

Dialectical Holism

The Lost Metaphysics of E. E. Harris

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Figure 1: Errol E. Harris at Northwestern University, early 1970s. Photo recreated with permission by Nigel Harris.

This thesis is dedicated to those whose love has inspired me to act upon my intuitions and to those who may yet find such inspiration from the work I leave and the life I lead.

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Abstract

Errol E. Harris devoted his life to grappling with the big questions concerning the relationship between nature and mind. Harris's career was distinguished, his works were widely published, and yet his metaphysics has until now been excluded from mainstream discourse. The purpose of this work is to outline Harris's philosophies of nature, mind, and science so as to provide his overarching metaphysics a rigorous and sympathetic assessment. This thesis begins with an examination of Harris's biography, including key inspirations that led to the development of his philosophical system. In the remaining three parts I compare Harris's distinctive phenomenological and interdisciplinary approach to the hard problem of consciousness with his closest theoretical analogues in the contemporary philosophies of physics, biology, and mind. I argue that Harris's metaphysics both anticipates and provides a means of unifying the theories of Bohmian quantum mechanics, systems evolution, and 4E cognition. Specifically, I contend that when clarified by the philosophical developments of systems theory, Harris's metaphysics reveals as yet unnoticed implications of autopoietic enactivism for a novel version of the anthropic cosmological principle. I conclude that insofar as the resulting metaphysics of "dialectical holism" remains consistent, it provides both methodological and theoretical principles towards revising neutral monism and naturalizing phenomenology.

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Abbreviations and Symbols

Abbreviation	Meaning
AE	Autopoietic enactivism
AI	Artificial intelligence
AL	Artificial life
AR	Anthropic reasoning
CAS	Collective autocatalytic sets
CBR	Cosmic background radiation
CDZ	Convergence-divergence zones
CIP	Causal Inheritance Principle
CMB	Cosmic microwave background
CoP	Completeness of Physics
COP	Cosmic optimization principle
CPM	Complexity producing mechanisms
DC	Downward causation
DNA	Deoxyribonucleic acid
DFT	Dynamic field theory
DNF	Dynamical neural fields
DST	Dynamic systems theory
€	Explicative process (Harris's theory of evolution)
φ	The unifying principle
EFT	Effective Field Theory
EMH	Extended mind hypothesis
ENM	Extended neutral monism
ESE	Epistemic selection effect
ET	Electron transfer
FAP	Final anthropic principle
FLRW	Friedman-Lemaitre, Robertson-Walker
GTR	General theory of relativity
GST	General systems theory

GUT	Grand unified theory
HKBL	Hyper Klein bottle logic
IIT (Φ)	Integrated information theory
K²	Klein bottle
KBL	Klein bottle logic
LHC	Large hadron collider
LNC	Large number coincidences
MPF	Metaphysical-Physical selection effect fallacy
MSE	Metaphysical Selection Effect
MUH	Mathematical Universe Hypothesis
MWI	Many Worlds Interpretation of quantum mechanics
NGE	Natural genetic engineering
NCC	Neural correlates of consciousness
NM	Neutral Monism
OSR	Ontic structural realism
PAP	Participatory anthropic principle
PHY	Physicalism
PSE	Physical selection effect
QFT	Quantum field theory
QT	Quantum theory
REC	Radical enactivism
RNA	Ribonucleic acid
ROM	Read-only memory
RW	Read-write
SAP	Strong anthropic principle
SOFT	Self-organizing Fractal Theory
SR	Special theory of relativity
ST	Systems theory/thinking
TAP	Teleological anthropic principle
ToE	Theory of Everything
WAP	Weak anthropic principle
WST	Wild systems theory

Part I

The Life and Work of E. E. Harris

Chapter 1

A Philosophical Life

1.1 Introduction

Although he was not in the habit of keeping a journal, Harris maintained detailed records of all his communications, research activity, and other academic endeavors. Many of his hand-written notes and even his autobiography, have (until the writing of this thesis) been preserved by his son Nigel Harris in Nottingham England. Reflecting my research into this material, Chapter 1 draws from Harris's autobiography to elucidate the central themes and experiences throughout his life that led to the development of his metaphysics. In chapter 2, I outline Harris's metaphysics and argue that this system anticipates a number of recent theories including *enactivism* and the *implicate order*. Part I concludes by highlighting the common metaphysical tenets of these camps and sets the scene for a deeper evaluation of Harris's system to be conducted in the following chapters.

