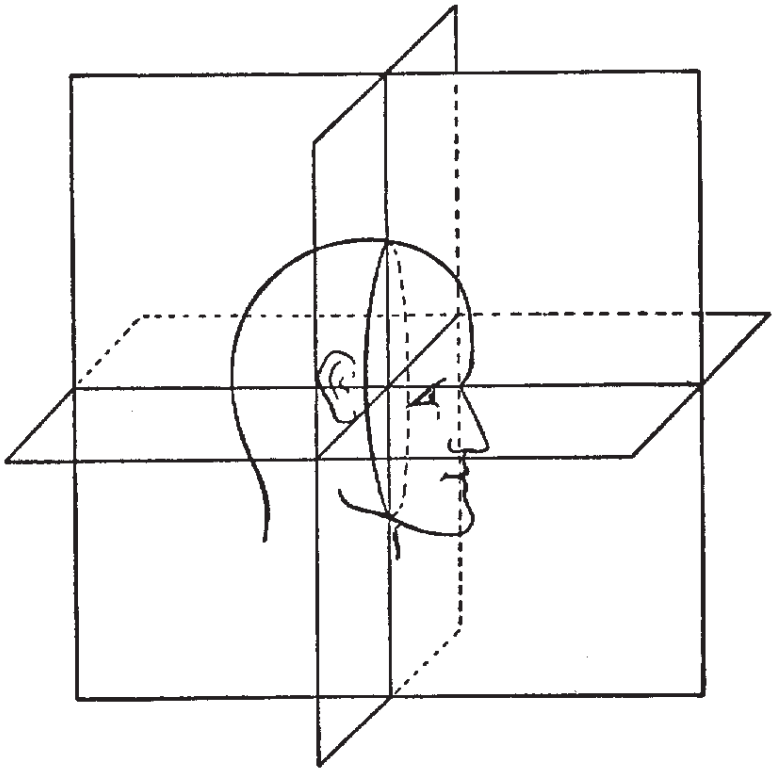

Fig. 4
The coordinate system of man

Figure 3

Berthoz (2009) argues that Uexküll was correct, that the vestibular system is a crucial element in high-level cognitive processing of our environments, to path-finding and navigation but also to the creation of a coherent self, deficiencies in which can cause a wide range of psychological issues. He draws attention to the now-established fact that the vestibular system, apart from its involvement in reflexive actions such as sight stabilisation, is also crucial in spatial orientation and plays a part in remembering paths travelled. It is involved in the body's awareness of itself and its relationship to space, and facilitates a number of fundamental body-world relations, problems with which cause perceptual difficulties. Further, it allows the juvenile body to build up an internal model of gravity in order to simulate this force and its action upon objects, orienting the body in terms of action, reaction and attraction. Such models allow anticipation and therefore an increase in the speed of neurocomputation, an obvious evolutionary advantage. For Berthoz, the restriction of the species-specific Umwelt serves two purposes, namely speed and robustness. By restricting complexity and speeding up apprehension through the processes of 'neurocomputation,'

environmental modelling and perception speeds offer a distinct evolutionary advantage. Selection for these traits over time will further narrow the channels of such environmental filters in order to increase such advantages. The cost is a reduction in complexity and holistic perception of the world. But it creates, through this process, an Umwelt. Through such sensory channelling humans, like all organisms, create a world.

As Uexküll explains, space and time become meaningful only through the distinguishing of perception marks, that is, through the separation of features which elsewise would coincide:

> Form and movement first appear in higher perception worlds. Now, thanks to experiences in our own environments, we are accustomed to assuming that the form of an object is its originally given perception mark and that movement only comes into play occasionally as an ancillary phenomenon, a secondary perception mark. That is, however, not applicable to many environments of animals. In them, moving form and resting form are not only two perception marks that are entirely independent of each other, but movement even without form can appear independently as a perception sign (2010: 79).

Compare this insight with these lines from a classic article of incipient second-order cybernetics, What the Frog's Eye Tells the Frog's Brain:

> The frog does not seem to see or, at any rate, is not concerned with the detail of stationary parts of the world around him. He will starve to death surrounded by food if it is not moving. His choice of food is determined only by size and movement. He will leap to capture any object the size of an insect or worm, providing it moves like one. He can be fooled easily not only by a bit of dangled meat but by any moving small object. His sex life is conducted by sound and touch. His choice of paths in escaping enemies does not seem to be governed by anything more devious than leaping to where it is darker. Since he is equally at home in water and on land, why should it matter where he lights after jumping or what particular direction he takes? He does remember a moving thing providing it stays within his field of vision and he is not distracted (Lettvin, Maturana, et al. 1968:234).

The frog's eyes, these researchers demonstrated, do not relay a necessarily accurate representation of reality but actively construct its reality to register only what is of interest to it. By implanting microelectrodes into the frog's visual cortex and creating what N. Katherine Hayles calls a 'cybernetic system, a bioapparatus reconfigured to produce scientific knowledge,' (1999:134), the team discovered that the maximal response in the frog's perceptual system was induced by fast, erratic movements while slow-moving and larger objects elicited little response. Its very perceptual system was therefore attuned to register its

prey, whilst ignoring those elements of the environment which held no survival benefits. Its perception of the world was restricted, funnelled only to register particular movements thus constructing only a minimally representative reality:

> As the authors noted, their work "shows that the [frog's] eye speaks to the brain in a language already highly organized and interpreted instead of transmitting some more or less accurate copy of the distribution of light upon the receptors. The work led Maturana to the maxim fundamental to his epistemology: "Everything said is said by an observer" (AC, p. xxii). No wonder the article was quickly recognized as a classic, for it blew a frogsized hole in realist epistemology (Hayles, 1999:135).

As Berthoz argues, the human brain does much the same, reducing epistemological complexity in order to more speedily apprehend those parts of the environment of interest in order to maximise neural processing, and so actively constructing its own perceptual world in a functional circle. This 'projective brain' not only emulates but simulates reality, building a perceptual world as it imposes on sensory data particular interpretive schemas or rules regarding stability, symmetry, kinematics and so forth in order to maximise the smoothness of perception through simplification of neurocomputation, thereby speeding up perceptual acuity. This top-down imposition, he argues, is a strongly selective force, determining what is and is not perceived (17).

Umwelt-creation is a dynamic relational process between organism and world-as-perceived, a centrifugal process[23] in which it projects onto the world rather than passively receives input, reflecting the world back onto itself via a meaning-endowed emulation. This inference of meaning regarding the environment is crucial both to survival and its social relations (18). It is how this world-as-perceived is endowed with meaning that is perhaps the most important and lasting point here. Uexküll says in *A Theory of Meaning* that all animal 'dwelling-worlds' are transformed by animal subjects into their environments, saturated with sign-carriers of meaning relevant to the subject itself. Even plants, he says, have immediate dwelling-worlds imbued with semiotic importance:

> The vital task of animal and plant consists in utilizing the carriers of meaning or meaning factors, respectively, according to their subjective structural plan…

[23] 'A key part of Uexküll's "technics of nature" consists of the idea that compositions or aggregates of nature are centrifugal. Although such mechanical machines as watches are always turning only toward their inner principles, which are predetermined and rely on those components (i.e., are centripetal), the "building" of an animal works as a project that always orients away from a center to the world' (Parikka, 2010:70).

> …For, in the environment of animals, every carrier of meaning is utilized through perception and effectuation. In every functional cycle, the same perception-effect process is repeated. Indeed, one can speak of functional cycles as meaning cycles whose task is determined to be the utilization of carriers of meaning…
>
> …The question as to meaning must therefore have priority in all living beings (2010: 150/151).

This is quite different from more conventional accounts of ecological dwelling. Take, for example, James Gibson's account of environment and animal perception in the now-classic *The Ecological Approach to Visual Perception* (2015; originally published 1979). Environment for Gibson is the surroundings for perceiving organisms, which he limits to animals only. Vegetation, he says, shall be treated in the same way that the non-organic world is treated by animals, as part of the landscape, akin to the physical, chemical and geological elements that make up their world. Despite this hard distinction that places plants on the abyssal side of the physical world, Gibson does concur as to the mutuality of animal and environment. Without animals there is no environment:

> The fact is worth remembering because it is often neglected that the words animal and environment make an inseparable pair. Each term implies the other. No animal could exist without an environment surrounding it. Equally, although not so obvious, an environment implies an animal (or at least an organism) to be surrounded. This means that the surface of the earth, millions of years ago before life developed on it, was not an environment, properly speaking. The earth was a physical reality, a part of the universe, and the subject matter of geology. It was a potential environment, prerequisite to the evolution of life on this planet. We might agree to call it a world, but it was not an environment (2015:4).

Environment and animal are co-constituting. This is the exact definition of the Umwelt-model of Uexküll's by-now classic ethology. Yet in the entirety of over three hundred pages not once is the term Umwelt or Uexküll himself mentioned. However, despite his neglect in some fields, in others Uexküll and his work has been rightly recognised and subsequently championed.

2.3 Biosemiotics

It is in the prioritising of the question of meaning that Uexküll has rightly been claimed by

founder of biosemiotics Thomas A. Sebeok as one of the neglected forerunners of this field. As Sebeok writes:

> Any observer's version of his/her Umwelt will be one unique model of the world, which is a system of signs made up of genetic factors plus a cocktail of experiences, including future expectations (2001: 54).[24]

Here Sebeok links semiosis with genetic makeup, experience and future-oriented behaviour to show how signs are never neutral but *qua* information must be meaningful in the triadic process of semiosis which the subject actively creates in its coupling to the world-as-perceived. Sign use and languaging are therefore fundamental to the emergent nature of the world-as-perceived in a process we might term *worlding*. "What," asks Søren Brier, "are the organizational principles (if any) of the observations or cognitions that generate living systems?"

> Organisms are more than dissipative structures; they are also self-organized. As systems they produce their own elements, boundaries and internal organization. The system, including the nervous system, is organizationally closed. All nerve cells impinge on one another. The senses have no privileged position. *Maturana and Varela contend that there is no 'inside' or 'outside' for the nervous system, but only a maintenance of correlations that are constantly changing. Thus the nervous system does not 'pick up information' from its surroundings; rather, it 'brings forth a world'* (2010: 88. Original emphasis).

This bringing forth a world through correlational maintenance is something that chimes with Uexküll's functional circle.[25] Cybernetics, a discipline concerned with the operation and

[24] The quote continues: 'A complicating fact of life is that the bare act of observation entails a residual juncture that disturbs the system being observed. The essential ingredient, or nutriment, of mind may well be information, but to acquire information about anything requires, via a long and complex chain of steps, the transmission of signs from the object of interest to the observer's central nervous system. Its attainment, moreover, takes place in such a manner that this influential action reacts back upon the object being observed so as to perturb its condition. In brief, the brain, or mind, which is itself a system of signs, is linked to the putative world of objects, not simply by perceptual selection, but by such a far-off remove from physical inputs - sensible stimuli - that we can safely assert that the only cognizance any animal can possess, 'through a glass, darkly,' as it were, is that of signs' (2001: 54). This is an interesting point and one that will need further discussion.

[25] 'Every environment is a closed unity in itself, which results from the selective sampling of a series of elements or "marks" in the *Umgebung*, which, in turn, is nothing other than man's environment. The first task of the researcher observing an animal is to recognize the carriers of significance which constitute its environment. These are not, however, objectively and factically isolated, but rather constitute a close functional—or, as Uexküll prefers to say, musical—unity with the animal's receptive organs that are assigned to perceive the mark (Merkorgan) and to react to it (Wirkorgan)' (Agamben 2004:41).

control of systems, entered into maturity in its second wave when its focus shifted from merely observing systems to including the observer as an essential and ineluctable part of the system being observed. Humberto Maturana with Francisco Varela argued that the world is composed of autonomous and "informationally closed systems" (Hayles, 1999:10) which through a process of autopoeisis, literally self-creation, create and sustain themselves through self-organisation, the environment merely setting off changes predetermined by the system's organisation. N Katherine Hayles is critical of this stance, and says:

> Autopoiesis…changes the explanation of what circulates through the system to make it work as a system. The emphasis now is on the mutually constitutive interactions between the components of a system rather than on message, signal, or information. Indeed, one could say either that information does not exist in this paradigm or that it has sunk so deeply into the system as to become indistinguishable from the organizational properties defining the system as such. (1999:10-11).

Hayles is right to be critical of an isolationist autopoiesis, as this self-creation or bringing forth of a world is still fundamentally reliant on the existence of the Uexküllian 'out there', the informational flux of phenomenal stimuli that creates the data points on which the world of a subject must needs map against. Humans do not live in such a vacuum, nor are they closed-off from the world in terms of organismic make-up.[26] Flesh and feeling are a unified melody[27] dependent every millisecond on the universal multitude for their ever-changing form:

> Uexküll for his part used the idea of "emergence" to differentiate between the mechanical understanding of structures and the inert forces of physical nature. The Estonia-born ethologist thought an animal is to be considered a dynamic and living entity; it is always more than its bodily mechanism, which is built from the

[26] 'Much as the concept of autopoiesis has helped in establishing the understanding of the self-asserting capacity of cybernetic systems it may nevertheless have tended to overshadow the semiotic aspect of life (Brier 1992, 1995, 1996). Self-production and self-reference is only half the story, the other half is other-reference or representation (and, in fact, other-production cf. e.g. Griffith and Gray 1994). A single genome and a single organism is just one instant in a grand historical process stretching billions of years back in time, and nothing in the cell or the organism makes sense if not seen in the perspective of the organizing influence of this deeply semiotic process.' (Hoffmeyer 1998:2).

[27] 'The biological world of animals and their environments consists of an artful play of interconnections, to the degree that one organism is necessary for understanding an other. The Umwelten of organisms are therefore not simply closed spheres, as if locking the organism within a self-concealed and isolated container. The animal is not an object or entity, but a symphony underscored by rhythms and melodies reaching outward for greater accompaniment. Individual Umwelten are necessarily enmeshed with one another through a variety of relationships that create a harmonious whole' (Buchannan 2008:28).

> constitutive parts of cells and "formation building orders" (Formbildungsbefehl). Instead, life is music and melody, a curious kind of understanding of material forces (Parikka, 2010:69).

Humans gain signals from the sensible world via sense organs and it is this throughput that is configured by the construction of physical selves as evolutionarily determined. The form of the signals that can be received is thus delimited or filtered by the flesh, nerve and neuronal networks with which bodies interface with the world-as-data-stream. I write 'world-as-data-stream' as Uexküll would argue that there is no world other than that created by the body combined with environmental data, the 'out there' a differential-generating component in the makeup of the world for that organism, an influx of data grafted into the resulting Umwelt. No world exists but through the flesh, and no world exists independent of the subject[28]:

> When framed in this way, an organism is never just one. Instead, each organism has a context, an Umwelt in which it lives, and, in being so, the organism is always already more than itself. It is the notion of the animal as "subject," then, that is precisely at issue. To know the organism requires knowing its other(s). But to what degree is the other, as other, a part of the subject? Where, in other words, does the subject begin or end, and likewise the environment?' (Buchannan 2008:29).

The physical body remains the core of its excursion into the world-as-data-stream. Without embodiment there would be no communication and therefore no information recursion through bodily autopoiesis and structural coupling (Maturana 2002) of organism with environment, which adapting the anthropologist Gregory Bateson is considered from a 'cybersemiotic' perspective as a difference which makes a difference *to a subject* (Brier, 2010). As Wexler (2006) puts it:

> The relationship between the individual and the environment is so extensive that it almost overstates the distinction between the two to speak of a relationship at all…The brain and its sensory processes are no exception. Sensory input is always a physical interaction with the environment (Brain and Culture – Wexler 2006:39).

[28] 'In reality, the *Umgebung* is our own *Umwelt*, to which Uexküll does not attribute any particular privilege and which, as such, can also vary according to the *Umwelt* point of view from which we observe it. There does not exist a forest as an objectively fixed environment: there exists a forest-for-the- park-ranger, a forest-for-the-hunter, a forest-for-the-botanist, a forest-for-the-wayfarer, a forest-for-the-nature-lover, a forest-for-the-carpenter, and finally a fable forest in which Little Red Riding Hood loses her way' (Agamben 2008:40-41).

The world, according to what Brier has termed '*cybersemiotics'*, becomes meaningful and information gained through a triadic Peircean interplay of object, sign and interpretant combined with self-referential second-order cybernetics. In an attempt to define an integrative field of cybersemiotics, Brier combines these ethological and phenomenological perspectives with those of cybernetics and the triadic semiosis of the American philosopher C.S. Peirce in order to provide a framework in which we may further intermesh the poles of living and non-living systems, of biological and non-biological informational existents.

Before discussing the cybersemiotic perspective, it would be worthwhile breaking down the term and asking: What *is* semiosis?

A deceptively simple question that one might simply answer: the creation and interpretation of signs. If semiosis, as Sebeok claims, is "[t]he phenomenon that distinguishes life forms from inanimate objects" (2001:3), then it leads to the further thought that life itself is defined by semiosis and that it is, perhaps, its most unique or base constituent. For if signs in their multiplicity create the language of life, the code by which life is emergent, if such semiotic patterns determine existence, then it is through language, in its broadest sense of meaningful communication, that life unfurls itself from the abyss of mechanism. This languaging is instinctual, and to re-coin an old phrase, is true to life, as life cleaves to it in the strictest sense. Signs are the vehicle of communication, one directional half of the phenomenological framework upon which incoming data is grafted to create a fluctuating informational model of the world-as-perceived. Signs are difference and difference is pattern insofar as it is a distinction between alternative possibilities to a subject. And as far as life and semiosis are considered co-extensive, the difference is crucial:

> The suggestive value is always working in the context of a life form, both in biology and in human cultural life. The key to the understanding of understanding and communication is that both animals and humans live in self-organized *Umwelten*, which they not only project around themselves but also project deep into their systems. I can these *signification spheres.* The organization of signs and the meanings they attain through habits of the mind and body follow from the principles of second-order cybernetics, in that they produce their own *Eigenvalues* of signs and meanings, and thereby their own internal mental organization, which is then projected onto the environment (Brier 2010:100).

As Maurita Harney (2007) states, the fundamental position in the field of biosemiotics is that all organisms are inherently and profoundly engaged in sign exchange and signification processes. Semiotics, the study of these processes, was developed philosophically by Peirce, who saw the process as a triadic relationship between a sign vehicle (*representamen*), its object and the interpretant, i.e., its representation in the mind. Peirce explains it:

> A sign, or representamen, is something which stands to somebody for something 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. That sign which it creates I call the interpretant of the first sign. The sign stands for something, its object. It stands for that object, not in all respects, but in reference to a sort of idea, which I have sometimes called the ground of the representamen (1955:99).

Harney argues that that which is now considered semiotic behaviour and what may practice it is today greatly expanded. No longer is meaningful sign exchange talked of solely between humans or the 'higher' worlds of animals, but even between plants:

> Peirce claimed that "the universe is perfused by signs, if not entirely composed of them" (CP 5.448n), thereby indicating that the locus of meaning in the case of the sign is not the human mind, but rather processes in nature. In biosemiotics, the focus of pioneering work was ethology, or communicative behavior in animals, but more recent development have extended semiotic inquiry to the entire life sphere. Indeed Peirce himself suggested that a plant's interaction with sunlight might be understood as semiosis: "Thus, if a sunflower, in turning towards the sun, becomes by that act fully capable, without further condition, of reproducing a sunflower which turns in precisely corresponding ways towards the sun, and of doing so with the same reproductive power, the sunflower would become a Representamen of the sun . . ." (CP 2.274). (2007:134).

However, human sign-making and human existence, he thought, were interlinked. For Peirce, 'phaneroscopy' and semiosis are interlinked and indissoluble.[29] He believed that existence was comprised of three modes, which he termed Firstness, Secondness and Thirdness. Firstness is independent being, what exists before all else. Secondness is that which is relative

[29] 'What I term *phaneroscopy* is that study which, supported by the direct observation of phanerons [ideas] and generalizing its observations, signalizes several very broad classes of phanerons; describes the features of each; shows that although they are so inextricably mixed together that no one can be isolated, yet it is manifest that their characters are quite disparate; then proves. beyond question, that a certain very short list comprises all of these broadest categories of phanerons there are; and finally proceeds to the laborious and difficult task of enumerating the principal subdivisions of those categories' (1955:75).

to other things, what reacts to other things. It denotes a *something else* to exist with, a propositional mode, that is, in relation to or with. Thirdness is that mode of mediation, the relation between firstness and secondness. Firstness, which is monadic, is equivalent to qualia. Think of wetness, hardness, or redness, for example.[30] Secondness, which is dyadic, is the brute reality of existence, that is, fact or experience. Thirdness, which is triadic, is the mediation between Firstness and Secondness, or that which produces laws and continuity, what Peirce called *synechism*.

To exist meaningfully, which in a world of information as [meaningful] differentiation is the same thing as saying *to exist*, is to create spheres of signification both inter and intra-corporeally, triadic relations within and between bodies, communities of sign-saturated *flesh* enclosed in feedback-loops[31]. These significant and signifying spheres, whilst looping, emanate outwards, latch onto other existents, experiencing perturbations not in the closed-off sense that Maturana and Verela would imagine, but through the ecstatic creativity of sign-play from cellular interactions upwards, the structural coupling of game players generating meaning through interactivity 'within the hypercomplex structure of the environment itself' (Brier, 2010: 325). This 'hypercomplex' environment is overlaid by the human social-communicative system, a system based upon representational behaviours that facilitate communal mediation between selves and shared environments, that is, the interleaving of subjective existences called community:

> In human speaking and the development of writing, our cultures have found a way of catching some of this pregnancy and vibration in the mesh of self-reflexive articulation. Each of us enters into this texture of linguistic culture as an infant awakening out of silence by babbling and interacting with our caregivers, gradually participating in a "language-thing" that is a formal part of the phenomenal world and lies at the heart of literature and philosophy (Westling 2014: 120-121).

Humans are symbol manipulating animals. We use non-denotative language infused with multiple meanings both present and residual. Language is both incredibly current and

[30] 'The mode of being a redness, before anything in the universe was yet red, was nevertheless a positive qualitative possibility. And redness in itself, even if it be embodied, is something positive and sui generis. That I call Firstness' (1955: 76).

[31] 'In *Theoretical Biology*, for instance, Uexküll suggests that we can and probably should consider the organism as resembling a community of subjects just as much as we think about a community or city like a large organism. This suggestion is not far off from various theoretical positions in the sciences today. The importance of boundaries in the ontological distinction of living beings is not necessarily new, but it is no less remarkable in this instance' (Buchnnan, 2008:29).

archaeological in nature. Of course, that is not to claim that nature and culture are opposed, but rather that one overlays the other like skin upon flesh, giving form, boundary and tactility, as well as a basic form of protection from the raw immediacy of existence. Nor is it to say that this utility divides humans from the rest of the animal kingdom, that an insuperable gulf has opened between us and we can but cry out to each other in mutual incomprehension.[32]

2.4 Cybernetics and Environment

As Michael Mahoney (1988) argues, the history of computing as a technology falls into a tripartite structure that must be considered when seeking to evaluate the factors in the evolution of digital technologies. Computing, he says, like the computer itself, is not one thing but many different things, and to talk in the singular is to fall prey to a conceptual error:

> There is about both terms a deceptive singularity to which we fall victim when, as is now common, we prematurely unite its multiple historical sources into a single stream, treating Charles Babbage's analytical engine and George Boole's algebra of thought as if they were conceptually related by something other than 20th-century hindsight. Whatever John von Neumann's precise role in designing the "von Neumann architecture" that defines the computer for the period with which historians are properly concerned, it is really only in von Neumann's collaboration with the ENIAC team that two quite separate historical strands came together: the effort to achieve high-speed, high-precision, automatic calculation and the effort to design a logic machine capable of significant reasoning (Mahoney 1988).

This historically-conjoined double nature mirrors the bifurcated origins of hardware from Blaise Pascal to the ENIAC and software from Leibniz to Turing, one the history of technology and the other the history of mathematics. The UNIVAC, the first stored-program computer, conceived and built by ENIAC designers J. Presper Eckert and John Mauchly, began to close this gap (Ceruzzi 2003). Yet despite their conjoining under a common rubric

[32] There cannot be reciprocal exclusion between continuity and discontinuity, because the progressive complication of given functions may turn, at a certain point and with certain conditions, into a "critical" restructuring [. . .]: the characteristics of human language can be explained with gradually progressive skills in the interpretation of meaning, which – at a certain point – reached a certain threshold, interact among themselves forming a completely novel situation, which is anyway still explainable with a gradual evolution of its single components. Semiosis is the result of an interaction between a subject and an object, between a structure and a counter-structure, between a receptor and a carrier of meaning. These two parts are in constant and reciprocal informational exchange. In fact, the exchange itself is the real generator of any semiotic phenomenon, since the latter would simply not exist if the subject was not affected by it and did not affect it. Any zoosemiotic research, from pheromones to whale songs, should take into account such a conception, otherwise it risks perverting the essence of the phenomenon of semiosis itself' (Martinelli 2010:28).

and physical artefact, they remain separated as technological object and mathematical operator, or at least their separateness is treated as a de facto split both amongst professional and lay users. This is an issue, Mahoney argues, that only deepens when considering the programming and production of software which lies in a middle zone as interface between the mathematical symbology and the electronic circuit boards allowing their operation: 'Unlike the extremes, the middle remains a craft, technical rather than technological, mathematical only in appearance.' From this split emerges this third, conjoining, strand of computing concerned with code and its programming, yet to view these strands as separable rather than as entangled parts of a larger system is a mistake. To link them under a unitary system highlights, rather, their mutuality, a relationship between internal and external components that may vary historically and geographically but maintain still a particular homeostasis while the system itself evolves:

> Seen in that light, the relation between hardware and software is a question not so much of driving forces, or of stimulus and response, as of constraints and degrees of freedom. While in principle all computers have the same capacities as universal Turing machines, in practice different architectures are conducive to different forms of computing (Mahoney 1988).

This chimes with Maturana and Verela's applicably analogous notion of correlative maintenance and autopoiesis that dictates an individual organism's homeostatic life processes under degrees of constraint and freedom while allowing for gradual species evolution. While the individual is phylogenetically constrained by the finitude of its existence, morphological freedom lies in the historicity of genetic drift producing a great diversity of evolutionary forms.

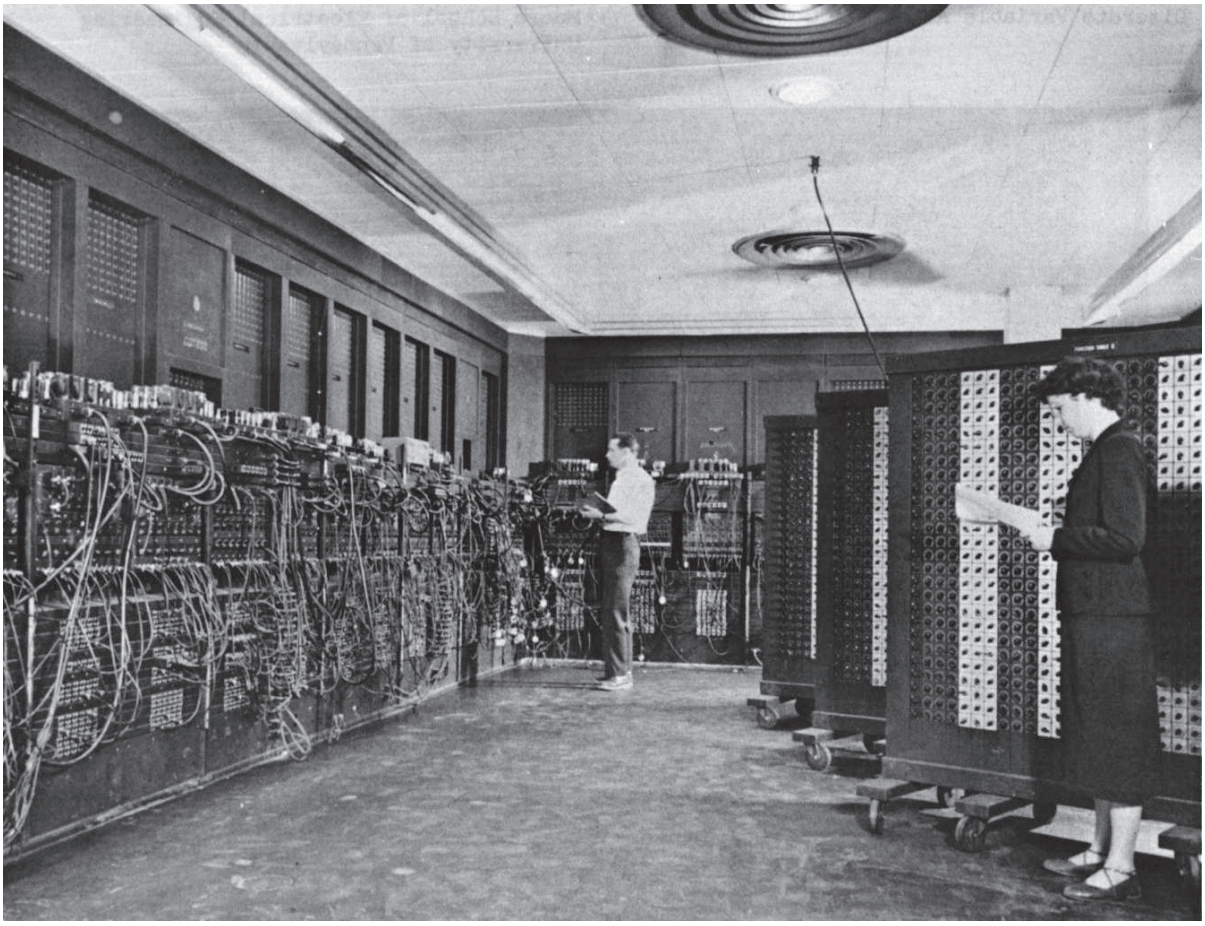

Fig 5 The entangled ENIAC.

Maturana and Verela's work is the direct offspring of the frenzy of cybernetic thought and experimentation that proliferated after the second world war, most notably with the publication of Norbert Weiner's *Cybernetics: Or Control and Communication in the Animal and the Machine* in 1948 and the series of Macy Cybernetics Conferences running from 1946 to 1953. Stemming from his scientific work on the development of automated antiaircraft fire during the war, Weiner's advocacy for this wide-ranging interdisciplinary approach to the symbiosis of human and machine, and system with environment, traversed information and communications theory, biological evolution, theories of the organism and its homeostatic mechanisms for survival, physical processes and entropy, neuroscience and developing digital notions of brain function, electrical engineering, machine-learning, and applied and theoretical mathematics. Its three main tenets were control, feedback, and this startling intertwined relationship between human and machine:

> The third core idea of cybernetics described a tight relationship between humans and machines. In the antiaircraft predictor project, the enemy pilot was recognized as effectively forming a single entity with the bomber, behaving like a "servo-

> mechanism" as the team at MIT had noted already in early 1941. It wasn't just the plane and the pilot that formed a servomechanism. Even the antiaircraft gun behaved as a "dynamic system," composed of multiple human operators and complex mechanics joined in the struggle against entropy (Rid 2016:49).

A system's interactions with its environment gives it a degree of control over that environment – environmental data is received through input and it controls the environment through output, allaying entropic disorder and the loss of information through this feedback loop. Feedback gives information about actual rather than expected performance, activating through negative feedback to cease whatever action the system is performing and stabilising at the desired state, a mechanic kinaesthesia akin to the human body. It probes the world continually to achieve a stable state. Entropy, of course, is destabilising, but life cleaves to the opposing direction:

> But while the universe as a whole, if indeed there is a whole universe, tends to run down, there are local enclaves whose direction seems opposed to that of the universe at large and in which there is a limited and temporary tendency for organization to increase. Life finds its home in some of these enclaves. It is with is point of view at its core that the new science of Cybernetics began its development (Weiner 1989).

In *The Human Use of Human Beings* (1989) first published in 1950, Weiner expands on his original conceptions of communication and control of machines and environment, adjusting the focus to include the human-machine-environment hybridity cybernetics hoped not only to describe but to develop into a new science of behaviour, information and machine-learning. Humans, he writes, are *immersed* in the world. The sense organs perceive the world while the brain and nervous system co-ordinate, store, collate, select and process this information until they stimulate the muscles to act upon the world and to send information back through kinaesthetic organs (1989:17). Information is the key to this process, not only for directing future action but for living in the modern environment:

> Information is a name for the content of what is exchanged with the outer world as we adjust to it, and make our adjustment felt upon it. The process of receiving and of using information is the process of our adjusting to the contingencies of the outer environment, and of our living effectively within that environment. The needs and the complexity of modern life make greater demands on this process of information than

> ever before, and our press, our museums, our scientific laboratories, our universities, our libraries and textbooks, are obliged to meet the needs of this process or fail in their purpose. To live effectively is to live with adequate information. Thus, communication and control belong to the essence of man's inner life, even as they belong to his life in society (18).

As human, so machine. Wiener contended that both person and modern machines were 'precisely parallel in their analogous attempts to control entropy through feedback' (27). Both have sensory receptors and special apparatuses to collect information which then becomes available to direct action or other operation. Both interpret external information, the raw influx of data, into usable information 'whether it be alive or dead', which is then available for reuse in informationally-controlled performance by effector organs. Both report back actual rather than intended performance to the 'central regulatory apparatus':

> When I compare the living organism with such a machine, I do not for a moment mean that the specific physical, chemical, and spiritual processes of life as we ordinarily know it are the same as those of life-imitating machines. I mean simply that they both can exemplify locally anti-entropic processes, which perhaps may also be exemplified in many other ways which we should naturally term neither biological nor mechanical (32).

This was perhaps an attempt to insulate cybernetics from accusations of treating cybernetic machines as fully akin to living creatures. Yet the reverse of these positions offers the more powerful critique of cybernetic thinking. As Rid (2016) explains, Wiener's tendency to anthropomorphize machines and their inner workings conversely 'mechanized man by using machine comparisons to understand human physiology' (49). This is a justifiable critique. However, cybernetics as a field was approaching a more fundamental crux that could indeed shed light on the relationships between organisms and environment by way of demonstration by simple machine, and would have a lasting influence on the direction that cybernetic thinking would take.

Psychiatrist and chief researcher at Barnwood House sanatorium, Ross Ashby's 'homeostat' was designed as a basic 'brain' whose function was to maintain homeostasis, to return to a state of equilibrium whenever its environment was disturbed. In his journal on December 28 1946 he wrote:

> I have devised a Unit…Its principle is that it uses multiple coils in a milliammeter & uses the needle movement to dip in a trough carrying a current, so getting a potential which goes to the grid of a valve, the anode of which provides an output current (Ashby 1946)

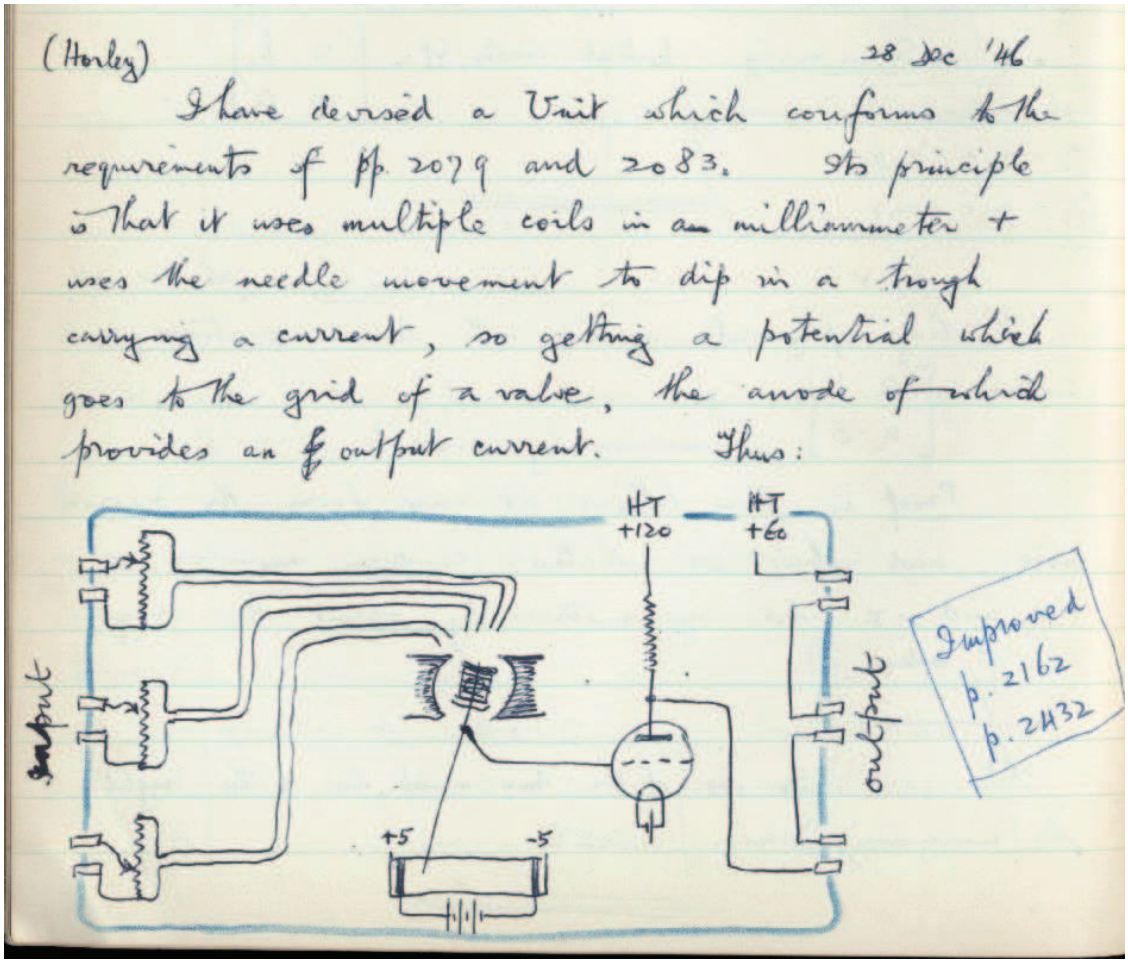

Figure 5

In much-simplified terms, the homeostat consisted of four independent yet electrically interconnected units, its four needles dipped in current-carrying water troughs, with resistance selected from twenty-five random settings. Any disturbance in one or more of the four units would cause electrical feedback to the other units causing either stable or unstable states, the disturbances cycling through various sequences until each unit found a stable state, with the needles returning to the centre of each trough, thus performing environmental feedback and control. The units, while inert in isolation, once paired with one or more other units developed 'interconnected, dynamic feedback interrelations…as the outputs of each unit

fed as input to the others and thence returned, transformed, as input to the first, on and on, endlessly around the loop' (Pickering: 2010: 104). No matter the configuration the homeostat could return to a state of dynamic equilibrium through a process of random reorganisation.

Yet this prototype brain demonstrated a particular cybernetic definition of that organ, adaptation. The brain, for cyberneticists, was a fundamentally embodied organ, not something that could be extracted and bodiless but intrinsic to the organism's physiological awareness and adaptation. Knowledge is important to survival but it is the ability of the brain to adapt, to react situationally, that is paramount. Therefore by design, 'the cybernetic brain was not representational but *performative*, as I shall say, and its role in performance was *adaptation*' (Pickering 2010: 6).

It is this notion of adaptation to the environment, 'finding and maintaining a relation of dynamic equilibrium with the world' (98), that was key to the development of cybernetics along the particular path the discipline took, and a controversial notion of the environment-body dynamic suggested by Ashby that was not welcomed with enthusiasm, at first, by querulous quarters of the radically interdisciplinary yet often conservative cybernetic-minded community. The Macy conference held from March 21-22 1952 was a fraught affair.[33] Ashby was invited by Weiner to present his research on homeostasis at the Bleeker Hotel in New York, although Weiner was unable to attend on that occasion. Anthropologist superstar couple Margaret Mead and Gregory Bateson did attend, alongside other important figures in the history of cybernetics such as Warren McCulloch.

It was Ashby's contention that the separation of body or system from environment was not as clearcut as conventional thinking allowed. Homeostasis was the mechanism by which an organism or system kept itself alive in a hostile environment, yes, but the homeostat that

[33] Much like the preceding and following conferences, which Pickering points to as one of the differences between American and British histories of cybernetics, with the American style suiting a more combative environment: 'This theme of having fun is another that runs through the history of British cybernetics and again presents a stark contrast with that of cybernetics in the United States, where the only fun one senses in reading the proceedings of the Macy Conferences is the familiar and rather grim academic pleasure of the cut and thrust of scholarly debate. The chairman of the meetings, Warren McCulloch (2004, 356), recalled: "We were unable to behave in a familiar, friendly or even civil manner. The first five meetings were intolerable. Some participants left in tears, never to return. We tried some sessions with and some without recording, but nothing was printable. The smoke, the noise, the smell of battle are not printable." Of the many conventional boundaries and dichotomies that British cybernetics undermined, that between work and fun was not the least' (Pickering 2010: 56).

Ashby had invented represented *both* system *and* environment simultaneously – any of the four units could provide the environment that the others had to adapt to in an instantaneous signal-and-response dialectic, meaning the machine was, Ashby argued, alive, able to learn and change its behaviour. This duality without formal separation was a fundamental insight for cybernetics (Rid 2016: 59). The idea of the fluidity between organism and environment, while difficult for some such as Justin Bigelow to accept, was nevertheless revelatory for others such as Gregory Bateson:

> Nature, Bateson thought, also didn't distinguish between organism and environment, yet it learned…For Bateson the conclusion was obvious. Survival wasn't a problem for just the organism or the mechanism. Survival was also a problem for the environment – especially "these wibbly-wobbly environments," he said vaguely. Bateson's thoughts galloped. This discussion with Ashby would mark one of two defining moments in Bateson's life, as he realized only later. Over the next two decades the anthropologist would explore the wholesome power of cybernetics and spiritually rearticulate the idea for the next generation (Rid 2016:60-61).

Yet although Bateson in many ways was a leading articulator of the cybernetic view of life, it was not a world view that, once formed, remained unquestioned, but instead was subject by Bateson to a lifelong interrogation. As his daughter Mary Catherine Bateson recalled, Bateson's experiences in the war left him feeling ultimately useless and with the opinion that applied social science was inherently dangerous (Bateson 1984: 176). The beginning of Bateson-senior's emergence as a vocal participant of the 60's counterculture movement began with his organisation of a week-long interdisciplinary conference in Gloggnitz, Austria in 1968 that gathered experts in many disciplines, including Warren McCulloch, by then part of the 'grandparent generation, one of the elders of cybernetics from whom Gregory felt he had learned most, his craggy bearded face already prefiguring his death' (181). The conference, 'The Effects of Conscious Purpose on Human Adaptation,' was hosted at the picturesque castle of Burg Wartenstein, which served as the European conference centre for the Wenner-Gren Foundation for Anthropological Research. The effect of the conference surroundings, a fortressed castle on hills overlooking rich woodland and farmland, gave an urgency to the proceedings, the aim of which was to discuss the dangers of modern human life to the ecosystem, whether pollution or nuclear disaster:

> The conference was called to discuss a single ominous proposition that Gregory had

> formulated. As Tolly [Holt] said, it had "the form of a scientific question but the substance of a warning cry." "*That the cybernetic nature of self and the world tends to be imperceptible to consciousness, insofar as the contents of the 'screen' of consciousness are determined by considerations of purpose.*" (Original emphasis. 182).

Bateson's contention, long-developed, was that perceptions and physical phenomena are not identical and that the perceiver is by necessity unaware of the transformations of the former into the latter in the process of creating mental pictures. For Bateson, consciousness provided a particular form of perceptual distortion that made the world seem to work in a linear, sequential fashion, from A to B to C, when, as subjects, we have little idea of the proliferation of effects each step causes:

> What the senses report to the screen of consciousness is not a physical object existing in the physical world, but a series of differences, from which a mental map of existence is constructed – but the map is not the territory (182).

Ashby's notions of the fluidity between body and environment were influential on the direction of cybernetics, but, like many great insights, it was not an idea that developed once or in isolation. Uexküll's ethological insights into the nature of the animal-environment intertwining also presaged the uptake of such ideas amongst not only biologists, but philosophers and theorists with diverse backgrounds and research interests. Consider the following passage from Ashby; it could be taken directly from a work by Uexküll:

> [C]onsider a butterfly and a bird in the air, the bird chasing the butterfly, and the butterfly evading the bird. Both use the air around them. Every movement of the bird stimulates the butterfly's eyes and this stimulation, acting through the butterfly's nervous system, will cause changes in the butterfly's wing movements. These movements act on the enveloping air and cause changes in the butterfly's position. A change of position immediately changes the excitations in the bird's eye, and this leads through its nervous system to changed movements of the bird's wings. These act on the air and change the bird's position. So the processes go on. The bird has as environment the air and the butterfly, while the butterfly has the air and the bird (1960: 37).

Such biologically-influenced cybernetic ideas and systems thinking were a direct outcome of the interdisciplinary collaborations that arose through necessity during the combat across Europe, Africa and the Pacific. By dismantling the artificial barriers between disciplines both theoretical and practical, between scientists, soldiers and engineers both during this conflict and in the following cold war with the Soviet Union, these groups and those influenced by them saw a new world of holistic informational actors, a system of informatics, infrastructures and institutions webbed through social and natural phenomena (Turner 2006:4). Yet as Turner points out, it was at the local, laboratory level, the level of experimentation, that the spirit of collaboration and crossover work flourished, while the products of such labour, from digital computer to atomic bomb, were controlled by rapidly expanding, rigidly hierarchical governmental bureaucracies.

What has the legacy of cybernetics left us with? Pearce (1993), as many others do, argues that humans work on a yes-no model, like the computer. [34] This brain-as-computer is a common trope. But it is not true. The organism has chains of decisions, yes, but this is subsumed within a constant probing that also says maybe, maybe, maybe, what if, what if, what if. Humans live in the interrogative mode. The sensual mode. The difference between first-order and second-order cybernetics lies in the difference between observed and observing, between recognising the observer as part of the system being observed, that the observer is situated within a world and therefore observes it from a particular, limited perspective. There is no omniscient view from which to observe a system. All knowledge is situated, which leads to the intense cybernetic focus on epistemic issues. As Merleau-Ponty argues in *Eye and Mind* (1964), to treat scientific observations of the world as if the perspective of the scientist were absolute and unbiased is to fall into this epistemic trap, as if being was that which was observed in a laboratory setting. This kind of absolutism is an artificial construction, an operational mode of thinking that reduces the world to preformed vectors, an ideological construction reproduced under cybernetic thinking which produces a human being as a kind of informational machine. This kind of constructionism through abstract indices that lends itself to the artificiality of the cybernetic modelling process leads to ‘a cultural regimen where

[34] ‘We model the world in terms of direct experience of our own minds and bodies, for we have no other way of doing it. Among other things, this explains why scientific models of explanation or classic structuralist theories like those of Levi-Strauss invariably take the human body as their basic paradigm: the ecology of a pond for example…the computer works on a yes : no model like we do’ (Pearce, 1993: 43).

there is neither truth nor falsity concerning man and history, into a sleep, or a nightmare, from which there is no awakening (Merleau-Ponty 1964:160).

Cybersemiotics, as conceived by Brier, is the integration of second-order cybernetics, which as noted accounts not merely for the system but for the observer as part of the system being observed, with the triadic semiosis of Peirce, and the notion of the autopoietic as postulated by Maturana and Verela:

> In this new second-order cybernetics, information is perceived as something that an outside observer would note as a creation within the living system, one that occurs when an autopoietic system creates structural couplings in reaction to constant perturbation from the environment (Brier 2010: 326).

The cybersemiotic approach uses Uexküll's notion of the Umwelt as a framework to integrate the other elements, and here we can clearly see the sympathy of these ideas, the difference lying in the openness which the semiotic side of the equation gives to the informational-processing of the organism that a strict autopoieticism would deny. Spanning disciplines integrates the information-processing paradigm with the meaning-oriented biosemiotic world-creation of the animal, "an evolutionary process theory [which] integrates the objective informational and the meaningful semiotic aspects of cognition and communication":

> The point of departure of Cybersemiotics is, minimally, an intersubjective, dialoguing dyad of concrete individual human beings with a social-communicative, embodied semiotic mind–with a common language faculty and a consciousness–they are 'the observers put into the observed' of second-order cybernetics. From this basis we obtain knowledge in four irreducible dimensions of reality: the physico-chemical natural world (energy, information, and matter), the biological world of embodied experience (life), the psychological world of conscious experiential mental life (consciousness), and the socio-cultural world's intersubjective actions and communications (language and meaning). Thus, although we live in one universe, we also in some sense live simultaneously in four different 'worlds' (Thomsen 2010:391).

As Brier notes, there are both commonalities between these theoretical approaches yet enough interesting differences to suggest that they need to be integrated into a single framework in order to address the deficiencies of each alone (2010:338). For example, as

second-order cybernetics integrates the observer and so takes cybernetics to a more advanced formulation, so biosemiotics advances Peircean semiotics through integrating all living systems within the semiosphere. They do this through what Brier calls *bioconstructivism*; that is, both see living systems as constructing their own life worlds. What Uexküll calls Umwelt, Maturana calls a *cognitive domain*, Reventlow calls a *rependium*, Von Foerster talks of *eigenvalues* and Brier himself terms *signification spheres*:

> The semantic capacity of living systems to assign meaning to differences that perturb the system's self-organization seems to be a pre-requisite for the phenomena of cognition, communication, language, and to its ability to observe and cognate, thereby reducing complexity through signification, by producing a signification sphere (342).

Peircean semiosis can be extended to include animals in this paradigm by referring not to language games, but what Brier calls sign games, thereby closing the gap between what can and cannot be considered meaningful symbolic behaviour, allowing symbols to be not only abstracted but embodied. Brier ties it together thus:

> When von Uexküll's *Umweltlehre* is integrated into a Peircean semiotic framework and further developed through the new knowledge gained by modern biology and cybernetics, it opens the way to a non-reductionist biophenomenology and biosemiotics. In Peirce's semiotics, everything in nature is a potential sign (a Representamen). This is a meeting point with Bateson's cybernetics, according to which everything is potential information, as information is difference that makes a difference for the self-organizing cybernetic mind-function. But actually this only occurs through the creation of meaningful signs. With Peirce, we can say that differences become information when an interpreter sees them as signs (343).

Brier's bringing together cybernetics with Uexküll's Umwelt is probably the most explicit fusion of both of these intellectual histories. Yet there is an argument that it is not radical enough, still situating much of the computational functioning within the sphere of the individualised organism, even with the interplay of external environmental signals. Andy Clark (2011) argues that we live, rather, in a state of profound embodiment in which the self is extended into the environment itself.

2.5 Profound Embodiment

Humans live in engineered ecological niches designed to create and enhance hybrid cognitive circuits between body, brain and world (Clark 2011; Sterelny 2003). This is what Andy Clark calls 'profound embodiment,' a state of external mental scaffolding enfolded into human cognitive makeup. This makes an embodied system that includes the external environment in an extraorganismic functional looping, allowing humans to mentally engineer themselves through environmental manipulation and niche enhancement. The agent-world boundary is something that is continually negotiated, extended, modified through this environmental and tool evolution, through the literal reality-engineering of language and symbol use, the constant recalibration of body and world. The tools and technologies we use to enact such cognitive niche construction are enfolded into the body schema. Cognition is extended out of the body into the environment. Humans do not think only with our brains, or with only their brains and bodies, but use the environment as a cognitive scaffolding to offload computational effort, to distribute cognition among the circuit of all three components that make the body-brain-world interface and neural network.

Cognitive scaffolding and distribution provide the cognitive-scientific parallel to the philosophical insight of Merleau-Ponty's later and last work and Uexkull's ethological insights. If humans are primed to make use of such cognitive scaffolds, to self-engineer their environments including the tools to calculate tasks and manipulate those environments, then their informational media devices, with their high-density streaming information loads, are necessarily addictive. Evolutionarily speaking humans are adapted for such plug-in information streams to supplement our Umwelten-al inputs. Humans power themselves through an additional data stream of symbolico-linguistic scaffolding that perforce sculpts their plastic neuronal setup and enacts the mechanisms of feedback rewards among particular chemical-neuronal pathways. If '[t]he loop through pen and paper is part of the physical machinery responsible for the shape of the flow of thoughts and ideas' (Clark 2011 xxv) then so must all writing and reading interfaces, all media through which humans think. Remember that Uexkull's functional circle is a loop. What flows out also flows in. The world is incorporated into human thinking, into the ground of being that is the body in the plane of experience, the central node of existence which is the zero-point of dimensionality and relation (Husserl 1989), as discussed in the next chapter. Cognitive circuitry, as Clark argues, extends out into the world and loops back into the body. The environment is not the external

setting for human existence as if we fretted upon a stage. Nothing signifies nothing. Everything signifies. The environment, as perceived through the physiological and neurological physiognomy of *brain, body and environment together* is the significant world for us as an individual of a particular species, but also that which we make use of in extended cognition. "No man is an Iland, intire of itself" (Donne 1999). Humans are an isthmus between the continents of being, of subject and object. Clark quotes Esther Telen:

> [C]ognition depends on the kinds of experiences that come from having a body with particular perceptual and motor capacities that are inseparably linked and that together form the matrix within which memory, emotion, language, and all other aspects of life are *meshed*. The contemporary notion of embodied cognition stands in contrast to the prevailing cognitivist stance which sees the mind as a device to manipulate symbols and is this concerned with the formal rules and processes by which the symbols appropriately represent the world (Clark 2008:xxvi. My emphasis).

Telen is correct, the mind itself is a meshwork of language, memory, emotion, perceptual and motor capacities, along with the environment. We cannot separate any one element from the intertwining matrix that comprises the organism and its Umwelt, the human being and its ground of being. Take out any one and you no longer have an adequate description of human life. Clark, however, quotes Telen and others to critique what he calls the 'BRAINBOUND' model which is this meshing or intertwining, focused on the neural functioning of the mind. For his 'EXTENDED' model, brain, body and environment all form 'inextricable tangles of feedback, feed-forward, and feed-around loops: loops that promiscuously criss-cross the boundaries of brain, body and world' (xxviii). This is right, and places his philosophy squarely in line with the ethological discoveries of Jacob von Uexküll a century before. It is a meshwork not in the sense of some regulated lattice but in the messily entangled nature of life.

As Clark notes, any interaction in an environment, whether real or virtual, takes time to master. Those who jack into a VR world through a new technology are, at first, clumsy, until the interface and the technical equipment through which the body moves itself in the virtual world becomes 'transparent equipment' in the same way Heidegger characterises the carpenter's hammer. Human infants need to develop this coordination of limbs, brain and environment before it slowly achieves this 'bodily fluency' (10). Once it achieves it, the body reaches this transparency which allows it to conveniently ignore it, until it jabs a toe or burns

its fingers on the hob. Likewise when we use a pen, in Clark's example, the pen itself is not the focus of our task. We have forgotten the many hours, days and months we practiced our cursive letters. My schoolhand was forever soaked in blue fountain ink, my pensmanship poor and scratchy, not so much lines as blobs of spattered and blotted ink. Gripping the pen so tightly in order to tame my errant hand, I developed a writer's bump that has forever stayed as the physical reminder of the effort it took to try to make that particular instrument transparent, to meld it into my body-plan. Even now, the transparency is not fully clear. The pen, when I use it, bites into my finger bump as I scratch my words onto whatever notebook or birthday card requires my hand. Pain, chronic or of a moment, brings this focus back to the body, reminds it that it is its singular interface for as long as the heart keeps beating and the skin shedding. The sensing process itself is used with external scene functioning as a just-in-time information store called on for task achievement. In this sense, sensing itself is a 'constantly available channel that productively couples agent and environment' (15). Sensory channels are open conduits allowing environmental influence on behaviour. Sensing a snakelike shape on the ground we hop before we even realise what has happened. The body's radically continual openness has dictated behaviour before the conscious mind can catch up. The body before anything preserves itself. Rather than perception shaping a picture of the environment, the environment is constantly engaging with that environment to modify action. In terms of information self-structuring, the body also actively engages the world to create 'computationally potent time-locked patterns of sensory stimulation':

> In human infants, grasping, poking, pulling, sucking, and shoving create a rich flow of time-locked *multimodal* sensory stimulation. Such multimodal inputs have been shown…to aid category leaning and concept formation (17).

This sensorimotor engagement with the environment is key to learning, to information processing, to conceptually ordering the world. Yet as Clark argues, this world engaged with is not outside the body; the body is radically open to the world and incorporates it into itself, including through tool use, in a process of 'transformative restructuring' (31) where this equipment becomes part of its embodiment. Clark turns to Haugeland's definition of interfaces where interface, system and component are all interdefined and interdefining. That is to say, components form a larger system by interacting through interfaces, marking this interactivity as key to the notion of the interface (32). The interface is the contact point between two parts of a system. Haugeland's conclusion regarding the subject of human-

environment coupling is that these interfaces that intermingle agent and world consist of low-bandwidth coupling. Discussing the merits of grid technologies with a web of interfacing component machines, Clark sees no objection as to why such contact points could not comprise high-bandwidth couplings to support his thesis of profound embodiment in which an agent may continually renegotiate the body-world boundary itself in order to incorporate new equipment or prostheses in the general sense into the bodily schema:

> [H]umans and other primates are revealed as constantly negotiable bodily platforms of sense, experience, and…reasoning, too. Such platforms are biologically primed so as to fluidly incorporate new bodily and sensory kit, creating brand new systemic wholes (37).

The body, then, is a modifiable platform, a system of mutable components interacting through sensual interfaces which are contact points to the environment, the boundaries of which are fluid, all in order to increase 'ecological control.' This is a radical reshaping of the human individual as bounded by the skin, moving in a world of objects.

Humans act on the world through niche construction, that is, through the active shaping of environments to best suit needs and fitness to environment in terms of selection pressures (61). The spider's web allows camouflage, communication, and capture of prey. Habitat-building often persists beyond any individual organism's life, thereby affecting the fitness of related conspecifics, as does the transmission of knowledge and practices through cultural learning. The important aspect here is the feedback cycles created that reinforce these patterns and benefits.

An example of powerful niche construction is the exploitation of space for cognitive processing (64). Humans use spatial arrangement to organise tasks, ordering ingredients in the sequence in which to cook them, for example. We take a complex environment and simplify it spatially to help organise our mental space, offloading cognitive problems onto the environment through simplification. As ecological engineers of cognitive niches, humans modify and adapt habitats for ourselves and for offspring. Further, we modify our epistemic environments through information structures. Such epistemic engineering is one of the traits that has made the human species so successful. The complexities of human cultures requires intergenerational transmission and engineering over generations. Humans are adapted not to

one specific environment but to the variability of environments. Variation and invention is key to human topographic spread and the dominance of human niche inhabitation compared to other fauna. Gregory Bateson somewhat disagrees with this statement of human uniqueness when he writes:

> A wild population of any species consists always of individuals whose genetic constitution varies widely. In other words, potentiality and readiness for change is already built into the survival unit. The heterogeneity of the wild population is already one-half of that trial-and-error system which is necessary for dealing with the environment (2000:457).

However, regarding developmental plasticity, despite the old saw of the civilising aspects of culture, humans may be the wildest species of all. As he goes on to say, the flexible environment must be considered along with the flexible organism, where the unit of survival consists of this 'flexible organism-in-its-environment.' This ability to adapt both self and environments so profoundly requires intense developmental plasticity in order to provide stable yet persistent neural reorganisation. This includes the use of external environmental props such as tools and instruments that literally extend our cognition into the environment:

> Plastic human brains may nonetheless learn to factor the operation and information-bearing role of such external props and artifacts (sic) deep into their own problem-solving routines, creating hybrid cognitive circuits that are themselves the physical mechanisms underlying specific problem-solving performances. We thus come to what is arguably the most radical contemporary take on the potential cognitive role of nonbiological props, aids, and structures: the idea that, under certain conditions, such props and structures might count as *proper parts of extended cognitive processes* (68. Original emphasis).

In some senses this is a radical proposal. In others, rather conservative. Merleau-Ponty (1994), writing in 1945 already indicates that exterior instruments and tools are incorporated into the body plan or image of the user. Tools become part of our physical and mental states and functioning. The body orients itself to the instrument and extends the body into it and further into the further-extended environment through use. The walking stick is his classic example. This will be discussed in the following chapter.

2.6 Conclusion: Return to Umwelt

However, there is also another sense in which the radicalness of this view is also conservative, in the sense that 'environmental niche' is itself a conservative portrayal of how humans form and modify worlds. John Deely (2001) argues that the environmental niche is much poorer in its portrayal of an organism's world than the notion of Umwelt. Whatever exists for an organism as an object does so only through the network of relations which are meaningful to it. Human objects are not frog objects are not whale objects. Objecthood is species-specific and therefore species-subjective. The object depends for its existence on the subject, which is therefore the ground of its being. Without this relationality, without the richness of the Umwelt in which the object is positioned in the flux of consciousness, the object is not an object at all. The physical environment, which without a subject is meaningless, is given meaning and turned into part of this lifeworld and so becomes a 'species-specific objective world' (129). Environmental niche refers only to those parts of an physical environment upon which an organism depends for physical survival. It forms a smaller part of *a larger objective world which is not entirely physical*. This is important, as we can therefore argue that the objective world of empiricism is a partial and incomplete view of existence. We cannot disassemble the worldview of our Umwelten. It is baked in. The Umgebung, which is the meaningless physical environment before its integration into the functional circle, cannot be accessed outwith the meaningful relations of perception and body-hood. Humans cannot see from an epistemological position outside the species-specific sensuality that gives meaning to their world: 'The status of objects as objects presupposes directly the action of signs, whereas the status of things as things does not' (130). Signs come before objects. In Peircean terms, things belong to the mode of secondness, whereas objects belong to thirdness. An object, therefore, is a thing signified.

The concept of Umwelt regarding human signification, however, has one shortcoming for Deely. Whereas it perfectly describes biological existence and signification, and how humans are bound by it as much as any other organism, it fails to describe the complexity of the human Innenwelt, the inner mental life, upon which the Umwelt is constructed. This Innenwelt is not wholly tied to biology. Although from conception the development of sense modalities are fixed according to genotype, the language one will speak, and which will accordingly model one's perceptions, is not. Communication is a universal phenomenon of life, whereas language is not. Communicative modalities overlap between species but

language, however, is not strictly a communication system but a modelling system, a way of envisioning the possibilities of the world not as given but as alternative to that which is presented in sensation or through perception. Exapted language use allows conspecifics to establish a linguistic code *when they both have an Innenwelt* not tied to biological constitution. Possession of an Innenwelt is the key to linguistic communication in order to interpret such communication. Our meaningful worlds therefore contain postlinguistic structures. It also contains technical structures, as will be more fully discussed in Chapter 6. We can apply the concept of Umwelt to the human-as-animal, yet can see that it also does not include all humans are. Uexküll's image of the bubble surrounding us all holds, but unlike most other animals human bubbles are more permeable, not restricted to only a biological semiotic web (133). By recognising that signs are indeed signs, rather than only using them, humans are able to escape our biological constitution. It is this self-awareness of semiotics that sets humans free. No longer is the human a 'rational animal' but a 'semiotic animal' who is able to both use signs and recognise them as such:

> because as linguistic the human animal is capable of modeling [sic] that fundamental reality of all experience which never appears to the eyes and ears or any other biological channel of sense; relations as such in contrast to the objects or things that are related; relations as such as the fundamental reality which makes possible the experience of objects in the first place; relations as such which makes possible the difference between objects and things; relations as such which, in their peculiar being and irreducibly triadic form, are that which every object presupposes; relations, those irreducible strands of the semiotic web which constitute the Umwelt or objective world in its contrast with and difference from the physical environment as such prior and in some measure common to every life form (133).

How do we know these relations? Where do the signs point to? How does the human body integrate signs into a phenomenological sense of self? In the next chapter we turn to thinkers such as Husserl, Merleau-Ponty, Nancy and Plessner to show how the body is the centre of the semiotic-phenomenological flux which is the world humans experience. By bringing the Umwelt back to experience and the body, by examining subjective sense modalities that create human perceptive worlds, we can bring these strands together in order to weave a finer picture moving forwards, to show the warp and weft of the self in the world of its own making.

CHAPTER 3

Husserl, Merleau-Ponty, the Body and the Chiasm

3.1 Husserl

How does the body inform? How does the body first centre itself semiotically? How is it a carrier of significance? From difference, a difference which makes a difference, to the subject which is our self. A semiotic link in an endless chain. An existential lightning bolt too often mistaken for the thunder which follows far behind it.[36] Husserl (2006) writes that the body lives in a spatial-temporal envelope. Each I has its body which is not the I itself but this 'thing' which belongs to space and time, a thing amongst other things. The I perceives its immediate surroundings and retains it in an ongoing now surrounded by a pervasive existence within Euclidian space. The body, he argues, is a kinaesthetic unity. Through its unified perceptions it constructs a lifeworld. Body is the medium to the world, the field of being. Humans forget the ground of their existence which is this body because it is so naturalised, so familiar, as to be invisible. The body is the initial point of orientation to the world, the zero-point of existence from which the world is anchored and through which the world is perceived and interacted with. Touch is the primary sense through which all else is given. The body as both subject and object is known when I touch my own hands together, through this double constitution which is a double apprehension of simultaneous touching and touched, of subjective objectivity that is at the same time both lifeworld and object in that world. Touch is constant. World and self are always in contact. Touch brings the world to the body and the body to the world. The body is always here in a world which is always there. Yet as Nancy (2018) argues, humans are not in front of the world, nor is the world in front of them. They are within it, in performative abandonment within the world, thrown into it on all sides.

In *The Crisis of European Sciences and Transcendental Phenomenology* (1970) Husserl writes that knowledge of sensible appearances, of a sense world, is gained through the body

[36] 'Difference is the state in which one can speak of determination as such. The difference 'between' two things is only empirical, and the corresponding determinations are only extrinsic. However, instead of something distinguished from something else, imagine something which distinguishes itself - and yet that from which it distinguishes itself does not distinguish itself from it. Lightning, for example, distinguishes itself from the black sky but must also trail it behind, as though it were distinguishing itself from that which does not distinguish itself from it. It is as if the ground rose to the surface, without ceasing to be ground' (Deleuze 2001:27).

and that everything concrete in the lifeworld, even animals and cultural objects, has a 'bodily character' despite any psychic or spiritual dimensions it might also possess (106). The bodily aspect of things is perceived through sensory organs, hands and eyes, ears, using the tactile, visual, acoustic aspects of existence to perceive and know the world through the ever-present body which comprises the perceptual field, a kinaesthetic unity comprehensively bound in each 'I move' and 'I hold' and 'I see' and 'I do.' This sensibility is the active, coherent ego essential to the experience of the lived, habitual body, the active joining force of what would otherwise be discrete sensations but instead compose the living body [*Leiblichkeit*].

Humans exist in a multimodal flux. Of bodily pressures. As Husserl notes in Book 2 of his *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy*, in terms of bodily motion the physical forces of impact and pressure cannot be entirely perceived by sight, nor by pure touch can we grasp pressure, pull or resistance (1989:42). While we do see the visual and feel the physical forces of bodies impacting one another, mechanical forces cannot be judged exclusively by a single sense. Rather, apprehension includes 'empty horizons of "possible perceptions"' which can be entered into at any time, 'a system of possible and, if I follow them up, actual, perceptual nexuses' (42). The sensuous body, then, is what Husserl calls a 'manifold strata' of different senses and the apprehension of sensual appearances. Such perceptions run parallel to one another in a complementary givenness, so that, for example, '[t]he given optical fulfillment [sic] of the visual schema refers to the tactual side of the schema and perhaps to the determined fulfillment [sic] of it' (43), increasingly recognised through experiential association. The body is the primary index for this manifold of experiences possible or actual, for the multiplicities of sensation. Material reality and its apprehension relies in its relationality and corresponding apprehension, a continuous shifting of relations rather than fixed, isolated properties, perceived by the subject which forgets itself, forgets the ground of its own existence, the kinaesthetic body comprised of mobile sense organs, the body which is 'the *medium of all perception*' (61, original italics), the organ of perception as a totality, whose eyes run over edges and surfaces to see them, as hands run over them to touch, corresponding parts of a larger schemata of perception:

> *the Body is involved as freely moved sense organ, as freely moved totality of sense organs*, and hence there is also given the face that, on this original foundation, all that is thingly-real in the surrounding world of the Ego has its relation to the Body (61).

The body is the bearer of the here and now, of the zero point of orientation through which the world of space and sense is intuited. As such, each thing has an orienting relation towards the body itself, towards this zero point. Even an object in the imagination – Husserl uses a centaur – is oriented towards the body when we picture it imaginatively. I cannot imagine it but in relation to the body, my body. As the centre of orientation it likewise constructs the spatial world, which again forms part of the nexus of spatiality, temporality and causality interwoven with the pre-eminent body, the subject which bears the essential necessity of experience (69).

Yet the difference in touch and sight in relation to the givenness of the body is fundamental. For Husserl, the body is constituted by touching and touching only as the original sensual dimension, a localization of tactility whereby I experience warmth or cold, pain, kinetic sensations, an 'interlacing' of touch and sensation and world (158).

> All these groups of sensations, as *sensings*, have an immediate Bodily localization. Thus, for every human being, they *belong, in a way that is immediately intuitable, to the Body as to his particular Body*, i.e., as a subjective objectivity distinguished from the Body as a mere material thing by means of this whole stratum of localized sensations. *The intentional functions, however, are bound to this stratum*; the matter receives a spiritual forming, just as, discussed above, the primary sensations undergo apprehension, are taken up in perceptions, upon which, then, perceptual judgments are built, etc. Hence in this way *a human being's total consciousness is in a certain sense, by means of its hyletic substrate, bound to the Body* (160. Original emphasis).

As Luoto (2018) notes, Husserl's aim is to clarify the dimension of the body in relation to the givenness of reality, of the constitution of space and time through the body: 'all things refer to a body, which is not simply a physical thing among others' (95). When I touch once hand with another I am both touched and touching, sensing and sensed, an objective and feeling form, which gives the body, through touch, this 'double constitution' through which the body becomes itself, is given to me as my body. This double constitution is made possible through a

> "double apprehension" (*Dopppelauffassung*), in which "the same touch-sensation is apprehended as a feature of the 'external' Object…and is apprehended as a sensation of the Body as Object"(97).

This double apprehension is inherent to touch beyond the touching of one's body; in touching an object I am aware not only of its features but of my bodily sensations in the touching of it, their co-appearance within touch which is 'bound' to the body in 'self-feeling' (98). This double apprehension offers an inherent difference to sight, which does not have this double apprehension, this localised sense of feeling alongside the perception of the visible world. The tactile body touches and feels, perceives the world and itself, always. As Luoto makes clear, the sense of touch is a continual probing, estimating, an approaching which is 'conditioned by a not-knowing manifest in palping and probing' which allows objects in turn to 'approach us' (92).

Husserl's earliest conception of the phenomenological character of our existence, of the world of experience, as entirely subjective was criticised for its solipsism (Abram 1997:31). Husserl's answer to this criticism is the notion of intersubjectivity. While one's body is experienced from within, other bodies are experienced from without, bodies which one is able to approach or move away from. Our own body, however is always there, or rather *here*, inescapable as the phenomenal ground and location of our being. Yet despite the differences between the experience of one's own body and the experience of other bodies, our experience is echoed in those other bodies, in the emotions, gestures and motions of those bodies. Other bodies resonate with our own, so that through associative empathy one is able to recognise the nexus of experience that is other people, other lives.

> The field of appearances, while still a thoroughly subjective realm, was now seen to be inhabited by multiple subjectivities; the phenomenal field was no longer the isolate haunt of a solitary ego, but a collective landscape, constituted by other experiencing subjects as well as by oneself (32).

There are phenomenal experiences that are completely my own, not shared with others, knowable only to myself. Dreams and daydreams, for example. And yet there are experiences which I share, that no matter how hard I will I am unable to alter, to command. The phenomenal field is therefore split between phenomena for myself, interior to my body, and phenomena shared collectively, that is, intersubjectively. We stare at the same waves crashing on the shore. Our perceptions of blues and greens might be different. Our moods could be different. I might see only greys but feel serene. You could be enraged by the

pounding waves. The character of the world is still filtered by our subjectivities, but we would most likely agree that we both see the waves, the seaweedy beach, the lowering sky. Subjectivities coalesce around the same phenomena. The sciences are not objective but intersubjective:

> The "real world" in which we find ourselves, then – the very world our sciences strive to fathom – is not a sheer "object," not a fixed and finished "datum" from which all subjects and subjective qualities could be pared away, but is rather an intertwined matrix of sensations and perceptions, a collective field of experience lived through from many different angles. The mutual inscription of others in my experience, and (as I must assume) of myself in their experiences, effects the interweaving of our individual phenomenal fields into a single, ever-shifting fabric, a single phenomenal world or "reality" (39).

Without the body, I would not belong to the world in the same way since I would not be able to approach the world or have it approach me. As noted earlier, for Husserl the body is the zero-point of existence. Yet paradoxically, it can only be this zero-point if it has a body in the first place, or rather, the originary place, this 'stratum' (Husserl 1989:161) of the body as its most intimate referent of psychic being in its lived experiences, of its apperceptive grasping of the world and of being grasped, of the embrace of the world in its approaching to the body as a '*physical-aesthesiological unity*' (163. Original emphasis). The perception of objects in space all appear in this relation to the world from the zero-point, whether near or far, left or right, above or below. The body and the psychical ego are the bearers of this zero-point, the centre-point of all relations which creates its own 'here' in relation to all external 'there' (166), the there-ness of the world and the here-ness of the body, a here-ness which is nonetheless mobile, able to roam within the there-ness which is the flow of appearances and orientations. The body changes position in space and things in the environment are reoriented so that 'all appearances of things preserve their fixed system according to form…the form of the order of orientation around a center, all this is necessarily preserved' (166) while the body is 'integrated into the causal nexus of material nature' (167).

3.2 Nancy

This material nature is not apprehended as a form of spectacle, as something to be separately seen and experienced, whether panorama or diorama. Humans are entangled with the material world, writes Nancy:

> [C]aught by it, mixed into it, carried along it by all the forces of my body which moves forward towards this world, incorporates its space, its directions, its resistances, its openings, and moves within this perception; my body is only the viewpoint from which this perceiving, which is also an action, can be organized (Nancy 2018:13).

This is not being in front of something but being within it, engaged with the world through this thrownness, an abandonment into being where the 'subject can only be perfectly secondary' (14). Existence, Nancy argues, performatively stages itself in its being-in-the-world, projects itself into this being in a coming to presence '[a]nd in this sense, a subject is a body' (17). The world is a 'disposition of presences' (18) in both a topological sense of space, but beyond this, in the sense of arrival and departing, coming and going, spatially but also temporally, time being the 'spacing of sense, the extension by which it stretches towards itself' and the 'signifier stretches towards the signified' (21).

As the hand stretches toward the world it is part also of the reached-for world and so reaches out in a coming to presence as flesh of the lived body, the body-as-psyche [*Leib*] and world commingled in this double apprehension of touching and touched, 'spreading out' [*Ausbreitung*] and 'spreading into' [*Hinbreitung*] the world via the localized sensations of a body-as-object [*Körper*], probing the world through sensation (Luoto 2018:101). Humans are body as psyche-abode and as body-object, a distinction not fully appreciated linguistically in the English language, which specifies body as body and mind as mind, and forgets that wholeness in which humans dwell which is apperceptive body-flesh-world, an amnesia that is a hangover from the Cartesian split that relegated the body in order to elevate the soul, when *res extensa* and *res cogitans* could never be untwinned or untwined:

> For Husserl, the lived body implies something other than the physical body, but this other than physical is inseparable from the physical. Being irreducible to physical determinations, the psychic or the soul exceeds the physical body, and yet is nothing external to it. In its capacity to touch, the soul is what is *in excess* of the tangible body *within* the tangible body (103-4).

3.3 Plessner

As noted above, for Nancy being-in-the-world is performative, as is the distinction between *Körper* and *Leib* for philosophical anthropologist Helmuth Plessner, who determined the distinction in a 1925 essay with Frederick Jacob Buytendijk (Krüger 2010:259). Plessner's distinction relies on this performativity which is made both by and for living persons, who 'stand within life…precisely *within* this distinction' (259). The distinction is formed as a question, as an interrogative mode of being and of behaviour. Phenomenology for Plessner is a method in which the *Leib* is connected to the immediate, direct register of subjective phenomena, whereas objective *Körper*-related phenomena can be accessed only indirectly, through reflection, experiment and therapy (261). *Physis* and *Psyche*, nature and mind, are rejoined in the expression of the mode of being as a living expression. It directs itself both inwardly and outwardly in its behaviour, directed out into the environment while the outside is directed back inside, a duality interwoven in space and time attuned to the surrounding environment. I have my body-as-object which represent me in the external environment but I not only experience that environment outwardly through the body-as-object but inwardly through the living body, my inner world of '*here and now*' (268. Original emphasis). The body-as-object experiences, or rather suffers under, objective time, but perceptual time is a related yet much more elastic flowing. Importantly, this distinction between inner and outer worlds is not formed from the perspective of organisms, according to Plessner, but from the world persons share (*Mitwelt*), our co-relationships rather than our organismic Umwelten:

> Thus, we have here abandoned the biological correlations between the organism and its environment (J. von Uexküll) because we are concerned with the question of how their determination comes to be possible. Anyone who resides within these correlations cannot determine them from the outside – that is, from the standpoint of a world with a foreground and a background – for he would not have any distance from the surrounding environment that he inhabits. By contrast, a scientist as a living person can distinguish between environment (*Umwelt*) in the foreground from a world (*Welt*) with a background (269)

In this sense, in both spatial and temporal terms the person is a protrusion from these correlations, a filter surrounding themselves from every direction in which they exist both as organism and the interactions of that organism, the co-ordination of shared life and self-life which determines our being-in-the-world for ourselves and for others in this ex-centric, public and private 'doppelgänger-hood' (270). This triadic 'we-hood' is made up of the

bodies as lived [*Leiblichkeit*] and corporeal [*Körperlichkeit*], which integrated form this third prong of personhood. Krüger argues that Plessner's notion of personhood is 'the irreplaceable answer to the question of how the tension between the physical body and the lived body can always be resolved anew', something lacking in Merleau-Ponty's dualistic analysis of the same integration of the two bodies (272).

3.4 Merleau-Ponty

Yet to say Merleau-Ponty's phenomenology can be reduced to a dualistic analysis is to read only the early, less radical of his work, and to make the most conservative evaluation of it. From *Phenomenology of Perception* (originally published 1945) the bend of the arc that his work would travel is more apparent in hindsight when tracing his thoughts backwards from the incomplete *The Visible and the Invisible* (1968). It is hard to overstate the importance of Merleau-Ponty's philosophical oeuvre. More than any philosopher, his work entails an urgent, passionate project written in lucid, lyrical, yet demanding language.

In *Phenomenology*, the world is intentional, that is, something the conscious mind aims at, but it is also, even at this stage in his philosophy, still one move on from this intentional understanding. Consciousness is always *consciousness of something* yet the world is not something thought but something lived through, communicated with but non-possessable, inexhaustible by us. Consciousness is the primary flux or upsurge of meaning perpetually directed at the world, is a project of the world which is a 'closely woven fabric' (1994: x). Phenomenological presence, this world experienced as manifested through primary consciousness, is not pure being 'but the sense which is revealed where the paths of my various experiences intersect':

> and also where my own and other people's intersect and engage each other like gears…
>
> …We witness every minute the miracle of related experiences, and yet nobody knows better than we do how this miracle is worked, for we are ourselves this network of relationships (xx).

Phenomenological engagement discloses this world of relationships, brings truth into being. Consciousness does not copy the text of the world but composes it. The idea of a fixed

external world does not hold. Perception is fundamentally ambiguous, continually shifting in relation to the contexts we find ourselves in. Sensual engagement with the world is not solely instrumental but dependent on physiology. The organism does not experience a stable world but one that holds meaning for itself; that is, biology and its referents are not reducible to physics. A physico-mathematical description or deduction does not cover the entirety of experience of the world the body inhabits and there are therefore different modes of intelligibility open to the organism. For Merleau-Ponty, the scientific, objectivist paradigm makes short work of sensations, marking them as isolated things experienced rather than the meaningful patterns of which the world is composed, of which the phenomenal fabric is woven. The experienced world is forced intro premade structures meaningful only to science rather than the self. In this manner sensation is purged of ambiguity and turned into an ideal of consciousness rather than what is experienced.

For the earlier Merleau-Ponty, phenomenological engagement discloses a world of our own being, which is a network of relationships through which humans compose the world and author their existence. Sensual engagement sits within a shifting world of such relationships, one in which meaning is not stable but continually changing. Such relationality cannot be explained away by the scientific objectivist paradigm. Meaning overflows such reductions. By forcing our abundant, unique existence into premade ontological structures, this epistemological stricture does not properly describe the meaningful modes of human being but purges it of the ambiguity and organism-directed meaning of this world-making process. Humans assume they live in a world of objects, but their perception is relational. They live in a world of spaces between things as much as a world of things themselves. If human perception could be primed to focus on the gaps between objects rather than the objects themselves, he argues, they would see an entirely different world. Figure and ground exist in an inseparable mutuality, yet the summations of human existence remain partial. The perceptual field is not only made of things but the spaces between those things which all form part of this patterning, of this interrelationality of which measurement takes no account, of the inhabitation of the world as a totality of static and moving objects that fixity cannot account for. The spaces and the relationality of those spaces exist as much as the objects held as definitive of existence. Figure and background always appear in relationship, are, in fact, irreducible structures of consciousness alongside thing and not-thing and the horizon of the past. The empirical realm of things such as atoms and chemical processes will always have a superior appearance of reality than qualitative percepts, emotions, and significations of

consciousness if our perceptual experience as the ultimate knowledge of reality *for us* is unrecognised. Phenomenal existence is made incomprehensible by empiricist constructions of the world. The cultural world is rendered invisible. Nature itself becomes merely a placeholder for the built world and the presence of other persons, not something huans are entirely entangled with, from the emotion read in somebody's face to the style of a particular building. Human space is diminished and perception impoverished. To not only recognise all these subjective emotions and feelings as real but as essential to our world, to the human world, the world a subject inhabits with and for others becomes a 'homeland' for such thoughts. The cultural world, far from being the illusion painted by an empiricist understanding of the world, is the sustenance which sustains existence. 'We shall, therefore,' he writes, 'have to rediscover the natural world too, and its mode of existence, which is not to be confused with that of the scientific object' (24).

Empiricism overshadows phenomenal lives to the point of invisibility. This viewpoint is one of the strongest currents in both Husserl and Merleau-Ponty. Where is the ground of the scientist who describes the world? Why is the lifeworld of the self so shuttered away in the sciences so that a pure crystalline brittleness overarches ontology and makes it a shell of the rich sensual lives subjects lead? Culture is calcified and dismissed, perception and space diminished. The homeland of living existence is painted in rigid monotones. For these philosophers of phenomenal lives, the excitation of emotions is as important as that of atoms, the movements of mercurial thoughts as fundamental as the planetary motions. Merleau-Ponty's work also suggests an ethics of care for the objects with which humans share existence beyond their importance to us, to recognise 'the strange mode of existence enjoyed by the object behind our back' (1994:25). What an incredible thought! How strange and disorientating, to think of the world outside our anthropogenic gravity and to state the importance of things other than ourselves or filially related to ourselves or to our sustenance and safety. Our bodies look forward, but behind our back, unconsidered, other stranger lives are lived. It is a statement, a viewpoint, that contains a multitude of profound revelations, that greatly expands the ground of being.

Attention, he argues, creates for itself a field which can be surveyed and explored mentally and physically, through the intention of consciousness and the ordering of percepts over time. The apparent unity of consciousness and of objects is built up by these overlapping acts of attention. The object not only stirs attention but is captive to it in this overlapping of

attentional steps which momentarily recaptures it, fixes it within its horizon. Meaning comes from the moment. Moment by moment. Yet sense experience carries with it its own meaning. The spectacle of the world is captured in a vision already pregnant with meaning. Sense carries with it the meaning for the body, is always referred to a body:

> The problem is to understand these strange relationships which are woven between the parts of the landscape, or between it and me as incarnate subject, and through which an object perceived can concentrate in itself a whole scene or become the *imago* of a whole segment of life. Sense experience is that vital communication with the world which makes it present as a familiar setting of our life. It is to it that the perceived object and the perceiving subject owe their thickness (52-53).

Here the earlier Merleau-Ponty is reaching towards the more-realised later philosophy of incarnation in the flesh of the world, in the reversibility of all perception with the world beyond the body. We see the strangeness made apparent of our relationality with a world which will always retain that shifting nature, will never, for us as subjects, remain a stable ground to stand upon. As we are always changing so our worlds, our Umwelten. The world incarnates us and is made incarnate by us. The thickness of the world comes not from isolating subjects and objects but by recognising their irreducibly interwoven nature. It is a thin and forlorn philosophy that sees the world only in terms of objects. Paraphrasing a remark by Cassirer stating that 'by mutilating perception from above, empiricism mutilated it from below too,' Merleau-Ponty reverses the sentiment to say that the removal of the existential content from perception, a mutilation from below, mutilates it also from above by passing over 'the upsurge of a *true* and *exact* world'(53. Original emphasis) which is the decisive moment in our perception of the world.

The scientific method, which places itself in opposition to the dogmas of religion is equally dogmatic in its unquestioning, unwavering faith in perception as the ground of knowledge by which things are transparently known, as if consciousness were a clear window to the world and its phenomenal contents fixed and objectified by a scientific perception. Space is reduced to a geometrical container in which all events are in turn reducible to physical forces. By associating movement to forces, paradoxically what is left is an inert, frozen universe of discrete objects, of lonely monads. Thus one natural object with generalised properties can be substituted for any other. This system of objectification is one in which one living body can be substituted *in value* for any other. Such an ethics does not make us equal but rather replaceable. Externality is superimposed over internality in a reduction of experience,

expressions and behaviour, of a particular style of being in the world as a living subject, and reduced to physico-chemical forces. That which impelled organisms to action is converted to the observation of external movements. By the elision of the subjective and the reification of that which could be objectified, the external world is projected into the living body that comprises an individual identity and reduced to an object amongst any other. This results in a subjective self with no exterior and an objective self with no interior, a hollow shell of being. For Merleau-Ponty writing in 1945, the dressing of this mannequin philosophy was being unpicked, unpacked and discarded as so much old clothes:

> Now this philosophy is collapsing before our eyes. The natural object was the first to disappear…For its part the organism presents physico-chemical analysis not with the practical difficulties of a complex object, but with the theoretical difficulty of a meaningful being (56).

By forgetting its origins, classical empiricist science, which is a particular form of perception, believes itself to be a complete method of understanding the world *in toto*. The task of the phenomenologist is to rediscover this missing meaningful layer of experience denied by this method. Even the reduction to consciousness as data which could be visualised today by high-powered fMRI scans of brain waves cannot capture the experience of existence. Experience of others is that which you cannot see but only understand through self-reflection, on your own experience and how it connects.

To experience objects is to realise that the body is at the centre of all perceptions. We cannot recognise the object in itself but in our perception of it from a particular angle. This is true of all organisms, of the particularities of orientation in the perceptive mode to which all sentient existence kneels. To see is to see from somewhere. To look at an object is to be plunged into it, anchored by it. To look at an object is to inhabit it and to know its aspects. Vision has two interweaving facets: objects cannot show themselves without concealing others since they form a system, and the concealed objects by becoming a horizon disclose the object perceived. Objects display themselves through this act of concealment and revealing, made possible by this ability to hide themselves behind others. Objects are therefore disclosed only in this system of objects with each object spectators of the hidden aspects of others, forming a co-constitutive system of seeing and being seen, of presence and absence. Sight of an object by a perceiving consciousness is at the same time ‘reiterated among all those objects in the

world which are apprehended as co-existent, because each of them is all that the others 'see' of it':

> [T]he house itself is not the house seen from nowhere, but the house seen from everywhere. The completed object is translucent, shot through from all sides by an infinite number of present scrutinies which intersect in its depths leaving nothing hidden (68-69).

The human gaze cannot sustain the world of objects. The facets of the world as perceived at any one time by the gaze are inherently limited. The plenitude of the object can only be realised in the mutuality of a co-constituting system of objects for objects. Here is a move away from the Anthropos as primary constituent of the world for itself but into which subjects, as individuals, are plunged, as a horizon-imposed structure that can never reveal the object entirely to them. The object, therefore, will always remain an alien being yet still subjects must go beyond individual experience to posit the object in the congealed whole.

The body rises towards the world, is stimulated by it into creating this world. It does not perceive a world, *it is a world* strictly speaking. The body is the vehicle of the world. To have a body for an organism is to have an environment from which it is inextricable. I am conscious of my body through the world, of which it is the pivot, the unperceived centre towards which all objects turn. The body is medium to the world but it is also composed of 'regions of silence' (82). I cannot know my totality as object proper since I inhabit the mode of my perception. This comprises two distinct layers, the body at the moment and the habitual body which acts as my guarantee, my ground of being. The body of the moment is always drawn to the world and is in a sense prepersonal and autonomous, cleaving to the world in general by perceiving the object in particular. Consciousness and the body, nature and culture, the sublimation of biology into the personal, these are grasped by and through the horizon of time past, present and future, through the passing of instants. The present is that which solidifies our life yet is also 'like a wound through which our strength ebbs away' (85). The past is secretly nourished by the body, which can recapture it. Time allows us to centre ourselves but never completely. The body is ambiguous to us since we inhabit it from a particular pole. It is 'both freedom and servitude' (85) in its ambiguity, which is understood through time, possessed by time, as every present becomes immediately past.

Here the earlier Merleau-Ponty follows Heidegger and distinguishes between Umwelt and Welt. Umwelt is a setting and Welt is a world (87). Animals live in an ecstasy of being that is a setting but not a world. He explains this distance from the world which allows reflection as the toing and froing of personal acts with corporeal form which are nevertheless combined in a singularity beyond the presumed Cartesian duality. This union between the physical and the psychic, between soul and body, is not an amalgam but a true unity enacted every living moment.

The body is always present, always perceived. I discern its difference from the objects around me in that they can be moved away from me, or I can move away from them. Objects imply absence in their mobility, whereas the mobility of the body is such that always moves with me, through which I move. It is a permanence of my self and not the world and even though it is marginal to my perception as my intentionality points outwards to the world, it is always with me, alongside me. Move your head around now and you will see objects disclosed within a system of objects. Slowly move your head from one side of the room to the other and you will notice the continual disclosure of objects as other disappear. Here, where my head is static, I can see the blurred outline of my hands moving across the keys. They are partially disclosed, at the edge of the visible, which shows us that the zone of disclosure is not absolute but exists in gradients. The world fades away from us, from this central pivot of consciousness as directed outwards.

The body cannot observe itself in its entirety. As an object amongst the system of objects it must necessarily remain partially disclosed. I cannot walk around it but only view its hidden aspects through the mirror, which in its partiality offers only the ghost of presence. As Merleau-Ponty says, I can never catch the living glance of the natural body but only chase after it. The mirror-body automatically follows my intentions but it cannot escape into a perceivable spontaneity. It is, rather, what he calls a simulacrum of the tactile body, the body that touches the world and knows it. When I touch one hand to another, one is touched and the other touching. One is known, the other knowing. One is muscle, tendon, blood and bone. The other ‘shoots through space like a rocket to reveal the external object in its place’ (92). It both touches and sees the world and at the same time cannot be seen or touched. As one part is touched the touching part retreats into the palpation of the object of oneself. Looking to one part of our body the body-complete retreats into and from sight. The presence and absence of external objects are held within this perceptual field of ‘primordial presence’ (92)

that the body controls, yet also sustains in co-constitution of those objects, in the pulse of duration which it gifts them. Yet although both hands cannot be touched or touching, the touched can anticipate the touching, can at any moment switch modes from touched to touching. The body is both mover and moved yet it also retains an outline, an image, a barrier through which other objects cannot cross except in piercing. The body is not an assemblage of parts but a unified field, each part in total relation to the other through this body image which comprises the body in total. Reaching for my cup of tea, each part works seamlessly with my will to execute the action. This compendium of behaviour and body is 'a continual translation into visual language of the kinaesthetic and articular impressions of the moment' (99). The body image is therefore a total awareness of the body in the intersensory world, a gestalt unity which composes not only the relations of body to self but of self to environment. The body image cannot be disassociated from the environment but exists in this totality, the functional circle of Umwelt. The body is orientated and anchored in space but at the same time constitutes space, for there would be no space without the body, as for time. Time and space are constituted by the body in a unified domain. As I know instinctively where to reach to scratch an itch, so this action takes place within the phenomenal body, that is, the unity of subject and world. I do not move the objective body, I move in a field which is the 'viscosity of tactile data' (109). That is, the virtual, human space is superimposed over physical space which nonetheless has a density of being-in-the-world.

We retain the memory of the historic body but it is never past, it exists always in the here and now. Space and time are not determinate points through which we pass but the flux the body belongs to, exists in combination with. The body understands its own world. It does not need thought to translate existence. This experience of the body is always experience of it in the world, a field of being which can be modified by objects, by tools. Merleau-Ponty's by-now classic example is of the walking stick, which no longer exists as an object for the blind person but is that with which she sees, 'its point has become an area of sensitivity, extending the scope and active radius of touch, and providing a parallel to sight' (143). If I pick up a stick, I can immediately perceive what is in reach or out of reach. The scope of my body is both extended and delimited in a new way. The boundaries of my physical space have broadened. Hat, car or stick, he says, to use them is to be transplanted into them, to have our body incorporated into them: 'Habit expresses our power of dilating our being-in-the-world, or changing our existence by appropriating fresh instruments' (143). We see here, in *Phenomenology*, an incipient philosophy of media which Merleau-Ponty never quite takes up.

Habit forms this knowledge in my hands when I type, as I 'see' with my hands, through the hands the keys, not in the knowledge of one key to another but in an entire space that the hands know and traverse:

> When I sit at my typewriter, a motor space opens up beneath my hands, in which I am about to 'play' what I have read. The reading of the word is a modulation of visible space, the performance of the movement is a modulation of manual space, and the whole question is how a certain physiognomy of 'visual' patterns can evoke a certain type of motor response, how each 'visual' structure eventually provides itself with its mobile essence without there being any need to spell the word or specify the movement in detail in order to translate one into the other (144).

This duality of intention and performance is the harmony of the body in the world, of the body anchored in the world. The key-bank is incorporated into bodily space. As is the mobile phone, the tablet, any tool or device which the body learns to incorporate into the physical space of the habitual body so that it becomes invisible. Driving at 60mph, my body makes continual microadjustments so that the car follows the contours of the road without conscious thought, my foot slightly adjusting pressure on the accelerator, my hands barely easing the wheel this way or that to keep in line with the visual data. This habitual behaviour resides in the body as 'mediator of a world' (145), which lends itself to a curious conclusion. That is, that all media is secondary and the body is the primary media through which all other media is virtually translated.

The body is medium but lends itself to different functions. For survival it restricts itself to actions that conserve life, and thus posits a biological world. In its movement from the literal to the figurative a world of significance beyond the biological is seen, such as when we dance and form a new interpretive duet with the world as space. When the aim cannot be achieved naturally by the body 'it must build itself an instrument, and it projects thereby around itself a cultural world' (146). From instrumentation, then, emerges a cultural foundation, at least in human terms. All culture is not instrumentation, we might say, but all instrumentation is culture.

Yet before any formal induction into the world of instrumentation and culture, humans are committed to the world in myriad ways through the body and its attachments, whether umbilical cord or breast. Acculturation exists prior to birth. Foetuses hear singing in the

womb. Melodies of songs intermingle with heartbeats. Bodies absorb nutrients from foods grown in a highly technologized agricultural society using genetically modified seeds and chemical sprays, harvesting schedules and transportation and distribution networks. And as they grow they map the spaces of their environment, literally growing into the matrix of enwombed relations. Bodies learn to move in this arena of objective space, where objects and spaces are plotted, reveal and hide themselves. Space is a fundament of existence, in which the body is placed and learns to map through the body. Our body, Merleau-Ponty says, is not *in* space but *of* it (148),in the way in which the body is the body at all, in its coming into being. The data streams of touch and sight are not translated into one another but unified absolutely in the body. This translation of sensual data is the body itself, the perception and orientation of the body in space, and space and its objects embedded in the body which has its own bearing in the world, a style of being. The tactile and visual are unified in this bodily bearing. The hand as it moves exists in this kinaesthetic field which unifies world and body and places them together in a 'nexus of living meanings'(151). This nexus can be extended and distorted by instruments, by cultural objects. The stick, remember, takes this bodily bearing and extends it out to the environment. A blind person does not feel the stick itself but sees with it, probes the environment. Meaning is grasped by the body as our motor habits, instruments and organs work to relate ourselves and worlds, work to unify body and world at each moment. Speech and language, too, serve this function. Humans 'can speak as the electric light becomes incandescent' (175). Expression brings the world to being, whether bodily movement, the concordance of the visual-tactile field, or the spoken words which create through the body the mapping of sensibility through articulation. This is both the articulation of unity and difference.