1.2 Education

Characteristically modest, Harris admitted that although always prone to introspection, he had "aversion" to talking about himself, convinced that his was an unimpressive story. Indeed, if it were not for his son Nigel's request, Harris would not have undertaken his autobiography at all. The autobiography was his final philosophical project, begun in his mid 90s. It is from this work primarily that we are provided insight into the development of his metaphysics.¹

Harris's father, Samuel (Jack) Harris was a businessman and his mother Dora taught music and dance. Jack and Dora knew each other when living in Leeds in the north of England and

¹ As the citations that follow were taken from an unpublished digital draft of Harris's autobiography, their page numbers do not correspond to those of *Bound in Shallows* (2015), which is the edited and published version of the original work that I drew from for this chapter.

met again after each had independently moved to South Africa. The two eventually married and Errol Eustace Harris was born in Kimberley, on 19 February, 1908.

Jack, an amateur gymnast and a soft-drink manufacturer had left school to work for his father at the age of 14 and during the second Boer war (1899-1902), he became one of the defenders of the town of Kimberley where he lived. Harris recalls that even though his father had never driven a car, he had learned to disassemble and reassemble an automobile engine just from watching a mechanic for a short time. When Jack took an interest in photography, Harris explains

he allowed me to watch how he worked, under a red light, with the developer, how he fixed the pictures, and then printed them in the sunlight outside. It was not just a silent display; he explained every step of the process to me as he went along, so that I understood what he was doing (p. 15).

Harris clearly admired his father's skills and they likely provided the impetus for his own practical interests later in life. Harris dedicated one of his later books *The Restitution of Metaphysics* (2000) to Jack, and in his autobiography said he was "the most understanding and sympathetic of fathers" (p. 13).

Harris's mother ensured that his upbringing was firmly grounded in Orthodox Judaism, requiring that he learn Hebrew from a young age. Harris described his mother as "a little woman under five feet tall, who made up in vivacity and talkativeness what she lacked in stature" (p. 11). Dora filled their home with classical music, which gave Harris a lifelong respect for the arts. Harris's upbringing was generally stable, aside from frequent changes of residence due to his father's continual professional struggles and Harris's debilitating bouts of asthma. In South Africa, his family, including two elder sisters, led a sociable life that frequently brought him into contact with adult conversation. Despite this, Harris describes himself as a lonely child, often finding himself in the African bush, immersed in his imagination and with only his dog for company.

Harris recalls his earliest classroom experiences that foreshadowed his love of education. Because his mother was busy with her teaching, she sent Harris to school with his sisters, Enid and Gwenda, "not as a pupil but for the teacher to act as baby-sitter, allowing me to play with toys while the lessons were in progress. My attention, however, was captured by what was going on around me and the blocks and toys were neglected" (p. 15). Likewise, nature captured Harris's attention from an early age. Here we find an early glimpse into his tendency

to recognize patterns across a range of natural phenomena. As his family commonly slept outdoors on hot summer nights, he remembers,

The crickets sang incessantly in full chorus and in the black vault of the cloudless sky the stars twinkled with cheery brilliance. I associated the sound with the sight as the twinkling seemed to me to keep time with the chirping, and I imagined that the stars were making the merry noise. This was a new version of the music of the spheres (about which, of course, I as yet knew nothing) (p. 17).

Although Harris was a late starter for primary school, due to his asthma keeping him at home, thanks to his home schooling, he was able skip two grades. Showing great academic potential early in his studies at the Grey Institute of Port Elizabeth, Harris won a scholarship and became editor of the school's newspaper. In his early teens Harris began taking a serious interest in literature. He became immersed in the myths and legends of Ancient Greece, Norse myths and legends, Dickens, *Helen of Troy*, and other classics. He claims that in these early years, English and Latin were his strongest subject while mathematics was his weakest. Though he was drawn to science since his youth, he would claim "ignorance" of mathematics throughout his career.²

Harris's hard work and early success enabled him to attend Rhodes College, Grahamstown, where he intended to major in English and Latin, envisioning a career in journalism. Following the advice of Arthur Lord however, Harris changed direction to pursue ancient philosophy, chemistry, and history. He was immediately captivated by Professor Lord's instruction and fascinated by his new topics of study including right action, justice, and utopia. Harris quickly set his sights upon winning scholarships to help his father, who was at that time struggling financially.

The study of natural sciences had inspired Harris to reconsider his own upbringing and question the values that he had previously taken for granted.