Merleau-Ponty's *Nature* (2003) is his most explicit dialogue with the ethological work of Jacob von Uexküll and the notion of Umwelt. Even in utero the foetus forms a duologue with its environment, the matrix of the womb shaping the identity, the I, which is growing within it, receiving nutrients from it, exploring the restricted space of its incubation and inhabitation, beginning, from the movement which distinguishes its powers of intention and motility, to form itself as a person. Language acquisition itself clothes the body, forms a second skin, while the acquisition of behaviour is akin to the learning of a formal language, of a style of being-in-the-world. Body and its behaviours exist in a reciprocal relationship. Behaviour is the movement of the body which is a medium to the world, which is clothed by the world and moves the world under its own powers. Time and space thus become defined. Subjects move

across both. Body and world are mapped onto one another. They are inseparably imbricated in the envelope of existence as each loops into the other in continual circulation of data, information and meaning

Merleau-Ponty demonstrates how the body, even before birth, is entwined with the world in a duologue of becoming in the maturation of the foetus in the womb, a dialogue which begins to shape identity in utero. The I posits itself through the body, through its position as perceived in the universe, in the world which it creates and recreates endlessly in a congenital recursive hallucination, the *Funktionskreis* from which Umwelt is emergent. But in what way may an individual body, at the centre point of a subjective-objective world-pool, create difference itself? Through action, which is itself a form of sign-making – of world-changing semiosis – in its difference-creation. The organism takes action, a form of what Merleau-Ponty calls 'dissymmetrical behaviour' from which sides occur, creating difference from the position in the womb, our originary *there*. From this singular plane the body creates and makes sides, become aware of difference through its movements (Merleau-Ponty 2003:146). The body make its first movements in the deep-space of the womb. From a position of rest, it stretches and turns. It kicks and pushes and expands. As it is unfurled in the flesh, encoded through growth – that is, maturation and endogenous mutation – it is unfurled in space. Just as later, as it learns to language explicitly, it is sheathed in a second, semiotic skin, an ever-forming lattice over and through which it can begin to weave the base linguistic frameworks to speak its world, to sing its being in the social round. The acquisition of behaviour as a process is akin to the learning of a formal language, with our body the spoken language.

> [J]ust as language designates only in relation to other signs, so too can the body designate an object as abnormal only in relation to our norm, only as rupture in relation to its position of rest (146).

From stasis to movement the body makes an impact upon the world, creates and takes sides, that is, difference. Behaviour is overt semiosis, a physical languaging as we – body-anchored but existentially oblique to one another – semaphore diacritically through the phenomenological darkness, accenting our existence as individuals, as an *I-body* and an *I-can*. But also, through our fundamental connectivity in our dialogues within and beyond our species and beyond life-forms themselves, that we are always we. Position matters. Position in space. Position of limbs. Position of words. But through language and behaviour we graft

Umwelten to each other like organs connected between bodies, create ourselves, semiotic surgeons as we are, as epistemologically conjoined.

> A word has a proper meaning which is differentiated in space; depending on its place in the sentence or in time; depending on the state of the spoken language [*langue]*. In every case, there is an inextricable relation between what is received and what is given (147).

So too as space becomes differentiated does duration. Bodies exist, too, in time. Moment to moment, point to point, the body can now distinguish itself through story, and through narrative create memory. Body and behaviour exist in a reciprocity of being. The body is the sketch of behaviour, which is a second body added to the natural body:

> Reciprocally, behaviour could be treated like a body, all the motor attitudes constituting a supplementary dimension of the body. If we consider the motor development of the embryo, we see that certain acts acquired separately suddenly telescope into one unique act. We touch here on a profound understanding of the notion of the living body: the body is a system of motor powers that crisscross in order to produce a behaviour (147-148).

The story of our flesh becomes sedimentation in the mind-body matrix in a process of becoming-through-time as we convert qualia-perception, muscle-action and the thinking-feeling duologue of our bodies into remembrance of time's passing. Into coherent identity. The present is an ever-cresting wave upon which all existents surf, swelling from the unfathomable depths of time past, bearing us aloft into the always-receding, roiling future. But my present is not your present. Your now is never mine. We surge upon an infinitely parallel plane but experience time infinitely differently. We make time as we make space: within and through our non-discrete bodies. Past, present and future are temporal entanglements enacted by matter as it creates difference. Karen Barad writes:

> [T]he historiality of phenomena is written into their materialization, their bodily materiality holds the memories of the traces of its enfoldings; space and time (like matter) are phenomenal, that is, they are intra-actively produced in the making of phenomena; neither space nor time exist as determinate givens outside of

> phenomena…phenomena cannot be located in space and time; rather, phenomena are material entanglements that "extend" across different spaces and times (2007:383).

The body is a crisscross of lines, of flesh, of tendons, of nerves, but interfused through the body are lines of story, of past configurations, of a continual but ever-evolving present which tells the body onto the world it creates through a functional looping, mapping the inputs onto its form and into its incipient structures. As Merleau-Ponty postulates, the animal, as both a physical being and a self-created meaning, is a field, the function of which is both to regulate and develop:

> It is a true electrical field. Only a field has properties such that it is always distinguished from things *partes extra partes*, because it always includes a relation between the parts and the whole. It is a regulative principle…
>
> Behaviour is neither a simple architectural effect nor a sheath of functions; it is something that is ahead of functioning, which carries a reference to the future…In view of its endogenous initiative, the organism traces out what its future life will be; it sketches out its milieu (*Umwelt*); it contains a project in reference to its whole life (2003: 150-1).

The body sketches out its whole life in this creation of an Umwelt. From these beginnings it creates the zone or envelope of all its behaviours, a place of entangled enactment. "Life," he says, "is not a quasi-interiority, it is only a fold, the reality of a process" (157). As a signifying node in the semiosphere, the sphere of all signification, it is the collapsed difference between particle and wave, a breaching of its own banks. A shimmering sign with diffusive edges collapsing fissiparously into separate but connected streams. An outgrowth of mutating lines, entangling ecstatically with the world. A vibrating harmonic within a deafening chorus. In The Visible and the Invisible (1968) he writes:

> We shall render explicit the cohesion of time, of space, of space and time, the "simultaneity" of their parts (literal simultaneity in space, simultaneity in the figurative sense in time) and the intertwining (*entrelacs*) of space and time. And we shall render explicit the cohesion of the obverse and the reverse of my body which is responsible for the fact that my body – which is visible, tangible like a thing – acquires this view upon itself, this contact with itself, where it doubles itself up, unifies itself, in such a way that the objective body and the phenomenal body turn about one another or encroach upon one another (117).

This final masterwork was incomplete when Merleau-Ponty suffered a fatal stroke, leaving his most radical project unfinished. What remains is a sketch in some senses, but one so pregnant with meaning that it brims with a strong moral energy. Here the human and animal do not exist as separated, with humans superior in their being, but interdependent and intertwined in one another's environments, in the chiastic structure of being that is the flesh of existence, that of brute being (Westling 2014). The body is not a thing but what Merleau-Ponty calls the 'sensible sentient' which is a world thinking itself (1968:126). As the body is part of the chiastic intertwining of the flesh of the world, so language cleaves to the interplay of similitude and difference, of externality and internality. Body is language is world is brain in a very real sense, a tetralogy of inseparable elements of our perceived-perceiving, touching-touched inversality. This is the flesh of the world manifesting. We speak the world as the world speaks through us, brings us to being. Within us exist two leaves of being, body and world, which interleave, involute around a common stem. From this meshed relationality our sentient selves emerge. The world we sense is what brings this self into being. From the ground of the world, through its interwoven carnality, we rise up, become the flesh that thinks itself.

The seat of our sensoria – the synapses in the brain, the spinal cord and the vining nervous system – grow and twist, entangling flesh and ganglia, breaking and re-growing, reforming the internal to best couple animal with Umwelt, flesh with idiosyncratic spacetime. Maturity is equal to a greater mapping of world and organism. A closer encoding. An unfolding and refolding:

> Folding-unfolding no longer simply means tension-release, contraction-dilation, but enveloping-developing, involution-evolution. The organism is defined by its ability to fold its own parts and to unfold them, not to infinity, but to a degree of development assigned to each species. Thus an organism is enveloped by organisms, one within another (interlocking of germinal matter), like Russian dolls. The first fly contains the seeds of all flies to come, each being called in its tum to unfold its own parts at the right time. And when an organism dies, it does not really vanish but folds in upon itself, abruptly involuting into the again newly dormant seed by skipping all intermediate stages. The simplest way of stating the point is by saying that to unfold is to increase, to grow; whereas to fold is to diminish, to reduce, "to withdraw into the recesses of a world." (Deleuze 1993:8-9).

For Heidegger, the human and the animal are separated across an unbridgeable abyss. Merleau-Ponty, on the other hand, viewed humans and animals not as separated by this gulf of being, but as intertwined in the brute 'chiasm' of the natural world.[37] From the bacteria in our body to the interrelationships humans hold with all animal life, the human subject is knotted into the weave of the world, the flesh of the world which is the facticity [*Geworfenheit*] of existence. As David Abram (1997) puts it:

> To acknowledge that "I am this body" is not to reduce the mystery of my yearnings and fluid thoughts to a set of mechanisms, or my "self" to a determinate robot. Rather it is to affirm the uncanniness of this physical form. It is not to lock up awareness within the density of a closed and bounded object, for as we shall see, the boundaries of a living body are open and indeterminate; more like membranes than barriers, they define a surface of metamorphosis and exchange. The breathing, sensing body draws its sustenance and its very substance from the soils, plants, and elements that surround it; it continually contributes itself, in turn, to the air, to the composting earth, to the nourishment of insects and oak trees and squirrels, ceaselessly spreading out of itself as well as breathing the world into itself, so that it is very difficult to discern, at any moment, precisely where this living body begins and where it ends. Considered phenomenologically – that is, as we actually experience and live it – the body is a creative, shape-shifting entity (38).

Humans exist, in this manner, in a state of interdependence, embraced in our intertwining with our own and others' environments. Westling sees Merleau-Ponty's ontology of being, despite being cut short by his untimely death before the discoveries of genetics and the data mapping of common ancestries could be known to him, as rightly anticipating the relationality of being in the dynamic unfolding of evolution through time, 'equal participants in the biota, with its dense ecological texture of interdependence' (2014: 27). His notions of this interdependence, this intertwining chiasm, were very different to his interpretation of the Western scientific logos, traditions and culture which sought, as he and many others have argued, to abstract the living from itself and present a plotted husk of the vital, living reality in which we and all existents are plunged. In 'Eye and Mind' (1964), a phenomenological dissection of the art of painting, he writes:

[37] 'He gave this relationship the name *chiasm*, which he took from the Greek *chiasmos*, meaning a diagonal crossing as in the letter *X* or in the DNA molecule. All organisms exist intertwined and in constant interaction with the flesh of the world around them, which is the wild or brute being in which we are immersed' (Westling 2014: 26-27).

> Science manipulates things and gives up living in them. It makes its own limited models of things; operating upon these indices or variables to effect whatever transformations are permitted by their definition, it comes face to face with the real world only at rare intervals. Science is and always has been that admirably active, ingenious, and bold way of thinking whose fundamental bias is to treat everything as though it were an object-in-general – as though it meant nothing to us and yet was predestined for our own use (159).

Merleau-Ponty's respect for the sciences is apparent here and elsewhere, yet he is a strong critic of the scientific *Weltanschauung* that refuses to accept its interpretive method as such or its unrecognised limitations. It is a method that sees the world in intervals, in clean breaks, as if peering through window slats where each section of the world was fitted together yet somehow separated, a contiguous flowing without fissiparation of seeing or experience. The world here, animals included, are objectified in their generalities rather than perceived in their particularities, an object-type that belongs to the world side of the human-world separation, when world is an object for use in whatever manner humanity sees fit and the category *human* is valorised in glorious isolation. Classical science, he writes, feels this 'opaqueness' of the world but attempts to construct it anew in its modelling modus, a transcendental, artificial, reductive system of 'data-collecting techniques' (160) that must view itself as based on this brute world and not framed in an idealist superposition. Scientific thinking must not view the world from above but 'return to the "there is" which underlies it:':

> to the site, the soil of the sensible and opened world such as it is in our life and for our body – not that possible body which we may legitimately think of as an information machine but that actual body I call mine, this sentinel standing quietly at the command of my words and my acts. Further, *associated* bodies must be brought forward along with my body – the "others," not merely as my congeners, as the zoologist says, but the others who haunt me and whom I haunt; the "others" along *with* whom I haunt a single, present and actual Being as no animal ever haunted those beings of his own species, locale or habitat. In this primordial historicity, science's agile and improvisatory thought will learn to ground itself upon things themselves and upon itself, and will once more become philosophy…. (160-161).

In contrast to the scientist the painter views the world with her body, a body of intertwining vision and movement, that makes through its mobility a difference in the world as it steers through the visible. All changes of place, he argues, are recorded on the map of the visible, which form a part of one's own landscape, 'marked upon the map of the "I-can". Each of the

two maps is complete. The visible world and the world of my motor projects are each total parts of the same Being' (162). The mode of seeing opens the body to the world, an immersion into the visible by which the radiant self proceeds through the sensible. The body both sees and is seen, by itself and by others. It 'touches itself touching'. As such it is immersed in the fabric of the world, a thing for itself and others, encircled both by itself and world which are made of the same stuff, doubly caught in and by the world, an indivisible joining of the sensing and the sensed (163). The body haunts Being just as Being haunts the body; light, colour, texture are echoed internally in the body. Although Merleau-Ponty does not mention it here, this is the Funktionskreis of a concentric Umwelt that the animal creates by this sensing-sensed duologue of environment and body, touching and touched by the world.

Like other organisms, humans know the environment through the sensible world they create with it, through this dialogue with physiognomy. Nature itself is ambiguous and primordial. It is not an object in front of us but what carries us, what Merleau-Ponty calls our 'soil' (2003:4). Subjectivity is the power to constitute the world, the lawfulness to order it. From the flux of being our subjectivities fix objects, individuate them under the lens of our apprehension. Living beings are both cause and effect and so in them we can recognize a causal finality. In the organism space and time are articulations of an order given unto itself in carnal experience, neither tools nor problems to be solved as under the scientific ordering which displace space and time from the body. Measurement forces an extended individuation where apprehension does so naturally, the scientific apparatus sampling a reality that does not exist in fact but as a construction of sense. The apparatus presents a mediated object which is a fixity determined artificially by the instrument. Probability functions congeal into orders of observation. Time is nature's pulsations recorded across minds which participate in its becoming. Humans order it through corporeal apparatuses as it flows, sensorial data inscribing time and space in the flesh, a double existence in which the objective and subjective bodies entangle and dance around one another.

Humans are caught in the middle of this interweaving, in the brute existence of savage nature where sense commingles. I possess the visible by being possessed by it, subsumed within it. Separated by the thickness of the body and the look, I strive still to see myself as others see me, to be seen and to know my own thickness at the heart of the visible. This thickness of sense is how I know the world:

> The thickness of the body, far from rivaling [sic] that of the world, is on the contrary the sole means I have to go unto the heart of the things, by making myself a world and making them flesh (1968:135).

The body is not a thing but is sensibility for itself, what Merleau-Ponty calls the 'sensible sentient,' a 'world that thinks itself' (136). The body exists as an intertext between sensible and sentient, two leaves of being, one side a thing among things and another that which touches and sees them, uniting the worlds of subject and object in itself, crossing the abyss and stitching it together. This duality, he says, cannot be accidental. It is what teaches us that 'each calls for the other' (137). This duality of intertwining exists not in a flattened relationship but a circularity of obverse and reverse. The flesh of the world is not matter or mind but what allows matter and mind to be, the relationality from which being emerges, 'a structure that makes possible affective relations, not an experience of a perceiving subject' (Bannon 2011:345).

Conclusion 3.5

The body does not come before the world, is not prior ontologically to space and time but co-constituted. The ontic priority of the body is so enmeshed with the world there is no division between external and internal but a continuous looping and wrapping. It is entwined in the flesh of existence which is the becoming of the world through our being, a surging forth. For Merleau-Ponty the chiasm is the intertwining of the flesh of the body with the flesh of the world, the relationality that brings being into being, the chiastic entanglements which produce one another. The functional cycle of the Umwelt is the not the circle I form. It is that which forms me. That from which I emerge. Through this circularity I not only come to recognise how the visible is the landscape of my being, holding in flux the upsurge of my being, but that there are landscapes other than my own, that world creation through this circularity does not imply solipsism but opens being up to overlapping interactions and the sharing of meaning, to the creation of culture and commonality. Herein lies community:

> Why would not the synergy exist among different organisms, if it is possible within each? Their landscapes interweave, their actions and their passions fit together exactly: this is possible as soon as we no longer make belongingness to one same "consciousness" the primordial definition of sensibility, and as soon as we rather

> understand it as the return of the visible upon itself, a carnal adherence of the sentient to the sensed and of the sensed to the sentient. For, as overlapping and fission, identity and difference, it brings to birth a ray of natural light that illuminates all flesh and not only my own (Merleau-Ponty 1968:142).

We have seen how the body is the centre of the world it creates, the anchor and zero-point from which it reaches out and grasps the strands of the world, weaving them together into a tapestry of being-in-the-world. Yet to create a more complete picture of the body in the world we need to discuss the relations of space and time that form the conditions of possibility within in, that map out the forms of the possible, that frame the compossibility of bodies and objects existing together, becoming together through time and space. The next chapter discusses notions of dwelling, space and place through Heidegger, Ingold, Westling and Malpas in order to map out the terrain of bodily dwelling, physical and digital spaces, and the meaningful places humans build within this realm of possibilities.

PART 3: ENVIRONMENT

CHAPTER 4

Space, Place and Dwelling

4.1 Building Dwelling Thinking

Where do we dwell, as we fold and unfold into one another, in the multiplicity of existents? How do we, as a species, enact our dwelling? In 'Building Dwelling Thinking' Heidegger asks a simple question, what is it to dwell? Humans dwell by building, he answers, for building has dwelling as its goal: 'Man's relation to locations, and through locations to spaces, inheres in his dwelling. The relationship between man and space is none other than dwelling, strictly thought and spoken' (2001:155). A supermarket or a train station is not a dwelling, but such structures, also, support dwelling. Dwelling and building, while two distinct activities, are intimately related. Dwelling is the end of building, as building is the means of dwelling. End and means are inseparable. Yet Heidegger argues that dwelling is not only a means in terms of dwelling. To build *is* to dwell (144).

Humans dwell, then, in the world, and they build to dwell. Think, says Heidegger, of a bridge. It connects two banks but it is the bridge which crosses over the stream, gathering the banks together and letting the stream run on in its course unhindered, undammed, gathering the seams of the land as a stitch gathers the split skin. Stream, bank and land are gathered into a neighbourhood – the etymology of neighbour, *near-dweller*, just as to build also meant, once, to dwell:

> What, then, does *Bauen*, building, *mean*? The Old English and High German word for building, *buan*, means to dwell. This signifies: to remain, to stay in a place. The real meaning of the verb *bauen*, namely, to dwell, has been lost to us. But a covert trace of it has been preserved in the German word *Nachbar*, neighbour. The neighbour is in Old English the *neahjjebur*; *neah*, near, and *gebur*, dweller. The Nachbar is the *Nachjfebur*, the *Nachjfebauer*, the near-dweller, he who dwells nearby (144-145).

A neighbour is one who dwells nearby. Together we, my neighbours and I, form neighbourhoods. The bridge, for example, is both thing and symbol, not one or the other, and that which it gathers into a neighbourhood is a *site*. The bridge is itself a location because only such a thing can create the space for a site. Before the bridge the location, as such, did not exist. Many spots along the stream could have been chosen, but only one became a

location because the bridge was built. We do not find a location to build a bridge but by building the bridge bring a location into being. The bridge determines the characteristics of the locality by its being built (152).

Location allows spaces, a space being that which has been cleared for dwelling, that which is within a boundary. The boundary, he says:

> is not that at which something stops but, as the Greeks recognized, the boundary is that from which something *begins its presenting.* That is why the concept is that of *horismos* that is, the horizon, the boundary. Space is in essence that for which room has been made, that which is let into its bounds. That for which room is made is always granted and hence is joined, that is, gathered, by virtue of a location, that is, by such a thing as the bridge. *Accordingly, spaces receive their being from locations and not from "space"* (152).

Locations determine space. This is important, because locations are where humans dwell, where they decide to build for dwelling's sake. Site determines space, delimits boundary, the horizon of human dwelling. In digital topographies, where dwelling is enacted in a horizon of digital information populated by digital objects, important boundaries, locations and sites are determined in the foci of human dwelling both formally and in terms of interest and attention. A website is a space whose location is determined by a fixed address in a matrix of information networks. Yet more than this, it is a place where meaningful interactions take place, where information important for human stories and uses both as individuals and communities is stored, shared, and intermixed. These locations and websites determine cyberspace, create the networked spaces in which we interact.

For Heidegger, however, as Louise Westling (2014) explains, the only locations that have significance are those upon which human have expended their agency:

> No place on earth seems to have meaning without the presence of human structures; for beaver or deer, there are neither banks for the river nor significant locations along it. Human beings are required in order to gather the "fourfold" unity of Being and to care for the world (23).

Yet as Westling argues, via the work of zoologists such as Donald Griffin and discussions of

the ethological developments of primatologists and the studies conducted by other scientists over decades, the supposedly 'abyssal' differences between human and animal are falsely conceived and erroneously propagated throughout history, not least by influential philosophers such as Heidegger. Humans undoubtedly exist as part of a biological continuum, a deeply embedded member of an animal kingdom that includes in other species the ability to communicate meaningfully, to develop and use tools, to manipulate the environment with clear, focused intentions, to memorise and count and solve puzzles, to not only learn but to teach, to feel joy, and to mourn. 'Heidegger's claim,' she says, 'that apes do not have hands that can share and welcome and give, communicating complex thoughts, is clearly ridiculous when seen in the context of such primate studies' (94). Animals, too, build to dwell, not only humans. Whether birds, beavers or bees, the widespread building behaviours that include selecting a location of significance for the nest, dam or hive and adapting cultural traditions to local conditions is blindingly apparent.

As Jeff Malpas (2017) states, Heidegger viewed the human as essentially *unheimlich*, this strangeness or uncanniness the essential conundrum of our existence. It is a problem because the thorniness at the centre of existence for the human cannot be reduced to a biological or physical explicandum. There is something of a riddle about our existence. But this, I think, comes from viewing ourselves from the inside out, from within the incorporated flesh-mind matrix that marks the nub of our being, the root of facticity in continual interplay with our perception of dwelling that places the mind or 'soul' in hierarchy above the body and its functions. It is easy to confuse the flux of data and our thoughts about it as a separate soul and not that which emerges from the flesh. The problem of the human can never be reduced to data 'as Heidegger put it…"can never be discerned through the mere description that establishes data"' (3). Humans know of their end, the finitude of flesh, and from that knowledge comes great violence and great sorrow to overcome. This is intimately tied to the problem of modernity and the existential challenges faced, but also caused, by human life, of the catastrophic potentials released by technological advancements, from the waxing and waning fear of nuclear annihilation, to the increasing environmental ravaging of the earth, to automated killing machines assailing the skies to combat terror, the intrusion into 'hostile' terroir through air-based lethality via technological distance both spatially and morally, 'and all of this as technology continues to proceed at an ever faster and more disruptive pace' (4). What we might also note here is that this is very much a Western-based perspective, a loss of faith not only in the divine but in the moral superiority engendered by the Enlightenment

project used to justify foreign predations and control of resources both human and material under the aegis of freedom from past existential bonds. Freedom for us, but not for you.

Being (*Dasein*) is that which given to a there/here of a situation, a specificity of dwelling in a topology, 'the saying of place' (7). The danger here, argues Malpas, is that the meaning ascribed to place in the human situation can lead us to prioritise the question of the human over that of the situation. Yet the links between these problems are indissoluble. To be is to be in an uncanny situation. This situatedness does not refer to geospatial location but is a self-reflexivity of being-in-the-world, a hermeneutic circularity that places humans both in and outside of a situation, simultaneously placed and displaced, at home and overwhelmed by a feeling of homelessness. Humans are at the same time bounded and unbounded, within the body and yet observing it in a dual positionality. What is the world in which Being exists in its everyday character? This is the environment. Being-in-the-world aims towards this environment in its worlding and in the idea of worldhood. Heidegger writes:

> We shall seek the worldhood of the environment (environmentality) by going through an ontological Interpretation of those entities within-the-*environment* which we encounter as closest to us. The expression "environment" [Umwelt] contains in the 'environ' ["um"] a suggestion of spatiality. Yet the 'around' ["Umherum"] which is constitutive for the environment does not have a primarily 'spatial' meaning. Instead, the spatial character which unconstestably belongs to any environment, can be classified only in terms of the structure of worldhood (Heiddeger 1962:94)

As the environment is discovered, so is nature, that towards which Being aims, which includes that which is humanmade. Through human constructs nature is revealed. The covered railway platform accounts for bad weather. Streetlights account for darkness and daylight, the position of the sun to the earth. Clock time is determined by this natural revolution of planet around a star. Nature is disclosed by technologies of dwelling.

But humans dwell with other beings. Malpas says that 'if we try to think of the human in terms only of animality or physicality, then we leave the human out of account' (13). This is an unfortunate conflation of animality and physicality. To think of animals only in physical terms leaves the animalhood of each specific animal out of account. Grouping animals together as non-human does each organism a dire disservice. It elides into one non-distinct grouping the beaverness of beavers, the antness of ants, the squidness of squids, the birdness

of birds [and more specifically, for example, the raveness of ravens], and by so doing deny them their specificity of being in *their* worlds, their Umwelten. Does an ant ever feel uncanny? I do not know. Does a whale feel morose? I would not be surprised. Malpas writes:

> [T]he direction in which we are lead [sic] when we ask after the situation of human is to the being of the human *in the world*, and so to the being of the human as always a being *in place*, which also means a being *in relation*, and so a being that is essentially open to that which is apart from it (13).

Fine. But does that not apply to the animal kingdom more generally? Are they not *in place* and so *in relation* and so open to that which they are, in some senses, also apart from, in the same ways in which humans exist both in and outside of the world? The modern world, Malpas states, is organised so as to flatten out distinction and difference, to level out the distinctiveness of human beings as a mode of uncanniness of being. The world, now, allows for human beings to exist only as something quantifiable, something to be manipulated and managed. This, however, is exactly what Enlightenment discourses did to the non-Western populations whose resources of flesh and environment were desired, and what is done still to the animal world. Uexküll's demolition of the mechanisation of animals should rightly have led to demolition of this type of levelling out of species and individuals within that species, of the animal world as a flattened plane that could be managed, manipulated and misused however one might wish to. Malpas states that the problem of the human is the problem of place. I do not disagree, other than to counter that the problem of the animal is likewise the problem of place, that is, of environment. Their body and their environment create their world just as humans do theirs. To see it otherwise is to state the old lie, as an old acquaintance from the American Bible Belt once did to me, that the world was created by God and all the animals in it for our utility. Even Giraffes? I replied. Yes, even giraffes, she said.

But Heidegger's perspectives on dwelling, despite their lack in regards to animal life, are not entirely without merit. Ingold, through his exposure to Heideggerian thought, adopts what he calls a 'dwelling perspective', a perspective on building which is a process of working with materials and bringing form forth into being 'rather than merely translating from the virtual to the actual' (2011:10). Think of building as a modality of weaving, he says. Making is to weaving as building is to dwelling, that is, we must look to the modes of dwelling and weaving as a kind of environmental attentiveness, attentiveness to process rather than just

focusing on the product of labour itself.

> Whereas the building perspective sets the maker, as a bearer of prior intentions, over and against the material world, the dwelling perspective situates the weaver in amongst a world of materials, which he literally draws out in bringing forth the work. He is, in that regard, a producer in the original sense of the term (2011:10).

Over twenty years ago, he says, he thought humans the only animals not fully *immersed* in their environments, able to view and muse upon their own existence from a step removed and so able to see things as they are rather than as they appear, standing amidst a world of objects not yet endowed with particular meaning but maintaining neutrality until utilisation. It was for this reason that Ingold previously took issue with the translation of Umwelt as 'subjective universe,' when the dominion of reflective subjecthood over neutral objects could only be a human trait, not one shared with animal kind. It was the Innenwelt, the interior subject universe which was the raw material of internalised representations, that derived from the Umwelt through this action of reflection. Yet it is not in ascribing meaning to a thing that humans differ from their animal counterparts, Ingold argues, but in the lack or loss of meaning that may occur for us, in the bleeding of signification that shocks us into the self-consciousness of our worlding. A carpenter hammering a nail has no thought of the hammer as object,[38] it merges into the world-as-perceived until something misfires and attention to the object as thing occurs. The facticity of an object only makes itself known to us when something jolts us out of the moment:

> 'What is this?' curses the carpenter as the hammer misses its mark; or the musician when the violin goes out of tune or a string snaps. This is not the kind of question that a non-human, without the gift of language, would ever ask (81).

The human animal is haunted by this loss of meaning. When we fail, when our actions fail, and meaning dissolves in the disassociation from the act, our worlds lose meaning. Not in meaningful world creation, which all animals share, are humans unique, but in this mourning, in this loss of meaning and futility.

[38] "To say a hammer has the function of being for hammering leaves out the defining relation of hammers to nails and other equipment, to the point of building things, and to our skills. – all of which Heidegger called readiness-to-hand --and so attributing functions to brute facts couldn't capture the meaningful organization of the everyday world" (Dreyfus, 2007: 248).

According to Heidegger, human worlds can be rendered meaningless as, unlike animals who are captivated by existence and exist in a closure of meaning and environment, humans exist in the open, detached from environment by reflection. Animals are poor-in-world whilst humans, he says, are truly world-forming. The animal fails to think of things as things, separate from one another and from the immersion of life. The animal, by being captivated by the world, is also unable to consciously apprehend it. Yet despite this, it has a fully-open engagement with its environment precisely because it is so captivated, a commitment that human beings, standing back and observing self-consciously, never can. But in this way the being-in-the-world becomes being-for-the-world as created:

> Unlike the animal in its captivation, which finds itself *taken* in an environmental embrace that is as passionate as it is overwhelming, the human being stands before the world, as a domain of things-in-themselves, and has of necessity to take a stance *towards* it. Here, concludes Heidegger, we see … the essential contrast between the animal's being open and the *world-openness* of man. Man's being open is a being held toward … whereas the animal's being open is a being taken by … and thereby a being absorbed in its encircling ring (82).

But unlike Heidegger, Ingold cannot countenance the idea that animal worlds have no meaning because they cannot linguistically symbolise nor step back from their worlds and reflect, as if meaning inhered only in reflection and abstraction, as if process was not meaning. The bee dances for direction-giving, but is there nothing, we might ask, symbolic there? And should the bee and the bear, the whale or the wasp be grouped under the all-embracive, reductive category *animal* and, in saying so, demarcate only homo sapiens as something separate?

> Yet is it not ironic that we should expect of the ant or bee, as a condition of its finding some meaning in the environment, that it holds before its mind some representation of the world and acts in accordance with it, when this is something we humans so rarely do ourselves? How often, I wonder, do we think before we act? Even when we do, the action hardly follows automatically from the thought, and may often diverge from it in ways never intended. As the philosopher Alfred North Whitehead wisely observed, 'from the moment of birth we are immersed in action, and can only fitfully guide it by taking thought' (Whitehead 1938: 217) (77).

Much of the time humans are as immersed in our Umwelten as any animal, acting, reacting, enacting desires. But the symbolic nature of Umwelt has been clearly shown as intrameshed

in the sense-making function of that autopoietic world, from tick to human. In fact, for Uexküll the tick in its simplicity of structure holds this potential for 'undifferentiated openness' and the simpler the animal the greater this potential, hence amoebas, as less structurated animals, are open to the world in ways the horse could never be (Parikka 2010:65).

The idea that the tool-using magpie or ape cannot apprehend the stick as thing is, also, pure nonsense. The assumptions, denied by close study, on behalf of animal kin are astounding. Any observation of non-human animals shows that there is more there than reactive behaviour and easily demonstrates the lie of their supposedly mechanistic being-in-the-world. There is an *animalhood* there as distinct as any personhood and a continuity between ourselves and other members of the animal kingdom. Humans are but one manifestation of that evolutionary continuity. Matthew Calarco (2008) poses the question against Heidegger's analysis of the human-animal question:

> How can we be assured at the outset of the analysis that the difference between human Dasein and animal life is definitive and *abyssal*, especially if the most refined bodies of knowledge we have from empirical and social sciences strongly suggest otherwise? (23).

This is the question we must continue to explore in order to understand not only animal dwelling but our own interconnectedness in the chiasm of our being in the flesh of the world.

4.2 Space, Place

Putting the animal question aside for the moment, there is still an important debate on the nature of space and place that must be discussed in order to comprehend the nature of human being as it relates to informational technologies and the virtual environments they support.

Malpas (2012) argues that, despite much attention on particular modalities of space or spatialities, few have seriously considered the phenomenon of space *as* space from within the structure of place or *topos*. The view of space within disciplines such as geography essentially view space as relational, 'a swirl of flows, networks, and trajectories, as a chaotic ordering that locates and dislocates' (228). This emphasis on flow and mutability offers not

so much a theorization of space itself but of the politics of space and social relations. Space is understood in this context as a flattened relationality, of linear intersection and convergence. This politicisation of the concept of space disperses with notions of boundary in relation to place; is, in fact, actively suspicious of the notion of boundaries and limits and dividing lines. At best these are heuristic frameworks rather than ontological analyses of the underlying conceptual nature of space and place, the ground of these concepts rather than a methodological means.

Thinking, he states, requires language. In any analysis of space and place the concepts themselves and their inherent preconceptions must be interrogated. With this in mind, any assumptions about the nature of such concepts should be guarded against, such that the concept of space is a literal, physical concept, and that one can easily assume what 'physical' means and move on without pause. The distinction between the literal and the metaphorical, he contends, is not absolute, nor is it paid any attention to in current discourse of space and place. Space and place, likewise, cannot be considered separately but only as a set of overlapping meanings not easily distinguishable, a nuanced set of interwoven senses that become sometimes more, sometimes less accentuated. For Malpas, there are three concepts undergirding these notions of space, place, and time too, the concepts of *boundedness*, *openness*, and *emergence* (233). Space may be thought of as the container or as what is actually contained. Does the universe contain space or is space that which contains the universe? Is it a box or what the box holds? This distinction relates to a distinction in Greek thought between the concepts of *topos* and *chora* (khora) versus *kenon*. In the latter case, kenon refers to the void, of space as an emptiness into which things, atoms, are filled. The two former concepts refer to a notion of boundedness which is a containing body, a womb or matrix through which things, objects, come into being. It is kenon as the idea of infinite extension, of extendedness, which determines our primary notions of space today. Topos and chora contain this idea of extendedness in terms of enclosure, of making space *for*, of space as boundedness. This conceptual shift from boundedness to extendedness is historical, shifting over time until the latter, in which boundedness plays no part, prevailed. Time, in this cosmology, is collapsed into space, becomes another form of extendedness rather than boundedness. In terms of space and place, space as extendedness becomes distinct from the boundedness of place, with the natural sciences conferring privilege on the former, a privileging that has further influenced various social science disciplines such as geography.

Malpas's third concept, of emergence, refers to movement, of coming forth, very much entwined in the notion of chora:

> The chora involves a notion of bounded openness, but that openness is an openness that allows for something to appear within it, and as such it allows for the thing that appears to emerge in that openness. This is why the chora is characterized as *matrix* or *womb* (or as receptacle – in that it *receives*): the chora is that which allows that which is contained and sheltered within it to come forth as apparent, as existing (235).

Likewise, the Aristotelian notion of topos as part of the *Physics* contains within it the idea of emergence, of coming forth. A body is enclosed by its surroundings, which press against it, and fills a place within that surroundings, against which it presses. Place is not static. It contains movement, an emergence which is likewise fundamental to time. These concepts are not separable but bound so closely that each takes on aspects of the other due to their entanglement. Openness can seem in character like an emergence. These concepts do not exist independently. This interrelatedness, argues Malpas, was gradually obscured with the prevailing dominance of the notion of extendedness, subsuming boundedness into it as a demarcating principle relating to interior regions. Openness became extendedness, became a void to be filled 'in terms of a homogenous, isotropic, measurable, and in principle unlimited field' (236). Our thoughts of *cyberspace* are likely similar. Cyberspace is often thought of as an isomorph of physical space, an empty homogenous space waiting to be filled with data, information, content. *How much space is on this server?* Rather, Malpas argues that space should be thought of in terms of khora, a bounded place of becoming, an evolutionary co-emergence of place, of an open dynamism. Place is always bounded, argues Malpas, and at the same time always open, dynamic, always becoming. Space and time are both intertwingled within this interconnected matrix, the becomingness of phenomenal happening through openness, boundedness and emergence. This is tied to appearance and embodiment. Differentiation occurs through the interplay of void and body. Appearance is 'always the appearance of some thing':

> is always a *taking place*, which is to say that it is always the establishing of a certain *there*. – which refers both to that which stands at the centre of a surrounding context or environment, the thing, *and* its immediate place…as well as to the context or environment that surrounds (237).

Things are never simply things in isolation but exist in relation to, are oriented towards, those things around them. It is this orientation and location that allows being-in-the-world, Boundedness is that which allows this relationality and orientation to occur, the realm of possibility of these vectors. Malpas's critique of geographic theorists such as Doreen Massey rests on this neglect of boundedness, the reduction of relata to points, to nodes in a flattened networking of the world, with relata reduced to functions of relationality rather than a co-existent mutuality. By paying attention to the often ignored ground of space and place the focus can move away from the framework of physicalist theory, refocusing on the conditions that allow space and place to emerge both in physical and social conditions, a reorientation that allows us to critique the relationality that undergirds 'the language of contemporary globalized capital' (240). That this language is mirrored by capital, particularly social media and search companies, is important. It allows a particular mode of being that is inherently exploitable to come to the fore. What this, what we might call 'nodalilty,' does is to reduce our relations to atomised points within an empty space. Human bodies and lives become nodes in a flattened sphere, data points, marketing points to be analysed and sold to. Such data profiles are two-dimensional constructs that have nothing of the flesh and blood in them but leached of life. Humans are extracted of value in their online lives through this increasingly symbiotic parasitism. Silicon feeds on carbon with a billion teeth.

Modernity, powered by the rise of communication technologies, is characterised by this sense of loss of place, accelerated by modern media technologies, by the growing ubiquity of digital media, or 'new media'[39] which 'seems to have the greatest potential for spatial, temporal and topographic transformation, and so for the 'dis-location' and 'dis-placement' of culture and of experience' (Malpas 2008:198). The dis-location of globalisation, an effect with seemingly unlimited geographic and cultural reach, is made possible through computerised communication technologies. Globalisation is inherently homogenising in its aims and effects, a threat to distinctiveness and so to the interlinked notions of place and culture, of any heritage made distinct through place, any differences exploitable, commodifiable. Cultural heritage is not only informational in nature, it is tied to place, to things and objects, to cultural 'practices and narratives that cohere around them' (198). By threatening the separation between near and far, of our sense of place, it threatens not only

[39] 'I take 'new media' to refer to a mode of contemporary media technology that centres on the deployment of computational techniques and devices for the production, reproduction, recording, communication and distribution of information' (Malpas 2008:199).

our heritage but the core of our identities and the ability to remain distinct in terms of the differences of experience which structure our becoming-into-existence.

This again is a reduction to nodality, a flattened net which bottom-trawls human cultural being and crushes the habitats which make an ecosystem local, unique and flourishing of life. Of course, subcultures still exist, and cyberspaces allow them to connect and to thrive even, and perhaps especially, in their morally harmful iterations. But everything is reduced to what can be commercialised and repackaged under a capitalist macrosystem that feeds the prevalent emptiness at the dredged bottom of modern life. The void of the soul matches the void that permeates notions of space, place and belonging. A sense of place gives the human a sense of difference yet place, for the last half millennium, has been reduced to bare location, to position in 'levelled-down, monotonous *space* for building or other enterprises…reduced to locations between which movements of physical bodies occur' (Ed Casey, quoted in Malpas 2008:201). Place is reduced to coordinates, points in space, that which can be mapped despite the loss of richness when we take the map for the territory and allow our selves to be sold to gain access to the map.

4.3 Conclusion

There is much of value in Heidegger's conception of dwelling, and much to critique, not least in his dismal conclusion regarding the animal question. Heidegger, assailed by the technology of the modern world, enacts a philosophy of retrenchment. Retrenchment is the act of pruning, cutting off or cutting out. Not only does he cut out the human from the animal and the animal from the human, he prunes the richness of human being-in-the-world by lopping off the branch from the tree, suffering under the illusion of isolation for a species cast out from the world's enchantment. The other use of the word retrench is military, to dig a trench for a second line of defence, and here Heidegger is defensively cutting a line between humanity and all other species in order to defend it against the attack of the modern on one hand and interspecies companionship on the other. In Heidegger, both hands are tied.

The discussion in these last two chapters of different foci regarding embodiment, dwelling, place and space in thinkers such as Merleau-Ponty, Deleuze, Heidegger and Malpas in relation to Uexküll's ethology allows this thesis to explore the intertwining of these notions, especially regarding the question of our intertwining embrace with digital technologies,

media, and capital. As stated in the introduction to this research, one of the main aims here is to interrogate human modes of dwelling in an attempt to explore how we humans, as biosemiotic subjects, interact through different forms of environment coupling, and so partake in the emergent digital Umwelten created by and residing upon ICT technologies and the Internet. The ideas presented above can be integrated to create a synthetic, embracive approach that encircles all existents, whether conscious or not, whether alive in the traditional sense or not. The uptake of Uexküll's ideas and the generative offshoots of his ethological ontology helps to create a theoretical foundation upon which to examine not only how humans exist in the analogue but also the emergent digital lifeworlds of contemporary 21st century existence. The growth of such worlds, and the digital *khôra* which provides the dwelling space in which they may exist, will continue to have an increasingly profound effect on human modes of *being-in-the-world*, and upon how our channels of communication and access to information will evolve, expand and reconfigure in ways barely imagined at this vertiginous technological moment, so fast are the technical horizons of science fiction and reality blurring. New informational objects, new things, come into existence daily, and humans, as their creators and curators, or their co-existents at the least, must consider their ontological status in order to not only ground themselves, but to remain morally culpable for their actions towards them. We must tell their sides of the story, too. Only by fully understanding the radicalness of Uexküll's demolition of the mechanistic conception of animal being and the ramifications for the artificial hierarchies of humans and non-humans can the effects on human interactions with new informational technologies be grasped. Space and place are important to this story. How humans fit into a world of many places. How they form place from space. How dwelling gives them a horizon and ground, a place to be and to do. And how those spaces have become commercialised, overridden by those who do not seek human flourishing but human control by a calculative machine matrix.

Yet this is only part of the story. Technics and the forces driving the evolution, dispersal and spread of technologies is the other half of the riddle of human dwelling. In the following chapter, technologies are brought into the mix of this intertwining in order to foreground the networks which they also form, between humans, the world and themselves. Without considering the forces behind the evolution of technologies and how they affect human being and dwelling, the current ethological position regarding digital technologies and the predicament regarding their abuse cannot be fully understood. As technologies can recoup the

lost unity of the world, so they can entrance and entrap, bringing drudgery and, worse, servitude to ends other than our own.

PART 4:
TECHNICS

CHAPTER 5

The Technical Milieu and Its Evolution

So far the discussion has focussed on the evolutionary basis of biological perception and how the worlds of organisms are a co-creation between physiological structure, environment and semiotic carriers of meaning. We have discussed how humans dwell in the world and build structures, how they compose and organise spaces both physical and digital. But to fully understand the construction of the human Umwelt, it becomes necessary to discuss in detail the process of technical development and the technical milieu through the coevolution of the human and the technical. It becomes vital, in order to understand the entangled relations of bodies and technologies, to return to the progressive critical understanding of certain theorists of the technical such as Ernst Cassirer, Ernst Kapp and Gilbert Simondon. The late nineteenth and early to mid-twentieth century is a key period when the philosophy of technological understanding was progressing among key figures contemporaneous with radical breakthroughs in biology and physics that destabilised the notion of our splendid isolation amongst animal species and upended the paradigm of a stable Newtonian universe. The development of organistic technical philosophies enabled radical new visions that saw natural and technical evolution, and natural and human history, not as separate spheres or domains of knowledge, but as entirely entwined with one another, as, indeed, the same processes of becoming.

5.1 Ernst Kapp: *Grundlinien einer Philosophie der Technik*

Ernst Kapp, writing in the late nineteenth century, was the pioneer of the organ-projection idea in the philosophy of technology which portrays tools as the projections of the human body. In *Elements of a Philosophy of Technology* [*Grundlinien einer Philosophie der Technik*] (2018) Kapp argues that organs are to the body what tools are to technology. In common understanding, organs are composed of those structures which nourish and support the body, the heart, the liver and so on, and of those placed at the threshold of the exterior body which permit sensible perception. To these two sets of organs, Kapp argues that the limbs and extremities of the body should also be classed as organs, important for the development of his organology of tools and their uses.

For Kapp, history itself starts with the invention of the first tool. Tools allow work and work

is history. This initiates the fundamental primary distinction from animalkind, who do not work. 'All work is activity,' he says, 'but only conscious activity is work' (30). The bee hive is industrious but does not involve work.[40] The historical state requires conscious vocational work, and history proper begins with the division of labour by vocation and the tools associated with this labour.

Tools are the afterimage or copy [*Nachbild*] of the inner organism projected outward and since, Kapp argues, self and body are indissolubly intertwined, the outer world, including the world of mechanical work, is an extension of the self, of the human organism itself, and of the human organism's inner world of representation. As the tool or mechanism is formed, albeit often unconsciously, on the "model of organic prototypal image [*Vorbild*]," (2018:24), this prototypal image can be used to understand and explain the human organism. The outward manifestations of the human through projection of the interior in tool design therefore allow the process to be reversed and to understand the organism through its productions. From the design of the tool the bodyplan of the organism itself can be derived. The tool is essentially a map or schema for the internal world of the organism and the schematic of its Umwelt. From the basic axe or shovel to sophisticated craftsperson's tools, to the most sensitive scientific apparatuses, even, he says, the human voice, all are organ projections with which the world is acted upon or perception extended:

> Our reflections to this point have ranged within the sphere of the body's extremities, the hand and the foot. We now turn to the organism's semi- extremities, to the sense organs that, intermediary between the external world and the interior neural world, are situated at the threshold of both. It is *vision* that is in closest contact with the extremities we have already discussed, because measure and number are submitted to its immediate oversight. The eye is the organ of light and the prototypal image for all *optical apparatuses* (2018: 61. Original emphasis).

The senses exist on the threshold of both the exterior and interior world, neither situated in the objecthood of the body or the subjecthood of the soul. Inner and outer, an intertwining matrix of form and feeling, of palpation and probing, sensing and sensibility. *Threshold*. From the Latin *limen* from which comes liminality. A liminal space. A doorway or entrance, a changing place, from here to there, from this to that,. The senses are liminal in that they are

[40] Tell that to the bees.

bound up in the flux not only of being but of becoming. Through the senses humans change but also create anew the creatures they are and the ways in which they connect with one another with and through the sensory world. From the senses humans are crafted into new shapes, new figures, touching as touched. Here is the parallelism of the senses and evolutionary adaptation, of information as the driver of fitness to environment.

There is no clear demarcation between the interior and exterior of an organism, of its body and the perceived world. Even when classifying extremities as objects existing in the external world, the entire body belongs to the inner world. Artefacts are composed of natural materials and belong to the construction of nature as outside world not only of a natural exterior but of matter formed by human hands. The outer world is a constructed representation of our handiwork, of worldbuilding through tool construction and material manipulation.

Organon is a Greek term with a tripartite meaning. Firstly, it is a member of the body. Second it is the after-image of the body's organs, the tool. Thirdly, it is the material of which it is made. The hand is a proper organ under this threefold structure

> Among the extremities, the hand counts as an organ in the strong sense, given its threefold determination: first, it is the human being's inborn tool; second, it serves as the prototypal image for all his mechanical tools; and third, because of its substantial involvement in the production of the material after- image, it is, in Aristotle's words, the "tool of tools" (35).

For Aristotle the hand was the tool of tools. Aristotle's original phrase, *organon pro organon*, can also be translated as the 'organ for tools' but Kapp further describes it as the mediator of movement and as means to an end (Ehlich 1989). Ehlich explains that the linguistic evolution of this term from its Indo-European roots to the Greek stem of erg-/org- is important, both in German and English. *Organisch*, or organisation, is a transdisciplinary term connecting fields as diverse as biology, history, philosophy, chemistry and sociology. Erg is closely related to the German *werk* and the English work. As Ehlich notes, *organon* has a philosophical pedigree beyond Aristotle's biological use where it is classified under mental activity: *organa* as a 'tool' of mental activity; writing as an *organon* of memory; arguments as *organa* of judgement; and post-Aristotle where logic is the *organon* or tool of philosophy. This is a use which continues through Kant and Schopenhauer, diversifying in the eighteenth century into

other disciplines such as political science, which ties a juridical use of *organa* to the political body of the state and its maladies. The linguistic analysis of language development at this time also took up the org stem, mirroring its biological uses in its theoretical analyses, with language as tool or instrument.

The hand is the natural tool from which the tool-object emerges, patterned after the hand, albeit unconsciously (35). From natural form to technical form, tools mimicked morphology. The hand is the first hammer from which hammers arise. First fist alone, then grasped stone, then stone strapped to a wooden shaft, technology emerges and takes on an evolution of forms outside of the biological stream.

> The concept of tool ascended from primitive tools and expanded to include the tools of particular professions, the machines of industry, the weapons of war, the instruments and apparatuses of the arts and sciences (36).

From the first stone that lay near to the hand that grasped it there lies a direct lineage to the atomic bomb and the annihilation of the physical form of those humans destroyed by technics and the cold calculations of war. Cells erased but for a shadow burned into stone. The evolution of the tool in turn spurs the evolution of the body from which it projected. Reciprocity of evolution begins in which tool and body form a chiastic mutuality of development and refinement, of dexterity and perfection of use. Look at the dexterity of the hand that is evolved to use the refined instruments in use today. Each refined the other, made one another fine both in use and structure.

> The nearest stone or branch, found and seized as is by the foot of an ape, remains a stone or a branch like any other stone or branch. But in the hand of the primitive human being, the stone or branch becomes the promise of the tool, the primordial cell of an entire cultural apparatus yet to come (44).

The form and motility of the tool, Kapp argues, become embodied in it through its refinement so that it becomes, literally, more ‘handy.’ Does the hand, then, in return become more instrumental? Does the spirit of the tool enter the hand? How does it affect the brain and its self-consciousness? The body, after all, is an evolutionary multitool.

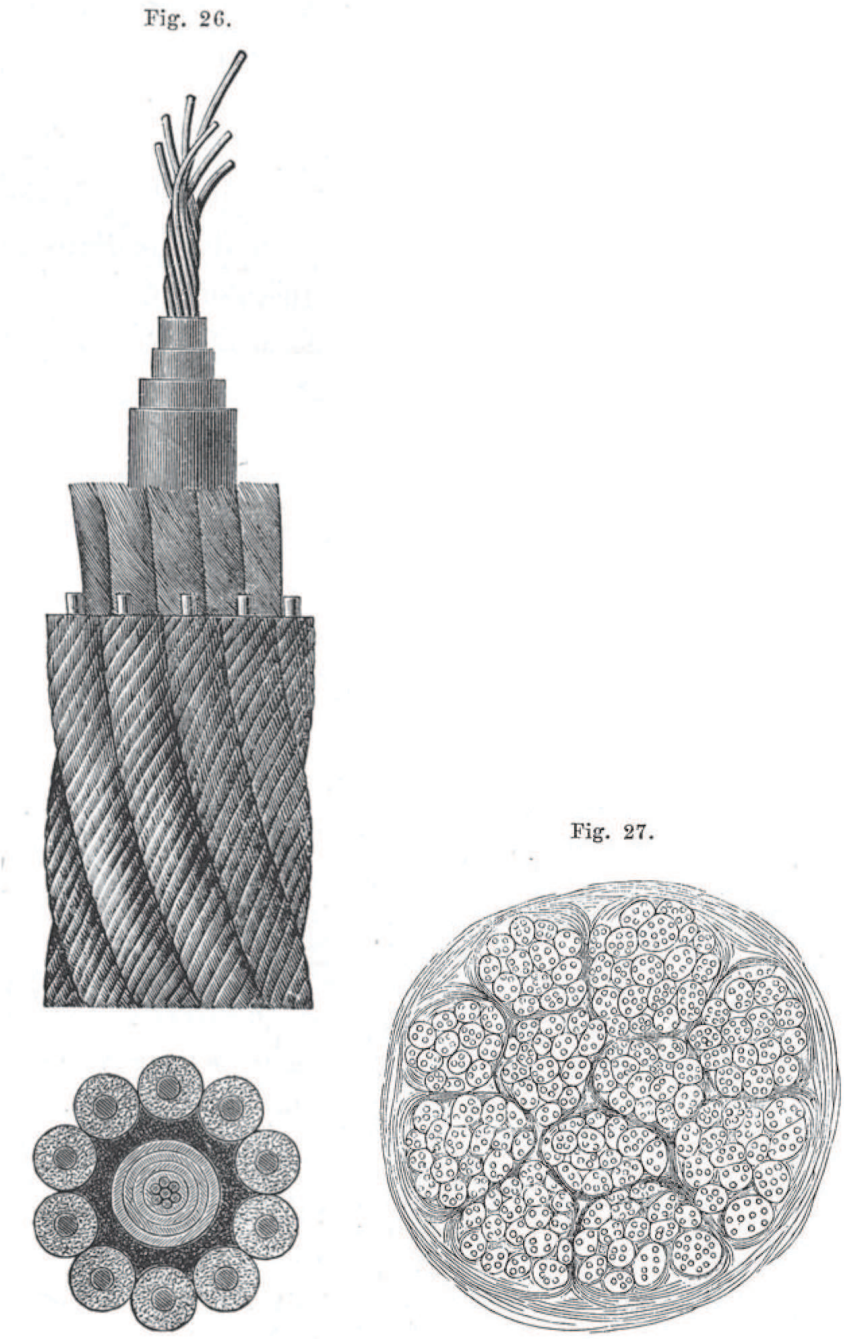

Figure 26. Deep-sea cable from 1865.

Figure 27. Cross section of a nerve.

Figure 6

It is not only the outer body in terms of organs and projections that Kapp's analysis covers. His model machine is the steam engine, whose rail lines in conjunction with steamship lines form 'the network of transport arteries through which circulate humanity's means of subsistence— a likeness of the blood vessel network in the organism' (96). The circulation of

blood, for Kapp, has an obvious analogy between the networks in which entire human bodies are transported and the organic processes inside those bodies. The electrical telegraph system and the nervous system again form an obvious case of organ projection from inner to outer:

> In this way, the *theory of organic development* corresponds with a *practice of mechanical perfectibility*— ascending from the primitive stone hammer through all tools, apparatuses, and machines of simple construction, to that complex mechanism in which the *model machine* may be recognized. We say *model machine* because science perceives its value as a tool and as a kind of physical apparatus through which to understand the interaction of natural forces as well as the life processes in the organism (99).

Kapp describes this as a process of 'self-finding' (100) in which humans work at first unconsciously, but through the refinement of tools, of organ projection, the layers of the unconscious are gradually stripped away and the conscious inventor takes the tool or instrument to the greatest level of refinement through seeing, finally, its possibilities with a concordance between the proto-image of the first organic projection and the after-image of a perfected machine. This progression to higher mechanical forms results in a shift from unconscious organic forms to the projection of their functional image. This reaches an apotheosis in the telegraph:

> [T]here is no other organ whose character is displayed as clearly in the construction that has been unconsciously formed in its image than the nerve cord is in the telegraph cable. Here organ projection celebrates a great triumph. Its principal requirement being: production taking place unconsciously on the model of the organic; followed by an encounter in which the original and the copy find themselves, compelled by the logic of analogy; and finally, revealing itself like a light switched on in the conscious mind, the agreement between the organ and the artifactual tool, with the greatest conceivable degree of identity (103).

In this stage of perfection, this is not even in the realm of analogy but of pure realisation of the body in technics: 'The nerves *are* the cable installations of the animal body; telegraph cables *are* the nerves of humankind!' (104). The rapture with which Kapp would have greeted digital communication technologies, internet cables and computer architectures, multimodal media and information streams, can be easily imagined. The body here, in Kapp's philosophy, is being everted to greater levels of perfection. The body has been turned inside out and stretched across the world, the nervous system strung across continents and oceans,

into dwellings and workplaces. And since then the networks have become wireless, spaced between transmitting nodes and cables, turned to aether, synaptic charges with information channels unstoppered.

What is the significance of Kapp's work today? West Kirkwood & Weatherby (2018) argue that the humanism Kapp demonstrates is a posthumanism. Why? Because Kapp demonstrates the inseparability of information and matter, of use and being in the duality of technology and bodies. Technologies therefore become the epistemological grounding for the human itself. Technological essence, technics, lies in how it works and how it is entangled in human being. Being is a dialectical process between subject and object, between information and materiality, an exteriorisation of knowledge that produces the possibilities of the human.

5.2 Cassirer's *Form und Technik*

As Uexküll contemporary, colleague and friend at the University of Hamburg Ernst Cassirer notes at the beginning of his influential *Form and Technology* [*Form und Technik*] published in 1930, technicity is primary in contemporary culture and its individual subdomains, no matter whether this is viewed as cause for praise or critique. The factuality of technicity's primacy is indisputable. Technicity's counterforces, its spiritual antonyms even, are actualised through and conjoined with technical thinking and so inevitably subjugated by it. The subjugation to technicity is impossible to resist in the contemporary paradigm. The Hegelian zeitgeist appears in thought once the processual transformation of reality has been completed, and the technological transformation must therefore be accompanied by a radical shift in thinking itself. Generally speaking, the age can be characterised only as it reaches maturity simply because thought cannot be concretized until the transformation has occurred and become widespread.

Knowledge, culture and metaphysics are interlinked in the domain of technicity, yet the philosophy of technicity, Cassirer laments, has not kept pace with the growth of technology in practice, with its scope and with its effects. Cassirer's diagnosis remains true today. Technicity overleaps philosophy. It is the hare racing blindly ahead of the tortoise, but a hare that never ceases to rest and with no finish line in sight other than potential cataclysmic downfall. The Kantian *quid juris* of technicity's validity and lawfulness remains unanswered. For Cassirer, the tension of his age lay 'in this impotence of "abstract" thought to be able to

penetrate into the core of the technological world" (275). Technology and philosophy form a polarity, a tension where the domain of technology cannot be placed beside modes of thought such as economics, morality, law, art or religion. These formations [*Gebilden*] do not exist in spatially static constructions but only in tensional, oppositional relationships which heighten and intensify through a metamorphic process. This oppositional process not only reconfigures and broadens the scope of our perceptions but initiates an alteration 'in the very *mode* of seeing' (275). Philosophy, Cassier argues, must therefore not simply find space for technology in terms of its works and their effects but must enquire into the conditions of its possibility, to question the grounds of its being, to make it speak:

> The world of technology remains mute as long as we look at it and investigate it from this single point of view. It begins to open up and to divulge its secret only if we return from the *forma formata* to the *forma formans*, from that which has become to the very principle of becoming (276).

Too often, still, most attention towards technicity is turned to technology's outward forms rather than its inner principles, its concrete manifestations rather than the cause of those instantiations, working back from material to meaning. What is the idea a technology embodies? What spiritual determination is fulfilled by it? How do we distinguish meaningfully between an appearance and idea? Plato's distinction between idea and appearance is grounded not in nature but in *techne* and craft:

> The artist who first invented the loom did not initially find it as something given in the sensible world; rather he *introduced* it into the sensible world by looking toward the form and purpose, towards the *eidos* and *telos* of the tool itself (276).

The eidos and telos of a tool, its essence and aim, are not manifested in an individual example of that tool but in the ground of being of its general form which encapsulate the eidos and telos. What is sought is the connection of culture to technology and of technology's lawfulness revealed not in its product but in its mode of production. We must be mindful of technology and its aims because its meaning is evasive, its boundaries blurred by other motives and modes of meaning. Technology can be judged authentically only within its own inherent law and the demands of its lawfulness as it exists. Yet the difficulty lies in its appearance only through its function, through its activity, not in what it externalises but in

that mode of externalisation. Technology is understood not through its products but through its power of production.

'Technogenesis' is what contemporary philosopher of technology Bernard Stiegler (1998) calls the process of coordinated dynamic adaptation between humans and technics. This is not a static Darwinian scenario of stable environment and mutable species. Both are transforming together. Technologies themselves and the environment are a part of this mutual transformation or evolution. From philosophy's beginnings, Stiegler argues in the first part of his *Technics and Time* trilogy, *technics* was separated from *episteme* and technical knowledge devalued as inferior. Beings and objects suffered an irreparable sundering into biology and mechanics. In between these two artificially opposed islands the work of Gilles Simondon, Bertrand Gille and André Leroi-Gourhan, reconceived the technical object as the focus for disparate forces and socio-technical development, a process of concretisation. Industrialisation and instrumentality overtook both the world and the sciences, leading to their amnesiac state through the cult of calculability.

> Philosophical reflection was now faced with such widespread technical expansion that all forms of knowledge were mobilized by, and brought closer to, the field of instrumentality, to which science, with its ends determined by the imperatives of economic struggle or war, and with its epistemic status shirting accordingly, became more and more subject. The power that emerged from this new relation was unleashed in the course of the two world wars (Stiegler 1998:2).

Through its technicalisation via calculation, science as technique itself suffers from amnesia, forgetting its origins, a crisis of which not only the sciences but the world suffers. The twentieth century wars that engulfed the world in technologically-powered slaughter resulted in the greater technicalisation of the world, in its computerisation and digitisation, the tightening mesh of human and machine through calculative rationality, with the latter dominating the byways of the former. Science, technology and calculation won the war and so the United States rose to its dominant sociotechnical apex. The configurative changes that occurred in this historical moment are still being thrashed out in the digitisation of human behaviours and relationships where reason (*ratio*) is usurped by calculation. Technical power is inverted through rationalisation which extends into all domains of society, resulting in the industrialisation of work but also an invisible system of domination. Where before societies

were based on communicative authority, now they are dominated by a technoscientific rationality seeping into all spheres of social behaviour. When technics and science thus become inextricably linked, a technocracy results which is not a system of technicians wielding power but the domination of technicians by that power of the rational cause to preserve and extend the system.

But what system is this, other than the totality of human ends bent towards the progress of a technocratic subordination? Digital technologies are sold as liberationist for the atomic individual in a technocapitalist society, a society that first atomises those individuals and second sells them an ostensible means of curing that very separation with the connectivity of information over the meaningful knowledge and communitas which they crave. A system that sickens you then knowingly sells you a philtre that is itself an extension of that sickness. To what end?

> By virtue of the way it has organized its technological base, contemporary industrial society tends to be totalitarian. For "totalitarian" is not only a terroristic political coordination of society, but also a non-terroristic economic-technical coordination which operates through the manipulation of needs by vested interests. It thus precludes the emergence of an effective opposition against the whole. Not only a specific form of government or party rule makes for totalitarianism, but also a specific system of production and distribution which may well be compatible with a "pluralism" of parties, newspapers, "countervailing powers," etc. (Marcuse 1991:5).

Our science is an organism-specific science. It is a human science oriented to making extractive sense of human senses. Quantitative data is oriented to the qualitative umwelt and is extracted from this standing point. One approaches things not in themselves but in one's perception of them. The symbol is irreducible to the brute this-ness of the object or its relations. Species-specific mental categories are as inescapable as the relations of parts which are positionally anchored by a particular perceiver. And the parts hold together in the pre-reflective 'inalienable presence' of existence (Merleau-Ponty 1994:vii). The phenomenological method is an attempt to return to this 'direct and primitive contact with the world.' But what world? How may the world exist without us, who perceive it? What lies beyond the arc of the torchlight of consciousness, a darkness beyond this limited illumination?

> The fact that there is *no* Nature *without* mind, or that Nature may be *done away with* in thought *without* doing away with mind, does not mean that Nature is produced by mind, or that any combination (even a subtle one) of these two concepts suffices to give the philosophical formula of our situation in being. Mind without Nature can be thought about and Nature without mind cannot ('The Philosopher and his Shadow', *Signs* 1964:162).

But is this true? Can we conceive of mind without nature? No. Mind and nature are co-extensive. Mind is nature, nature mind, which is not to say it is reducible to intentionality but that mind is a product of nature sensing itself being, of the thinking and feeling of *being-as-flesh*. Existence is aimed at perception, perception is *for* existence. This is not a 'closed, transparent milieu' collapsing objective into subjective, but the ineluctability of our mental constructs *towards* '"things simply as things" (*blosse Sachen*)':

> Our most natural life as men intends an ontological milieu which is different from that of being in itself, and which consequently cannot be derived from it in the constitutive order (163).

Reflection itself as an act orients ourselves to the world in terms of an 'attitude', a totality of acts towards *blosse Sachen* experienced at a reflective remove. The naturalist attitude makes the mistake of believing it has direct access to the world rather than its representation through perception. Back to the things themselves, yes, but through phenomenological enquiry which gives the feeling of existence, its style of being, not through an inadequate idealism. We do not copy the text of the world but compose it (Merleau-Ponty 1994:9) through the instantiation of ourselves in a flux of being-as-relationship, 'for we are ourselves this network of relationships' (xx), of an openness towards the fluctuating patterning of world-as-lived. Perception of a thing is ambiguous and shaped by context (PP:11). The scientific method, in contrast, admits of no ambiguity but strong-arms the universe into categories meaningful only to its only method. This is a line and this is its length. A reductive dimensionality to measure all things without remembering the original measure, the body, the location of difference (Hoel and Carusi 2018).

The body was the original site of human data flows both in terms of world-building perception and communication between individuals. It is not only the point of origin for the species member but for the biological information imperative. Biology at root is information

spread across lifetimes on one level, and experienced from the phenomenal to the chemical during an individual lifetime on another. Biology is digital beyond the singular organism's analogue experience of its passing through time. It is a 'code-duality':

> Code-duality refers to the fact that living systems always form a unity of two coded and interacting messages, the analogly coded message of the organism itself and its re-description in the digital code of DNA. As analog codes the organisms recognise and interact with each other in the ecological space giving rise to a horizontal semiotic system (the ecological hierarchy of Stanley Salthe (1985)), while as digital codes they are passively carried forward in time between generations (after eventual recombination through meiosis and fertilisation in sexually reproducing species). This of course is the process responsible for nature's vertical semiotic system, the genealogical hierarchy (Hoffmeyer 1998:2).

Heredity, Hoffmeyer argues, is 'semiotic survival' of a code duality in a perpetual retranslation back and forth between these digital and analogue codings of the living system, of 'meaningful interpretation inside the contextual system of the lineage and its eco-semiotic niche' (ibid). What is this contextual system that Hoffmeyer talks about? It is the story of which intergenerational lives are composed. Life is the story: 'A story is that little knot or complex of that species of interconnectedness we call relevance' (Bateson 1980:14). As analogue organisms interact in the environment, they survive and mate and pass on their recoded digital DNA. Life proceeds through the digital-analogue intertwining in the body and environment. This intertwining is the story from which life emerges:

> [T]he fact of thinking in terms of stories does not isolate human beings as something separate from the starfish and the sea anemones, the coconut palms and the primroses. Rather, if the world be connected…then *thinking in terms of stories* must be shared by all mind or minds, whether ours or those of redwood forests and sea anemones…Context and relevance must be characteristic not only of all so-called behavior (those stories which are projected out into "action"), but also all of those internal stories, the sequences of the building up of the sea anemone (ibid).

Stories build up externally in action and internally in the coded flesh. But information escaped its fleshly bonds. Data, information, and knowledge became exosomatically stored with the birth of communication technologies beyond bodily (speech, gesture) transmission between individuals. Although able to travel across time and space in the form of walking bodies, data, information, and knowledge were still dependent up to the birth of writing on

body-storage. With exosomatic communication technologies the hierarchy of information transmission relegated the physical body to a lower capacity state and prestige. Body storage is linked inherently by the physical limitations of its capacity to accurately store and transmit data, to travel from one physical location to another to spread that information, and for the receivers of the body to accurately comprehend and in turn store and transmit that information accurately. The original data rot was the physical death and decomposition of the human body. The body-to-body chain was finally broken through the symbol scratched, etched, painted, revered on the cave wall and exalted everywhere else but faded away due to environmental degradation. The symbol was the caesura between the body and one-to-one information entwining. One-to-one became one-to-many. The birth of the artist. And critic. Through carved fertility statuettes, through braided jewellery, through tools, through weapons, and totems made for the afterlife, the birth of the object-as-symbol took representation out of its epistemological hollow. And before this, much before this, through language itself as a stream of concretisation through symbolic world-building. Once language became metaphorical the birth of information transmission through free-floating symbolism could occur. But language and toolmaking are the two halves of human being, Cassirer argues. We are rational beings in that reason is rooted in language. *Ratio* and *oratio*, thinking and speaking, are interchangeable. As Wolff (2006) puts it:

> The same specialisation of the neurology of the brain that lead to the truly human use of tools is also responsible for the truly human use of *language*; the formation of technical syntax testifies to the formation of the technics of language. This allows paleoanthropologists to believe that the ascent of the fabrication and use of tools was accompanied by the ascent of the use of language (Original emphasis).

The other interconnected side of our being is the technical, of forming and bearing tools to shape external reality, to assert power over a reality that is manifest but also manipulable 'and by virtue of which he gains a mental "image" of this reality…':

> All spiritual handling of reality is bound to this double act of "grasping" [*Fassen*], of "conceiving" [*Begriefen*] reality in linguistic-theoretical *thought* and "comprehending" [*Erfassen*] through the medium of *effective action* the intellectual and technological giving of form (Cassirer 283).

The form of the world is not received by us but formed by us, says Cassirer, formed through speech and action, thinking and doing. Thinking and doing 'stem from a common root' (284)

from which they unfold and branch off. Language itself is not passive reception of the form of an object but is itself an act of world-creation. The world is formed through language and speakers of different languages do not simply use different names for objects but necessarily have different worldviews. Their languages determine their worlds differently. The same holds true for material tools in that different tools determine and shape different parts of reality. Use a different tool and shape a different reality, a reality shaped by human will piece by piece:

> The will that initially seemed limited by its proximity to the lived human body, to the movement of its own limbs, gradually explodes and breaks through all spatial and temporal barriers (284).

Both meaning and action are thus expanded and intensified and the world is shaped into aspects previously unrealised. Each of these changes in reality also reorients the I and the body to this new reality or this new phase of being, forms a new relationship between "I" and reality. The subject and object are set into the oppositional relationship of intensification from which the I sets itself apart and recognises objects-as-such, and 'Nature' in terms of an quasi-independent structure rather than an amorphous material that is bent through magical thinking to human will but recognised through technological comportment. The natural world is disclosed as a world of objects through the collapse of the magical into the subject-object apartheid that persists still, of the dislocation of the body and world introduced through the technoscientific caesura. What this achieves is a subjugation of the subject to the *objectivity* of the natural world and a domination of the body as the true measure of being. In this rearrangement the object determines the subject, determines the world of the body. The body is delimited by this structuring of object over flesh, where previously the body had ordered the world. Through the structuring of a fixed, external world the world and the I become opposed. The Cartesian ego arises over this fixed ground, a palimpsest erased and etched over to objectify the body.

This discovery of the I against the ground of nature, Cassirer argues, forms a disclosure, 'the grasping and making one's own of an essential and necessary interconnection that previously lay hidden' (291). Yet reality, he says, although now measurable, is not rigid but has an inner mobility, a plasticity and formability bound by limits of the possible, a border in which desire and fantasy are placed and where will and submission emerge. Tool use, no matter how imperfect, allows the will to subject the world to itself. The first imperfect tools contain the

principle of use which allow not only the discovery of nature beyond the magical but the mastery of that nature through action, a mode of action which is a mediation of nature. Logical thought allows the mediation of communication within the logical sphere. Analogically, tool use provides the same mediation in the objective sphere. It is not the *terminus medius*, the border between, thinking and the objective world, but between the will and its goal.

Technological comportment not only sets itself between the will and its goal but allows a proper distancing between them. The body itself, when reliant only on its limbs and organs to effectively act on the world, could not create distance between this action and knowledge of such activity. Human beings could not properly comprehend the world because they were apprehended by it. Absorbed by the world, they could not conceive of it as an objective domain populated by objects. Tool use allowed this distance to be taken between the will and its goal, allowed comprehension beyond immediate physical grasping. Tool use broke the binding spell of subject and world which allowed foreseeing and so foresight. Rather than focusing on immediate sensory stimuli, the mode of paying attention to something 'spatially absent and temporally remote' (292) was enacted in the foresight and distance provided by tool use beyond the body-as-actor.

For Cassirer, writing in 1930, no genuine tool use by other animals had been established, demarcating the difference between our knowledge of animal worlds and tool use now and then. This stance on isolated human tool use has since been proven incorrect. Cassirer contends that this distance, this line of sight created by tool use, allowed the establishment of the principle of causation beyond the looser association of events established by magical thinking's apprehension of causality to a stricter causation as a category of Kantian pure understanding. This strict causation allows an orientation to objects-as-such through representation so establishing the sphere of objects as a domain of action rather than an magical-mythical interplay of forces influenced by individual desires and influence. Tool use breached this magical-mythical sphere and established objective determination beyond the lived body and beyond the individual lifespan, a tangibility that while set apart cannot exist apart but is actualised only in its effects, of its technical essence as exertion on the world:

> The form of its activity comes to be in "matter." They are not separated from one another but are apprehended and comprehended as an insoluble unity. The object is

> determined *as* [*als*] something only insofar as it is *for* [*zu*] something. This is because in the world of tools there are no mere things with properties; rather, there are only, to use a mathematical expression, ensembles of "vector-magnitudes." Although every being is determined here in-itself, it is, at the same time, the expression of a certain performance [*Verrichtung*]; and in the intuition of this performance, a fundamentally new *direction of seeing* [*Blickrichtung*] opens up for the human being: the apprehension of "objective causality" (294).

5.3 Simondon's *Du mode D'Existence des Objets Techniques*

For Gilbert Simondon, too, in the phase-shift from the magical mode of being in the world, technicity is one of two fundamental modes of existence that comprises the world-human ensemble, the other being the religious mode. At the point of this phase-shift and the dissolution of magical unity comes aesthetics as the neutral balancing point between religion and technics. Both religion and technics each have a theoretical and a practical mode. Between the *theoretical* modes of technics and religion scientific knowledge emerges as a mediation between these modes, whereas between the *practical* modes of technics and religion ethical thinking emerges.

The technical object, Simondon argues in *On the Mode of Existence of Technical Objects* [*Du Mode D'Existence des Objets Techniques*] (2017), has only ever been studied as an instrument which exists in a multimodality of relations to humans rather than as existing in their own technical reality. The task of philosophy, therefore, is to discover and deepen 'the relation that exists between nature, man, and technical reality, the burden of alienated human reality which is enclosed within the technical object' (2017: xiii). Human beings and technical objects exist in this master-slave dialectic, one where subjugated technology holds over us the power of alienation because it is itself in a state of alienation. By introducing a properly representative understanding of technical objects into the cultural discourse through an enquiry into their genesis this double alienation of human and technical objects can be reduced. The discourse of *information* is the most suitable framework by which to understand this relation between ourselves and technical objects and so bring about a cultural integration of technical objects and persons.

A gap exists between human use and human understanding of technical objects, objects which are not artificial beings but as a concretized mode of reality. These structures are not

simply an organ but a body, a *milieu*. This milieu is the ground of being of other technical structures through successive cycles of technical evolution and stored information, through the evolution of technical objects as elements, individuals and ensembles as information cycles. We could follow Brentari (2015), a translator of Uexküll, who differentiates Umwelt as a species' environment and milieu as its context and transfer this to the mode of existence of technical objects. However, Simondon, at least in translation, conflates these two meanings, using milieu to refer to technical objects in context to one another and as a particular environment that they inhabit.

The rapport between human and machine exists both in major and minor modes at the level of technical individuals and technical ensembles. The minor mode is the expertise of individual tool use through concrete application and apprenticeship, a symbiosis of both within a determinate milieu. The major mode consists of polytechnic understanding of this instrumentation itself. At the level of ensembles, discourse on the technical mode centres around value notions of technical progress for good or ill as related to societal progress. With the progress from artisanal practices to industrialised machine-work and loss of autonomy of the craftsperson runs a parallel trajectory of optimism to pessimism regarding technical progress. Replacing the notion of the individual tool-bearer is the idea of the machine individual and a notion of progress tied to human as coordinator of technical ensembles. Rather than being replaced by machines, human progress is enshrined by deeper understanding of information and communication theories that place human beings not as manipulators of technical individuals but as the mediating centre of technical ensembles, the *translator* of information flows between such ensembles. The open machine must of necessity maintain a level of indeterminacy in order to receive information. As the agent of information flow, information exchanges between machines are facilitated by operator intervention, a mutuality which is a coupling of the living and non-living.

The rupture of the magical mode of thinking, that is, the primitive mode of being in relation to the world, resulted in two oppositional but simultaneous phases, the technical and the religious. The technical phase stands as a mode of data extraction, of the key-points of our relation with the world, whereas religiosity stands as the attachment of totality in its ground functions – that is, specificity versus generalisation of the mode of existence. Aesthetic activity mediates between these two modes but loses its neutrality as it tips towards either the sacred or functional. Culture itself, Simondon argues, sets itself up as a fortress against the

technical system, relegating technical objects to non-human spheres of reality, when in fact the human reality and the technical reality are bound up in one another. Technical values and knowledge must be incorporated into culture in work analogous to the abolition of slavery and the reintegration of the mutually-constituted horizon of being elsewhere denied.

For Simondon there is no true opposition between human and machine, between technics and culture. Technical objects are the mediator between ourselves and the natural world. If the machine is foreign and strange, inside this strangeness the human remains imprisoned, misunderstood and enslaved. The unbalancing of culture results from this misunderstanding that relegates technical objects to the sphere of utility, as assemblages of matter alone and not partners in the deep symbolic symbiosis which crafts our reality. The fear of relegation of the human under the aegis of automation likewise stems from the fear of a machinic perfection that does not exist. The indeterminacy, the very openness of the machine, allows for it to be receptive to information, and this sensitivity to information likewise allows the creation of the technical ensemble. Through their degree of indeterminacy machines exchange information and construct ensembles. The open machine with a high degree of indeterminacy results in more efficacious actions and interactions, with us as their living interpreters akin to the conductor of an orchestra. The machine and human are not separate from one another; humans exist among the technical. Technical objects are the crystallization of human reality, of human gesture, transformed into the working structures which compose and modify that reality.

The evolution of culture through artisanal and agricultural technical modes resulted in a fundamental distortion of the understanding of the technical world. There is a disjuncture between reality and the cultural codes that no longer adequately describe the technical reality that supports human culture. Technical reality is transforming faster than culture can reflect, revise, decode and describe.

> *Turning and turning in the widening gyre*
> *The falcon cannot hear the falconer*
> (Yeats 1919).

The machine is held to be the herald of progress, but for whom? Those Lancashire rioters who destroyed the power looms replacing their skilled bodies with unskilled machine

overseers saw the technical entity of the loom as their direct adversaries. Why? Because the technical mode had been internalised within the human when only tools rather than machines existed. The human tool-bearer was replaced by the efficient machine.

> To this phase corresponds a dramatic and impassioned notion of progress, which turns into the rape of nature, the conquest of the world, and the exploitation of energies. This will to power expresses itself in the technophile and technocratic excesses of the thermodynamic era, which take on both a prophetic and cataclysmic spin (21).

Writing in the mid-twentieth century, Simondon saw the integration of the technical into culture as resulting in greater stability through the shoring of the foundations of cultural expression and human being. The twentieth century saw the replacement of thermodynamics as the dominant mode of technical operation with the rise of information theory and informatics. The machine now becomes that which increases information and negentropy, promotes stability and life against the degradation of energy and the increase of disorder. For Simondon, 'the machine is that which fights against the death of the universe' (21).

The technical ensemble is comprised of technical objects. The technical object does not just appear nor is it ever simple. A tool is a multi-scale envelope of technical and temporal enfoldings (Hayles 87). It is comprised of technical elements (axe head), technical individuals (composite axe made from head, shaft, bindings) and ensembles (flint used to knap the head, fabrication of bindings, tools used to make shaft, the axe-maker themselves). Such tools are a plurality of functional zones brought together into one object. The adze, for example, is manipulated in its forging and hammering so that it consists of differing molecular zones of hardness, sharpness, strength, and so can function on multiple levels while existing as a particular tool. It is a plurality assembled through fabrication into a stable structure.

Yet as Simondon argues, the specificity of a particular tool or technical object is illusory. Specificity is unstable. The technical object has no fixed structure but is always evolving. Likewise, the same ends may be achieved by differing structures and functionalities. The tool is neither this or that specific thing but the coming-into-being of a particular convergence at a particular time, a concretisation in a succession of technical beings evolving through adaptation and convergence of functions. The particular instantiation is a culmination of this convergence in a series that moves from the abstract to the concrete, that is, a unit that is

coherent and unified within itself. Simondon uses the example of the automobile engine which has evolved from an abstract engine comprised of a logical assemblage of units with distinct and unique functions to one that is comprised of inseparable elements which could not exist or function apart. Each element is so well connected that they exist in a system of reciprocal causalities. We can think of the convergences of the smart phone which combines the functionalities of once separate technical objects now fused together into one coherent ensemble. Each element is essential to the object that now exists so that by disaggregating its functions that object would no longer exist. Take away the camera or the internet connection or the text or voice functions and the smart phone is no longer itself as a coherent technical ensemble.

From abstract to concrete, coherent and unified needs mould themselves into the industrial technical object. The production line does not create standardisation, he argues; rather, standardisation creates the production line. The formation of stable types of objects is the result of an analytical organisation which accompanies the move from abstract, individual artisanal objects to concrete industrial objects through a system of needs which is less coherent that the system of objects. It is needs which mould themselves on to the industrial technical object rather than objects which answer needs, and so the industrial object shapes civilisation through its theatre of causal reciprocity and successive stages of coherence through which functional synergies are discovered.

The abstract technical object does not constitute a natural system but is the physical translation of an intellectual system, an artificial ‘bundle of applications’ (49) which does not precede but comes after knowledge. The concrete technical object, on the other hand, exists in a closer form to the natural object in that its coherence results from a circular closure of causality within itself and an incorporation of the natural world. The concretised technical object no longer has any need of any supportive artificial milieu for its continued existence. The regulative environment of the laboratory, workshop or factory is shed through its increased internal coherence and ability to function within the world proper so that ‘the object frees itself from the originally associated laboratory and incorporates the laboratory into itself through the play of its functions’ (50).

The history of computing offers an obvious example. Think of the mainframe computer, which at first was isolated within the artifice of the laboratory setting and then became

associated through networks with objects external to the laboratory, internalising its functional requirements so that it could exist within and connect to a variety of environments. Not only does this lead to decentralisation but to the consideration of such technical objects on the level of natural objects beyond the notion of their applicability of scientific principles. Despite not sharing a schematic structure with any natural object, the stability of their structure and functions posits them on an analogous plane to natural objects existing within a particular milieu. This is not to say, however, that the technical object should be identified with the natural object nor technical evolution equated with biological evolution. Yet the technical object, like the natural organism, is still coupled to a milieu, especially those objects which result from *hypertely*, or functional over-adaptation. Such objects are too fully enmeshed in their milieu to function outside of it due to their intense coupling with it.

The technical object can sit between two different milieux, can be the meeting place where two previously distinct milieux meet. Though these milieux are separate systems they are coupled through the technical object. The traction motor is Simondon's example here:

> The traction motor not only transforms electrical energy into mechanical energy; it applies it to a varied geographical world, which translates technically into the shape of the tracks, the variable resistance of the wind, the resistance of snow on the tracks…creating a reaction that is the translation of this geographical and meteorological structure of the world…*the two worlds act upon each other* via the traction motor (55/56. Original emphasis).

The technical object here realizes a techno-geographical mixed milieu through its own functioning, its condition of existence wherein it constructs this third mixed milieu out of the two milieux previously separate. Likewise, techno-geographical and other mixed milieux are called into existence via human intelligence applied to concrete situations in which given realities are shaped into new matrices of inventive adaptation and tool use. These milieux exist only through such concretely constituted systems. The technical object creates its own milieu. A bodily organ is, like the technical object, its own condition. Concretization through the adaptive mixing of milieux brings about relational environments that exist in their actualisation. The processual functioning of organ and technical object create these mixed, proximal zones. Individualisation of the object occurs through this causal process within the associated milieu it creates around itself that is at once technical and natural. This 'associated milieu' is a mediation between the natural and the technical, between fabricated and natural

elements coexisting within an associated milieu that occurs through functional adaptation and action. The technical object evolves through adaptation to evolving milieux, at the centre of this joining. Concretization "*presupposes the problem to be resolved*" (57, italics in original) and is possible through the conditions that this concretization creates. Here we see a kind of functional circle of adaptation analogous in the technical object to the biological Umwelt created through evolutionary adaptation to particular environmental conditions, creating the world in which it exists through the act of its constitution. Both create the milieu/Umwelt in which they exist through the performative act of their existence. The living being, like the technical object, carries or creates its own environment and 'this capacity for conditioning itself lies at the root of the capacity to produce objects that condition themselves' (60).

This ability to self-condition its own environments is the core of the inventiveness of life, wherein stands the ground of existence from which forms dynamically evolve. The relation of dynamic forms and ground is the relation of actualities to virtual possibilities. Ground is the system of virtualities, potentials and forces from which actual forms arise and interact, the system that lays down the myriad possibilities of actualisation. From the virtual, actual beings come into existence and condition a milieu in which they exist. The milieu itself is the arena of information in which the play of possibilities is moulded within a specific structuration by virtue of that informational conditioning. Here we see the importance of information conceptually to Simondon and his notion of technical evolution. The milieu of the technical object, like the organism's Umwelt, is the information channel of its interplay between virtualities and actualities, between adaptive possibilities and concrete form. As Stiegler (1998) writes:

> This inorganic matter organizes *itself*. In organizing itself, it becomes indivisible and conquers a quasi-ipseity from which its dynamic proceeds absolutely: the history of this becoming-organic is not that of the humans who "made" the object. Just as the living being has a collective history in the sense of a genetic history informed and inscribed in a *phylum* – a phylogenesis – and an individual history – an epigenesis – regulated by its indetermination in confrontation with a singular milieu and regulating in turn its morphogenesis, the technical object calls into play laws of evolution that are immanent to it, even if, as in the case of the living being, they are effected only under the conditions of an environment, to wit, here, that of the human and the other technical objects (71. Original emphasis).

The living being is not only a system of connected organs combined into generative systems but the ground of its own being through its interlaced lymph nodes, through its blood, its

connective tissues, the interconnectedness of all cells in the matrix of the body. ‘Within a living body,’ writes Simondon, ‘all living matter cooperates in life’ and the body is ‘informed energy’ (62) creating the conditions of its own existence through interactions within and outwith its body. The diffuse is as important as the well-defined, connective tissues as important as the valves of the heart. Thought shares with life this need for a ground of existence, our mental perceptions, memories, representations existing not alone but as part of an interconnected ground of mental virtualities and possibilities, the play of relations which forms the khôra of consciousness fizzing between life on one side and thought on the other. In this same way, the technical object straddles the middle of the natural world and the structures of its existence through its associated milieu.

Yet the evolution of technical objects and natural organisms vary greatly in their paths. The technical object evolves through fabricated elements which are detachable, [re]combinable, reincarnated in new forms through the combination of new and old elements in original actualities. The living being, says Simondon, is *engendered*, the technical object *produced* in a process of *serrated evolution*, successive evolutionary stages in which relaxations and genesis follow hills and hollows, oscillations comprising spurts of change in which new forms are invented followed by periods of stability (68). The technical being, in contrast to the biological, can produce elements different from itself. However, through the body of the tool-bearer, through habits, gestures, through physical action, the technical object is often integrated into other technical ensembles. The body itself becomes the associated milieu of different tools through their use with the body, through the totality of operations in which these tools are put to use. The carpenter uses knives, squares, planes, measures, levels, saws and a variety of other tools in an integrated technical ensemble that requires skill, experience, and the integration of technical objects into the bodily schema of coordinated actions. This integration can happen beyond the individual body, in groups of tool-bearers working together. Carpenter, mason, bricklayer, electrician, excavator, crane operator, all form with their tools a technical ensemble that in concert builds a structure, not to mention the wider ensemble of architects, planners, goods suppliers, designers, manufacturers, and so on.

Before the invention and dispersal of thermodynamic machines, technical milieux of artisanal production greatly depended on the surface geographical environment for dispersal of energy through, for example, hydrological and biological powers, through the waterwheel and the ox yoke. The nodes of industrial production were yoked to the geographical dispersals of energy

which could be harnessed by the technical ensembles mediating between energy and productive capacities. Productive habitations followed the lines of rivers, the contours of hills and valleys, the geographical milieu in a superior position to a still subordinate technical milieu. Thermodynamic machines and the intense extraction of carboniferous energies resulting in heavy transport systems both for materials and the sources of that energy allowed the break away from these thermogeographical restrictions. Around the sources of coal extraction and iron works industrial centres sprang and grew large, but with the laying down of lines of locomotive transport centres and peripheries could be combined into networks of energy and material exaptation, followed by networks of commerce. Apart from the United States, such technogeographical milieux still mostly adhere to dispersal patterns of technical evolution and industrialisation laid out by the combination of technical progress and thermodynamic environmental entanglements. As Manuel Castells (2004) notes, the continued information technology innovation of non-US post-industrial metropolitan centres and beltways such as Paris-Sud, the London M4 corridor and Tokyo-Yokohama, relies on the synergies and cross-fertilisations facilitated by the dense co-location of universities, research centres, skilled innovators and labour, technology companies, networks of investors, varied businesses, goods suppliers and producers, transport infrastructures, and the like. The technogeographical concentration of these elements derives directly from their historical development as sites of thermodynamic centres of production where technics and geography combined to create large-scale industrial activity. Synchronicity of technical evolutions occur in different periods, parallel evolutionary moments that change the technogeographical milieu in tandem. The parallel development of thermodynamics and the railway were replaced by the synchronic development of electrotechnicity and the car, the resulting industrial decentralization needing a different form of transport to move people and goods across territories where train lines did not pass. From the laying of lines of electricity across the technogeographical domain sprouted the radial system of roads that crisscross the United Kingdom and converge around major industrial centres which still maintain their power and influence.

As noted above, for Simondon the tool is a plurality of functionally different zones brought together in one structure and technicity is the degree of this object's concretization. The tool is not reducible to form or matter but exists as an 'intermediary between form and matter' (72). The inventor of tools does not proceed from a zero position by giving form to matter but by combining and incorporating already preceding technical elements to form a stable

technical ensemble of elements not previously combined in that particular formation. The mastery of a tool requires us to individualise ourselves from a technical perspective, to learn such schemas, gestures and habits that allow proper use of the tool in the understanding of its form and matter. In this way *the user becomes the associated milieu* which defines the mutual relations of technicity at work in the tool. The tool is put to task by the regulation of the body. Yet like the body itself, technical phenomena are partly recognised by the dominant culture and also partly obscured.

For Simondon, as mentioned earlier, the relationship with technology forms a minor and major mode. The minor mode is the naturalised, non-reflective use of technology exemplified in childhood. The major mode consists in its rationalised, self-aware use of technology, through reflective operation as an adult. The apprentice is distinguished from the adult crafts[wo]man and the engineer, who through their witnessing and relation to human society and the world of technical objects incorporate technicity into culture. The major and minor mode are akin to two different languages, resulting in cultural incoherence and contradiction when the technical object is judged in relation to ourselves. Yet throughout antiquity, he argues, the technical sphere was relegated to a lower social sphere through its associations with servile work. Greek culture and the symposium did not bend so low as to recognise technics.

Each epoch suffers from this same inadequate relation of culture to technicity, recognising only certain aspects while ignoring others. When it comes to technical understanding, cultural exclusion creates blind spots that cannot recoup the full mode of technical dominance of any one era. The Renaissance and Enlightenment objectification and mechanisation of the animal world discussed earlier had a parallel in the disunification of the technical with the natural, with the shift in understanding of the technical from an integrated artisanal perspective to technical objects as belonging to the artificial. The result was a distancing of human and world. The technical object for the engineer does not belong to the natural world but is an abstract object devoid of natural meaning. The linkage between the natural and the technical is broken. This disjuncture continues today. The shift from craft to mechanics, from artisan to engineer, allowed technics to shift into an elevated majority mode. Yet proper cultural recognition from a holistic perspective would necessarily entail an intermediary between the minority and majority status of the technical, between culture and technics. The artisan is viewed through a portrait of concreteness, of manipulation of the sensible. The object itself is

here dominant. The engineer in turn, by reducing the technical object to a set of relations or characteristics, turning it into merely a product, entirely dominates the technical object. Only by approaching the technical sphere with a sense of solidarity, of an equality of social relations, can the technical and the cultural be fully incorporated.

As noted, Simondon distinguishes between childhood and adulthood technical knowledge, between that which is instinctual and implicit and that which is rational and explicit, which bears weight on how he judges particular types of knowledge and being. For example, the farmer who knows where and when to plant a seed, to sow a crop, to plot a pasture or plant a tree, whose knowledge is of a superior nature, yet who cannot explicitly codify that knowledge, is one whose knowledge is operational rather than intellectual, who inhabits a kind of 'technical subconsiousness'(106). Although an expert, this expertise is a kind of living symbiosis with the thing known, a direct and profound knowledge of the world the individual inhabits, or rather cohabits with symbiotically. Simondon sees this as an animalistic, intuitive relationship with the world, with the rhythms and flows of nature, a stability of perception and mental structures coexisting with the terrain of their knowledge and the terroir of their inhabitation. Even, he says, of a kind of second nature acquired during childhood, through an ancestral participation passed on through generations of knowers and doers. Such operative schema cannot be verbalised or schematised by the participants of that knowledge if they retain only the technical subconsciousness. Yet this is not to derogate such knowledge, to place it in a position of inferiority to technical training via graphically transferred knowledge, through learning via written and symbolically interpolated information. It is, however, more rigid in that it is acquired in a childhood to which one cannot ever return. In such knowledge exists a powerful relational causality exerted by the skill of the technician acting with passion upon familiar matter, a relationship to which they were initiated into from youth.

Inversely, there exists what Simondon calls an adult technical knowledge, a knowledge derived from scientific, rational, theoretical and universal principles. His paragon example of this is the *Encyclopédie*, which represented a seismic force of 'technical encyclopedism' (110), bringing together those whose collaboration came not from social or political considerations but from the desire to share rational knowledge, practical documentation, and precise information so that anyone possessed of it could replicate the technical discoveries

within for themselves:

> For the first time, one sees a technical universe constituting itself, a cosmos wherein everything is related to everything else rather than being jealously guarded by a guild. This consistent and objective universality, which supposes an internal resonance of this technical world, requires that the book be open to all and that it constitute a material and intellectual universality, a block of available and open technical knowledge…It aspires to govern itself on its own, and to manage itself. It is principally in this sense and through its technological power that the *Encylopedia* brought about a new force and a new social dynamic. The causal circularity of encylopedic knowledge excludes the moral and political heteronomy of the monarchy [*l'Ancient Régime*]. The technical world discovers its independence when it realizes its unity; the *Encyclopedia* is a kind of Fête de la Fédération of technics discovering their solidarity for the first time (111).