Suddenly I experienced what seemed a revelation, that there was no such God as I had hitherto imagined, but simply a prevailing harmony in Nature and that most of our religious practices were based on false beliefs, prayer being inappropriate and futile. Of course, I did not express this revolution in my thinking to my parents (p. 33).

² Interestingly, evidence to the contrary can be found in Harris's personal notes, which reveal dozens of hand-drawn diagrams of early science experiments accompanied by their corresponding mathematics.

As his knowledge increased, it became clear that Harris had found his path. “I was enthralled, and decided that it was Philosophy to which I really wanted to devote myself. This experience set the mold for the rest of my life, although I little realized it at the time” (p. 37).

Suffering from sciatica and an apparent chronic stress, Jack’s health had been declining for some years leading up to a cerebral hemorrhage. Jack died July 28th 1928, just shy of his 59th birthday. For a time this meant that Harris was to run his father’s share in a water purification company. This was a very difficult time for his whole family and Harris took on the responsibility but was not at all poised to succeed in business. Despite these challenges he was able to continue his education at Rhodes where he earned his B.A., won two scholarships, and continued his work toward an M.A. It was at this point that Harris’s understanding of scientific discoveries and political ideologies was significantly expanded. He began attending science lectures, including one by Sir Ernest Rutherford on his discovery of the structure of the atom. Through his studies of history, Harris came to more fully comprehend the “unreasonable” mentalities that perpetuated racial and class divisions exemplified in the South African climate.

Harris’s spirituality too was at this point ignited by study of Spinoza. He recounts that Spinoza’s “Ethics (despite its dry geometrical method) is the only work that has ever aroused in me genuine religious emotion” (p. 41). Concerning immortality, Harris developed an argument against what he considered “the common belief in an after-life.” He approved of “Spinoza’s idea of the eternity of the soul as meaning that the attainment of truth in adequate ideas was not subject to time and so was not destroyed with the human body and the concomitant stream of imaginal consciousness (*imaginatio*) in the human mind” (p. 42). Indeed, Spinoza’s work provided the seed of what would later become Harris’s holist metaphysics:

largely under the influence of my professor I came to see reality as a single whole in which everything was causally connected directly or indirectly with everything else. This, I thought, had to be conceded if only because one accepted the law of gravity, according to which every material body reciprocally attracted every other. If, then, the universe was an infinite whole, this Whole would answer to Descartes’s definition of God as a perfect being [...] This clearly (as I understood it) was the position of Spinoza of whose philosophy I had become a devotee (p. 45).

Nevertheless, his system would undergo numerous developments in the following years. For a time Harris describes himself as following Berkeley, convinced that “everything was ideal”. At this point Harris became sympathetic to the Christian *Oxford Group* at Rhodes,

who inspired him to reject aspects of Judaism in favour of a ‘more pragmatic’ and ‘disciplined approach to spirituality.’ Harris admits, “[t]heir message caught me on the rebound, when I needed support, reassurance and guidance, for the conduct of life after the loss of my father” (p. 45). Eventually however, Harris lamented that their practice appeared to lead to “self-deception.” Resonating with Socrates, Harris believed that an individual’s religious convictions were secondary to the conduct and analysis of one’s own life. Religion, he concluded, could even act as a crutch, permitting individuals to avoid *self-observation*.

After a time, Jack’s business was sold as per Dora’s arrangement and Harris was free to fully devote his efforts to his philosophical career. Laying the foundation for his later works by closely following Hegel and Spinoza in his M.A. thesis, Harris graduated in 1929 with the highest examination grades yet recorded at the college. By recommendation of professor Lord, at the age of 22 Harris took up his first academic position at Fort Hare College and immediately set about caring for his mother and sisters. Interestingly, at this time Harris recalls that shortly after his arrival a mathematics lecturer asked him “what is the use of philosophy?”, to which he replied, “it was what enabled one to decide the use of anything else” (p. 50).

Although he had only a cursory knowledge of psychology from his earlier studies, at Fort Hare, Harris was required to teach the subject up to an advanced level. After a year of this work, he sought to further his career and applied to the Lovedale Christian School, where he aimed to continue his studies toward a second M.A., this time in psychology. During his interview however, the headmaster was initially unsure about giving Harris the position since he was not a self-professing Christian. “Mr. Shephard asked me to come for an interview, and he [questioned] me about my religious beliefs. In reply I said that I considered the Sermon on the Mount the most important thing in life. At that he terminated the interview and I was offered the post” (p. 53). Unfortunately, Harris found apartheid policies more evident at Lovedale than any of his previous institutions. This put extra pressure on him to manipulate the social situations toward integration and equality. Harris recalls making a point to work *with* the students during their required manual labour details on campus and intentionally interacting with the black staff members when the faculty was otherwise divided.