We can quite clearly see Simondon's enthusiasm for the *Encyclopédie* and its advancement of technics into cultural acceptance on a scientific, rational basis, a revolutionary force that provides access to technical knowledge beyond the intuitive grasp of those born into a particular sect, guild or trade. The principle of universality, of utopian idealism, is here similar to what we have seen for the cyberutopian dreams of those who fêted the advancements of the internet and its digital environs. As that dream is daily laid to waste, still the pronouncements of the digital dreamscape's revolutionary potential sound in endless governmental and corporate white papers, without addressing the socioideological capitalist rot at the base of the technological edifice. Knowledge is liberating. Information provides a key to escape. But when the terministic screen frames information and its uses solely within a failed socioeconomic paradigm that results in environmental catastrophe, promises of liberation remain empty. Here is where technicity meets the edifice of power, which shapes it to its own ends.

Yet the spirit of freedom and hope continues to beat against the walls erected against it. For Simondon, the humanistic spirit of the Renaissance saw this first fundamental movement towards a freedom of intellectual scope alongside the Reformation's ethical and religious opening, an widening of the circle of knowledge beyond adherents to any particular group. Humanism is entailed in this encyclopaedic spirit. The sciences were slower to follow. The Enlightenment freed the sciences which in turn liberated technical thought, bringing reform to social and administrative spheres via industrialisation. This liberation from the technical subconscious required forms of knowledge transmission beyond the oral mode of minor

technics and intergenerational transmission. Only the visual can provide the technical specificity required for transmission of a major technics, and so '[t]he civilization of the word gives way to that of the image' (114). The word gives way to the image, and by doing so becomes universal, sidestepping the particular languages of initiated groups. The visual sign transmits the oral message but remains, in the time of the Renaissance and before universal literacy, the privileged sphere of scholars and priests. For this reason, muses Simondon, it is perhaps why the Renaissance failed to bring forth a technical universality to match the spirit of universal humanism. Writing before the widespread diffusion of the television, although still within an era of cinema by a number decades, Simondon attributes a return to orality to the mass spread of telephones, telegraphs and radio waves. The invention and spread of the internet would be more akin to a symbiosis between the oral and visual, between the auditory and haptic.

But what of this humanism and its spirit of liberation? What ends does it meet? Encyclopaedism for Simondon *is* humanism, in the sense of liberation from alienation. Cybernetic thinking creates a symbolism between human and machine, which allows the engineering of the human to conform to the machine and therefore creates the space for a technological encyclopaedism. Having become mechanised, the human can only gain freedom by superseding the technical functions of the machine world. Each age, he says, creates the humanism most suited to its circumstances because it counters the particular alienation of that age. The danger lies in the fact that any invention of a particular age that lays claim to supporting the liberty of peoples, whether technical, scientific, or ethical, inevitably becomes an instrument of their enslavement. Time and again we see technological advancements appear, heralding new progress for the rights of the many, only to be turned against them. Digital technologies and their repressively installed infrastructures are no different. The cost of letting digital information and interfaces be controlled for profit become more apparent with each day, the dangers to individual freedoms and privacy more conclusive. For Simondon, humans free themselves from social constraints through technics. The equality derived from *technical* encyclopaedism was an information technology revolution. A *technological* encyclopaedism would complete the revolution and allow the individual to return to the social. Yet far from generating intersocial solidarity, digital echo chambers are tightening bonds between mutually antagonistic groups and their affiliated political and moral stances. Simondon's answer lies in avoiding any doctrinal humanism and rediscovering the humanistic principles most suited to counter the present powers of

alienation. The danger he saw in the twentieth century was in the alienated technical reality that overcame individual comprehension, of a mechanised industrial world beyond the scale of human thought. Added to this onslaught, today we suffer under the crushing dread of a seemingly unstoppable climatic nightmare which the mechanised world of trade and accumulation has brought about, solidified by a digital codification. Where to start? What to do? The scale of the issue is beyond any one of us. Simondon places his faith in the power of the technics of information and information theory, which brings information technology and its understanding to inhabit a central place in a diverse array of human praxes and disciplines. Information theory is an inter-scientific discipline that traverses numerous domains of human thought and practice, not a technics of technics but a mediating manner of thinking between technics, between sciences, and between technics and the sciences. It does so because the sciences are both theoretical and instrumental. A technical relationship exists between the sciences that information theory can bridge, while technics can take a scientific form. Information theory can serve both as a technics of the sciences and a science of technics, establishing a reciprocity between these functions. It is at this level of universality where technics and encyclopaedism can meet and cohere.

The development of better tools and more precise instrumentation in the eighteenth century is an important historical marker both in technical progression and towards technical alienation. The distinction between tool and instrument is important for Simondon's historical analysis:

> if by *tool* one understand the technical object enabling one to prolong and arm the body in order to accomplish a gesture, and by *instrument* the technical object that enables one to prolong and adapt the body in order to achieve better perception the instrument is a tool of perception (130).

Here Simondon echoes the views of Ernst Kapp without explicitly mentioning his organistic philosophy of technical development which sees tools as extensions and images of the human body. However, Simondon highlights this important distinction between instruments and tools. Tools have an active use and instruments a perceptual one. It is instruments which are the extensions of our perceptual apparatus. We could say, therefore, that it is through instrumentation that the scope and scale of the human Umwelt are magnified. The tool has a direct action on the world, whereas the instrument's function is information gathering before any direct action on the world takes place. Microscopes and telescopes both change the scales

of our observation but do not directly act on the world so changed. The information gathered makes a difference to us as subjects before any action occurs. The advances in eighteenth century technics acted on the individual level, where technical improvements had a direct bearing on the precision, force and speed of a person's actions and the widening of their perceptual scope. Yet by the nineteenth century the individual had been displaced by machines and made a spectator to machine progress. The individual is no longer at the centre of perception and action, craftsmanship is supplanted by mathematic precision, and an era of calculative technocraticism becomes the dominant mode of productive action. This goes hand in hand with human progress tied to the possession of nature and the transformation of social structures which disassociated intellectual progress and work focused on results rather than process. The resulting alienation is not only socioeconomic but physio-psychological. The machine as tool no longer extends the corporeal schema of its operator. The job of the technician is to monitor the self-regulation of the machine and ensure its functioning. This technical operation requires both technical and natural life in the form of its operator. The domination of the worker to the machine ensemble's ends mirrors the domination of the natural world.

We can argue that, according to this viewpoint, prior to the machine age the development of sophisticated tools and instruments further liberated bodily skills and powers, the abilities to perceive and act on the world in finer detail, with greater precision. Tools for the artisanal craftsperson are integrated into their bodily schema through this power to act upon the world. This integration is a particular creative process that occurred from the first manufacture by chipping of flake choppers and bifaces, and persisted until the machine age when it became much reduced as artisan practices largely diminished. As noted, with Merleau-Ponty the tool or instrument is incorporated into the bodily schema. Yet for Ernst Kapp, writing in the latter nineteenth century, the process was not an integration but a projection outwards into the world of the body's organs. This is an important viewpoint.

For Simondon (2017), however, the machine age causes a dislocation between the powers of the body and the understanding and integration of technics, resulting in alienation. This technocratic philosophy is an 'enslaving violence' (141) in contrast to a true technical philosophy which is founded on a full understanding and study of information. Without placing a technical philosophy into the context of information, it is merely a study of human power and the technical world:

> The machine is only a means; the end is the conquest of nature, the domestication of natural forces by means of a first act of enslavement: the machine is a slave whose only purpose is to make other slaves. Such a dominating and enslaving inspiration can coincide with the quest for man's freedom. But it is difficult to free oneself by transferring slavery onto other beings, men, animals, or machines; to reign over a people of machines that enslave the entire world is still to reign, and every reign presupposes the acceptance of the schemas of enslavement (141).

To enslave is to be enslaved. Freedom does not come from enslaving others. Technocratic rule by machines does not provide a true philosophy of the technical world but is, he says, the rape of nature, the possession of the earth through violence and domination. To modify the earth, such as creating a bridge between two pieces of land, is a violence that attacks its natural integrity. If we recall Heidegger's notions on dwelling, the bridge is a structure that produces a site for human ends. It turns the earth to a means for dwelling. Simondon's view, clearly, is that this is an act of power and control, where the natural is subsumed under the technocratic. This will to power was evident in the technocratic age of thermodynamism and industrialisation. The change to electrification and electrical information channels represented a development in both knowledge and power, and a resulting shift in the philosophy of technics. Electric currents shifted from high energy carriers to low current signals, vehicles for information where the accuracy of the information channel, the efficiency of form, becomes more important than the power carried. This efficiency of form of information is still not enough, however, to found a true philosophy of technics. Information distinguishes itself from noise by its power of signification. Information is regularity where noise is chaos, yet it is not an absolute order. It exists halfway between absolute regularity and pure chance, not as form itself but the ensemble of variable forms. For Simondon, this provides the difference in effect between form and information, between living organisms which need information and machines which are created from and uses forms. Signification and meaning making is a human activity, what gives value to an event. This is a human interpretive act. We are the mediator between machines and through this act of mediation a proper philosophy of technics can arise.

What, Simondon asks, do technical objects mean to our being-in-the-world? The manifestation of technical objects engenders a definite mode of existence that affects other human productions. Yet the creation of this definite mode of existence, of technicity, is one

of many modes of existence. It is not the originary mode but part of a larger process of genesis, which must be understood as implicating both objects and non-objectified realities in which technical genesis is only one smaller part of the geneses existing between ourselves and the world. In order to understand technicity, then, we must understand our relations with the world, our powers of acting and of creation. To understand technicity and the philosophical importance of the genesis and use of technical objects, a broader scope, a deeper understanding of our relations with the world is paramount. By genesis he means the process of general individuation. Individuation occurs when a system comes into being in a oversaturated environment rich in potential but internally incompatible forms, which resolves into a newly compatible structure. Structuration is the basis of a new organisation which forms a metastable equilibrium in the individuated individual. In terms of our relation with the world, we must apply this definition of genesis to the world as a system comprising ourselves and our milieu. Evolution itself can therefore be thought of as the search for a metastable equilibrium through changing forms, in which the system continually aims to reduce the gap between organism and environment. Yet this is not only a process of continual adaptation. Individuation occurs in oversaturated systems in a process of successive tensional resolutions, these resolutions occurring through the process of structuration, of the emergence of new forms. The potentials of an oversaturated system are not only the virtuality of potential forms but also those forces pushing virtual potentials into being in successive waves of individuation. Yet equilibrium never happens. Evolution, including technicity as part of this system, finds new ways to evolve, new modes of being and manifestations of form and forces which drive it to evolve rather than reach an equilibrium which dissipates these forces. Evolutionary selection works on the level of species and technical series to bring closer adaptation to environmental pressures, including organism and tool.

Technicity evolved as a solution to our being-in-the-world, yet the solution itself becomes problematic when technical individuals evolve into technical ensembles and the technical universe is oversaturated. Technicity always belongs to a system and carries with it this capacity to evolve. It is, remember, a mediator between us and the world. A shovel mediates the world differently from a telephone, but both emerge from this evolving technical sphere, to act upon the world and to enhance perceptions. Technicity is acted upon simultaneously by forces of convergence and divergence, through splitting and coming together depending on levels of saturation. When technicity becomes oversaturated by incorporating the reality of being into itself, it splits into theory and praxis where theoretical knowledge gives us the

ground of technicity and praxis the schemas for its action in and on the world. To understand technicity we cannot seek to analyse the objects themselves but must be aware of the deeper rivers of technicity running beneath all individuation and concretisation. Humans experience the universe as a milieu, in Simondon's term, that is, as an Umwelt. An environment for meaningful behaviour, dwelling, survival. The ground of our being, of significance, of significant action, of information. From the isolation and breakup of the mediation between ourselves and the world, objects appear. In the magical mode of thinking this technical objectification and religious subjectification that drives the split between object and subject has not occurred but rather provides 'the birth of privileged points of exchange between the being and the milieu' (177). It is a unitary ground of being with world and selfhood combined, with the reticulation of space and time into places of privilege and concentrated power that draw upon the ground of being. Reticulation is one of Simondon's key terms in the latter stages of *On the Mode of Existence of Technical Objects*. Reticulation is a netted pattern, a lattice or mesh. The world is meshed into key points of influence, of moments and places that dominate the terrain surrounding it, delimit it and, in Simondon's words, govern it. The magical world is a network of interlinked power and place, of key-points bound together in a reticulation:

> In such a network of key-points, of high-places, there is a primitive lack of distinction between human reality and the reality of the objective world. These key-points are real and objective, but they are that by which the human being is immediately bound to the world, both in order to be influenced by it and in order to act upon it; they are points of contact and of mutual, mixed reality, places of exchange and communication because they are formed from a knot between the two realities (178).

This sentence is key for how we may think about the knotted nature of physical and digital information, of the meshwork of significant places and moments existing both virtually and on physical servers, infrastructures, networks both real and electrical, composed of symbols and structures, technical ensembles and human beings who form powerful connections in places both on and offline, through interfaces, programs, and bodies. Here we see the mutual, mixed reality that is the nature of digital information architectures individuated by associated milieux which enable new 'theatres of individuation' (Barthélémy 2012) in hybrid realities, points of contact between humans, and humans and machines. In our online lives we see this heady lack of distinction between the reality of the objective world and our human, subjective realities. These mixed modes of existence are so beguiling for this very reason. They are not

places where we forget the body and become pure mind, a vision the Silicon Valley cybernauts tried to sell us. Rather, they are intoxicating because they return us to the magical mode of existence before the caesura between the world of objects and our subjective selves, where the power of flux and intermingling sweeps us into the reticulated nets of being with the world as an indissoluble meshwork.

Natural places, such as the heart of the forest, for example, are a reality that concentrates natural powers and focuses human actions. It is through this vast structuration in a reticulated network of key-points that the exchanges between world and selves takes place, where reciprocal influence of both world over us and us over world takes place. The magical universe not only consists of a reticulation of key-points of power but of access points to domains of reality, 'thresholds, summits, limits, and crossing points, attached to one another through their singularity and their exceptional character' (180). These reticulations are both spatial and temporal, with our being-in-the-world also manifesting in and through temporal structures. The internet and other digital spaces, like the natural world, consist of numerous domains of reality, access points to information, to environments, to relations with others, worlds other than our own where we can learn and play together in moments of becoming. And, also, play with identities other than the ones assigned to us at birth and through socialisation. Such digital transformations that manifest the drag-acts of identity and performativity allow the subversion of those conservative social forces that delimit the epistemic and ontic character of flesh as flesh, of the body as a site in which the doxa of daily identity is enforced and nonconformity punished. The evolution of such technical milieu are reorganising the organic itself:

> Novel technical apparatuses of all sorts are to be seen: machines for circulation, communication, for sight, speech, entertainment, calculation, work, "thought"; soon machines for feeling and for doubling oneself ("tele-presence" or tele-aesthesis, virtual reality), and for destruction. These include living machines – "chimera" and other *biological artifacts* [sic] currently translate not so much an organization of the inorganic as a reorganization of the organic (Stiegler 1998:85).

In the transition from the magical world and unitary figure and ground to the technical and religious modes of existence, figure and ground become separated and detached from the universe. Key-points which are detached from their specific ground become technical objects which are mobile and abstracted from their milieu. Environment and key-point no longer

have strict concordance and so lose their power of influence over that ground since they are no longer reticulated. As such, technical objects may only influence momentarily, instant by instant. The simultaneous network-rupture that frees the ground allows it to detach and become universal rather than tied to a concrete particular, to stretch over world and time. Liberated ground powers individuate in figures of gods, heroes, and clerics, while figural key-points become objectivised as tools and instruments. Before, there had been a perfect unity of figure and ground and individual and milieu, without a definite difference between the subject and object. As soon as the first tool and figure of divinity arrived, a distance between humans and world opened. Objectivity is never completely tied to world and subjectivity to ourselves. We have moments when we shift in and out of these perceptions, when we recognise the body as object and when we feel the world as part of subjective selves. Technics and religion form these diametric poles that are really two beats in the same rhythm. Each is a phase of a more basic unity and taken together cannot enclose all reality of the joining of ourselves with world. In the gap between technics and religion 'science and ethics are born' (Simondon 2016:182).

Where technical thought becomes mobile in the split between object and subject, technologies of place, such as digital environments, and technologies of communication, such as the mobile phone, recoup this loss and create a more unitary ground, connect technicity once more to a reticulated mode of being in a world. Yet they do this because they are themselves detached from the world, because they mediate between subject and world. For Simondon, this is a liberation from enslavement to the ground of the world, a progressive force that allows us to escape powers of influence and control. He writes:

> [I]n technics the whole of reality must be traversed, touched and treated by the technical object, detached from the world and applicable to any point and at any moment. The technical object distinguishes itself from the natural being in the sense that it is not part of the world. It intervenes as mediator between man and the world; it is, in this respect, the first detached object, since the world is a unity, a milieu rather than an ensemble of objects; there are in fact three types of reality: the world, the subject, and the object, which is the intermediary between the world and the subject, whose initial form is that of the technical object (183).

The technical object mediates between us, the subject, and the environment. Three types of reality commingling. Yet digital information exchanges, flows and structures disrupt these mediations while facilitating them. Slave to the ground of being no longer, the unification of

figure and ground in the unity of physical and digital worlds brings with it the danger of outside influence. The newly-reticulated meshing of these worlds bring liminality to the fore. Power once again inheres in places created as key-points of community, of the influence of the world over people and people over world. Seemingly every day there is a new story of people falling from great heights after the search for the perfect selfie goes awry. The blood sacrifices of ancient religions has been replaced by the theistic impulses of magical unity found in networked social media, bodies sacrificed to the implacable false idol Instagram.

Caught in the web of digital information flows that connect technics with the body, subjects struggle to free themselves from the sensorial stream of massive data inputs. The overwhelming volume of data, information and knowledge scaffolding current lives disorients and attaches to the senses, to the liminal phase-shifting of being-in-the-world through sensual engagement doubled in the digital. Only a broad methodological approach, Hayles (2012) argues, can capture the likewise broadness of societal and personal technological transformations this entails. Digital media can be used as interventions in the dynamic adaptations between humans and technics to 'subvert and redirect the dominant order' (83). Critiquing the Bergsonian distinction between time as subjective process and time as objectively measured, Hayles asks a series of provocative questions on the sense of time constituted by and potentially experienced by objects, and the co-constitution of evolutionary processes through time of humans and objects:

> How have the complex temporalities of objects and human coconstituted one another through epigenetic evolutionary processes? Along what time scales do interactions occur between humans and technical objects, specifically networked and programmable machines? What are the implications of concatenating processual and measured time together in the context of digital technologies? (84).

So we must consider even measured time not as a uniform flow but as a conjunctive flux of human-plus-object-time in the context of digital technologies. Human-plus-object-time not only has an rapidity-effect on how we experience time phenomenologically, this rapidity stems from the compression of the phenomenological time-experience in technology usage. For Hayles, the complex temporalities embodied by technical objects enfold past into present and present into future, requiring us to reconceptualise them not as static entities but 'as temporary coalescences in fields of conflicting and cooperating forces' (86), an object-

centred perspective that begins with the technical object rather than with the human. Attention is a key concept here, a dynamic with a fuzzy boundary that exists at the centre of consciousness alongside the more occluded unconscious and non-conscious faculties that all figure in technological interactions. Embodied human cognitions bring tools into being through these dynamic interactions. The tool maker is themselves embedded in and working within a larger socio-technical milieu in which the tool making and its processes are refined, reshaped, reused in its technical evolution a process of concretization which resolve conflicting requirements within the milieu in which a technical individual operates. The technical object is a repository of virtuality and a metastability allowing both stability of use and potentiality of adaption, the concretization of the milieu through new configurations and ensembles in complex temporal enfoldings. Digital flows allow the manipulation to increase in intensity and speed. Allow a common fracturing of voice and perspective in the mutative growth of media channels. Embodiment is the nodal process of being as presence and the power of change, of the accumulation and entropic dissipation of energy flows. We know reality on the levels our senses and Umwelt-channelled thoughts and probing give us filtered access to. Through technologies as exploratory tools, through the power of technics we scrape through ontological barriers to our enshelled habitation, to widen and deepen the burrows of the body and the grooves of the mind-in-body-in-environment nesting.

The characteristic *easiness* of new media allows a radical transformation in the balance of attention. An easy book or a difficult one is precisely alike in its mechanics of words printed on paper pages bound into book form. The interface between book, body and brain is a stable environmental scaffolding technologically speaking. The content is mutable and transformative. A digital alphabet of 26 letters creates stable [i.e. bounded] instability and flux. Digital interfaces magnify this flux. The contract between eidos and telos becomes unstuck. The hardware + interface + content continuum of digitality is unstable and shifting, with the interface at the heart of this change. The digital interface allows differing bodily interactions which attract, compel and consolidate attention and its focus into habitual physical behaviours. The body learns to be digital, that is, to interact digitally across digital domains, and the brain in turn is rewarded. The organic is not just being reorganised, as Stiegler (1998) states. It is being programmed. The organic, the flesh, is turned into a computable vector of control. Digital attention works partly on the level of dopamine release. Our bodies and brain become captive to the pleasure-inducing, habit-forming device. Yet this captivation exists also because the digital interface uses gesture and touch to mimic the

moulding and manipulation of environment through tool use that is our evolutionary heritage, of the grasping and therefore shaping of reality via cyber-simulacra. The hardware capabilities allow particular interface interactions, and the content is continually modified and updated, but the central matrix of desire is focused upon the physical reinforcement of attentional reward through gesture, sound, touch and light which creates and reinforces a potent pleasure cycle. Animal infants thrive through touch and that biological imperative is here multimodally redirected to our digital surrogates, allowing us to continually self-soothe, to be held and comforted and loved by these pocket-sized machines. Love, desire, need, are digital. We groom our devices through touch, tap, gesture, slide, and in turn we are groomed, in every sense of that word. Technology companies today are predators. Digital devices, like pictures (Mitchell 2005), are world-building, but on the level of body-brain neurochemical prompt and response. They build a world of acceptance and release, of information transcoded into emotional connectivity on a biomolecular scale. The circle of nerve transmission and informational relay to the brain and back through the body are intentionally consolidated from the first touch when we compulsively reach for our phones in the morning. Did we receive any likes, emails, notifications in the night? What happened in our sleep? What's the weather? What news portends? What did we miss? Connectivity is the drug and our devices are the dealers. But in great part this digital interfacing taps into the plasticity of the brain and our neural functions.

As Malabou (2008) argues, plasticity is the central feature of the brain's architecture. Plasticity comes from the Greek plassein, to mould (2008:5). Plasticity has two senses. Importantly, it is the ability to receive form but also to give form. To talk about the brain's plasticity contains these two senses. We know that the brain, like the schoolchild, is mouldable, as the Jesuits well knew. We know also that the brain, as well as formable, is formative. It brings forth a world. An Umwelt. The brain is plastic on three levels: in its developmental plasticity; in its ability to modify neuronal connections; and in its ability to repair itself. But as Malabou notes, writing originally in French, plasticity is also *plastique*, explosive. The brain has the ability to take form but also to explode form, to annihilate. This very plasticity and its malleability poses an ethical dilemma. The mathematician, the mechanic, the musician, each has a unique brain whose structure has been modified by their occupations but also by their differing life experiences:

> The entire identity of the individual is in play: her past, her surroundings, her encounters, her activities; in a word, the ability that our brain – that every brain – has to adapt itself, to include modifications, to receive shocks, and to create anew on the basis of this very reception. It is precisely because – contrary to what we normally think – the brain is not already made that we must ask what we should do with it, what we should do with this plasticity that makes us, precisely in the sense of a work: sculpture, modeling, architecture. What should we do with this plastic organic art? (7-8).

What, she asks, should we do with a brain that is truly living and mouldable, with modifiable synapses whose connections are not only shaped by life but actively shape it in the formation of a world, whose networks shape the very structure of our consciousness? We know, she says, that we all live in a reticular society, that networks and our involvements in them matter. And yet we are still ignorant of the brain's plasticity, that the brain and its formation is life's fundamental work.

Brain, body and world are indissolubly intertwined in a meshwork of matter and meaning. To shape the world is to shape ourselves. To shape ourselves is to shape the world. To return to Clark and his notion of the extended mind and its myriad loopings:

> It matters that we recognize the very large extent to which individual human thought and reason are activities that occur solely in the brain or even solely within the organismic skin-bag. This matters because it drives home the degree to which environmental engineering is also self-engineering. In building our physical and social worlds, we build (or rather, we massively reconfigure) our minds and our capacities of thought and reason (xxvii).

To allow ourselves to be shaped unconsciously by digital technologies is to allow the moulding of the brains and bodies which constitute our worlds. By allowing societies to be infiltrated by coercive technics of control and calculation is to be taken over at the level of cells and neurons, to be actively shaped by these forces of control. The plasticity of these connections are an indisputable strength, allowing our species to thrive but also to dominate other life. To destroy it. Yet this very plasticity is a vulnerability. It is a doorway through which calculating forces can enter, either with our permission or without our knowledge. The looping circles of brain body and environment are pathways along which viral vectors can be carried. Digital interface designers attempt through attentional attrition to kidnap the *corps vecu* [lived body] by hijacking the physical body through the chemical-neuronal reward

mechanisms activated by the senses. By doing so, Umwelten are likewise subordinated to control. Digital computing and communications devices are not siloed or passive. They are nodes in an *archi-textured* data-flow of which human subjects are the subject of unending interrogation. As bodies physically move and move their devices they are tracked by satellites and surreptitious sensors. Smart environments, buildings, streets, squares and the like monitor them, too. The United Kingdom is awash with surveillance technologies, from the governmental to the military to the civic to the privatised to the commercial. Each of these spheres forms overlapping nodes in the surveillance matrix that moulds Umwelten both in terms of perceptions and action constraints and prompts. Digitality in its plasticity mimics this liminality of our identities which are premised on the plasticity of personhood over time, that we are compelled by our environments and so find our environments compelling. This is the essence of an enhanced ethological analysis, especially when our Umwelten are considered societally rather than on the level of an individual organism. Such calculations are intrusive forces working *en masse*. They are brain worms that hollow out the dorsolateral prefrontal cortex that regulates control. By letting them shape us, control us, turn us not into consumers but into the consumed, in turn they consume the *milieu universel* that is the reticulation of all life and all non-life, the meshwork of being around whose centre we turn. Capital has always sold the lie that we, the individual, are the consumer. And while we consume, it consumes us. Bodies have always stoked the furnace of its engine. Bodies, too, have always been the fuel. Individuals throw themselves willingly into the fire because they are captivated. Digital technics and massive information flow has increased the speed and scope of this parasitic control. The plasticity of brains, in its success at intervening in the forces of life through technics, has allowed human habitats and our co-species to be reduced to the meagre price of our own lives. Allowing our brains to be moulded in particular ways forces our bodies into literal environment-changing actions. Species suffer. The world warms. The air is choked with pollutants and microplastics. We are, in the most profound sense, our biome. And our biome is dying.

It is worth thinking on a global scale about issues that affect the whole earth. Latour's notion of centring offers a valuable insight. The centring process that occurs in in the production of knowledge through cyclical accumulation is what Bruno Latour calls the formation of a 'centre of calculation' (Latour 1988). Knowledge gains its worth not in its production but in its reuse, in the fetching back from a periphery to a centre in order to make familiar that which is distant. Cycles of accumulation allow one point to act on at a distance on many other

points, creating a central gravity:

> As Lisbon, London, or Versailles exerted control and centering by the gathering of geographical mapping information under the aegis of empire, so centering renders a geographic gravity upon the digital data it accumulates from afar as it ingests it into the swelling physical databanks located at precise geolocation coordinates. By gathering the maps of the world, cartographers become the center of that world, a world that, while much reduced, revolves around them as masters of shrunken time and space. Data scientists dream the same dream but with exhaustive data maps of human attributes, behaviors, voting patterns, brands of toothpaste, all objects of their analysis no matter the beating heart beneath (Loughnane & Aspray 2018).

The invention of any new media enhances the accumulation cycle, each mediatic innovation being absorbed into and strengthening the centre of accumulation. Digital computing and communication technologies offer a particularly powerful reticulation of centres and peripheries to the networks which form the knotted meshworks of knowledge production and population control. This mobilisation of media and movement back and forth of information lies at the heart of technoscience, and is key to understanding the centre of any powerful network which involves these accumulative cycles (Latour 1998:233). The force of rationalising systems and systemic abstraction allied itself with the domination of human bodies and natural resources, and the extraction of their worth through production of goods and work. Two sides of the same coin, it is wrong to treat as two distinct histories the Enlightenment project and the subjugation of non-Western humanity and the earth. Outside of the European identity forged by notions of whiteness, geography, and heaven-ordained superiority, lay a world and many peoples to be exploited. Yet what consumes others if you unleash it ultimately consumes yourself. Bodies and their respective Umwelten in Western digital economies today are subject to these methods of abstraction, rationality, objectivity and control refined in colonial contexts. Although there are many recent historical examples of the digital concentration of data through reticulated centres of accumulation, such impulses are far from new. Lewis Mumford writes:

> Between the fifteenth and the nineteenth centuries, the New World opened by terrestrial explorers, adventurers, soldiers, and administrators joined forces with the scientific and technical new world that the scientists, the inventors, and the engineers explored and cultivated: they were part and parcel of the same movement. One mode of exploration was concerned with abstract symbols, rational systems, universal laws, repeatable and predictable events, objective mathematical measurements: it sought to

> understand, utilize, and control the forces that derive ultimately from the cosmos and the solar system. The other mode dwelt on the concrete and the organic, the adventurous, the tangible: to sail uncharted oceans, to conquer new lands, to subdue and overawe strange peoples, to discover new foods and medicines, perhaps to find the fountain of youth, or if not, to seize by shameless force of arms the wealth of the Indies. In both modes of exploration, there was from the beginning a touch of defiant pride and demonic frenzy (1970).

Today this frenzy has combined abstract symbols, rational systems and universal laws and spliced them more completely to the concrete material world and the organic, using new constellations of control via data and digital technologies, infrastructures, interfaces, and interwebbed knotworks which trap bodies and their perceptual worlds like the proverbial fly.

5.4 Conclusion

Life begins and ends with the body. It is the ouroboros of being. The body is ground and horizon of existence. The zero point from which all extends. Yet the body as a cohesive whole is also illusory. It is 60 percent bacteria. It is a symbiote. All we believe we are is not everything we are. Yet we live in a state of ignorance of this most basic mutual, mutable constituency. The body is the originary commons. The interface exists as a boundary, a threshold utilizing contact languages to bridge body and world, to act as the skin, the mediator between the internal mirror world and the buzzing environmental inputs pinging the sensual apparatus. Technology is at the same time a probe and a translator (enframer), formed to conduit information into Umwelt-specific symbols translatable to the individual. As the spider weaves a web in relation to the blindspots of the fly, technology must translate information to compensate for the blindspots that exist outside human Umwelt-funnelled perceptions. UI design is precisely this type of interface-based zone of contact languages. Networked together, it is the web of our desires and our discipline from the outside. Firms that employ the techniques of digital tracking have turned us from spider to fly, from weaver of webs to captive within them. Digital technologies and communication networks were utopian in promise but were always a lie. Without the dismantling of the capitalist paradigm, digital means could only ever become subservient to capital's ends. Where does it end? Where will the paths of resistance lead? How can we best resist the seemingly impossible weight of these forces, when we are worn into ghosts by the demands of the working week that extracts the health of our bodies and environments and turns them to ash?

Life begins and ends with the body but also the social body of which it forms something larger than itself. Moving from individual physiological analyses up to the societal and species level is vital to an ethological understanding of information. Tool and language development are common drivers of hominisation on both the individual and societal levels:

> When this technological and linguistic development beyond biology development took place, when ethology superseded biology as formative of the new species, human society formed in distinction from the zoological species (GP 131); a social body formed of which the characteristics is cultural and of which the study exceeds that of the study of the constitutive members (Wolff 2006).

Nature and culture, body and society. An understanding of human ethology must encompass the entire range of this technically-mediated existence, of the tangled knots that allow these frames not only to intersect but to gel. The following chapter uses a methodological conceptual framing to show how this can work in practice.

Chapter 6:

Conceptual Knotworks

> Modern man has no unified worldview. He lives in a double world, at once in his own naturally given environment and in a world created for him by modern natural science, based on the principle of mathematical laws governing nature. The disunion that has thus pervaded the whole of human life is the true source of our present spiritual crisis (Patočka 2016).

Four methodological concepts will be discussed in this chapter in order to bring thematic unities to the fore when discussing the overlapping of bodies, environments, technologies and information; those of *diffraction*, *entanglement*, *interface* and *rhizome*. These conceptual orientations not only provide diverse structures on which to hang transdisciplinary connections, but also allow a framing of Chapter 7's first-person research conducted in the Media Archaeology Lab at the University of Colorado Boulder in order to show the importance in any ethnological analysis of the body of phenomenal interactions with information technologies. It is an instrument to orient perception as the discussion moves further into issues of environmental world-building and technological scaffolding.

Entanglement demonstrates the move from the notion of the flattened network to a sinuous meshwork in which existents, including digital objects and information, are thoroughly entwined in thick reality. The ruse of the unifying metaphor attaching itself to everything 'digital' as cloud-like and weightless under the aegises of capital and its discourses of control must be subverted. This metaphorical unification elides the many differences in digital platforms, technologies, interfaces, information channels and filters, and in how these subsist on physical infrastructures, how they shape the worlds humans inhabit, their bodies and the choices available to them.

Rhizomatic thinking shows the tentacular mutuality of existence, of the flow of existents, power and information. By allowing rhizomatic thinking, artificially separated discourses can be brought together, academic divisions that plot subject knowledges along different axes can be reknotted, what has been torn asunder can be unified, and so allow a differential diagnoses of an underlying malignancy.

Interfaces are important because they are the *thresholds* of interaction in which physical and digital worlds and bodies meet. In their formalisation they allow or deny particular information flows (Emerson 2014). By framing what can and cannot be said, they frame what can also be imagined. The concretisation of the interface and its restrictions is therefore antiutopian because the space for manifesting fantasy is bounded prior to interaction by the design process, itself bounded by the ideologies under which it was designed and its designers laboured.

Diffractive analyses and modes of thinking reduce the divisions in the sciences and the humanities that were rendered under the auspices of ideological construction. By thinking in terms of flows and manifestations beyond the human, differences of human, animal and environmental interactions can be healed, providing an ethical account of the universe in terms of information and becoming

6.1 Entanglement

While the physical reality of anthropocentric sensual existence, and how objects relate to human desires through Umwelt-oriented grasping is often considered, the reality of existents most alien to human life – whether plant, mineral, binary-coded object, or something entirely more strange – and their relations to one another outside of human concerns is less discussed.

Tim Ingold writes:

> When everything tangles with everything else, the result is what I call a *meshwork*. To describe the meshwork is to start from the premise that every living being is a line or, better, a bundle of lines (2015: 3).

But everything is knotted into the weave, of course, not only life forms. Physical existence is a vast intra-related meshwork in which information as difference is primarily embedded, the pattern in the fabric. Information, both in physical and digital forms, infrastructures and formats, exists as a fundamental part of this universal meshwork, or in Simondian terms *reticulation* (2017), an entanglement increasingly essential to new forms of semiotic interaction with non-human participants. It includes, as Simondon argues, both biological and technical beings. New informational objects are created daily in their many millions, new

entanglements of form, and, as their creators, curators and mappers, it is right to consider their ontological status as much as others in order to remain culpable for one's actions towards them. But how is a fully-realised dialogue with these objects cultivated, amongst the stunning multitudes already in existence? How can the ever-evolving networks they form be mapped? How can human life be 'placed' or oriented within them, physically, spatially, philosophically?

Networks are composed of nodes and arcs, blobs and lines. Etymologically, node is a Middle English derivation from the Latin *nodus*, or knot, meaning a lump in the flesh, a point of intersection. Human bodies are knotworks of nodes and arcs, of blobs and lines, lumps and strings. They are indissolubly knotted from the moment of conception, their materials and accompanying chemical-bacterial biota unbundled only in death to be re-knotted into other combinations. Bodies continually ingest and absorb the world, excrete and exhale it. Intake and expend energy. Nutrients. Pollutants. They shed their skins, sending it into the aether to drift as dust. Bodies couple and uncouple in myriad senses; for procreation, for pleasure physical and social, for survival, enthralled in the dance of being, in the mixing of matter. Bodies are enmeshed. To mesh is to entangle, to become entangled. The mesh denotes both the netting and the space between. Muscle and bone. Tendon and vein. Nerve and skin. Grassland and cloud. Sidewalk and sunset. Machine and Signal. Page and binding. Space and place. It is both resistance and liberty. Warp and weft. Push and pull. Wrapping and unwrapping. Twining and untwining.

For Ingold, this process of knotting is key to life:

> [I]n a world where things are continually coming into being through processes of growth and movement – that is, in a world of *life* – knotting is the fundamental process of coherence. It is the way forms are held together and kept in place within what would otherwise be a formless and inchoate flux. This applies as much to forms of knowledge as to material things, whether made like artefacts or grown like organisms (2015:14).

There is no point of insertion into the world. No point zero that can ever be pinpointed. The body literally grows into it, fully enmeshed, a bundle made from the tangling of many other bundles. The I posits itself through the body, through its embodied position in the universe, in

the Umwelt which it creates and recreates endlessly, the functional circle from which identity is emergent. It is an *I-can*. An intertwining of being and existent. A knotwork of the sensible and the sentient.

The body has no outside point with which to view it, this knotting. No god position to encircle it. The form of the signals that it can receive is delimited or filtered by the muscular, nerve and neuronal networks with which it interfaces with the world-as-data-stream. The visible. The auditory. The olfactory. The haptic. The proprioceptive. The species and technological tangible. The body weaves them together through the sensory knotting of environment with flesh.

It is with this question of meaning and its semiotic reconfiguration that networks can be more fully discussed. While network analysis, for example, can sketch a representation of tangled human existences, the ontological limitations are such that perceptions are funnelled into flattened, hierarchical patterns of connection to best produce and reproduce representational schemata. Since complexity is already reduced through Umwelt-creation in order to enhance environmental apprehension, what this achieves is effectively a double reduction.

The network node and line are a reduction of epistemological complexity, a tracing of singular layers extracted from a seething multitude. And there is nothing wrong with that, of course. Network creation and analysis are vital analytic tools to help simplify reality in order to better comprehend it. Modelling serves a vital function in the understanding and capture of information. But all existents are embrangled in a profound interconnectivity that washes over any notional diffusiveness of being. All are knotted and tangled together beyond any reductive disentanglement of connection.

In terms of digital humanities work, including network analysis and the spatial turn, there is also an argument to be made for a conceptual reorientation centred on networks, maps and corpus linguistics, and interrelations not only within such schemata but with all other existents. Specific analytic and hermeneutic practices on a local, iterative level may here be tied into the widest, most general of philosophical issues both epistemologically and ontologically. Digital humanities and wider research practices are intimately affected by the broader philosophical issues that this study addresses. The creation of world-forming technologies, symbolic storage and transmission systems is an arc receding back from this

moment through prehistory, and must be wound into a story not only of animal life, its evolution, and its relations with non-living objects, but with the physical evolution and expression of the universe, of matter itself in its becoming-entangled:

> [M]atter does not refer to a fixed substance; rather, *matter is substance in its intra-active becoming – not a thing but a doing, a congealing of agency. Matter is a stabilizing and destabilizing process of iterative intra-activity*. Phenomena – the smallest material units (relational "atoms") – come to matter through this process of ongoing intra-activity. "Matter" does not refer to an inherent, fixed property of abstract, independently existing objects; rather, "*matter*" *refers to phenomena in their ongoing materialization* (Barad 1997: 151. Original emphasis).

The intention here is to finely redefine the conceptual viewpoint from which to approach discussions of networks[41] – to effect a subtle shift from the idea of the epistemologically flat network to the omni-dimensional *meshwork*[42] in order to allow for the 'thickness' of reality and its existents [i.e., intra-active relational phenomena] that the idea of networks, by virtue of ontological limitations, are unable to fully contain or present. Likewise, to move from the idea of the network node to the meshwork knot, from network to 'knotwork', an entanglement of forms held together under the weight of their own tensional interrelatedness. To untangle and then re-knot the material-semiotic entanglements that denote existence and being-in-the-world, of the wrapping of bodies in a world-flesh matrix that becomes through intra-active contexture, the embodiment that contains both the objective and phenomenal bodies dancing around the same axis and the pulsating, the vibration of all existents within existence:

> We never have before us pure individuals, indivisible glaciers of beings, nor essences without place and without date. Not that they exist elsewhere, beyond our grasp, but because we are experiences, that is, thoughts that feel behind themselves the weight of the space, the time, the very Being they think, and which therefore do not hold under their gaze a serial space and time nor the pure idea of series, but have about themselves a time and a space that exist by piling up, by proliferation, by encroachment, by promiscuity – a perpetual pregnancy, perpetual parturition, generativity, and generality, brute essence and brute existence, which are the nodes and antinodes of the same ontological vibration (Merleau-Ponty 1968: 115).

[41] In the most general sense of that term.
[42] My work here is indebted to that of anthropologist Tim Ingold.

For Jane Bennett, even the common sense of embodiment that counters representationalist schemata is not radical enough, does push back enough against the doctrine of empiricism and the subject-object split. She writes:

> In a world of vibrant materialities, the agency of a self appears not only as radically *entangled* with nonhuman things, but as partially composed of such stuff. That's why I think that the notion of our "embodiment" is insufficient; we are, through and through, an array of bodies, many different kinds of them in nested sets (258).

As with bodies, so with informational realities, entanglements of the body's sensual-semiotic data cycle with symbol-bearing technologies, with physical and digital media, that form rhizomatic, knotted *nexūs* through autopoietic modes of discourse,[43] intertextual twinings manifesting in the latent fertility of the hetteroglossic *khôra.* Texts, technologies and bodies are nested sets of embrangled matter. Particles, cells, liquids, fibres, solids, gases. Chips, bits, keys, screens, wires, lenses, cases. Words, [e]ink, [e]paper, binding, neurons, archives, mouths, waves, ears, noises, silence. Flesh and world.

The complexity of human ethology, of human existence, is apparent.

Ingold writes that blobs are divided between inside and outside, are contained, are themselves containers. They take up space, they take territory through a process of territorialisation. Lines on the other hand give life, form connection. They partake in deterritorialisation. Everywhere in life we have blobs and lines. A cell gives energy, a flagellum motility. The assemblage [*agencement*] theory of Deleuze and Guattari is too blob-like for Ingold, too static and self-contained in its compartmentalisation of objects and agencies. The line, rather, is life, is movement, is form, the whirl of the organism in interbound motion.

Classic ecological thinking places the organism in a world, examines the relations between organisms and world. It is a blob-like relationality, surrounded by an exterior environment

[43] 'Discourse is not a synonym for language. Discourse does not refer to linguistic or signifying systems, grammars, speech acts or conversations. To think of discourse as mere spoken or written words forming descriptive statements is to enact the mistake of representationalist thinking. Discourse is not what is said; it is that which constrains and enables what can be said. Discursive practices define what counts as meaningful statements. Statements are not the mere utterances of the originating consciousness of a unified subject; rather statements and subjects emerge from a field of possibilities. This field of possibilities is not static or singular but rather is a dynamic and contingent multiplicity (Barad, 1997:147).

yet enclosed within itself, in its own skin, bounded and separated other than in its behaviours. It exists within a territory strictly defined. Such organisms, and humans themselves, may exist together in superorganic aggregations but still maintain their inherent divisions and individual boundedness. The organism, in this paradigm, is always discrete.

As Ingold argues, human and nonhuman minds and lives are not discrete, they are open-ended and wrapped around one another, they interpenetrate in a fluid reality. They are tentacular, interweaving in the oceanic metaphor used by Marcel Mauss 'to form a boundless and ever-extending meshwork' (11). The comparisons between sociological and ecological analyses show that organisms and human beings are *submerged* in their environments, environments, bodies and beings caught up, entangled in a mutuality of relations.

Existence is knotted. It is tensional, a continually morphing knotting and release interleaved with symbolic meaning and manifestations It forms a knotwork. But it also flows. Flows of information, of time, of memory, of contrapuntal forces, of gestures, languages, codes and emotions. Life pulses. It has rhythms. As Maurice Merleau-Ponty writes in *Phenomenology of Perception* (1994; originally published 1945), 'the smile, the relaxed face, gaiety of gesture really have in them the rhythm of action, the mode of being in the world which are [sic] joy itself' (186). These joyful modes of being are the singing which comprises the upsurge of being-in-the-world. Different languages are different ways of singing the world, the meanings of which cannot be fully transcribed between languages. Each language is a non-reducible music of being in which people fully live, in which they inhabit the world, that which they sing of. Languages codify perceptions and frame semiotic interactions in meanings shared.

Bodies are not solely located in the here and now of immediate environments, in the buzz of being that places it in one nodal point of existence. The networks in which a body partakes, and within and through which it forms knotted nodes in the vectors of becoming, stretch it through time, space, matter and meaning. Spacetime is elongated and shortened, looped, bent, twisted and fractured. Such distortions put paid to the notions of the unitary body and mind as a discrete yet parallel constitution existing on a singular plane of existence. Yet the body is our human home among this flux. It is not transcendent, but it is transformed. It is always transforming – itself, others, and the worlds it inhabits. Not least through technics, which terraforms inner topographies as much as it does the exterior environment. Each person is an experiment in change and culturally-mediated evolution.

Like other organisms, the world does not happen to humans. Humans actively explore it as they create it, through the grasping of hands, through the groping vision of eyes and the braiding of sight and touch (Mitchell 2005), through channels of sound, through ambulation, through smell, through movement and balance and dance, through running, climbing, singing, even gustation and digestion. Human DNA does not describe the totality of being. Humans are 60% bacteria. In the words of Legion, we are many. The world is that which nourishes the body and the search for sustenance is the most primal of urges alongside the music of bodily movement which accretes through time into gesture, a style of being. The world is what bodies eat and drink and make clothes and shelter and tools from. It is the ground of human being, the horizon of all experience. The body belongs to the world as the world, properly, belongs to the body. The world is the self and the self is defined through technics which frame the body in the world of its making. Each co-constitute the other in what Merleau-Ponty (1968) calls the chiasm of flesh, the chiastic intertwining of world with body that is the flesh of existence.

In terms of biodiversity, the digital milieu is poorer in relations than its physical substrate simply because its base is a multispecies meeting point while it is not. The internet and digital information flows are designed around human-centred interactions, human-centred body adaptions, human-centred domains of knowledge. Where, I might ask, is the internet for ravens? It is an absurdist question but it serves to highlight the meaning-bifurcation of digital and physical environments even as they intermesh in their symbiotic structural relations. The human-centred environment of physical signs, while partially semiotically distinct and buttressed by particular human cultures, is overlaid with myriad semiotic crossings and demarcations, with diffuse boundaries across species lines, with signs that hold simultaneously similar and distinct meanings. Flesh means food to those that consume it. It may not hold the exact meaning for predator and prey but those who wish not to be eaten still tremble with the sense of the heavy sign, of their bodies as such. Here is Henry in *White Fang* as he makes that exact epiphanous leap across species boundaries, as wearily he realises the symbolic divide between human and animal, predator and prey, is collapsing in the great wild north, and his body, full of sensitive, sensuous feeling of world, is but ‘so much meat’ to be devoured:

> As he piled wood on the fire he discovered an appreciation of his own body which he had never felt before. He watched his moving muscles and was interested in the cunning mechanism of his fingers. By the light of the fire he crooked his fingers slowly and repeatedly now one at a time, now all together, spreading them wide or making quick gripping movements. He studied the nail-formation, and prodded the finger-tips, now sharply, and again softly, gauging the while the nerve-sensations produced. It fascinated him, and he grew suddenly fond of this subtle flesh of his that worked so beautifully and smoothly and delicately. Then he would cast a glance of fear at the wolf-circle drawn expectantly about him, and like a blow the realisation would strike him that this wonderful body of his, this living flesh, was no more than so much meat, a quest of ravenous animals, to be torn and slashed by their hungry fangs, to be sustenance to them as the moose and the rabbit had often been sustenance to him (London 2011)

Here is the paradox of intertwining subject- and object-hood, of the body as an inner-outer intertwining, the Moebius strip of the soul-as-body. No matter how much one may define oneself and symbolically interpolate the world into the body and the body into the world, thus interpellating the self-as-world, the universality of definition and categorisation is resistant, is beyond a catholic enclosing in the matrix of meaning in which all are caught. As with flesh, so with technology, which bears meaning beyond what human thought would give it, involved in its own evolution and technical milieu (Simondon 2017).

Technology and media are involved in diachronic transmission but also synchronic communication (Debray 2004). Digital media technologies are involved in the rise of mass synchronic communication networks between technical objects and the creation of massive synchronic ensembles. The invention of the printing press, like the proliferation of many new media, caused moral panic. Yet printing press technologies transmitted slow information packets known as ‘books’ or ‘manuscripts,’ which took weeks or months, even years to arrive at their physical destination and relay meaning across the page-body-brain functional circle. Each book was a slow-fused bomb that rocked a world. Today the self is cluster-bombed into informational attrition and commercial submission. Information packets in the form of bits and bytes are now transmitted at lightspeed across geographic territories. The speed of cultural transmission follows the vectors of information relays. With this increase in informational speed, the churn of culture is multiplied by many powers. Yet understanding has not followed as quickly. It becomes ever more difficult to find a stable bearing when social communities become fractured only to rebound and reform according to increasingly extreme interests and affiliations. Human ends are subverted by digital means. Social and

cultural relationships and behaviours are tracked, monetised and distorted. Synchronicity is overpowering diachronicity, the stability of cultures shared, and purposes made common.

Multimodalities by necessity have greater sensual engagement. Yet this involvement of the body can easily be abused, ideological defences overwhelmed in the rush of multichannel stimuli. The visceral immediacy of the internet can be used for good or evil. In March 2019 a white nationalist murdered fifty Muslim worshippers at two mosques in Christchurch New Zealand. The atrocity was streamed on Facebook Live. Any massacre, any accident, can now be viewed immediately, byte for bullet, the videos streamed or uploaded shortly after to a variety of media channels and platforms. Immoral media outlets such as the *Daily Mail* posted parts of this video on its website with autoplay enabled. This power of immediacy, this test to the communal psyche, is still not understood. A technological information circuit is drawn between us. A moral circle. Whether such horrors turn out to also be an ethical handcuffs or noose, human lives are both bonded and in bondage to such digital outrages; put in a position of moral subjugation. What are the implications for the *sensus communis*? Where is our common bond under the relentless pressure pushing us apart? How do we, socially, societally, as a species, hold together?

The tracking and discipline of bodies and behaviours shows the lie of Cartesian dualism, that the technocratic management of the body subdues the soul which is the truest self. It also shows the lie of cyberutopian dreams. *A Declaration of the Independence of Cyberspace* states, ‘Our identities have no bodies, so, unlike you, we cannot obtain order by physical coercion’ (Barlow 1996). Such dreams have turned out not only to be futile, but also to dangerously erase the struggle of those without privilege. Algorithms and tracking cookies know that online behaviours are signs of physical presence, of life in the worlds in which they partake through those bodies. Ethologically, they subvert the shapes of our Umwelten. Humans are not disembodied brains clicking through psychic force, they have not left behind their meat prisons and transcended into the cloud of information. Their bodies are their real selves and those which must be properly managed both in terms of capital and in terms of control. Desire and subservience are the two nodes of the current paradigm. Of 239 large corporations surveyed in 2018, research firm Gartner found that half are using ‘non-traditional’ technological means and big data to surveil workers, including measures such as analysing telephone transcripts, emails and text messages, tracking meetings between individuals, and monitoring genetic data, health data, online behaviours and social media

postings (Wartzman 2019). As Wartzman reports in a 2019 article on digital attitudes towards these practices, most workers are apathetic towards such employer intrusions, a radical shift in privacy mores. In the United States, health insurers track behaviours through devices strapped to bodies, telling them not only how active customers are, but where they have been, where they shop, even who they meet. They track behaviours through scanning social media posts and adjust insurance premiums accordingly. The two realms of body and information channels coexist and intertwine. Yet the disciplining of Umwelten by digital means is growing. Information nets grow tighter, the gaps between grow smaller, and people are caught gasping for air that grows rarer. Yet as Zuboff (2019) argues, companies are no longer content simply to record bodily behaviours but to actively shape them on a grand scale, to mould them into predictable patterns to best monetise them, to wrest the power of choice from the individual to better serve the profit motive. Despite liberationist promises from Silicon Valley's cybertarian acolytes, the digital information has not led to emancipation but capture. This is part of what Haraway (2016a) describes as the rearrangement by science and technology of social relations, in a process she calls the informatics of domination (28). Zuboff's 'surveillance capitalism' is arguably a subset of the informatics of domination, where technics uses the already-established cost-value reduction of all life and all that the earth contains to dominate through informational control. Capitalist informatics has yoked technics to its bloodthirst but informational regimes exist, or have existed, or will exist, beyond any capitalist society and its mode of reductive objectification:

> In relation to objects like biotic components, one must think not in terms of essential properties, but in terms of design, boundary constraints, rates of flows, systems logics, costs of lowering constraints (Haraway 2016a:30).

Bodies are run through with rhizomatic networks, of capital, control and information. Yet existence has always been connective, rhizomatic. An ethological analysis can begin to unwind these threads to show them more clearly.

6.2 Rhizome

Existence is rhizomatic, a mutualism of relations and feeling. Umwelten cannot but overlap, interconnect. Although notions of hierarchy persist, human life perdures, in fact, in a heterarchical symbiosis.

Deleuze and Guattari write:

> The rhizome is…different, a map and not a tracing. Make a map, not a tracing. The orchid does not reproduce the tracing of the wasp; it forms a map with the wasp, in a rhizome. What distinguishes the map from the tracing is that it is entirely oriented toward an experimentation in contact with the real…The map is open and connectable in all of its dimensions; it is detachable, reversible, susceptible to constant modification. It can be torn, reversed, adapted to any kind of mounting, reworked by an individual, group, or social formation. It can be drawn on a wall, conceived of as a work of art, constructed as a political action or as a meditation (2002: 12).

The tracing translates the map, the open rhizome, into a fixed image, stabilized and neutralized, the burgeoning multiplicities and entryways and exits closed off. Make a map, they say, not a tracing. The orchid and the wasp produce a rhizome, which I interpret to be the entanglement of Umwelten, of perceptual worlds enjoined in living maps borne by the pullulation of knotted existents.

While these connections must be plotted still, the tangled nature of being that subsumes human desire and its limited concerns must also be held in mind, remembering that the universe is imbued with infinite points of difference in endless dialogue. Matter has its own morality weaved into it, and human life is imprinted with its patterning. It is woven in and it must be approached from within this knotted morass of difference. The spatial turn in the digital humanities and the use of thick mapping, for example, allow for a move towards this greater complexity and interactivity, towards an openness in plotting and replotting connections both present and residual. For maps not to be closed and finished and static, but ever-evolving and growing ever thicker, ever more knotted. As maps, so books:

> The same applies to the book and the world: contrary to a deeply rooted belief, the book is not an image of the world. It forms a rhizome with the world, there is an aparallel evolution of the book and the world; the book assures the deterritorialization of the world, but the world effects a reterritorialization of the book, which in turn deterritorializes itself in the world (if it is capable, if it can) (11).

Book and world form a rhizome. But there are infinite perceptual worlds, and infinite textual [re]engagements entangled in the heteroglossic nexus. Books/texts/hypertexts are knotted in rhizomatic, formal and informal collections. They collect upon shelves in libraries and homes and offices, on desktops and hard drives, on networked communication devices, knotting ever more deeply into tangled lines. And they are classes of documents within phyla of documentation, sitting in a higher domain of information that includes physical and digital kingdoms, each forming rhizomatic bundles in their higher but non-discrete physical and digital ecosystems while sending out fissive lines of flight breaking ever further down from genera to genre to script until we reach the heteroglossic utterance, particlewave of intertwining [hyper]text and Umwelt.

Information congeals across the physical, is bound into its form. Think of the rhizomatic intertwining of the calf's peeled, treated and stretched skin, of the goose-feather quill and the flesh, blood, tendon and boned hand that sweeps the ink from pot to parchment in a stylised gesture of being. Does anyone remember that the parchment had a mother once that loved it, that it trod and fed upon the green earth, gathered up the grass with a hot, wet tongue? Or that the quill knew the radiant curvature of the earth as it flew in a V towards warmer climes at the height of an airliner? If world and word are symbiotic intertwinings, what does this mean to the plotting of new words in Shakespeare plays, wor[l]ds that sprang from material, living entanglements? Does the quill remember that dream of flight deep in its form when it glides across the page? Does the algorithm of the JPEG file of a digitised fifteenth century book of hours contain within it the data-ghost of beating wings? No longer JPEG [Just Parchment Excluding Goose] but GIF [Goose In Flight], a reversion to former form[ats].

And what of the words dancing on this screen as I tap them out. Now. Now. Now. Eye. Brain. Nerve impulse. Finger. Keystroke. Word. Thought transmogrified into light. Saved. Uploaded. Do I focus on the feel (plastic; resistant) of the keys as I touch them [as they in turn touch me]? Do I think ever of the fingers that touched these parts on the factory floor, constructed this machine and many like it? Were they gloved? Were they weary? What of the men (or women or children) who mined the materials? What of the air they breathed, heavy with toxins?

> What if you breathe the heaviest of air? What if you breathe residue of the metals and chemicals of digital culture? Should we speak of the exploitation of the soul through

> the contamination of the lungs? (Parrika, 2015: 90).

Attempts are often made to quantify and trace connections ('am I looking at the right connections?' I might always remember to ask myself in absolute seriousness), to plot them and graph them and pin them to a board. And herein lies the danger in imitation, of importing techno-ideological apparatuses unquestioned and mistaking *modus operandi* for *modus vivendi*. The scientific method and the representationalist doctrine are inadequate to the task if they remain unexamined in their situational specificity. To abstract the line [literal; figurative; graphical] and pretend that a digitised image or corpus analysis, for example, exist *in vacuo* without accounting for the method and the apparatuses and the actors involved, and how they are knotted together in all their polyvalence, creates not a map but a tracing:

> [I]t is inaccurate to say that a tracing reproduces the map. It is instead like a photograph or X ray that begins by selecting or isolating, by artificial means such as colorations or other restrictive procedures, what it intends to reproduce. The imitator always creates the model, and attracts it. The tracing has already translated the map into an image; it has already transformed the rhizome into roots and radicles (Deleuze & Guattari 2002:13).

This ossifies the living multiplicity into a static form, turns a vibrant map into a flat image, objectifies and stabilises the unstable subject, plots its ever-changing form onto static axes. It is over-determining our surety of significance:

> It has organized, stabilized, neutralized the multiplicities according to the axes of significance and subjectification belonging to it. It has generated, structuralized the rhizome, and when it thinks it is reproducing something else it is in fact only reproducing itself. That is why the tracing is so dangerous. It injects redundancies and propagates them. What the tracing reproduces are only the impasses, blockages, incipient taproots, or points of structuration (13).

This method of stabilisation, then, reproduces these points of structuration, routine measurements created to allow abstract analysis. Measurement kills off multiplicities so as to create static tracings. That is fine. But the tracing must not be mistaken for the map and used in isolation as if it were the world entire, 'It is a question of method: *the tracing should always be put back on the map*' (13. Original emphasis).

Similarly, the apparatuses of measurement, whether in a physics laboratory or digital humanities centre, create 'specific material reconfigurings of the world that do not merely emerge in time but iteratively reconfigure spacetimematter as part of the ongoing dynamism of becoming' (Barad 1997: 142). As Barad argues, apparatuses are not passive observing instruments but part of the productive nexus of phenomena, enacted material-semiotic configurations of reality, material arrangements that embody the concepts they exemplify. As quantum physics experiments demonstrate, the nature of the apparatus-observer entanglement used to make measurements:

> …enacts a cut that resolves the inherent ontic-semantic indeterminacy through which the "subject" and the "object" emerge. Apparatuses are the conditions of possibility for determinate boundaries and properties of objects and meanings of embodied concepts within the phenomenon (143).

Measurement resolves indeterminacy. Experimentation creates phenomena. The stabilisation of phenomena that results from measurement is something to bear in mind beyond the boundaries of technoscientific enquiry. This thesis, like any complex form of composition, of weaving, takes connections that might previously have been only traced and turns them into an unstable, rhizomatic, entangled map pointing to other destinations, plotting other possible spaces not in a definitive measure of their extent but in their burgeoning capacity for expansion and growth, a Mobius lasso. As the whorl within a plank of wood that curls upon itself, the closest ideational distances are not always best pursued by following the line from start to finish, by establishing a fixed order:

> Principles of connection and heterogeneity: any point of a rhizome can be connected to anything other, and must be. This is very different from the tree or the root, which plots a point, fixes an order. The linguistic tree on the Chomsky model still begins at a point S and proceeds by dichotomy. On the contrary, not every trait in a rhizome is necessarily linked to a linguistic feature: semiotic chains of every nature are connected to very diverse modes of coding (biological, political, economic, etc.) that bring into play not only different regimes of signs but also states of things of differing status (Deleuze & Guattari 2002: 7).

The text has permeable boundaries of form that bounce the reader-author intertwining back into the tangled weave and out into the entanglements of text and utterance, technologies and

bodies and worlds. Ideas and words, like physical selves, are not fixed in time but ever changing, reformatting, moving from one material to another, transmigrating media and flesh. A document will be preserved in a particular format, but it will not remain stabilised. It is unsteady on its feet, forever buffeted by the changing of its contexts within the heteroglossic nexus. Over time, solid rock becomes sand, becomes a b[r]each to make new footprints upon, washed into other patterns by diffractive waves. Things disintegrate and reform, and no clear boundaries exist no matter how hard one scrapes [sandblasts] away the clutter. Talking of Henri Bergson on the physiology of perception in her essay 'Powers of the Hoard', Jane Bennett writes:

> He modeled perception as an essentially *subtractive* process: most of the swirl of activities around us are screened off or allowed simply to "pass through" our bodies; only a few are isolated for attention and "become 'perceptions' by the very isolation." The principle of selection is pragmatic: we typically discard those vibrant materialities that have "no interest for our needs" and what we do detect "is the measure of our possible action upon bodies." Normal perception is biased towards instrumentality rather than vibrancy, simplification rather than subtle reception (2012: 245-6).

Academic disciplinarity likewise uses a subtractive process in order to cohere to and so reinforce the boundaries of a subject, in an intellectual subject-hood pragmatically selecting materials to construct an instrumental argument by parsing the complexity without recontextualising insights. But past eyes fly the particles [waves] of infinite words/worlds,[44] other lines of thought and knots of argument that bodies let drift. The rhizomatic process is therefore additive, a continual rolling and expanding beyond its own boundaries that mirrors its contrapuntal involution and coiling upon itself. In the same essay collection as the previous quote by Jane Bennett, Julian Yates writes:

> I share in the excitement felt by many in the humanities who explore the interpretive or ethical gains to be had in deploying the figure of an associative or additive model of a network, infrastructure, contexture, ecology, grid, knot, or mesh on offer in other disciplines in order to render the complexity we name "world"… broadening access to

[44] Not to imply that worlds and words are synonymous, or that words and language takes precedence. 'Language,' writes Barad, 'has been granted too much power. The linguistic turn, the semiotic turn, the interpretive turn, the cultural turn: it seems that at every turn lately every "thing" – even materiality – is turned into a matter of language or some other form of cultural expression.' I agree. But semiotic interpretation is an inescapable partner in the whorl of matter and meaning, the hermeneutic overlay of the self-world becoming.

> the privilege accorded to humans by the order of finitude bestowed by language to include non-humans (animals, plants, fungus, stones, stars) (2012: 177).

By reknotting disciplines together, the strands of those worlds that ought not to be separated but celebrated in their intertwining complexities, the joy of the multitude, in the contexture of vibrant matter and bodies and texts, become a more heavily textured world-picture, an Umwelt delineated.

6.3 Interface

Ideology is the coding of the semiotic system which determines the symbolic resonance of objects and ideas in a particularly executed worldview. Ideology delimits the possibilities of the interpretative function in the *Funktionskreis* ('Functional circle', see Uexküll 2010 later), overlaying the more fundamental physico-chemical ground substance that keeps the world-body functional circle revolving round its peculiar axis. It is the skein coiled from cell to cerebrum, from symbol to speech to script. Biopower (Foucault 2008) is exercised upon physiology, the *milieu intérieur*, the body's inner environment, both acting and acted upon in the process of Umwelt creation. Similarly, the senses:

> I understand Foucault's (1978) concept of biopower to refer to the practices of administration, therapeutics, and surveillance of bodies that discursively constitute, increase, and manage the forces of living organisms (Haraway 1997:11).

Control the body, control the world – a lesson learned quickly by the most unimaginative despot. As the *milieu intérieur* creates the body's homeostasis, so ideology creates the semiotic homeostasis of Umwelt that determines [synthetically static] semantic interpretation of the world-as-perceived and its actants. Habitat to habitus. Cellular communication depends on the electromagnetic extracellular matrix. Analogously, *ideology is the invisible interface* at the heart of the hermeneutics of selfhood and worldhood, connecting islands of meaning in an apparent archipelago of difference; apparent only because islands are merely the visible promontories of a singular surface. As ideology screens [enmeshes] being as it is created by the entanglement of its vining multi-cellular-symbolic systems, it too creates the illusion of difference between subjects and objects, between selves and worlds, while fostering the equally powerful feeling of connection between kith; that is, between body, clan and land, the

exuberant promotion of which, as we know, leads along disastrous byways.

Discourses of the body, the female body, the non-white body, the disabled body, have reified ideological abstractions which sheath the natural body in cultural meanings from the outside (Balsamo 1999). These abstractions mask natural bodies, re-placing them in a nexus of discourses intended to control those bodies through technologies. Epistemologies of the flesh are determined by ideologically constructed ontologies of the body. Why does this matter to the interface? Because the body is medium to the world (Merleau-Ponty 1994). Because the body is the interface to the world. And that which interfaces can be controlled through interlinking, of technics with flesh, flesh with language, language with technics:

> One should expect control strategies to concentrate on boundary conditions and interfaces, on rates of flow across boundaries—and not on the integrity of natural objects. "Integrity" or "sincerity" of the Western self gives way to decision procedures and expert systems. For example, control strategies applied to women's capacities to give birth to new human beings will be developed in the languages of population control and maximization of goal achievement for individual decision-makers. Control strategies will be formulated in terms of rates, costs of constraints, degrees of freedom. Human beings, like any other component or subsystem, must be localized in a system architecture whose basic modes of operation are probabilistic, statistical. No objects, spaces, or bodies are sacred in themselves; any component can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language (Haraway 2016a: 31-31).

Language is not only an ideological operator in the exterior world. Language, thought and body are overlaid in a symbol-laden meshwork. Signals are constructed in order to codify and control, to create system architectures. Body and language determine each other, interpolated symbolically through the other via what Kenneth Burke terms 'terministic screens' [de]limiting the scope of interpretation. Discussing the origins of language, he writes:

> The ultimate *origins* of language seem to me as mysterious as the origins of the universe itself. One must view it, I feel, as the "given." But once an animal comes into being that does happen to have this particular attitude, the various tribal idioms are unquestionably *developed* by their use as instruments in the tribe's way of living (the practical role of symbolism in what the anthropologist, Malinowski, has called "context of situation") (1966: 44).

For Burke, language breaks down in the 'scientistic' and the 'dramatistic', though they are not, he says, mutually exclusive. The former is a language of definition and symbolic logic, the latter is hortatory [moralistic], and therefore utilised in the language of stories, of mythology and literature, theology and advertising. Scientific language is that of definition, but definition is a symbolic act itself:

> The dramatistic view of language, in terms of "symbolic action," is exercised about the necessarily *suasive* nature of even the most unemotional scientific nomenclatures. And we shall proceed along those lines; thus:
>
> Even if any given terminology is a *reflection* of reality, by its very nature as a terminology it must be a *selection* of reality; and to this extent it must function also as a *deflection* of reality (45. Original emphasis).

This is a crucial point. The terminologies humans develop and deploy as symbol-using animals do not merely reflect unbiasedly the reality perceived but select what *can and cannot* be perceived.[45] This is a deflection, he seems to be saying, from whatever is the 'out there' of existence beyond the filters of human terministic screens. What Burke is arguing here is in essence the symbolic, i.e. ideological, counterpart of Uexküll's notion of Umwelt [perceptual worlds]. They are, in fact, the same thing, although Burke is talking primarily of human beings as the symbolic animal *ne plus ultra*. Even Uexküll's humble tick[46] atop the branch is using simple terministic screens [concrete rather than abstract linguistic meaning-carriers] to filter those symbolic cues essential for its survival. Where language is involved, of course, the level of complexity and ideological function exists on a vastly different level. But the sense of continuity can clearly be seen. To make his point explicit, Burke (45) talks of looking at different photographs of the same object made with different colour filters that changes not only the colour of the object but highlights different forms and shapes depending on the filter applied. Similar to the visual field where filters may draw attention to one characteristic of an object over another, so terminology acts as a filter over perception to highlight different aspects of the world. It takes little pondering to see how deeply a scientific, legal, political or poetic terminology deeply affects the modes of perception

[45] As discourse defines the contours of the [un]sayable. See footnote 12 above.
[46] See Chapter 2.

regarding, for example, the human body.

> We have now moved things one step further along. Not only does the nature of our terms affect the nature of our observations, in the sense that the terms direct the attention to one field rather than to another. Also, *many of the "observations" are but implications of the particular terminology in terms of which the observations are made.* In brief, much that we take as observations about "reality" may be but the spinning out of possibilities implicit in our particular choice of terms (46).

The idea of terministic screens is a powerful conceptual tool to rethink much of how humans perceive through filters that are not only biological but overlaid with ideological self-selection through choices, conscious and unconscious, of languages and their specific terminologies. A Bakhtinian reading of terministic evolution would argue that the fracturing of languages into separate terminologies is the result of sociohistorical factors, of the function of ideological discourse over time. Such categorisation is created by verbal-ideological evolution resulting from the discourse of specific social groups and their *aktuell* concerns. As Bakhtin notes, '[t]hese forces are *the forces that serve to unify and centralize the verbal-ideological world*' (1981:270. Original emphasis). This homogeneity of language is the expression of language's centripetal forces in opposition to the heteroglossic, reacting in order to maintain the unitary linguistic system. Not the abstract, stable system as conceived by Saussure, but a system expressing and affected at all levels by a particular ideological stance:

> Thus a unitary language gives expression to forces working toward concrete verbal and ideological unification and centralization, which develop in vital connection with the processes of socio-political and cultural centralization (271).

However, since language is stratified in terms of linguistic dialect and socio-ideological usage this resultant unity of terminology is unstable and fluid. Alongside the centripetal forces of centralization and unification, the centrifugal forces of decentralization and dis-unification coexist. The meeting point of these opposing forces is the utterance and the environment, the linguistic plenum, where it exists is *dialogised* heteroglossia

Dialogism, another of Bakhtin's terms, is the process of negotiation between the possibilities

that the heteroglossic nexus contains – the relationship between the actual concrete manifestation of the utterance and the flux of potentialities within which the utterance operates. But as R.B. Kershner points out, the concept may be viewed in terms of knowledge and being also:

> The condition of our existence is…heteroglossia, a conflicting multiplicity of languages; dialogism is the necessary mode of knowledge in such a world, a form of relationship between or among different languages that, like dialectics, defines a sort of logic (1992:16).

There is in this assertion a connection between ontological status as human subjects and the epistemological foundations which shape fundamental human grasping of the world. Kershner goes on to say that 'because for Bakhtin consciousness is always language, and thus unavoidably ideological, the linked processes of perception and interaction with the world are always dialogical' (16).

Terminology, then, is a function of specific social groups and their concrete, working concerns, their everyday uses of language whether personal, political or professional. But epistemological deployment of terminologies has exacting ontological ramifications. Meaning determines being, and vice versa.

> I hope…to suggest how fantastically much of our "Reality" could not exist for us, were it not for our profound and inveterate involvement in symbol systems. Our presence in a room is immediate, but the room's relation to our country as a nation, and beyond that, to international relations and cosmic relations, dissolves into a web of ideas and images that reach through our senses insofar as the symbol systems that report on them are heard or seen. To mistake this vast tangle of ideas for immediate experience is much more fallacious that to accept a dream as immediate experience. For a dream really is an immediate experience, but the information that we receive about today's events throughout the world most decidedly is *not* (Burke, 1966: 48).

As bodies and terministic languages, so any functional symbol systems humans use or employ are ideologically saturated interfaces operating between brain-body-world, which brings the discussion back to digital computing and its respective sensual-semiotic interfaces.

In *Reading Writing Interfaces*, media archaeologist Lori Emerson (2014) argues that,

although ‘interface’ is a cross-disciplinary term, regarding computing it is generally conceived of as point of interaction between any combination of software and hardware components, expanded by Florian Cramer to include eight different kinds of interface including human-to-hardware (mice, screens and keyboard, for example) and human-to-software (such as the graphical user interface (GUI)). Emerson’s definition, she states, is broader:

> I settle on an even more expansive definition so that interface is a technology – whether it is a fascicle, a typewriter, a command line, or a GUI – that mediates between reader and the surface-level, human-authored writing, as well as, in the case of digital devices, the machine-based writing taking place beneath the gloss of the surface. The interface is, then, a threshold, but in a more complex sense than simply than which opens up from one distinct space to another space…while interface does grant access, it also inevitably acts as a kind of magician’s cape, continually revealing (mediatic layers, bit of information, etc.) through concealing and concealing as it reveals (2014: x).

The computing industry uses sleight of hand to promote so-called ‘interface-free’ devices in order to convince users that ‘the boundary between human and information is eradicated (ibid: x-xi). What this amounts to is an ideologically driven distortion that promotes the idea of the ‘user-friendly’ device while actually restricting all access to its inner workings, alienating the user in terms of understanding and tinkering. Promoting the idea of the ‘invisible’ interface is a Trojan gift which allows manufacturers to close down their devices in order to turn us into passive consumers:

> [W]hen transparency not only transforms into that which is valued above all else but also becomes an overriding, unquestioned necessity, it turns all computing devices into appliances for the consumption of content instead of multifunctional, generative devices for reading as well as writing or producing content…These closed computing interfaces that are well on their way towards invisibility are both operable and inoperable, the one at the cost of the other (ibid: xi-xii).

Emerson argues that the outlines of our computing devices are ill-defined or partly invisible precisely due to the nature of our enmeshment in media and because ideology by definition is that which we do not see. The screen of the computer or pad recedes from our view when seeking to examine it critically. I would further argue that it is both screen-physical and screen-as-terministic-screen; it oscillates ontoepistemologically depending on the subject of

our critical focus, at any one moment a physico-informational gateway, a symbol-bearing proxy for the interface between body and hypertext, a two-way, looping transfigurative virtual window from machine code to optic nerve to finger, and an ideological gatekeeper that prevents its own breaching whilst hindering our ability to speak fluently and at full liberty, or to analyse the modes of constriction. These technologies strive to become invisible, to efface themselves from view in order to evade critical engagement. Emerson writes:

> Without attention, however, to the ways in which interfaces are anything but invisible in how they frame what can and cannot be said, the contemporary computing industry will only continue unchecked in its accelerating drive to achieve the perfect black box not only through the latest ubicomp devices but also through parallel developments such as so-called Natural User Interfaces, Organic User Interfaces, and even the now widely prevalent multitouch interfaces. All of these interfaces share a common goal underlying their designs: to efface the interface altogether and so also to efface our ability to read, let alone write, the interface, definitively turning us into consumers rather than producers of content (xvii).

But actually there is one type of content production that is very much encouraged through the uses of these devices. The promotion, and consumption, of [virtualised/commodified] selves through social media, what Paul Virilio (2005:17) calls 'pure communication' or the advertisement of self, consumers and actors in a virtualised reality.

In the late 90's Virilio argued that an active 'screen' optics had replaced a passive geometric optics (i.e. the Galileon telescope) resulting in the loss of the 'horizon line of geographic perspective' (2005: 14) and established a substitute 'artificial horizon' that placed the media perspective above the spatial perspective. This computer-mediated visualisation results in the virtualisation of our reality:

> The much-vaunted 'virtual reality' is not so much a navigation through the **cyberspace** of the networks. It is, first and foremost, the **amplification of the optical density** of the appearances of the real world (14. Original emphasis).

Note that Virilio says not the amplification of the optical density of the world, but of the *appearances* of the real world. Primary reality from this point, he argues, is split between '*the actual reality* of immediate appearances and, on the other, of the *virtual reality* of media trans-appearances' (15. Original emphasis). Such a split, if agreeing with Virilio, cannot but

have serious ontoepistemological ramifications for a sense of coherent being and *being-in-the-world*, a bifurcation of the sensible and the virtual[47] spectacle:

> The aim is to make the computer screen the ultimate window, but a window which would not so much allow you to receive data as to view the horizon of globalization, the space of its accelerated globalization…
> …
> Here the computer is no longer simply a device for consulting information sources, but an automatic *vision machine*, operating within the space of an entirely virtualized geographical reality (16).

For André Nusselder, this supposed split is part of a fantasy projection in which humans seek to surpass the limits of reality through computer technologies, to explore new spaces when feeling so entrapped by the closure of the real that otherwise hems them in[48]:

> They offer to relieve us of the burdens of reality. From a Freudian perspective, this wish-fulfilling aspect of technology functions as the realized fantasies of a hallucination. What we cannot have in reality, we can have via the fantasy screen (of the computer). As a "consensual hallucination," cyberspace would be the utopic, new ideal world (2009: 11).

The interface, in this case then, is used a portal to a virtualised self and space free from the constraints of very real, very entangled selves and of real spaces, of specificity and embodiment. It is an oneiric urge towards seamlessness, towards connection with others through technology. But as escape is merely wish fulfilment, perhaps, too, is the illusion of connection. It is the design of the interface, hardware and software, that is the manifestation of this desire. The interface design is itself an physico-symbolic embodiment of desire. Following Derrick de Kerckhove, Nusselder writes that technology is:

> [A]n extension of our mental and bodily functions…an externalization of our inner selves. Design gives a form to these technological extensions of ourselves, and is therefore at the interface of the body and the mind, the material and the cultural, our "inside" and "outside" (15).

[47] Interestingly, Haraway (1997) argues: 'One must understand that the reality effect of "virtual reality" is no less and no more "real" than that made available – and enforced – by the material, literary and social conventions of the first scientific revolutions and renaissances that make up the stories about European-derived apparatuses for the production of matters of fact and states of self-evidence' (270).

[48] Literature of course, in this sense, would be a much older 'virtual reality' technology.

Virtual reality, he writes, is the closest approximation to this desire made manifest through immersive technologies, of this projection out of the body and into another space, another, purer, place of being. But how digital information achieves its manifestation is through the actualisation of metaphor through design. Metaphors:

> [A]re therefore crucial for the understanding of virtual reality, for virtual environments can be considered objectified metaphors delivered as sensory patterns (Biocca 1997, §1.2). According to Sandy Stone, cyberspace is nothing but a space in which everything, including bodies, exists as something close to a metaphor (16).

Marshall McLuhan sees metaphor, Nusselder states, as the first technology for human engagement with the environment from new perspectives. Media translates experience using the power of metaphor to actively [re]shape perception. For Nusselder, interface metaphors, such as the virtual desktop, translate digital objects that have no phenomenal existence in themselves but are purely noumenal representations, objects of representation translated by the interface into something meaningful to the user. Since digital information does not of itself possess a true or exact form, a form to which it must adhere, then necessarily it is not an objective transformation but open to manipulation, distortion. The digital rejects Platonic essentialism. It is free to metamorphose through metaphor. 'Cyberspace' is not an objective reality filled with objective information but an imaginative space which uses metaphors to communicate and to exchange information. Metaphors necessarily involve processes of bias, distortion and misrepresentation in creating new domains, which from a Lacanian perspective is explained by incorporating distortion as a fundamental part of our reality. Following Freud, metaphorical structures distort through the unconscious processes of condensation of associative chains that are therefore overdetermined i.e., they no longer have a single referent, are dense with meaning and unconscious association at the threshold of conscious thought. For Lacan, this condensation is a metaphorical process that gives rise to that which does not actually exist but is a substitution that enacts an impossible reality. Computer-generated worlds, then, are impossibly real representations, of a virtual, photorealistic presence of impossible phenomena. The description of actuality, of a truth of being, is an impossibility under the constraints of a necessarily metaphorical language that flees exactitude:

> All of our reality can therefore be said to be metaphorical. We never see "reality as it

> really is," but always via (conceptual) frameworks. The displays of the computerized world that surround us are new frameworks, in which we design our reality via the metaphorization of data. This metaphorization proceeds along the two basic principles that characterize most computer applications: *selection* and *compositing* (17).

Ideology works on this level of selection and composition in the Umwelt-dynamic of organism as it intra-actively interfaces with the 'out there' of physical existence. Sensual apparatuses work at the level of metaphor to render the world into understandable phenomena, perceptually constrained by phylogenetic boundaries. The body creates itself as a metaphor in its very becoming-into-the-world. The symbolic overlay or terministic screen that sheathes the world-body apparatus both in its becoming and its iterative sense-making of that process is an unconscious substitution of an impossible reality condensed into meaningful patterns of difference.

From terministic to computer screens, the overlay of ideological functions both of the organism and technology can now be better seen. Perception and technology function as mutual interfaces at the subliminal level. Through the mode of metaphor technology and body enmesh, condensed sensual-semiotic parameters in the Umwelt-driven grasping of world through powers of reception and enaction. Of seeing the world and acting upon it. Unlike Nusselder, however, I argue that digital information [content and architecture] exists not in a separate noumenal realm, but is inherently and ideologically entangled with the phenomenal, and although its binary transmogrification may have philosophical ramifications that need intense exploration, this does not except the digital from material-discursive practices or analysis.

There is also another sense of interface that must be further explored in this thesis, the idea of the body interfacing with the world. The body exists as a code-duality of analogue organism in an environment which relies on the digital code of DNA for transmission of the series of which it forms one member (Hoffmeyer 1998). There is another duality inscribed in the morphology of living systems, which is the duality of interior and exterior, the surface or boundary between the inner and outer acting as an interface between these dual aspects:

> Life is built on a fundamental asymmetry, but this is not an asymmetry between organism and environment. Instead it is an asymmetry produced by any closed membrane (e.g. the skin) which separates the world into two equally excluded parts: an internal part and an external part. The membranes of living systems - at whatever level, i.e. whether they encircle sub-cellular organelles, cells, tissues, organs, or organisms -

> are in fact best described as interfaces facilitating a highly regulated exchange of signs between interiors and exteriors. Life should fundamentally be seen as organized around the nested set of membranes or interfaces which we call organisms (Hoffmeyer 1998:4-5).

Jean-Luc Nancy (2016) writes that the body is nothing but outside, an outside involuted and folded. There is no Cartesian ghost in the machine and no disembodied I which feels or feels itself feeling. There is only a 'network of sentient receivers and transmitters':

> Being outside myself as this inside, prohibiting penetration (except by disemboweling or suffocating me), the outside is indefinitely wrapped, absorbed, sunk in its own magma, both fitting it so well and absolutely foreign to that which this magma fills, to that which it sustains and animates, to all this skin exposed with its orifices, mucosa, pores, and hair, all its contacts and communication, all the vibrations of the world, of matter and images, of timbers and resonances, all these gases and squirts, these air currents, these mirrors, these pieces of metal, these other skins, these words, these impressions, depressions, and expressions (2016:no pagination).

The body is not only an outside either but an 'outside-within.' From the outside into the body's interior folds, impressions travel, as does food, knowledge, air, for this is where, in the intestines and stomach and lungs, it feels itself feeling. In the nerves, the palpitations of the heart, in the muscles, the lymph nodes. But in using these words, he says he goes too far, for they belong to the classifications of medicine, anatomy, physiology, which signify not the body but something different, something functional, instrumental, turning the body into an apparatus that can be measure, represented, projected onto a screen. A terministic screen. This is not the body, what lies beneath with its tastes, moods, tenderness, boredom and desire. The skin, 'a thin contact sheet, almost nothing' is that which allows us to separate inner from outer, to maintain this sense of duality that everywhere is porous, for the skin imprints the outside world on to the inner world at all moments:

> That which comes out and that which enters, shit or thought, speech or saliva, excitation, excoriation: everything goes in pairs and keeps the one outside the other in a constant rustling and movement of the same ensemble in itself, completely outside of me. As for me, I remain an intimate null point of spirit nowhere to be found in this entanglement smeared with pulp, tissues, and fluids that, in their entirety, give place to the soul, which ought to be conceived as extended along the vessels and the teguments, knotted into the lymph nodes, and bathed in plasma (ibid).

The skin is a part of the body's entanglement, the interface of its duality through which sensations and nutrients and the fuel of life travel in and out, backwards and forwards. Communications between world and self are continually travelling in both directions, in the functional circle that includes information but also includes world and everything in it. The skin is the body's evolutionary technology of touch and sense, the way the body flows into and out of the world, and the world flows into and out of the body. It contains its own thresholds, and these thresholds are also used to identify the body, to label it, to place ideological markers upon it. Bodies are judged by their skin. Their thresholds hold values which are intently and intensely political. Ahmed and Stacey write:

> [W]e call for a skin-tight politics, a politics that takes as its orientation not the body as such, but the fleshy interface between bodies and worlds. 'Thinking through the skin' is a thinking that reflects, not on the body as the lost object of thought, but on inter-embodiment, on the mode of being-with and being-for, where one touches and is touched by others (Ahmed & Stacey 2004).

The skin is interface between inside and outside but it is more than a site of perception and protection, it is a site of inscription in which the sociopolitical is contested, terrain fought over. Skin makes the difference in life and death, marks one as victim or aggressor. It is a screen upon which desires and hatreds are projected. It is also a marker of inner worlds, when the body blushes from anger, embarrassment, when it is flushed with want or exertion. Interface in the face. Touching, touched. Inside and outside are entwined and folded. It is a point between life and decay, the dead cells drifting into the atmosphere, settling on windowsills. The skin is inescapable, no matter the dreams of disembodiment through cyberspatial ejection from the heavy body, escape velocity to nowhere. Dreams are made of these vectors of pure light and information, but to take such dreams for reality would be to configure an information without heft, without sense in all senses. To conceive a life without the body would literally be nonsense. Without the weight of the world which is its cellular self it would lose its anchor. It is through the interface of the skin and of the body more generally that humans have a world at all. The body is the medium to the world and to all other media. To be without a medium would be to lose the message that is the difference-generation of consciousness encoded in the matrix of flesh.

6.4 Diffraction

In order to disassemble the logos of the Western (Judeo-Christian) technoscientific *Weltanschauung*, which privileges a methodological strategy of 'modesty' and 'self-invisibility' in order to establish an unchallenged ontoepistemological, i.e. white masculine, orthodoxy, Donna Haraway (1997) repurposes the trope of the scientific 'modest witness' used by Steven Shapin and Simon Schaffer in their book *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (1985). She writes:

> This is the culture within which contingent facts – the real case about the world – can be established with all the authority, but none of the considerable problems, of transcendental truth. This self-invisibility is the specifically modern, European, masculine, scientific form of the virtue of modesty. This is the form of modesty that pays off its practitioners in the coin of epistemological and social power (1997:23-24).

As she goes on to remark, it is this power that guarantees the authority of the modest, i.e. scientific, witness without personal opinion or particular embodiment to muddy the observational waters. Only the modern, masculine, European gaze can possess the ontoepistemological security to efface itself from the narrative in order to erase the power structures that deem it the proper authority to act as 'mirrors' of 'reality'. No other social categorisation would have the temerity to ignore the situated exactitude of its embodiment and its perception.

It is this, she argues, that endows him with the 'remarkable power to establish the facts':

> He bears witness: he is objective; he guarantees the clarity and purity of objects. His subjectivity is his objectivity. His narratives have a magical power – they lose all trace of their history as stories, as products of partisan projects, as contestable representations, or as constructed documents in their potent capacity to define the facts (24).

The power to view the world from an ostensibly objective position, the scope of his purview that effaces his subjectivity in order to adopt this unadulterated perception of the world of objects before him, and to make judgement on their ontological *nature* and *order*, is what Haraway calls the materialised practice of experimental philosophy, or 'science', that became

standardised and widespread in the seventeenth century. A 'culture of no culture' (25) which bifurcated the two cultures of science and the humanities, cleaved the 'rational' masculine mind from the 'irrational' female body, a schismatic rupture of mentality from corporeality that still oppresses our senses of the self as a unitary body-world today. Bodily modesty became, therefore, the female virtue, and mental modesty that of the male:

> In this regard, historians emphasize the critical role of the defeat of the hermeneutic tradition in the establishment of scientific mechanistic orthodoxy and the correlated devaluation of much that was gendered feminine…in science. The virulence of the witch hunts in Europe…and the involvement of men who saw themselves as rationalist founders of the new philosophy, testifies to the crisis in gender in that molten period (27).

Feminist critiques of the scientific method are important because they get to the heart of the ruling, unspoken assumptions that guide that methodology as an ontoepistemologically unbiased 'reflection' or 'measurement' of the world 'out there' as it is or, rather, as it is assumed to be; a world known without reference to the body of the knower and its situatedness; a worldview, known as 'realism', that simply cannot, truthfully, exist. As Karen Barad argues from her background in quantum physics, measurement is not something that is external to us just as we are part of the nature we wish to understand and measure (2007:67). Measurement is the meeting point of the natural and the social, 'a potent moment in the construction of scientific knowledge – it is an instance where matter and meaning meet in a very literal sense' (67).

To escape the back and forth between the critiques of realism and relativism, Haraway repurposes prevalent philosophical and scientific optical metaphors and proposes a new category of semantics she calls *diffraction*, referring to the refraction phenomenon of wave patterns. Reflexivity, she argues, merely displaces the false choice between these binaries onto worries concerning the authentic and the really real, the copy and original (16):

> Reflexivity is a bad trope for escaping the false choice between realism and relativism in thinking about strong objectivity and situated knowledges in technoscientific knowledge. What we need is to make a difference in material-semiotic apparatuses, to diffract the rays of technoscience so that we get more promising interference patterns on the recording films of our lives and bodies. Diffraction is an optical metaphor for the effort to make a difference in the world (16).

Unlike reflection, diffraction patterns concern difference, interaction, interference and reinforcement, a 'metaphor for another kind of critical consciousness' (274).

For Karen Barad, diffraction is more than a metaphorical mode of pattern interference. As Bateson (2000) defines information as difference which makes a difference, Barad (1997: 76), echoing this conception, views diffraction as *patterns* of difference that make a difference, and so acting upon the fundamental constituents of the world:

> So while it is true that diffraction apparatuses measure the effects of difference, even more profoundly they highlight, exhibit, and make evident the entangled structures of the changing and contingent ontology of the world, including the ontology of knowing. In fact, diffraction not only brings the reality of entanglements to light, it is itself an entangled phenomenon (1997:73).

Barad (140) argues that reality is not made up of things-in-themselves or things-behind-phenomena. Reality is enacted as a dynamic materialisation of phenomena in their intra-activity – it is this relation of being, this engagement and entanglement, that gives rise to phenomenal existence. Bodies, objects with determinate boundaries [relata], do not pre-exist relation, do not exist in separation, but become bounded through this intra-active engagement. Agency is not something bounded by discrete forms actuated from within, agency is a flow through mattered bodies structuring reality through their becoming in spacetime. Spacetime emerges from this dynamic flow of agency as it materialises topologically through agential possibilities:

> [T]he primary ontological units are not "things" but phenomena – dynamic topological reconfigurings/entanglements/relationalities/(re)articulations of the world. And the primary semantic units are not "words" but material-discursive practices through which (ontic and semantic) boundaries are constituted. This dynamism is agency. Agency is not an attribute but the ongoing reconfigurations of the world. The universe is agential intra-activity in its becoming (141).

For Barad, the diffractive methodology she adopts from Haraway and further extends is used to examine the 'dynamic relationality' of material-discursive, boundary-making practices that produce 'subjects' and 'objects' within disciplines but from a rigorous transdisciplinary perspective. In using this diffractive methodology across discipline boundaries, she argues, it

is important to remain attentive to the finer details of different disciplinary practices (93) without prioritising one field over another. Rather, her diffractive methodology rethinks the relations between fields (science and the social) not in terms of their exteriority but through highlighting diffractive patterns of relationality as an 'exteriority within':

> As such, the diffractive methodology that I propose stands in stark contrast to some of the more usual modes of scholarly engagement that aim to "bridge" the humanities and natural sciences. Importantly, a diffractive approach has no patience for…common modes of analysis [which] are only of limited value, and insufficient for understanding the deeper philosophical issues at stake (93-4).

And the philosophical issues at stake are fundamental, especially for our modest witness. Since phenomena are specific ontological entanglements, and measurement is the marking of one part of a phenomenon by another, there is nothing inherently human-centred about these material configurations of the world, they are not human-produced phenomena but constitutive of reality itself. This leads to a radical conclusion:

> There are no pre-existing, separately determinate entities called "humans" that are either detached spectators or necessary components of all intra-actions. Rather, to the extent that "humans" emerge as having a role to play in the constitution of specific phenomena, they do so as part of the larger material configuration, or rather the ongoing reconfiguring, of the world. Thus no a priori privileged status is given to the human – and this is precisely the point. "Humans" are emergent phenomena like all other physical systems (338).

The human is not a special category that exists outside of nature, exterior to phenomena under investigation, but constituted as a boundary within phenomenal intra-action. Existing as an ineluctable part of material entanglements, to be human is likewise to partake in the ethical entanglements of matter. For Barad, diffraction is an ethical matter[ing], or as she calls it an 'ethico-onto-epistemological matter':

> Diffraction is a material-discursive phenomenon that challenges the presumed inherent separability of subject and object, nature and culture, fact and value, human and nonhuman, organic and inorganic, epistemology and ontology, materiality and discursivity…*Diffraction is…about the entangled nature of differences that matter.* This is the deep significance of the diffraction pattern. *Diffraction is a material practice for making a difference, for topologically reconfiguring connections* (381).

Diffractive analysis, then, allows a reconfiguration in the splits in matter and meaning, subjects and objects, that were prised apart under the ideological guide of the modest witness, to recognise not only the non-human animal in an ethical account of the universe but all other intra-active agencies. A posthumanist ethics embraces the full entanglements of matter with the 'other', because everything is other, differences which make a difference, which are of value, a kinship beyond the artificial bounds of a humanist ethics that is a vehicle for exclusion. It allows a radical exteriority beyond the illusion of the discrete and cohesive 'I', the 'I' blind to the breaching of its banks every moment of its knotted existence. Allows one to remain alive to endless possibilities. For Haraway, that means a reconfiguration and expansion of the idea of the modest witness, of who has the authority to bear witness:

> Valid witness depends not only on modesty but on nurturing and acknowledging alliances with a lively array of others, who are like and unlike, human and not, inside and outside what have been the defined boundaries of hegemonic selves and powerful places. I am thinking, centrally, of selves such as scientists and and places such as laboratories…it is past time to queer them permanently, to revise them generically, to color them back into visibility. The empty spaces of both the "culture of no culture" of self-invisible technoscientists and the "nature of no nature" of the chimerical entities emerging from the world-constructed-as-laboratory must be remapped and reinhabited by new practices of witnessing (Haraway 1997: 269).

For Barad this means taking responsibility for the becoming of the universe, to 'meet it halfway' (1997: 396). As noted above, measurement makes a cut that resolves ontic-semantic indeterminacy, but this is not to congeal difference into sameness. For Merleau-Ponty (1968) the visible is 'cut out in the tangible' (134) and vice versa, the visible and tangible encroach upon each other, infringe on one another. As the same body sees and touches the world the worlds of the visible and tangible overlap, are 'encrusted' on one another. Every movement of the body moves the scope of vision, and every vision takes place in the tactile space:

> There is double and crossed situating of the visible in the tangible and of the tangible in the visible; the two maps are complete, and yet they do not merge into one. The two parts are total parts and yet are not superposable (143).

In plotting interconnectedness, maps are created that are total parts and yet are not superposable in the sense of sameness, but alive in their difference and in our awareness of,

in our attention to that difference. What impact does this have on our knowledge of mediatic phenomena, of the body's movements in digital spaces? How are digital media and bodies entangled? Digital information is cut out from its physical substrate, and is encrusted with the physical from which it takes its form and its foundations. Digital information is always tangible through the interfaces that allow its manipulation and the platforms that provide its manifest potential. To move in digital space is to first move in a physical space. They are to one another action and reaction. Warp and weft. The physical and the digital are two hands touching. Two planes plotted on the same axis. As consciousness arises from physical phenomena, so digital information arises from physical architecture, and cannot exist without it. The digital relies on the physical for its Umwelt-creativity, for its embodiment in the world and its becoming-into-the-world. Without physical enmeshment, there would be only void.

6.5 Conclusion

These four methodological themes of *diffraction*, *entanglement*, *rhizome and interface* allow the exploration of issues relating to the intertwining of information, bodies, environments, interfaces and technologies, and will gain a personal valence to amplify their effects in the chapter covering first-person research at CU Boulder's Medial Archaeology Lab. Like both the human body and media technologies, these concepts are both metaphor and physical actuality in one, patterns of interference and coherence to both amplify and disrupt interlinked ideas, the waveforms of critical consciousness rewoven into differing forms.

If informational devices are windows into other worlds, they are inherently framed, and focused on aspects of the world from a particular viewpoint. The windows of modern digital information technologies are purposely locked and their platforms walled gardens which control the flows of information pouring in and out, of what ideas may be planted and tended, of which actions permitted or denied. As the foliage of flowers is subtended by the bracts beneath them, so human flourishing is subtended by the technologies and symbolic structures supporting it, shaping it, and holding its forms up to a particular light. But the light is not the light of the sun, it is the glare of the screen, and unfurling towards it makes those worlds vulnerable to control. Digital information has less 'ontological friction' (Floridi 2013) than previous forms of information carried by analogue technologies, and by human selves as bodies of information before that. The cost of moving information in terms of energy and economics is much reduced. Information flows like never before, and yet at the same time it

is regulated and reduced to channels controlled by vested interests. Digital interfaces penetrate the barriers of selfhood more easily. The ontological reduction in friction causes a like-mannered reduction in epistemological resistance. Information overpowers minds with meanings that have agendas. It directs Umwelten through digital pathways which are predetermined for by the parameters of the integrated interface. At the same time, as the massive dataverse generates its own gravity, by being exposed to so much information humans grasp for familiar certainties to anchor their selves within the stream of so much difference. Information is difference which makes a difference, but the difference can be negative in its effects, causing a retreat, a regression. The power of Facebook is that it gathers familiarity and similitude together, reminds the user of a past and present which holds no danger or personal development but is a proxy for the shrinking down from fearless adulthood to fearful infantilism. It is the power of the known, of the *heimlich*. Nostalgia resides not only in *nostos*, the return home from the unfamiliar, but *algos*, the painful longing for that which has past. Within this bifurcation social media wages war at the level of the individual and her psychological defences, the pernicious effects of which, since humans are social animals and this is social media, pervade the social arena, with echo chambers and filter bubbles (Pariser 2012) rotting the edifices of democratic norms (El-Bermawy 2016).

I hope to use these critical lenses to frame our upcoming discussion of first-person research at the Media Archaeology Lab, to help us think through issues of technological being-in-the-world not from overly formalised perspectives, but in ways which matter ethologically, which can bolster awareness and so can be used to buttress psychological defences against the onslaught of information that is the modern world, that form the modern Umwelt.

PART 5:
Applied Ethology

CHAPTER 7

Media Phenomenology and Technical Ethology in Practice

In the digital age, materiality can be reactivated, because it was always a virtual condition (Bruno 2014).

We cannot fully reckon with the gravity of surveillance capitalism and its consequences unless we can trace the scars they carve into the flesh of our daily lives (Zuboff 2019).

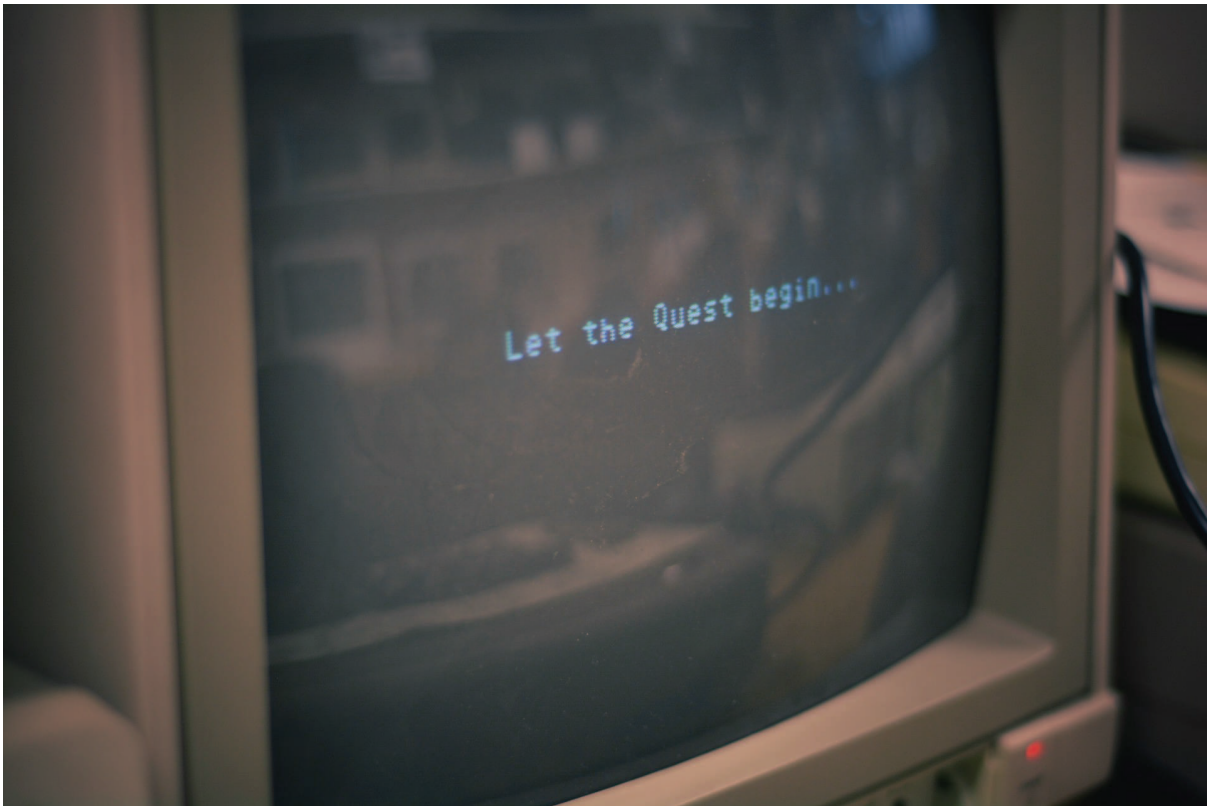

Figure 7

7.1 Introduction

This chapter presents excerpts of my first-person research at the Media Archaeology Lab, framed within in a reflection of the experiences and a discussion of media phenomenology and ethological theory, a joining of my physicotechnical experiences and the application of an ethology of media to a perceptual, sensual analysis. The intention to study historical computing technologies, or *encounters* with those technologies, at the Media Archeology Lab

was to allow me to think through ethological concepts and how my Umwelt is formed, shaped and moulded through computing technologies from a practical, phenomenological standpoint, to interrogate my perceptions as they encounter unusual technological interfaces – unusual to myself of course, not necessarily in themselves, although a case could be made that all technologies are unusual in their specificity of use in time and space by a singular body, something I will return to. As the quote above from Shoshana Zuboff indicates, it is through the personal, through our storytelling from the first-person perspective, that we can resist the modus operandi of digital devices which seeks to capture, monitor and control our behaviours for profit, that scars us in its reduction of the human to networks of influence and capital. Resistance on the individual level means trying, somehow, to grasp and share the ineffable in life, that which is idiosyncratic but also, hopefully, portends to species commonalities without assuming a transcendental universal subject. As empathic beings we can share stories that are relatable on the level of feeling, emotion, of sensation. As living beings humans are entangled in the stories of life and being of all existents. An ethological analysis works on the species level but can be demonstrated on the level of a particular individual. In this way, no claim to universality of experience is claimed but to show by example of a particular instantiation of the triadic relations between a body, environments, and technologies.

I also wanted to explore my phenomenological encounters through the integration of photography and framing through secondary technology, and to recreate if possible some of my sensual experiences through the camera, pairing a vintage manual Nikon lens from the same era as much of the MAL's equipment with a digital camera body. Like most digital technology, the digital camera wants to automate most functions for you, but with a manual lens you are forced to manipulate it with your fingers, to literally focus the lens along with your mind and body, to manually set levels, to move your body back and forth without the ability to zoom in order to frame the world. Your eye is set slightly out of your body, your sight partially displaced into your hands. The tactile and the visual become intertwined through the technical nexus of camera, lens and body.

Figure 8

One of the most important research areas that I identified in my research and that I wished to explore further was the actual relationship of software and hardware to users from a practical, body-based perspective: i.e. how do users perceive computing technologies and software interfaces through their senses, especially regarding the multimodality involved in traversing digital spaces via physical technologies? How do subjects integrate them into their body schemas and so into their Umwelten? In doing so, an ethological analysis of technological engagement can be sketched and the importance of Uexküllian notions of environmental world-building shown. The first-person perspective regarding body-technology interactions is vital to this research in terms both of explaining and also defamiliarising everyday experiences with media technologies, a practical approach whose benefits are neatly summed up in this paragraph by Varela and Shear:

> [S]ubjective experience refers to the level of the user of one's own cognitions, of intentions and doings, in everyday practices. I know that my movements are the products of coordinated series of muscle contractions. However, the activity of moving my hand operates on the emergent scale of motor plans that appear to me as motor intentions as an active agent-user, not the muscle tones that can only be seen

> from a third-person position. This practical dimension is what makes interaction with third-person accounts possible in the first place (and not an abstract armchair description so familiar in philosophy of mind) (Varela & Shear, 1999:4).

This section will seek to flesh out the ethological ideas discussed so far by delineating a subjective account of the physical manifestation and personal manipulation of technologies at the Media Archaeology Lab. This approach involves synthesising my deskbound research with practical approaches and using physical technologies to think through theoretical problems – precisely what the lab was created for. The Media Archaeology Lab is unique in that it works, as director Lori Emerson notes in her book *Reading Writing Interfaces* as 'a kind of thinking device that…makes it possible to defamiliarize or make visible for critique contemporary *invisible* interfaces and platforms' (2014: xvi).

Following Emerson, I examine the human-interface matrix from a sensuo-ideological perspective, critiquing the ways in which physical interactions mask and obfuscate ideological operators engendered by technological manifestations. The time spent research at the lab enabled me to additionally think through these ideas from a practical and personal standpoint, using past technologies to defamiliarise my own body-media interactions, allowing the strangeness of the physical-digital encounters that occur to come to the fore. This has allowed me to examine my phenomenological commitments to current technologies.

The MAL stores a number of differing computing technologies, some of them familiar and some not. The machines familiar from my childhood or adolescence, an Amiga 500 for example, invoke a completely different set of feelings and interactions from those that are unfamiliar. Intensity of reaction is gauged in autonomic response (Massumi 1995), an embodiment of prefeeling-as-intensity played out through expectation and response:

> Intensity is qualifiable as an emotional state, and that state is static-temporal and narrative noise. It is a state of suspense, potentially of disruption. It's like a temporal sink, a hole in time, as we conceive of it and narrativize it. It is not exactly passivity, because it is filled with motion, vibratory motion, resonation. And it is not yet activity, because the motion is not of the kind that can be directed (if only symbolically) toward practical ends in a world of constituted objects and aims (if only on screen) (86).

In this immersion [plunge] into the Media Archaeology Lab, then, I wished to explore questions such as: How are technologies integrated into my body plan, into my sensorial experience of the world? How do unfamiliar technologies bring such world modelling via screens, instruments, hardware, peripherals and interfaces to the fore? Do unfamiliar technologies help to examine, for example, the braiding of touch and sight and other modalities of experience? What is the importance of tactile media studies to the development of a phenomeno-ethological approach to media and information? I also wanted to ask broader questions, such as: How does memory and sensual body-memory play into this process of worldbuilding? Our Umwelten are built on memory, which is the foundation of identity when navigating the present. In recognising this, I also wanted to talk about how memory, our senses, the body and its sense of being-in-the-world, and the environment are all interfused along physical vectors affected by technology use. The boxed sections below were written during my research, and have been lightly edited so as to retain the flowing nature of their composition.

7.1 Encounters

Logging on to the Apple IIe and loading bpNichol's 'First Screening' I experience this sense of anticipation and strangeness. First I must navigate a technology at once both familiar and unfamiliar. There is a screen, keyboard and disc drive, nothing unusual in itself, but where do I switch it on? How do I load the disc? How will I operate the system? I fumble with the hardware, fingers unsure. Likewise, with the software. Run commands, while partially familiar, are rarely used and certainly not as the main command interface between my body and the machine. I use them usually only when confronted with a rare diagnostic problem. Text input seems cumbersome but also surprisingly direct, as if a mediating layer between myself and the program has been removed, like the peeling of an apple skin. At the same time, the materiality of the interface is more apparent, as is the materiality of my body in its hesitancy, its lack of surety, stepping away from the confidence of the repetitive gestures – swipes, taps and pinches – that govern the use of my phone, for example. My fingers reach out tentatively, recoil, unsure. Common gestures feel unnatural because of the overwhelming presence of the body-machine connection. This is before the poems have even begun to display and the presence of another mind [artistic affect; telepresence; Barthes' death of the programmer?] or of other possible meanings make themselves known.

Figure 9

On my first visit to the MAL I was initially overwhelmed by the physicality of the media. On reflection, this pertains in part to the massive aggregation of unfamiliar technologies. This is not a singular encounter of one new machine, but a profusion in a few basement rooms of historical computing technologies, hardware, software, peripherals, screens, discs, boxes, and most of all plastics and metals. Our Umwelten work on familiarity. Humans create heuristics of their environments to apprehend them more speedily. Engagements with technology are likewise subsumed into the familiar of a known sensual world. Since I can remember I have always had what you might call an abundance of sense, a heightened sensitivity to textures, sounds, lights, noises that were often too much to cope with. Crowds frightened me. Certain textures repulsed me. It was if the normal membrane that provides the usual insulation from the outside world was too thin or missing, that the buffer that creates this sense of separation of body, brain and world, of the sense of an inside and outside, was too porous. Data would stream in, overload a flesh and neuronal system with a too-high input setting. Processing the data, turning into rational, ordered information was difficult, at least in the moment of its reception. *Percepts-as-feelings* rather than thoughts would flood into the spaces of my body.

The texture of a certain pillow might make my teeth ache as I lay there groaning against a perceived wrongness in the heft of it. Leaning against a wall might disrupt my inner sense of equilibrium and leave me unable to move. I would struggle to maintain balance on a shiny surface, finding it too dazzling to hold back a rushing vertigo. A standing-room-only train full of drunk football hooligans on a shopping trip with my mother when I was young was a vivid nightmare; the smell of cheap lager, sweat and stale cigarette smoke; the noise of lurid, atonal chanting; the florid, tattooed flesh; gurning faces so close to my own. My first paid-for haircut was a trauma which lacerated mind and body. I remember still the hairdresser leaning against my arm, her weight pressed against my leg, as if she were seeping into my skin, enveloping me into her folds. Silently I screamed inside for twenty minutes. But not all was bad, of course. This heightened sensitivity meant that I could often smell wonderful things others could not, or more vividly. Pleasant textures and sounds were enveloping, cocooning. Colours and forms popped and buzzed in my mind, transcendent, inspiring reams of teenage doggerel. Landscapes and seascapes were not separate from my body but swept into and through me, flooding me as I dissolved into them.

Here in the lab textures, sights and sounds are new yet also partly remembered from childhood. The feel and colour of certain plastics. The bittiness of screens. The clicks and clacks and beeps. Even the smell of this media, all is pervasively different and strange from the machines I am now accustomed to. From the interfaces that seek ever more to efface themselves, including in an olfactory sense. My MacBook is odourless, but perhaps it will smell in time, grow pungent in age. Yet what the lab presents is essentially an opportunity – the strangeness of the media allows a process of separation, of unweaving the lines of that technological thicket the support our Umwelten.

The poems themselves, concrete, moving manifestations that make use of the technological frame both to display and disrupt meaning, use that enclosure to draw attention to the mind-machine interlacement. The poetry technologizes itself through its own media[tion] while at the same time forcing temporary physical passivity as it runs through its sequence. It is a form of captivity as motion forces immobility, allowing the mind to run free with associations. And of course immobility causes a particular parallel focus on the body. As Massumi states, it is not passivity but motion, resonation, vibration. Bodies and machines both resonate, of course, if we listen. The hum of a monitor or drive fan. The hum of a body-

mind. Resonance is mediation [body to machine] or anti-meditation. It fills mind and body. What it shares with meditation is that singular focus. Networked media allows a particular kind of inattention, of wandering focus. A non-networked artwork that makes use of the screen's/machine's materiality is an absolute physical anchor to that place and time [locally manifested network between body and machine], wherever the mind might run in its free associations. The sequence creates a syntax that the observer must not only observe but absorb and obvert. Words move on the screen, repeat, change order, make shapes, create associations through a denial of staticity and the promotion of dynamism.

All bodies resonate. As Merleau-Ponty says, 'the body is a system of motor powers that crisscross in order to produce a behavior' (2003:147-8). Bodies hum with this system of powers, whether you can hear it or not. Cells, atoms, particles are in perpetual motion. In the Media Archaeology Lab, you hear the hum and buzz and whirr of the machines. You feel the heat of their circuits, of their expended energy. But it is not the drone of a uni-type, dullard office, of a monotone Windows-pack. It is a diverse grouping of animals wanting to play. They are non-networked, which enforces a fidelity to their presence, and to your own. You are here, now. A particular time and space with a particular instantiation of a historical technology. But you are also not alone, in the sense of not being alone when you read a work of literature. Reader, author, brains, bodies, printing [textual] technologies; a communicable comprehension of cultural symbols as the framework of a language and a set of conventions, the symbols themselves, the manifestation of a particular media technology whether page and binding or silicon and screen. Instances of reading form a supra-synchronous entanglement of minds via sensible bodies over time and space. Technologies mediate between the body and the environment. The book itself might hold its own internal chronotope within its symbolic configuration, but the work itself both in the particular instantiation and the wider set of its manifestations exists within a larger spacetime allowing transcendent communication of the body-minds that substantiate them – the traces of the neuronal networks of authors and editors activated [enacted] by the interrelationship of symbol manipulation with mind-body of reader. *Software/wetware[brain]>Hardware[technology/distribution networks]>Software/wetware[brain]*. Fizz, transmission, fizz. A rhizome that cuts across boundaries.

And here is bpNichol's *First Screening*, actively moving forward and back, up and down,

traversing the screen. Building itself up, tearing itself down, creating a tower of Babel, turning inside out, back to front, deconstructing its own meanings as it piles them up semantically and spatially. Its motion, though, comes from an interior read-write process travelling from disc to circuit to screen, a kinetic luminosity that performs a puncturing [mobile punctum] through the screen-as-archive:

> The tensile surface of the screen canvas is an archive. It contains several "sheets" of the past, which, unfolded, lead all the way back to the birth of modern vision and its history of visual surfaces. In fact, the play on surface, which characterizes the history of ornament, is an expression of modern visuality, and surface luminosity can be said to lie at the very aesthetic roots of modernity (Bruno 2014:6).

Since digital technologies create additional environmental sensual triggers, their plasticity alters the body-environment relationship, the ethological dualogue. As Bruno argues, the digital screen allows [hosts, holds] simultaneity, a multiplicity of planes, of patterns, of virtual connectivity and movement on surfaces. It is a site of fluidity and transformation. The screen is not a shallow surface. Its depth, its surface tension, comes from this connectivity of relations, this space of transformations. It is an intimate space both in projection and reception, 'a form of intersubjective transfer that engages the material world and the forms of transformation that operate within its space' (9). The observer is 'enveloped' and 'absorbed' with the 'temporal effects of environmental surfaces. The sensing of a luminous surface produces such an environmental tension, for it holds us to the rhythm and passage of time in space (87). This, she argues, is related to the digital as a field of relations (93). The body is empowered by this flexibility in materiality. The surface of the flat screen becomes a three-dimensional, haptic, motile space where forms move, create texture, opacity, a 'plastic materiality' (96) where the surface becomes transformed into an environment as the observer experiences, through this surface movement, a manifesting projection. The digital 'can reinvent a surface condition that is a form of materiality' (99). No matter the screen's material, this idea of surface tension creates a 'refashioning of materiality and a reinscription of textural movement on our cultural screens' (101). The screen is no longer a marginal part of a work but is a central medium. It is 'pushed to the limit of its potentiality to become the actual core and structure of the work' (101). *First Screening* is an affecting example of this manifest, plastic materiality that brings the surface tension of the screen to the attention of the viewer of this kinetic art as it constructs and deconstructs itself on the slight curvature

electronic screen with its inner luminosity, unfolding both in space and time but continually adjusting the frame of its own reference. The screen of the Apple IIe is a site of textural and textual intertwining, an architecture of itself as physical forms and of its digitally coded movements and manifestations:

> As textural matter builds a dense plane of perceptual intersections between inside and outside, a thick, layered space of interactions between subject and object, interior and exterior, emerges in time. As pliable material, sensitive to environmental mutation and mobile subjectivity, this pliant surface shows itself capable of holding the folds of time and the inner structure of temporality. Insofar as it is a physical skin, it can also express the sensorium of affects, the sensations of mood, and the sensuality of atmosphere. It is in this sense that surface can be read as an architecture. Not only is it constituted as a space in itself; it is a maker of space. Furthermore, the surface has the character of architecture in the crucial sense that it is not flat. This surface is acted on, plastically activated, and sculpted. It is carefully dwelt on, articulated in planes that are mutable and fabricated as transformative fabric. Densely built up in this way, it is constructed as deeply tensile, in the sense that it also a landscape of projective motion and connectivity. Such a surface, far from being superficial, is indeed a sizable, moving entity: it is a space of real dimension, a site of intimacy that can, in turn, be inhabited. Which is to say, it is a real screen (101).

This materiality is fashioned by media as it uses the pliancy of the hybrid screen, returning a sense of temporality but also subjectivity, a spatiality of experience enabled by the material base which is nevertheless simultaneously subject to and permits its transmogrification by the dance of coded light:[49] 'This surface-partition enables us to partake in communal forms of dwelling in the material world' (108). The digital screen hosts these simultaneous planes, or what we might call vectors of becoming in a mediatised environment-body coupling, an Umwelt duologue that expands the territory of our dwelling in its intertwining with our physico-perceptual embrace: 'The language of the screen has turned into an actual material condition of our existence. In an articulated simultaneity, virtual movements are taking place on an environment of screen surfaces' (113). Bruno calls this surface luminosity 'stains of time' (116), and if we think of the weathering of architectural forms, whether humanmade or

[49] 'There is a potential for transformation in the possibilities of cultural transfer between the modes and periods of media. If light can be the force of this transformative movement, it is because it holds the capacity to include us in its environment. Cast on every object and body surface, light is an atmosphere that envelops the subject in its space. It is an embracing experience that makes us sensitive to forms of experience. In light of time, the inner workings of subjectivity can come into place. Immersion in the subtle changes of atmosphere makes us indeed aware of temporal shifts that are not only external but also internal' (128).

natural structures, time becomes visible in space, time's effects, through the laws of entropy, thermodynamics and the endless malleability of matter, inscribe this flux of being onto the surfaces that surround us. These 'layers of temporal density' (116) are overlaid on surfaces. The material world experiences this layering in the build-up of residue, but the residue of the phantasmagorical screen is in the space and shape of our perceptual experience, in the experience of the flux of time as it bubbles and warps through the body-mind becoming as it sits and watches and comprehends the multiple layers of meaning, including the cultural residue that accumulates with the creation of interwoven art forms enabled by the technical structuration of dense experience relayed by accumulating artworks embodied by media. And in the processional of concrete linguistic-semiotic markers that comprise *First Screening* the viewer is captivated in a particular physical pose, sitting in front of the screen:

> The subtle, complex process of material siting exposed in the art of projection includes making room for time and history. A nonlinear sense of time and layers of temporal density emerge while traveling on the surface of media. We are engaged in observing a phantasmagoria of projection that is returning on our screens and taking place in forms of future archaeology that reinvent an archive (116).

We have here, observing the cycle of *First Screening*, a kinetic capture of the attention that renders an immobility of the body – to a degree. The body, like the mind, is never fully at rest, but always readjusting kinaesthetically. Artworks and media both seek to capture and immerse the world of experience, both of the psychic and the physiological which, as Merleau-Ponty states, are not experience separately as the *in-itself* and *for-itself* but are reintegrated into existence, both directed towards a *world* (1994:87). Body and mind face out toward a world while at the same time always pulling that world in. This is the ethological functional circle and is, in essence, the inseparability of organism and environment. Without an environment you have no organism, and without an organism you have no environment. Media and its interfaces transpose communication beyond the ken of physical proximity of both parties. Yet despite the absence of the artist, the body of the perceiver is always present, the centre-point of perceptual experience: 'the permanence is absolute and is the ground for the relative permanence of disappearing objects, real objects. The presence and absence of external objects are only variations within a field of primordial presence, a perceptual domain over which my body exercises power' (Merleau-Ponty 1994: 92). Media does not control but it does extend and distort this primordial domain. It exercises a power to conjure perceptual

objects across and through and from its dense surface. We have the power to turn from the screen, but the screen has a power to capture attention. Merleau-Ponty writes in the *Phenomenology of Perception* (1994) that an external object never reveals all its sides to us without hiding the rest but that we have the power to move and choose which side to observe (90). This is only partially true of media where the screen presents a side upon a surface while withholding others. In that sense it is an amalgam of experience rather than a direct referent – we are immobilised on a singular sitting plane while we experience the motility of objects. Of course, we have the ability to move and manipulate these light-objects through inputs of peripherals such as keyboard or mouse, and this physical input remains an important distinction from the immobility of the cinema screen, whether 2D or 3D.

When the sequence ends my mind drifts away to the snow slowly falling outside, the random coherence of unique bits of matter that are non-reducible to bits per se. I rerun the sequence one, two, three more times. Each time is the same but different because the associative chains it creates are additive and at the same time unique. Layers not repetitions. Like the buildup of snow. The circuity of water as it encounters world (atmosphere, ground; eddies, runnels, dirt). Artwork, computer, person. Also a circuit. Mind, body, world. Life in medias res. Alone in a lab but not alone. The hum of machines, of thoughts. The attempt by the mind to create narrative coherence, which is arguably a byproduct of the Umwelt dynamic, data→information→world. Software here is the persistence of a perturbation, a purposive incursion into another's Umwelt. It is the intention to disrupt. To alter. To affect. To have an effect upon. And it persists until the disc itself decays.

Past/Present. This is not created as a historical artifact but an artistic affect. Making use of current-at-the-time technologies. How does the passage of time change representation? What does time make more clear in terms of the entanglement of software/hardware/intention/body? Here I am entangled with each further repetition.

Figure 10

Bruno writes:

> On the fabric of the screen, opacity and light, two of these critical surface data, come subtly into place to create an experiential environment that includes the landscape of interiority. In this textured, translucent fabrication, the stain of time can never be permanent. On the plane of the screen we can observe the transformative dynamics that affect the times of subjectivity and experience. In this fluctuating environment, the mark of a previous time, even a memory, seeps through the fabric of the present as a force of change (128).

The surface data includes the interiority of perception, memory, awareness of setting as the body experiences it, the pointedness of time and space but fluctuating in this mediated immersion. Fabric is an interesting term, also, originating from the Latin *fabricare*, meaning to construct, to build skilfully, as an artisan, a *faber*, would, one who works in hard materials not the textile delimitation we hold to today. Also, of a building, an appliance, a machine. Bruno talks of the fabric of the screen but we can talk, also, of the fabric of the machine, of the hardware, of the peripherals, of the totalising fabric of the skilfully constructed computing

appliance. And yes, the body too. Dutch anatomist Andreas Vesalius published *De humani corporis fabrica* (On the Fabric of the Human Body) in 1543, bringing a new verisimilitude and accuracy to the interconnections beneath the skin, the dense weaving of flesh, bone, nerve and muscle.

Figure 11

The body, as Merleau-Ponty noted, is always present, whether our mental attention is focused outward or not. The body has its own awareness mechanisms, of continual feedback and control of its environment externally but also internally. Of hunger. Temperature. Of pain. Rather than letting the body recede from view, pain brings the body into hyper-local focus: 'pain reveals itself as localized…it is constitutive of a 'pain-infested space' (93). Shortly before commencing the research for this project, I began to feel pain in the joints of my body;

my ankles, shoulder, elbows, but especially knees and hands. My fingers in particular began to ache as if they were being crushed, sat on by an elephant. They began, too, to bend. I became intensely aware of this other kind of 'digital' existence, this continual manipulation of the world and of objects through my fingers. It is not something that, although we are aware of, we dwell on particularly, in general life at least. But pain is a focus like no other. Human fingers are particularly dextrous, skilled, and able to conform aspects of the physical world to the will of the body. Yet despite this, it is not in manipulation, argues Susanne K. Langer (1974), that the finger absolutely excels, though it does excel in this also, but in its evolutionary specialisation as a sense organ:

> The sensibility of the hand is not only high, but epicritical[50] beyond any animal's tactual sense, except possibly that of the elephant's trunk…The responsiveness of many creatures' vibrissae is quick, but apparently not epicritical; it seems to indicate contact without further perceptual details. But the human hand is a complex organ in which the distribution of sensory nerves and the extremely refined musculature coincide, as they do in our eyes and ears, to implement perception of form, location, size, weight, penetrability, mobility and many consequent values. Its measured movements and the coordinate orientation of its parts, which permit fingering of objects, making it capable of judging the qualities of surfaces – rough, smooth, varied, patterned – and their characteristic ways of absorbing or reflecting heat, which gives us information of temperature contrasts and gradients (257-258).

Both hands can work together, can touch the same object to create a more complex single impression. At all times, the skin and its structures are mutually engaged in tactile perception, in the pressure of objects, in the feel of surfaces whether they be wet or sticky, hairy or slimy, oily or tacky. These qualities are both multimodal and often nameless. We recognise the feeling but we do not necessarily have a name for such feelings or textures. The world brims over with such complex tactility as perceived through the skin and the hands. The hand is a multimodal, epicritical organ for perceiving the world sensually, multimodally. Sight is rich but it is of one degree only. It does not achieve the blended richness of touch. As I type this now, with my attention drawn towards these organs, I feel the textures, temperature, pressure of the surfaces which my hands rest upon and force downwards. The feel of this modern computer is entirely different to the media my hands touched in the Media Archaeology Lab, which were less smooth, more resistant. The shape of the keys was more defined. They required greater pressure to push. The plastic was warmer than the brushed metal of this

[50] Relating to the sensitivity of nerve fibres regarding touch, temperature etc.

machine, which always remains cool. And each machine in the lab had a slightly different feeling, texture, temperature, stickiness or smoothness or other particularity. In fact, some of the keys were broken, which had their own effect.

The mouse is not sensitive. It requires dragging. The keys are klunky. The SEE button does not function so I use K. The 9 key is falling off. The noise of the keys is distrakting but this may beome less apparent. The heating system has kikked in now. What else do I notise? The skreen is small. It reminds me of something out of a sixties siense fiktion film. The six key does not funktion. I feel as if I am transliterating. Perhaps from the Soviet era. Out of my peripheral vision I am aware of many different mashines, all with that same yellowed plastik look. This reminds me of the komputers I had growing up, with the same resistant feeling of material, and later in my teenage years the older equipment I used to kollekt and hoard. My room was full of old pieses of equipment, audio, elektronik, visual, kameras, tape players, mixers, old komputer kosoles, peripherals, all attakhed in odd ways, wires everywhere as I tried to konnect different things into a new amalgam. Sometimes it worked, often it did not. I do not really do this anymore but not for want. I am not allowed to hoard anymore. It is a marital prerogative enforsed but also now everything is now streamlined, or so you think. We we moved from Skotland we had boxes of things we no longer really needed. Old kables that didn't have any funktional equipment to attatsh to. Gadgets that no longer worked or needed missing attatshments. I find gadgets a derogatory word somehow, though. Perhaps that is something subjektive. It is quiet now other than my typing. I have just notised the blinking line waiting for my input. This is something we no longer have.[51] It is like the beat of time. Waiting, waiting. Say something. Do you have anything to say or should I just keep blinking?

I have just been to the bathroom – I use Amerikan words now – and on – I kanno koniue fml keys are no working.

[51] I have just noticed the blinking line of my Word programme, of course, now my attention is drawn to it.

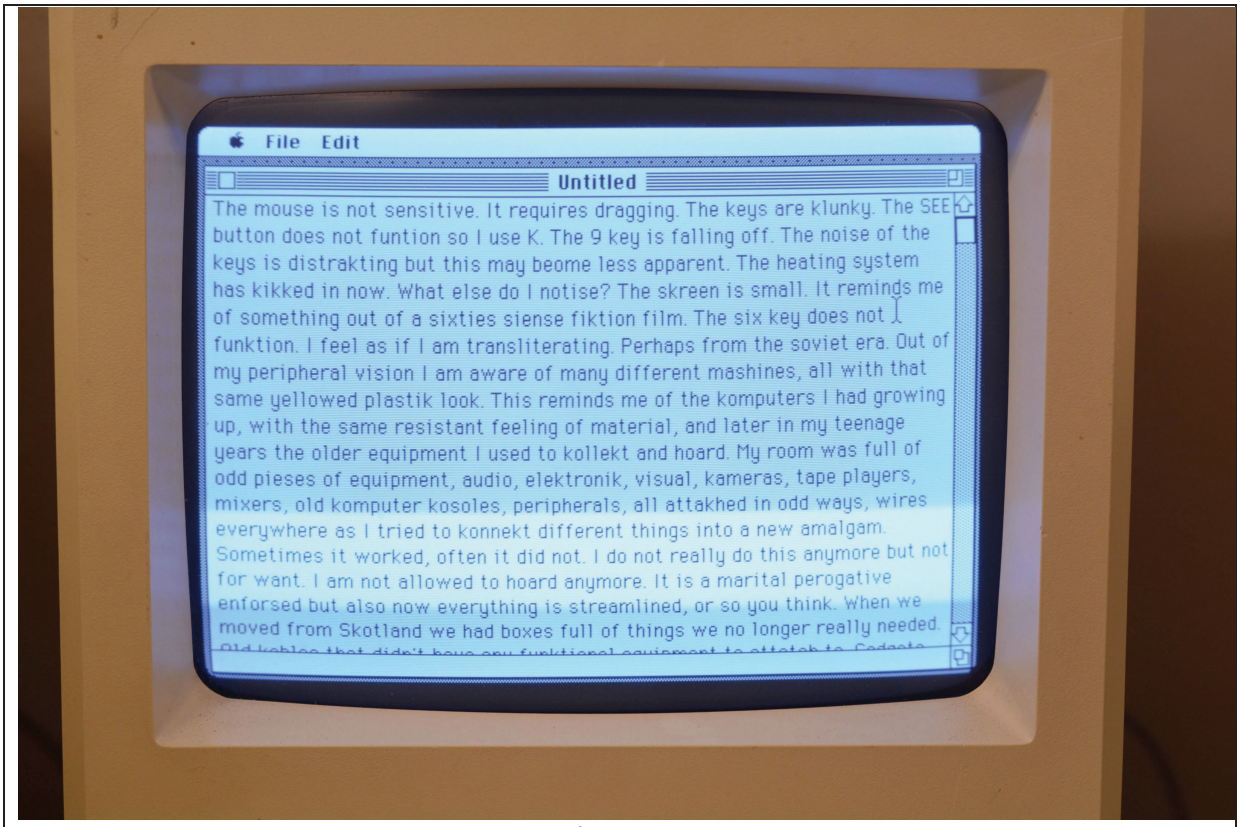

Figure 12

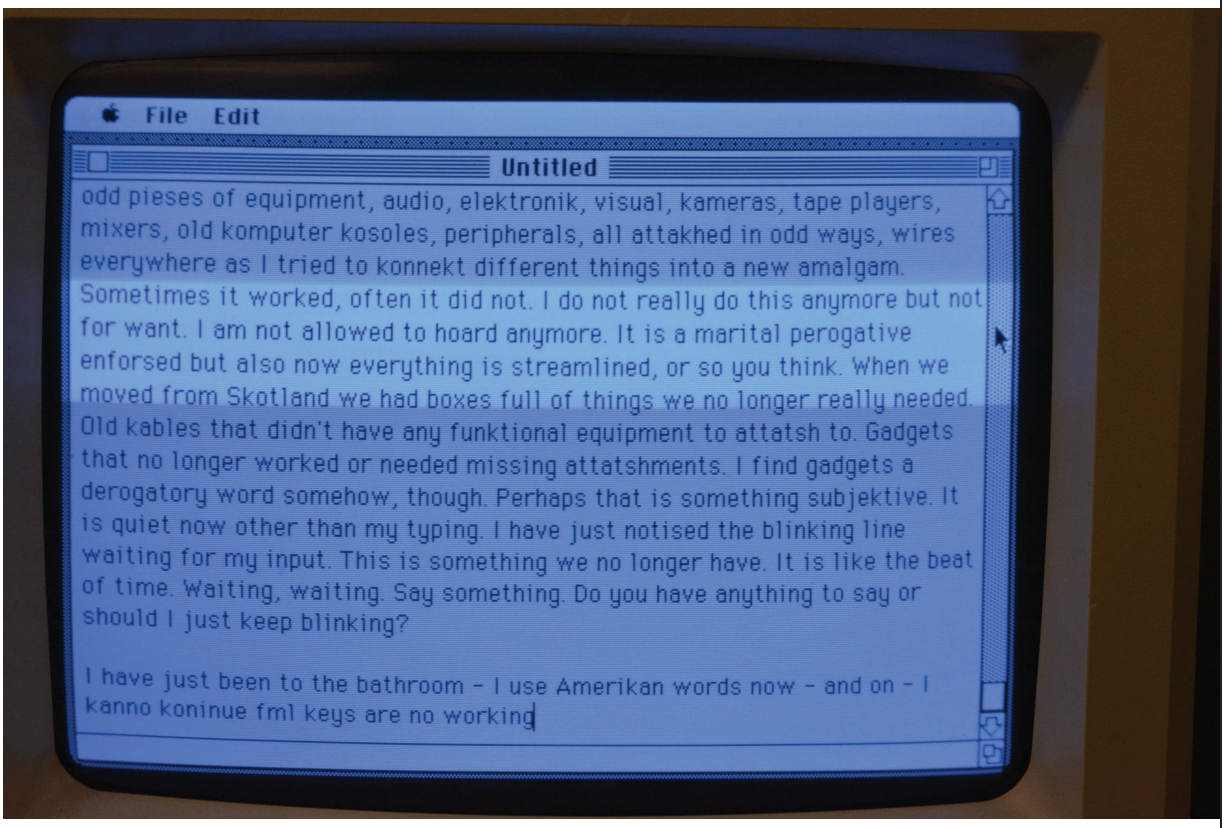

Figure 13

Typing is usually automatic. I have incorporated the keys into my body plan. Yet here I had to type around my meaning, use my fingertips to evade the broken promises of functioning media gone awry over time. Is time working against meaning or merely altering the possibilities of its expression? The dysfunctional key interrupts the rapture of this meaning-making, of communication. The '"productive" key' (Flusser 20011:29) is no longer productive of meaning but a hindrance to its expression. The world, according to Flusser, has disintegrated, has become intangible, and can only be made tangible once again through computation, through the gathering of particles onto surfaces, through the synthesizing of images onto the computer screen. Even with my faulty keys some meaning is being made. An image is being generated. I am transliterating it through the glitch in the hardware. But the image is still a stitch of particles, an illusion of seamlessness generated by individual points generated to create a composite whole, 'envisioned surfaces computed from particles' (33).

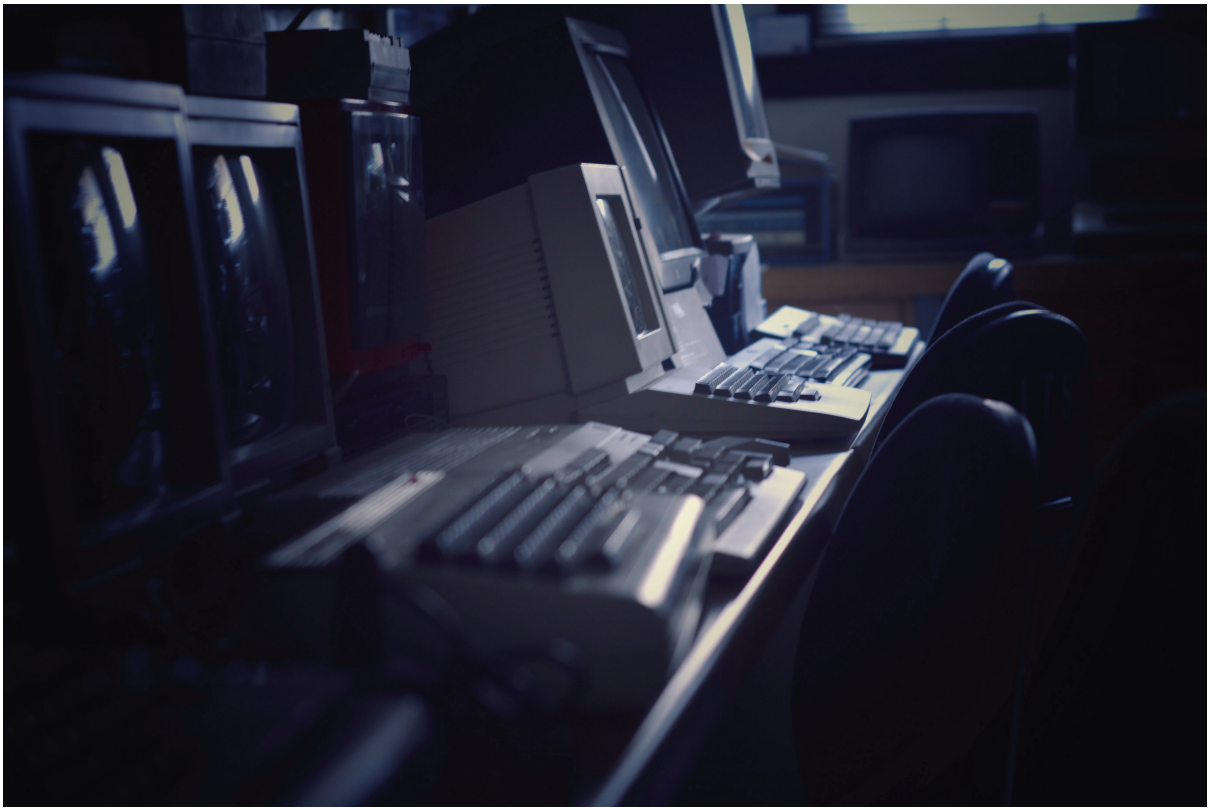

Figure 14

I used my fingers to type but they required a functioning keyboard, without which my mind was forced to adapt sounds and letters to suit my meaning. Of course, meaning is not fixed but ever-changing, and so is the spelling of words, which used to be much more variant until the mechanical printing press began to solidify signs and standardise our spelling. Time, of

course, was also standardised and the world, in all its burgeoning temporal varieties, was forced to fit a very square hole. Time became clock time. Signs became concretised. Fingers, which were used not only in themselves but to craft other tools for exploration, modification and sensing of worlds, became tools themselves, forced into spinning mills and then factories, made to repeat and count, to grow insensate and rough through chemical or mechanical abrasion, to lose their feeling for the world, a form of blindness. Finger blindness. Digital means fingers means counting numbers ten and under means human computation means digital computation:

> Since the fingers on one hand number five, from this is derived the number of digits on which the first counting systems were based. The ancient Greek word for this counting by fives was πεμπάζειν, or "fiving." Both hands together, totaling ten digits, supplied the decimal system, and ten fingers plus the two hands themselves the duodecimal system (Kapp 2018:56).

The etymology from the use of fingers for manually counting the world to digitally computing the world has a very clear lineage. The digital has *always* been physical. I raise a finger: one. I make a fist: zero. Yet the lineage of our finger evolution to our globally-linked media networks has been obscured. Media technologies extend the range of our Umwelten, creating synchronous and asynchronous communications possible across multimodal space. But this, too, is what the senses do. They extend and enrich our Umwelten. They allow us to perceive in a many-mirrored fashion. Without eyes or tongues or noses or ears, and indeed without fingers, our Umwelten would diminish in their congruent modalities [while potentially enriching those remaining, of course, such is the wonder of the adaptive brain].

Figure 15

De computo vel loquela digitorum (On Calculating with Fingers) in *De ratione temporum* by Bede the Venerable

Likewise we must remember that our mediatic extensions are not primary but secondary organs of sense and exploration. Humans command through fingers or mouths, navigating cyberspaces from the vantage of a physically-anchored body. We crawl *into* cyberspaces with our senses as if into rabbit holes but we are not yet fully enveloped physically by them. We do not fall into those Wonderland worlds unless by processes of dreaming while awake. The screens are, rather, looking glasses. And our fingers touch the glass as we peer inside.

Figure 16

'Through the looking-glass, and what Alice found there' by John Tenniel

We are entangled by them, but not yet consumed in our entireties. This may change. Technology is becoming more addictive, more consuming. Technologies of communication are becoming more fastened to our Umwelten. This is the stated aim of developers, to stitch these technologies into the weave of our being so that we are not even aware any longer of the physical technologies but fully immersed, engaged, addicted (Emerson 2014). As Vilém Flusser writes, this emerging society, constructed by and through images, we may call a utopia, in its groundlessness, in its unmooring:

> It will no longer be found in any place or time but in imagined surfaces, in surfaces that absorb geography and history. [We seek] to grasp this dreaming state of mind as it has begun to crystallize around technical images: the consciousness of a pure information society (2011:4).

For Flusser (2011), the stages of pictorial evolution that humankind has ascended, using his metaphor of the ladder, number five rungs, each stage moving from the concrete image to a higher level of abstraction (6). Rung one is an four-dimensional space-time conjoined, animate world, peopled by animals and ourselves, a world of concrete being. This was superseded by a three-dimensional existence focused on graspable objects. The tool. The totem. The weapon. Forty-thousand years ago we entered a two-dimensional mediated existence. A world of imagination. Of mediation between ourselves and the environment as expressed in cave painting. Four thousand years ago, humans pulled themselves up another rung to the world of linear text, of history and understanding, of explanation. Linear text inserted itself between us and our images, a further level of mediation. Humans have, now, reached the fifth rung, the rung of the technical image, of dissolution of the image into particles. A move away from clarity into a realm of computation and calculation (7). Technical images arise from a different mode of being in the world. Although superficially resembling traditional images, their meaning represents a schism, a cultural revolution. Their meaning is made in an entirely new way from the traditional image. Defining the difference between the two merely by the means of their technical production is wholly inadequate to understanding this difference, which is a radical difference of being.

I cannot reach out and touch the sky or the hills beneath. Eyes see relationships between objects and can from this construct models or worldviews: ‘It is about taking a deep measure of circumstances and producing from it a two-dimensional realm of images between the situation and the subject: the universe of traditional images’ (8). Images, however, are two-dimensional, forming a circle of representations, of meaning transposed from one to the next in a magical action, a mediation overlaying the objects themselves. Images, unlike objects, cannot be held. Their lack of dimensionality means that they cannot be grasped in themselves but only at their surfaces. This grasping allows them to be abstracted into a linear single dimensionality, into a universe of text, concept, narrative, into explanation. These concepts strung together form texts ruled by orthography, and the circumstances described by the text are manipulated by them, that is, the text changes the world.

Figure 17

These rules, the rules of the text, are not natural rules but are the result of play, and in recognising them as arbitrary and not based upon natural law, the notion of orderliness crumbles, 'the orderly threads fall apart and the concepts lose coherence':

> In fact, the situation disintegrates into a swarm of particles and quanta, and the writing subject into a swarm of bits and bytes, moments of decision, and molecules of action. What remains are particles without dimension that can be neither grasped nor represented nor understood. They are inaccessible to hands, eyes, or fingers. But they can be calculated (*calculus*, "pebbles") and can, by means of special apparatuses equipped with keys, be computed. The gesture of tapping with the fingertips on the keys of an apparatus can be called "calculate and compute." It makes mosaic-like combinations of particles possible, technical images, a computed universe in which particles are assembled into visible images. This emerging universe, this dimensionless, imagined universe of technical images, is meant to render our circumstances conceivable, representable, and comprehensible (10).

By stepping back from the objective world, by painting the cave wall, the symbol came into being alongside the emerging subject, the symbol-bearer who uses, these days, the computer,

the tablet, the phone, and the book. But symbols still serve their original function, to carry meaning and to manipulate the world through information. They are change-bearers. The image, the coded symbol, allows through succession and continual circulation to code and decode knowledge, to use imagination in the generation and evaluation of knowledge and experience. For pre-textual consciousness the image is still imbued with magical thinking. For the post-textual consciousness, post-linearity, pushing past the dominance of text, the universe dissolves into quanta, into bits of information. But these bits are not graspable directly. They must be manipulated through media technologies. Through interfaces. Via keys. For Flusser, keys are something we still do not rightly understand. Key are bridges between a tripartite world of atomic, human and astronomical dimensions. They work on the level of the infinitesimal, of particles, and by doing so may have effects on scales many times larger. The apparatus of the computer is black-boxed – where the mechanical action of the typewriter could previously be observed now the letters jump from the keyboard to the screen. The process has moved from the mechanical to the synthetic. Action [or what we could term 'handiness'], as stated earlier, first freed us from our lifeworlds, according to Flusser. The next step of liberation was visual observation, followed by conceptual explanation. The fourth step toward freedom was the 'computing touch' (28):

> The current cultural revolution can be viewed as a transfer of existence to the fingertips. Work (hand), ideology (eye), and narrative (finger) will be subordinated to programmed computation. In this way, keys will free us from the pressure of changing the world, overseeing it and explaining it, and will free us for the task of giving meaning to the world and life in it (28/9).

What are we doing when we touch media? When we gather and manipulate particles? What does it mean to touch and be touched by a technology, a technology that is distorting of our Umwelt? What effects are being produced both bodily and in our worldview? Do we touch to wake or touch to dream? When we reach for the environment, when we mediate that environment through technology, through this tactility the world, our individual world, is not just built but grown, accreted in layers of time and space and flesh intermingling. The world we grow and fold into through touch and smell and sight and sound and taste is a thoroughly integrated fold in our organismic makeup as it involutes through the spacetime fabric of existence and the inescapable embranglement of existents. Touch is primary for the flesh, for the expansion of flesh into a world. For all the talk of new haptic media, all media is and

always has been haptic. Books, yes. Tablets of stone or plastic and glass and electronics, yes. Water is a medium for the body and language of the whale. What would a water-based media do to our sense of touch and connection? What would be the difference between a ‘dry’ and a ‘wet’ media? Is it a meat medium, this body? Nerve based? What about media based primarily on vibration, whether of water or air or solids? What about media experienced through vibrissae? A whisker-based media? Can we conceive of a media of horripilation, of hair and wind and temperature? Haptic feedback provides sensory susurrations, whispers of the world coming back to us through materials and motors and a multimodal mimesis of sensory conditions.

Figure 18

Parisi and Archer (2017) argue for the urgent need for a haptic media studies to counter the visual and aural dominance of media studies in its historical and present modes, a reorientation through the sense of touch in order to reverse the dismissal of neglected categories of media, and to create new strategies for discussing the interplay between the media and the senses. Haptic media studies is crucial in this development of an ethological phenomenology of media and technics. While sight and sound have been the dominant modes

of media studies not only in regard to the senses but as defining parameters of media itself, touch and its roles in apprehending media have been comparatively ignored and undertheorized. Yet the rise of haptic media, of touchscreens, gesture-based media controllers with haptic feedback, and of wearable computing, shows the urgency for the development of a haptic media studies both in present forms and of historic media. As they note, mediatic touch has been addressed by writers since Denis Diderot's 1749 'Letter on the Blind for the Use of Those Who Can See,' for which he ended up as a guest of the dis-*missive* French authorities who took a dim view of his secular, rather than oracular, opinions. A couple of centuries later in 1956, Frank Geldard addressed other experimental psychologists at a meeting of the American Psychological Association lamenting the lack of study on touch and on touch-based forms of communication. Only recently in Game Studies has proper attention been paid to these fields, while at the same time suffering from a missing 'historical framework for understanding the intertwined material, cultural, economic and technical lineages gamic touch is bound up in' (1532).

A haptic media studies would:

> reveal the role touch plays in shaping habits of mediatic interaction, by highlighting the structured "techniques of the body" (Mauss, 1973 [1935]) that accrue gradually around media forms. It would show the specific ways in which media are used to encode, store, and transmit not only tactile sensations but also ideations and ideologies of touch (1524).

Touch, they argue, does not exist in a political or ideological vacuum but is, like all the senses, affected by its encounters by various apparatuses. In order to show the ideological nature of touch, haptic media studies must be properly placed in the genealogy of media studies in its own right and as part of the larger study of media and mediatic interactions. By treating audiovisual media as the default, the absence of research on touch-based media is increasingly apparent and problematic; even when touch is addressed it is situated in relation to the visual, as an intractable conflation where sight is still the predominant mode and touch is an additional guide or parameter. The sense of touch must not be absorbed into a more general perceptual approach to media studies, but like audio-visual sensual constructions of media, touch is neither solely a biological or phenomenological category but constructed and continually negotiated site of meaning. By framing touch as a constructed category, it 'connects its conditions of emergence to broader shifts in the production of knowledge about

the senses' and treats the senses as 'epistemic agents' both responsible for and subject to wider systems of knowledge and meaning (1527). Game Studies scholars have demonstrated that technical developments in media touch, like those in audio-visual media, normatively shape the formation of the human subject and frame the uses of the senses:

> Building on Foucault's attention to processes of subject-formation, these studies recognize the complex entanglements of media, technology, and the senses in broader economic, juridical, epistemic, and political traditions. What this means, in brief, is that the rise of new technologies cannot be divorced from the way that they re-form and reshape habits and structures of perception (1532).

Any new media technology requires cultural training, by education in listening and seeing practices, for example, in order to use that technology successfully. Touchscreens, likewise, require initiation into the practices of touch used to navigate the instrumentality of those media which use it. A genealogy of haptic media can trace the evolution of haptic instrumentality from 18th century experiments with electricity to electrotactile machines in 19th century laboratories to the current legal battles over patents for haptic technologies amongst the tech industries largest companies. Situating haptic technologies in a genealogical progression with a long lineage disrupts the utopian narratives of touch-based media and haptic interfaces which have emerged alongside the development of haptic computing technologies and their adoption in new media technologies. This emergence has been accompanied by a push to redefine haptic technologies by those who most profit from their deployment as addressing a fundamental deficiency in human touch that haptic technologies can remediate in order to bring the world more fully to hand, 'a solution to the ocularcentrism of interface culture' (1533). Haptic media studies addresses, rather, the lack of attention paid to touch in media studies, creating 'an archive around touch' in order to reorient media studies away from a domineering audiovisual perspective:

> Executing this shift in orientation will entail a reconsideration of what counts as the media historical archive, an opening up of the field to new points where the past collides with the present, along with a new attention to the hapticity of media. Our suggestion is far from radical: changing modes of mediation always involves a reorganization of what constitutes the archive – the discursive and material a priori – of media history (1534-35).

Parisi and Archer's conception of haptic media follow WJT Mitchell's (2005) provocative argument that there is no strictly visual media, that the label 'visual media' is a prescriptive categorisation that functions as a form of ideological 'sensory hygiene'. To limit media to a single sense is to project an acceptable set of practices and habits within a preconceptualised frame of reference. It is a misleading term intended to limit media to a single sensory receptor, when in actuality media is inextricably multimodal, is always 'mixed media'. From Aristotelian drama to silent films, no mediatic expression involves only a single sense. Architecture too is about dwelling, not sight. Even painting, argued to be the most purely visual medium, is a mixed media, is steeped in the sense of touch.

> [E]verything one sees is the trace of a brush or a hand touching a canvas. Seeing painting is seeing touching, seeing the hand gestures of the artist, which is why we are so rigorously prohibited from actually touching the canvas ourselves (2005:259).

The elevation of the visual above the other senses is a predominant media fetish that reached its apotheosis in abstract modernist art, an attempt to escape into a purely visual medium that was doomed to fail because all media involves this mixture of 'sensory, perceptual and semiotic elements' (260). Mediation cannot but involve this sensorial mixture, what McLuhan calls a 'sensory ratio' (261), the differentiation between media occurring as a result of the predominance of the elements in the mix. A medium, in addition, is defined not by the technology it uses, or the technique, not by the materiality it utilises, of paint or stone or metal or plastic, but, following Raymond Williams, is a material social practice constructed from all of the above in addition to the skills and habits both of creators and users of media, of social spaces, of institutions, and the marketplace. Media for McLuhan was not only a sensory ratio but from the human-side of the equation both a sensory extension and a sensory amputation.

Figure 19

In forming Umwelten through technologies engaged by braided senses, the importance of a tactile media studies for an ethological approach to media and information studies is apparent. As human senses are braided, so the oracular dominance of media offers a distorted view of sensual ratios in the bodily engagement of environment and its modelling through such sensual entanglement. An ethological analysis incorporates the tactility of media alongside other modalities of sense to offer a holistic account of how worlds are formed through mediatic engagement, of the technological absorption of media through use, of the diffusion of the body through technologies, of environmental inhabitation beyond the immediate physical environment, of environmental manipulation through information interfaces and infrastructures.

The reification of media objects into single-stream sensorial classifications further obscures the workings of semiotic operators, of the Peircian sign exchanges essential to communication. Signs do not exist *in vacuuo* but in symbolic relation to one another and to the world, as repeatable coded meanings referring beyond themselves. Mitchell's aim is to work towards a more subtle media taxonomy beyond talk of 'visual' media, an taxonomy that involves empirical and phenomenological analysis (262). Media is composed of two triadic structures; of the 'theoretic' primary senses of hearing, sight, touch, at the primary sensuous level of media, and of the Peircian triadic sign-functions. The sensory-semiotic nexus, then, can involve any complex interplay between these six elements. Yet in ethological terms, these six elements identified by Mitchell sit within the higher triadic structure of body, environment and technics. The interplay of the senses and sign systems in this larger whole show how the body and information congeal into a sensational body-world through technical manipulation of environmental situations.

Not only is there a relation of dominance and subordination, and the triggering of one sense by another, Mitchell draws attention to the phenomenon of what he calls 'braiding' where one sensory channel or semiotic function is seamlessly interwoven with another. In media terms, the mixing of sound and vision in film and television offers a straightforward example of this braiding or 'suture' of sensual elements. But sight itself, Mitchell continues, is not a singular sensorial element abstracted from other senses, nor is it something we naturally do but must learn to do, as shown by those who regain sight after blindness who must learn how to see again: 'Natural vision itself is a braiding and nesting of the optical and tactile' (263).

Vision is both sight and touch. As we noted in Merleau-Ponty (1968) earlier in Chapter 1, the visible and tangible are encrusted upon one another.

Figure 20

Images are part of the functional cycle which by the necessity of our own vitality must be made part of the expression of life both in its forcefulness out-turning and its ever-pregnant absorption. Representations are inescapable in the forming of world. The inductive-rationalist Cartesian position happily elides the force of everything that undergirds thought and separates a line of thread from the entire weave that composes the tapestry of consciousness and bodily experience, elevating it to a poor-in-world icon-less hagiography. Reason reigned supreme over the body's inhabitation of world in the same forgetful manner as digital information is elevated above the physical infrastructures which make it possible. Deeming it as the solo pilot of the body, the singular praise of reason is a greater folly than the supposed magical thinking in non-Western cultures so derided by the cabal of rationalist philosophers, scientists, colonialists and industrialists, those who sought by disreputable and devious *systems* both of thought and theft to plunder the wealth of other(ed) nations.

Industrialists, obsessed with speed, forged the quickening of these extractive processes, whether of material goods, environmental reserves, or human energies. The body of others is so much flesh to feed upon. What some consider the monstrous Uexküll depicts as life bounded in its own interests. The tick is a monstrous being in its thirst only for blood and its spreading of disease. In its singularity it is the dreaded othering of nature. But what then is the human, the omni-butcher of beings, who take all others and kills and disassemble into meats and skins and bones, who turn these others into clothes to drape over our own skins, who extinguishes their lineage on the earth? Barbarism is turned only outwards, repressed through industrial processes so that the firsthandedness, the culpability of butchery is dealt with elsewhere, out of sight and mind. Leathers and furs and oils and packaged meats and milks. What is the irrepressible rebellion of irascible Moby Dick but the roar of nature offended by the tyranny of slaughter and slavery?

Flesh, technology and ontogenesis are merged in the rupturing of the line between life, death and decay and reel us into an un-attentional state. We exist in the flux without the mooring of conscious presence. It is a rest from the existentially exhausting state of being present. The ease of sleepwalking versus the obligations of life and duty and care. What is it to say that the world and myself as a thinking being are not held apart but are intertwined in a matrix of being and meaning? We fully encounter ourselves in the world every breathing moment, yet we are told that the I-myself, whether you call it soul or consciousness, that has its seat in the body is a perceiving, rational agent beyond that body and beyond the world to which the body belongs. We are flesh as object, yes, but the I-myself sits alone, they say, aloft above the world. From dust to dust, the body will rot, but the ecclesiastical position is that the true self will rise to heaven's domain. And even the atheistically minded amongst us still find it difficult to say that the body, this body here, frail as it is with all its aching of heart and flesh, is all we are, and all we will be, and when it is gone then so, alas, shall we. But the world itself, creator and monster, will stitch us back into its ever-folding flesh.

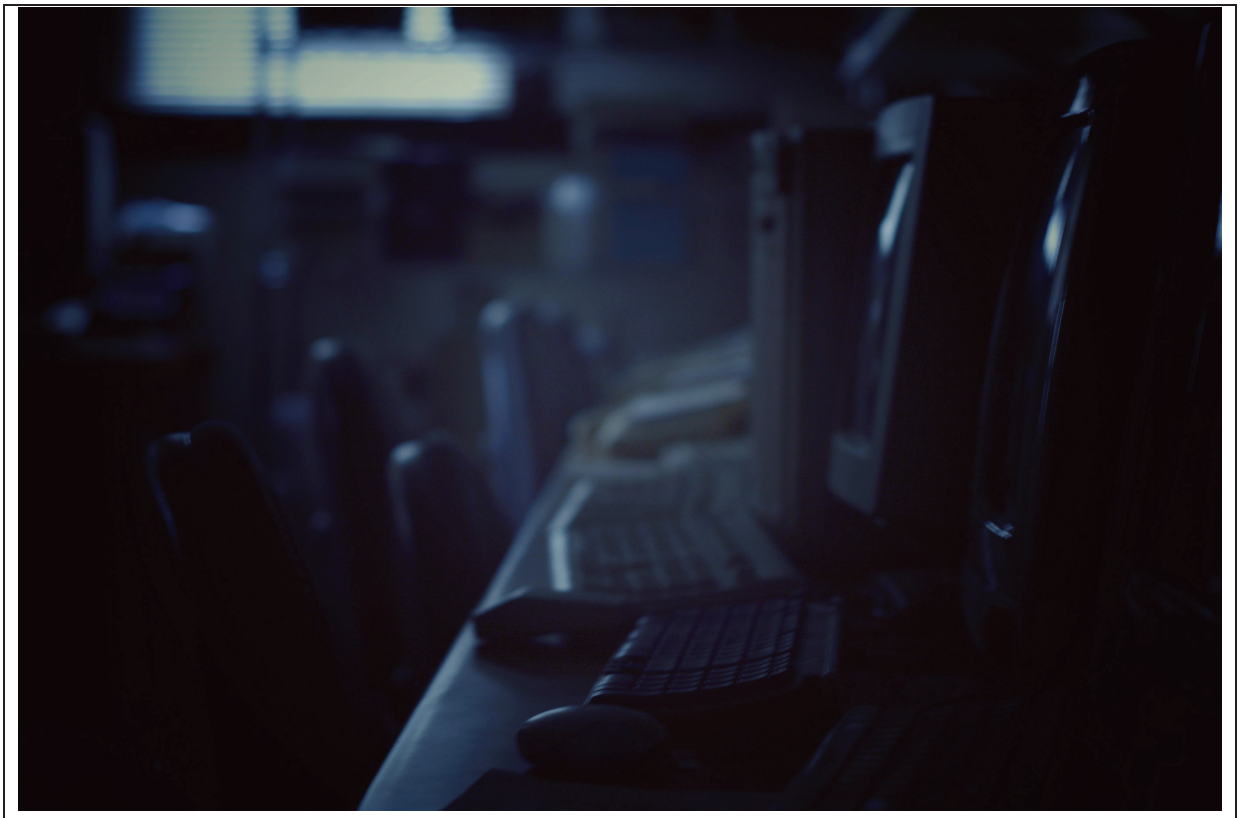

Figure 21

The subject-object sundering no longer holds. Outside, you see the snow whirling in the wind's currents. You look beyond the warmth of this room, protected by the glass, part of the world and yet apart from it. Is this not the same partitioning as the traditional conception of the soul, or the rational Cartesian ego? You see the snow but you do not feel it. You see the forces of the world in the buffeting of that snow, but cannot reach out your hands beyond the window. The house is a shelter but also a boundary. It draws limits on the world so that brute existence is kept at bay. But this is a metaphor only. One's world and one's perception of it are irreducibly intertwined. There is no partition. No glass. No barrier. The world is not subdivided between body and consciousness and soul and the objective this-ness of nature. The this-ness of nature would have no meaning in the derivation of its physical laws without the mind to which it makes sense, the milieu in which that knowledge is situated. Yet the instantiation of our toolmaking does exist, of the glass window and its manufacture, of the walls and their construction, of the table you type on, the cup you drink tea from, of the teabag and its construction and the growth and harvesting and drying of the tea leaves. Of the sun that beat down upon the plantations where it was grown. Of the water that sated the thirsty pickers. The technicity of this world of objects is a mutifolding cocoon. Sight and

touch and technics-as-process are comingled senses. Flesh and sense are made concrete through human-oriented technological production. Through technics not only as process but as enframing. We see [perceive] quite literally through the transparent glass of technics without realising that it is there framing our modes of perception.

Here are screens, banks of sightless seers seeing into your self. What is seen looks back. Yes the void itself but also all nodes of existence. Entrelacs. Intertwining. Vibrissae. Vibrating. What is perceived is perceiving. The sightless see through you. The handless touch through your hands as they are held. Everything held holds you in turn. You are held in the embrace of the world. Entranced, entrancing. The self as thrown into being. The illimitable self-reserve, standing reserve of the soul. The intertwining draws its power from the knotting. We are powered as much by rocks and crystals and dirt and water as electricity and sunlight.

Figure 22

7.3 Conclusion

The Media Archaeology Lab is a place for ethological exploration and experimentation, bringing the triadic interplay between body, environment and technology forward into conscious awareness, into phenomenal reflection. Digital computing technologies are often focused on the output than the process of interaction, as tools to do with rather than tools to think with. An ethological approach that uses historical technologies allows the unspoken assumptions involved in technical interactions to speak, allows the role of the body to sing where previously it was muted. Technology use is a haptic process because our ethological being-in-the-worlds we create are always funnelled through the primary medium of the body. Haptic media encounters therefore are important to developing an ethological phenomenology and a philosophy of technology viewed through an ethological lens. The Media Archaeology Lab has an important aim:

> In a sense, then, the reconfigured media archaeology approach we are trying to take up in the lab is a reconfigured media archaeology applied both to computing's past and to a constantly receding present that masquerades as the near future. Without reading early computing devices and interfaces against their contemporary off-spring and vice-versa, the present slips from view for the contemporary computing industry – which is accelerating its drive to achieve perfect invisibility through multi-touch, Natural User Interfaces, and ubiquitous computing devices – desires nothing more than to efface the interface altogether and so also efface our ability to read let alone write the interface (https://mediaarchaeologylab.com/about/).

The Media Archaeology Lab does more than reverse the attempt by designers to make the interface visible. By making the interface return to the body, the body itself becomes more visible as a locus of entanglement with these technologies. Webs of being stretch both ways. The body returns to itself in the world. Loops back onto itself. Two hands touching. Worlds colliding. Technologies are incorporated into the bodily plan [*Bauplan*]. The body extends out into the world and the world folds back into the body. Technology mediates this functional circle, expands it and distorts it beyond the here and now. The more easily this process of technological incorporation occurs, the less critical distance we have from such carnally indoctrinating processes. The more we can force the gap open through these strange encounters that destabilise the melding of bodies with ideologically designed information systems, the more we find the space for resistance, can find room to breathe in a technologically unbalanced world.

Figure 23

PART 6:
Conclusion

CHAPTER 8

Being-With: The Importance of Understanding Technology Through Ethological Practice

This thesis set out to illuminate questions regarding human ethology and the role of technics and technologies in the human species' perceptual worlds known as an Umwelt. It sought to answer how bodies, environments and technics integrated into an Umwelt and how individual perceptual worlds were further entangled in sociocultural forces and the wider existence of rhizomatic knotworks of beings and existents that make up the general world.

By modifying the traditional dyadic structure of the Umwelt comprising body and environment in a functional perceptual circle to a triadic interplay of body, environment and technics, the processes by which ethological evolution and human being-in-the-world are mediated through technologies existing in technical milieux were demonstrated. The interlinking of human phenomenal experiences with sensuo-tactile engagements with technologies was made more clear. By further demonstrating an ethological approach to mediatic engagement with concrete historic technologies through a particular body, the engagements of the body through sight, sound and touch were brought to the fore. Such tangible multimodal engagements are important in the ongoing mapping of human entanglements with technologies, not least as digital computing and communication technologies become more fully integrated into the human body-plan, as the interfaces through which we connect to sources of information and to one another become further naturalised, invisible and potentially insidious. An ethological approach counters this naturalisation and designed invisibility, counters the forces of habituation through use and familiarity.

No thesis with such wide-ranging material or topics could hope to encompass everything written or thought on any one of those topics. There will inevitably be gaps, opportunities for further research. Studies in paleoarchaeology and human evolution, in historic tool development, in digital-biological interfaces and human-computer interactions, would all likely lead to enrichment of the ideas presented here. Most notably, an in-depth consideration of the work of paleoarchaeologist André Leroi-Gourhan and the rising influence of his *groundbreaking* work would in turn enrich discussions and debates in the information studies

field. The study of information, particularly in that field labelled *information science* is too taken with the mechanistic, mathematical and formal aspects of information and not enough with its humanistic applications, contexts and histories. *Information studies*, as a field, offers an appropriate countervailence, a counterbalance resituating information within human, social, animal and environmental frameworks. By broadening the study of information using ethological analyses, shifts in power away from technocratic agencies can be conducted, emphases on human doing can be refocused to include the ethical, the ethnographic, and the enlightening of existence through the mutual compact of being.

This thesis demonstrated the building blocks of ethological understanding regarding information and its study. Much work is still to be done. From cells to cellphones to satellites to societies, the implications of informational ethology and interrelated approaches to the study of the human species is apparent. But the human is entirely entangled with the universe beyond the human. There is no study of the human and its informational productions without ecological and evolutionary contexts, without demonstration of the knottedness of biotic diversity. Cultural, social and technical domains supervene on the natural. Information binds them together. It is the vein in the rockface of reality, of the strata of being and knowing. By highlighting the importance of information to all other domains of knowledge, its study can receive the attention it requires to move such knowledges forward, to integrate forms of knowing and create a more comprehensive understanding of being.

Such insights are important not only on the individual level but on the societal level. Natureculture (Haraway 2003) transcends individuals. It works on the level of species, both human species and others. It works on the level of societal entanglements. It includes the earth and its cultural and natural productions, the networks formed, knotted, tangled and sometimes torn and trampled.

The notion of the Umwelt is a profound concept with which to think through the study of information, to conceptualise informational environments, digital technologies, and perceptual world-building through bodies and environments. It shows how the subject is unbounded, that the skin is not the barrier between bodies and the world but a point of profound connection on the route to multiplicities of being-in-the-world, of the inward-outward involution of what has previously been considered an impermeable, discrete individuality. Further, that there is not one world but many. You and I have our own worlds

and yet they are connected. You and I share an intersubjective plane, and yet we see these common features according to the tinting of our personalities, histories, emotions, according to the different bodies we inhabit, in which we dwell and become.

Uexküll's own metaphorical understanding is of a soap bubble surrounding our heads, that we are literally in worlds of our own, which to an extent is true, but also misleading. Everything looks different at different magnitudes. Levels of scale reveal new structures. Bubbles create foam, on the border between the states of liquid and solid, and I think it is right to think about our cognitive world constructions not as a matter of one soap bubble but as a multitude among multitudes, as something which is both solid but also evanescent, fleeting as life itself when our own particular bubble bursts but the foam continues on. And through this existential evanescence which is, at the same time, a continual birthing, humans connect. We share signs. Connect worlds. This parturition is made up not only of our human bubbles but of all perceptual beings interacting with existents whose perceptions reside in the extended nature of perception. Of existence perceiving its self. In terms of our own species, it is also made up of our cultural constructs, of our linguistic and technical scaffolding and extendedness which creates structures of the social beyond individual existence and therefore has life or lives of its own. It is composed of our physical constructs, our buildings and structures, our shaped environments, moulded and formed by technological building and excavations, our inventions and tools, in the individual and the aggregate. From house to village to city to savannah to wetland to prairie to forest, and onwards. In assemblages the aggregate accumulates. Language, too, has this duality of physical and extraphysical existence. Like semiotic signalling more broadly, language is codified in the dynamic patterning of every conscious brain endosomatically, dispersed amongst the neurons of each and every speaker, listener and writer, encoded by brains and bodies, nerves and cellular structures. The conditioning of a muscle or anaerobic function is as much cultural as it is physical. Nature and nurture are inseparable. Writing and orality likewise both make language exosomatic but also inscribed within and onto the body, its nerves and cells and matrices of morphological mimicry and sensual symbiotic symmetry of the environment through evolutionary adaptation. As the body is part of the chiastic intertwining of the flesh of the world, so language cleaves to the interplay of similitude and difference, of externality and internality. Body is language is world is brain in a very real sense, a tetralogy of inseparable elements of our perceived-perceiving, touching-touched inversality. Following Merleau-Ponty (1968), this is the flesh of the world manifesting. We speak the world as the

world speaks through us, brings us to being.

Yet we must also remember the lessons Haraway teaches us in *A Cyborg Manifesto*:

> Communications technologies and biotechnologies are the crucial tools recrafting our bodies. These tools embody and enforce new social relations for women worldwide. Technologies and scientific discourses can be partially understood as formalizations, i.e., as frozen moments, of the fluid social interactions constituting them, but they should also be viewed as instruments for enforcing meanings. The boundary is permeable between tool and myth, instrument and concept, historical systems of social relations and historical anatomies of possible bodies, including objects of knowledge. Indeed, myth and tool mutually constitute each other (2016a:33).

As Haraway argues, biological and communications sciences are both constructed by codifying the world into a common language in order to control it, to reduce resistance to instrumental governance, to allow all difference to be subsumed under an ideological exchange of parts through disassembly and reassembly according to the parameters it chooses. Cybernetic-systems theories of feedback and control have permeated technologies from computer design to database construction to military weapons systems to social media interface-networks, where all systems are reduced to the flow of information and its probabilities in the service of power. Everything is dissembled and reassembled to allow the permeation of information and division into quantifiable units, including our relations with one another and the world. This includes life itself through genetic coding and biotechnology research, where organisms are reduced to divisible units and information-processing devices, and their environments and ecosystems determined by notions of feedback and control. Much of the current discourse around information science and the philosophy of technology focuses on Artificial Intelligences and the building out of AI systems of control, calculation and capital networks. Current informational ecosystems are made discrete through cookies and tracking technologies, through advertisements which frame all interactions online. At the base of all digital actions through Internet-enabled environments sits another larger system which exists to codify and monetise each click and drag, each finger swipe and tap. Internet interfaces for mediating the flows of control and capital are massive Pavlovian machine-meshworks designed for our capture. On one end your sister posts a picture of your niece's graduation, which is milled through the networks to maximise your response, which is returned through this interface-enabled information-processing mill. You are dredged via

real-world relationality to provide shuttling information exchanges through the socially-mediated networks of feedback and control. Maximal response is required. Why else would your strongest bonds be utilised in this way but for real-world capture through the simulacra of sociality that feeds parasitically off its genuine bases. Umwelten are reified and monetised through technology.

This simulated social interface-modelling is the core of its business model. Everything from the modern state down to cells themselves are framed and controlled by digital design, through pocket-sized microelectronics, through networked technical systems that reify the social, the sexual, the biological, our home life and work life, gender relations, familial relations, animal-human relations, the biota itself, filtered through pervasive digital regimens of ideological framing devices. Cybernetic feedback mechanisms, high-speed informational cable and wireless relays, addictive interface design, all are allied with societal anomie reinforced through mass media and new media messaging, through the disruption of relations of commonality and mutual polity, through enforced austerity, through the weaponisation of so-called economic-anxiety to enforce other hatreds and political division, through the extraction of wealth from all sources of environmental biotic and mineral richness, endless signalling through symbolic systems and terministic screens, an information overload designed to overwhelm with the emphasis on fracture and frightening difference, of the cost-benefit analysis of every action to an individual. You and I. And all the while systems of surveillance which supervene on our physical selves, sustained on the mediated self.

What does it mean to consider the reticulations which both trap and yet also hold humans up? How to assess the duality of such structures, how to separate the good from bad, the connectivity from the control? Technologies are not just as good or bad as the actors wielding them, whether individuals, corporations, agencies or systems, but as good or bad as the designers and corporations who bake ideological assumptions into their coding and form. The world is caught in a fundamental capitalist paradigm and so technologies cannot but help reflect that. It is wired into their forms and the assemblages that they form, the networks they make, and the effects they have upon the world and ourselves. Our task is to understand that control of bodies and so release the tension, pry open new modes of being that are unimaginable until someone imagines it and believes it possible. This is the point of an ethological analysis, to pry apart the triadic interplay of bodies, environments and technologies, so that how each influence and control the other can be made visible. Digital

technologies allow coercive control twinned with the capacity for escape. They offer connectivity, which is the lifeblood of the desperate desire for unity and meaning. They allow us to step out of our skins, we think, but it is illusory. Rather than organ projections out into the world, now minds tilt into networks designed to allow them to forget their bodily presence while at the same time rewarding that unblinking attention. But it is attention of the wrong sort. This might sound like generalities, but I speak from specific experience, of the hooks in the brain that the screen and its baked-in gestures provide. I catch myself with my phone in my hand, unaware that I have taken it from my pocket and begun scrolling. Unconscious of my surroundings, I have become unconscious of my world. An ethological analysis brings us back to conscious awareness of the world and how such perceptual worlds, as experienced by bodies, are manipulated.

As Barad (2007) argues, apparatuses are not passive observing instruments but part of the productive nexus of phenomena, enacted material-semiotic configurations of reality, material arrangements that embody the concepts they exemplify. Reality is not made up of things-in-themselves or things-behind-phenomena. Reality is enacted as a dynamic materialisation of phenomena in their intra-activity. This relation of being, this engagement and entanglement, gives rise to phenomenal existence. Bodies, objects with determinate boundaries [relata], do not pre-exist relation but become bounded through this intra-active engagement. Agency is not something bounded by discrete forms actuated from within, agency is a flow through mattered bodies structured by and structuring reality through their becoming in spacetime. This brings us to an ethics which is entangled with matter and meaning:

> Ethics is about mattering, about taking account of the entangled materializations of which we are a part, including new configurations, new subjectivities, new possibilities – even the smallest cuts matter (Barad 2007:384).

What does this matter for our being-in-the-world with technologies, with animals, with people? Agency is a flow. Flows forms knots. Knots when cut through create difference, new lines to tangle. To tie. This is the entanglement of the sensual, sensate object. Through entanglement with others subjects are individuated. Personhood is a process of continual becoming in which a subject is externally defined by intra-active flows. It is how they respond, how they direct those flows, which is important. How they cut and tie them. How they bind them. Being-with is an ethico-onto-epistemelogical matter. It is how humans

choose to be-with and the connections they highlight over the divisions dividing them from their animal kin and from their home, the earth, which matters. Which forms the matter that binds them. Western epistemology, Barad argues is a process of mediation, a lens to view culture, consciousness, technology, language and labour, all of which hold nature out of reach 'generating and regenerating the philosophical problem of the possibility of human knowledge out of this metaphysical quarantining of the object world.' (374-375). It is this quarantining between nature and objects, between ourselves and our animal kin, that must be overcome to renew our philosophical engagement as subjects. As humans being-in-the-worlds-we-create. To continue to focus on human difference is to cut us adrift. Even the smallest cuts matter, she says. But so do the smallest knots. If we cut without tying, everything human appears to be rootless. Humans seem as if we were formed uniquely. And we mourn it. Uexküll's ethology teaches us humans are not uniquely formed. That we are biosemiotic creatures like any other. Our tool use defines us to a degree, as does our dwelling, our structuration of form, language, culture, technologies. But as Simondon taught us, these objects are never finished but always changing, generating new forms in the flows of technics through time. Language is a world-shaping technology which never stops changing. That which forms is never finished. Completeness is a myth. Containment is a myth. Absolute difference is a myth. We have focused too long on the being-in and not on the being-with. Becoming and being-with is the story of the universe. Of our kin, human and otherwise.

You and I. Us.

Bibliography

Abram, D., 1997. The Spell of the Sensuous: Perception and Language in a More-Than-Human World. New York: Vintage Books.

Ahmed, S. & Stacey J., 2004. 'Introduction: Dermographics.' *Thinking Through the Skin*. Eds. Sara Ahmed & Jackie Stacey. London and New York: Routledge.

Agamben, G., 2004. *The Open: Man and Animal*. Stanford, California: Stanford University Press.

Ashby, R., 1946. 'Homeostat' design in journal dated December 28, 1946. Accessed at http://www.rossashby.info/journal/page/2094.html.

Bakhtin, M. M., & Holquist, M., 1981. *The Dialogic Imagination: Four Essays*. Austin: University of Texas Press.

Bannon, B.E., 2011. 'Flesh and Nature: Understanding Merleau-Ponty's Relational Ontology.' *Research in Phenomenology* 44:327-357.

Balsamo, A., 1999. *Technologies of the Gendered Body: Reading Cyborg Women*. Durham and London: Duke University Press.

Barad, K., 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham & London: Duke University Press.

Barlow, J.P., 1996. 'A Declaration of the Independence of Cyberspace.' *Electronic Frontier* Foundation. https://www.eff.org/cyberspace-independence.

Barthélémy, J-H., 2012. 'Glossary: Fifty Key Terms in the Works of Gilbert Simondon.' *Gilbert Simondon: Being and Technology*. Eds. De Boever, et al.

Bateson, G., 2000. *Steps to an Ecology of Mind; Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. San Francisco: Chandler Pub.

…, 1980. *Mind and Nature: A Necessary Unity*. New York: Bantam.

Bennett, J., 2012. 'Powers of the Hoard.' Cohen, J. J. (ed.). *Animal, Vegetable, Mineral: Ethics and Objects*. Washington, DC: Oliphaunt Books.

Brier, S., 2010. *Cybersemiotics: Why Information is Not Enough!* Toronto: University of Toronto Press.

Berthoz, A., 2009. The Human Brain "Projects" upon the World, Simplifying Principles, and Rules for Perception. *Neurobiology of "Umwelt": How Living Beings Perceive the World*. Berlin: Springer.

Buchanan, B., 2008. *Onto-Ethologies: The Animal Environments of Uexküll, Heidegger, Merleau-Ponty, and Deleuze*. Albany: State University of New York Press.

Burke, K., 1966. *Language as Symbolic Action: Essays on Life, Literature, and Method*. Berkeley: University of California Press.

Cassier, E., 2013. ‘Form and Technology: (1930).’ *The Warburg Years (1919-1933): Essays on Language, Art, Myth, and Technology*. New Haven: Yale University Press.

Deely, J., 2001. ‘Umwelt.’ *Semiotica*. Vol. 134-1/4: pp. 125-135.

Deleuze, G., 1992. ‘Postscript on the Societies of Control.’ *October*. Vol. 59: pp. 3-7.

…, 2001. *Difference and Repetition*. Patton, P. trans. London & New York: Continuum.

…, 1993. *The Fold: Leibniz and the Baroque*. Conley, T., trans. London: The Athlone Press.

Deleuze, G, and Guattari, F., 2002. *A Thousand Plateaus: Capitalism and Schizophrenia*. London: Continuum.

Derrida, J., 1998. *Archive Fever: a Freudian impression*. Trans. Eric Prenowitz. Chicago & London: The University of Chicago Press.

Digital Intelligence Today, 2013. ‘Fast Facts: Information Overload 2013’. http://digitalintelligencetoday.com/fast-facts-information-overload-2013/. Last accessed May 19, 2015.

@DigitaVaticana: And that's why we say "computer" and "digital"...De computo vel loquela digitorum (On Calculating with Fingers) in De ratione temporum by Bede the Venerable. Pal. lat. 1449 (first half of 9th C.); Urb. lat. 290 (11th/13th C.); Vat. lat. 642 (12th c.); Reg. lat. 1263 (11th C.). Twitter. April 19 2018: 9:25am: https://twitter.com/DigitaVaticana/status/986958848274718720.

Donne, J., 1999. *Devotions Upon Emergent Occasions and Death's Duel*. London: Vintage.

Dreyfus, H., 2007. ‘Why Heideggerian AI failed and how fixing it would require making it more Heideggerian.’ *Philosophical Psychology* 20(2):247-268.

Dunn, E.S., (1965). *Review of Proposal for a National Data Center. A Report Prepared by Edgar S. Dunn, Consultant to the Office of Statistical Standards, Bureau of the Budget*. Washington: Office of Statistical Standards, Bureau of the Budget.

Ehlich, K., 1989. ‘Greek and Latin as a Permanent Source of Scientific Terminology: The German Case.’ Florian Coulmas (ed.) *Language Adaptation*. Cambridge: Cambridge University Press.

El-Bermawy, M.M., 2016. ‘Your Filter Bubble is Destroying Democracy.’ *Wired.* https://www.wired.com/2016/11/filter-bubble-destroying-democracy/.

Elo, M. & Luoto, M., (eds), 2018. *Figures of Touch: Sense, Technics, Body*. Helsinki: The Academy of Fine Arts at the University of the Arts Helsinki.

Emerson, L., 2014. *Reading Writing Interfaces: From the Digital to the Bookbound.* Minneapolis: University of Minnesota Press.

Flood, A., 2015 ‘Oxford Junior Dictionary’s Replacement of ‘Natural’ Words With 21st-Century Terms Sparks Outcry.’ *Guardian.* http://www.theguardian.com/books/2015/jan/13/oxford-junior-dictionary-replacement-natural-words.

Forster, E.M., 1910. *Howards End*. Urbana, Illinois: Project Gutenberg. Retrieved March 18 2017 from https://www.gutenberg.org/ebooks/2946.

Foucault, M., 2008. *The History of Sexuality: The Will to Knowledge: Vol. 1*. London: Penguin.

Haraway, D., 1997. *ModestWitness@Second_Millennium. FemaleMan_Meets_OncoMouse: Feminism and Technoscience*. New York: Routledge.

…, 2003. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*. Chicago: Prickly Paradigm Press.

…, 2016a. 'A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century.' *Manifestly Haraway*. Minneapolis: University of Minnesota Press.

…, 2016b. *Staying With the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press.

Harney, M.,2007. 'Merleau-Ponty, Ecology, and Biosemiotics.' *Merleau-Ponty and Environmental Philosophy*. Cataldi, S.L. & Hamrick, W.S., eds. Albany: State University of New York Press.

Hayles, N.K., 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics*. Chicago: University of Chicago Press.

…, 2012. *How We Think: Digital Media and Contemporary Technogenesis*. Chicago: Chicago University Press.

Heidegger, M., 1962. *Being and Time.* Oxford: Blackwell Publishing.

..., 2001. *Poetry, Language, Thought*. Hofstadter, A., trans. New York: First Perennial Classics.

…, 2013. *The Question Concerning Technology: And Other Essays*. Harper Perennial: London

Hokusai, K., 1832. 'The Falling Mist Waterfall at Mount Kurokami in Shimotsuke Province (Shimotsuke Kurokamiyama Kirifuri no taki)' *Museum of Fine Arts Boston*: https://www.mfa.org/collections/object/the-falling-mist-waterfall-at-mount-kurokami-in-shimotsuke-province-shimotsuke-kurokamiyama-kirifuri-no-taki-from-the-series-a-tour-of-waterfalls-in-various-provinces-shokoku-taki-meguri-234348.

Hoel, A. S. & Carusi, A., 2018. 'Merleau-Ponty and the Measuring Body.' *Theory, Culture & Society*. 35(1): pp. 45-70.

Hoffmeyer, J., 1998. 'Surfaces inside surfaces: On the origin of agency and life.' *Cybernetics & Human Knowing*. Vol. 5: pp. 33-42.

Husserl, E., 2006. 'The Basic Problems of Phenomenology.' *Collected Works*, Volume XII. Dordrecht: Springer/

Ingold, T., 2011. *Being Alive: Essays on Movement, Knowledge and Description*. Oxon: Routledge.

…, 2015. *The Life of Lines*. London: Routledge.

Kapp, E., 2018. *Elements of a Philosophy of Technology: On the Evolutionary History of Culture*. Minneapolis: University of Minnesota Press.

Kershner, R.B., 1992 *Joyce, Bakhtin, and Popular Literature: Chronicles of Disorder*. Chapel Hill: University of North Carolina Press.

Kristeva, J., 1984. *Revolution in Poetic Language*. Trans. Margaret Waller. New York: Columbia University Press.

Latour, B., 1988. *Science in Action: How to Follow Scientists and Engineers through Society* Cambridge, MA: Harvard University Press.

Lettvin, Maturana, et al., 1968. 'What the Frog's Eye Tells the Frog's Brain.' Reprinted from *The Mind: Biological Approaches to its Functions*. Corning, W.C. & Balaban, M., eds. pp 233-258.

Luoto, M., 2018. 'Approaching the Untouchable: From Husserl to Merleau-Ponty.' *Figures of Touch: Sense, Technics, Body*. Elo, M. & Luoto, M., (eds). Helsinki: The Academy of Fine Arts at the University of the Arts Helsinki.

Macfarlane, R., 2015. 'The word-hoard: Robert Macfarlane on rewilding our language of landscape.' *Guardian*. Accessed at: https://www.theguardian.com/books/2015/feb/27/robert-macfarlane-word-hoard-rewilding-landscape.

Macinnes, I. & Di Paulo, E., 2005. 'From the Inside Looking Out: Self Extinguishing Perceptual Cues and the Constructed Worlds of Animals.' *ECAL'05 Proceedings of the 8th European conference on Advances in Artificial Life*. Verlag, Berlin, Heidelberg: Springer.

Malpas, J., 2008. 'New Media, Cultural Heritage and the Sense of Place: Mapping the Conceptual Ground.' *International Journal of Heritage Studies*. 14:3: pp. 197-209.

…, 2012. 'Putting Space in Place: Philosophical Topography and Relational Geography.' *Planning and Environment D: Society and Space.* Vol. 30(2): pp. 226-242.

..., 2017. 'In the Vicinity of the Human.' *International Journal of Philosophical Studies*, 25:3: pp. 423-436.

Marsden, P., 2013. 'Fast Facts: Information Overload 2013'. http://digitalintelligencetoday.com/fast-facts-information-overload-2013/. Accessed May 19, 2015.

Martinelli, D., 2010. *A Critical Companion to Zoosemiotics*. Dordrecht, Heidelberg, London, New York: Springer.

Mauthner, N. & Gárdos, J., (2015). 'Archival Practices and the Making of "Memories."' *New Review of Information Networking*. 20:1-2: pp. 155-169.

Merleau-Ponty, M., 1964. 'Eye and Mind.' *The Primacy of Perception*. Evanston, Illinois: Northwestern University Press.

…, 2003. *Nature: Course Notes from the College de France*. Vallier, R., trans. Evanston, Illinois: Northwestern University Press.

…, 1994. *Phenomenology of Perception.* Trans. Colin Smith. London: Routledge.

…, 1968. *The Visible and the Invisible*. Evanston, Illinois: Northwestern University Press.

Morton, T., 2013. *Hyperobjects: Philosophy and Ecology after the End of the World*. Minneapolis: University of Minnesota Press.

Mumford, L., 1970. *The Myth of the Machine: The Pentagon of Power*. New York: Harcourt Brace Jovanovich Inc.

Nancy, J.L., 2016. 'Inside Out.' *The Philosophical* Salon. Trans. Michael Marder. https://thephilosophicalsalon.com/inside-out/. Published 04/04/2016.

…, 2018. 'Body-Theatre.' *Figures of Touch: Sense, Technics, Body*. Elo, M. & Luoto, M., (eds). Helsinki: The Academy of Fine Arts at the University of the Arts Helsinki.

Nusselder, A., 2009. *Interface Fantasy: A Lacanian Cyborg Ontology*. Cambridge, MA: MIT Press.

OFCOM, 2014. 'Adults' Media Use and Attitudes Report 2014'. http://stakeholders.ofcom.org.uk/market-data-research/other/research-publications/adults/adults-media-lit-14/. Published 29 April 2014. Last accessed 20 May 2015.

Parikka, J., 2015. *A Geology of Media*. Minneapolis: University of Minnesota Press.

…, 2010. *Insect Media: An Archaeology of Animals and Technology*. Minneapolis: University of Minnesota Press.

Pariser, E., 2012. *The Filter Bubble: How the New Personalized Web Is Changing What We Read and How We Think*. London: Penguin.

Patočka, J., 2016. *The Natural World as a Philosophical Problem.* Evanston, Illinois: Northwestern University Press.

Pearce, S.M., 1993. *Museums, Objects, and Collections: A Cultural Study*. Washington, D.C.: Smithsonian Institution Press.

Peirce, C.S. (1955). *Philosophical Writings of Peirce*. Buchler, J., ed. New York: Dover Publications.

Salvo, M., 1964. 'Speech, Sproul Hall, University of California, Berkeley (1964-12-02).' Accessed at https://en.wikiquote.org/wiki/Mario_Savio.

Sebeok, T.A., 2001. *Signs: An Introduction to Semiotics*. 2nd ed. Toronto: University of Toronto Press.

Simondon, G., 2017. *On the Mode of Existence of Technical Objects*. Minneapolis: University of Minnesota Press

Stiegler, B., 1998. *Technics and Time, 1: The Fault of Epimetheus*. Stanford, California: Stanford University Press.

Tenniel, J., 1871. 'Through the looking-glass, and what Alice found there.' Accessed at http://www.alice-in-wonderland.net/resources/pictures/through-the-looking-glass/.

Turner, F., 2006. *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*. Chicago: University of Chicago Press.

Uexküll, J., 2010. *A Foray Into the Worlds of Animals and Humans*. O'Neil, J.D., trans., Minneapolis: The University of Minnesota Press.

…, 1934. 'A Stroll Through the Worlds of Animals and Men: A Picture Book of Invisible Worlds.' *Instinctive Behavior: The Development of a Modern Concept*; Schiller, C.H. trans & ed., New York: International Universities Press, Inc.: 5-80.

…, 1926. *Theoretical Biology*. MacKinnon, D.L., trans., Edinburgh: The Edinburgh Press.

Unknown, no date. **'**ENIAC (Electronic Numerical Integrator And Computer) in Philadelphia, Pennsylvania. Glen Beck (background) and Betty Snyder (foreground) program the ENIAC in building 328 at the Ballistic Research Laboratory (BRL).' U.S. Army Photo, Public Domain, https://commons.wikimedia.org/w/index.php?curid=55124

Vesalius, A., 1543. 'Untitled Image.' *De Humani Corporis Fabrica*. Accessed from https://commons.wikimedia.org/wiki/File:Vesalius_Fabrica_p194.jpg.

Virilio, P., 2005. *The Information Bomb*. London: Verso.

Wartzman, R., 2019. 'Workplace Tracking Is Growing Fast. Most Workers Don't Seem Very Concerned.' *Fast Company*. Published March 20 2019.

Westling, L., 2014. *The Logos of the Living World: Merleau-Ponty, Animals, and Language*. New York: Fordham University Press.

Woolf, E., 2006. 'Hominisation and humanisation: a perspective from the sociology of technics.' TD : The Journal for Transdisciplinary Research in Southern Africa, Vol. 2(2).

Yates, J., 2012. 'Sheep Tracks – A Multi-Species Impression.' Cohen, J. J. (ed.). *Animal, Vegetable, Mineral: Ethics and Objects*. Washington, DC: Oliphaunt Books.

Yeat, W.B, 1919. 'The Second Coming.' https://www.poetryfoundation.org/poems/43290/the-second-coming. Last accessed 04/04/2019.