Just as he resumed his studies, Harris received a response concerning the Queen Victoria Scholarship to which he applied as a shot in the dark but quickly put out of his mind. He discovered that the candidate ahead of him was out of the running, which meant that much to his surprise, he could now study at any British University. Considering the advice of A.R. Lord, Harris decided to study philosophy, politics and economics (PPE) at Oxford. With that

Lovedale, his mother and sisters gave Harris a warm parting and he set sail for his first trip to England.

From my earliest childhood I had heard my parents talking of “going home to England”. They had done so after the Boer War and expressed hopes of doing so again after the Great War, but it was not feasible because my father had been out of work for most of the time and they could not afford it. So I had subconsciously learned to think of England as home (p. 56).

1.2.1 Life at Oxford

In the fall of 1931 Harris began research at Magdalen College Oxford. Upon arrival, his apartment appeared particularly lavish in comparison to his earlier residences and was beautifully situated just next to Deer Park. Though Harris had initially enrolled as an honours B.A. student, it quickly became clear to his tutor Thomas Dewar Weldon, that a D.Phil., would be much more appropriate. Though confessedly intimidated in the face of this unexpected challenge, Harris set himself to the task and quickly discovered that at Oxford he was in his element, able to make new friends and grow in ways never before possible.

Initially facing the daunting task of writing his D.Phil. thesis proposal, he explains “I wanted to address the problem that, it seemed to me, ought to be faced by Idealists of how the human mind, which on their theory ought to be all-inclusive, could still be regarded as a finite inhabitant of an encompassing world” (p. 59). His biggest challenge in this regard was fending off the criticisms of his appointed supervisor, H.H. Joachim, a Bradlean scholar and logician who purportedly never approved of any philosophical work a student wrote. After a consultation J.A. Smith suggested the elaborate title “*The Bearing of the Concept of Evolution on the Problem of Including the Human Mind within Reality as a Whole*”. With that, Harris had his heading and it was one that would remain for the rest of his career.

To meet his challenge, Harris attended Joachim’s lectures and set about writing a critique of Bradley’s theory of *finite centres*.³ As predicted, this first critique did not win him any

³ For Bradley, the Absolute articulates itself in a plurality of lesser though unified psychical wholes (or *finite centres*) (Bradley 1969, p. 464). As has now been widely discussed, Bradley’s finite centres bear striking resemblance to Leibniz’s monads, for Bradley’s finite centres like Leibniz’s monads, cannot directly share content nor causal interaction; however, they are coordinated to one another in that they are all partial manifestations of the same overarching Reality (Candlish & Basile, 2013; Eliot, T. S., 1916). For Bradley, finite centres are framed within a monistic metaphysics and in this way, it is clear that they are essentially idealistic (that is, one-sided) versions of what Harris would later develop under the name “unifying principles.”

ground. Undeterred, Harris turned his attention toward a number of topics that were seldom discussed in the 1930's, including a criticism of S. Alexander's *emergence* and A. N. Whitehead's *process philosophy*, as well as a reinterpretation of Hegel's *Naturphilosophie*. Such a massive project demanded extensive preparation in many peripheral areas. For this, Harris was tutored in Greek, steeped in Aristotelian philosophy, and studied Cartesian rationalism. Additionally, during this time, Harris recalls, "Einstein visited the university: he spoke to the Philosophical Society on the Quantum Theory, and I was taken to the meeting as a guest" (p. 9).

For his first spring vacation of 1932 he "went on a walking tour of Devon and Somerset" claiming to be "collecting cathedrals", marvelling at their differing styles and beauty. He explains that the English countryside,

appeared to me as the acme of peace and gentle beauty, with its green fields, greener than I had ever before seen, and trees with luxurious foliage so dense that one could not see the sky between their branches. Never before had I seen hedgerows so variegated and extensive or fields with the traces of Mediaeval strips still visible, the historical inheritance of centuries of culture (p. 62).

As all was going according to plan, the following summer of 1933, Harris had hoped to travel abroad and continue his exploration of Europe, but his sister Gwenda, living in England herself, was not financially settled so Harris devoted his resources to her assistance instead. As a result, Harris was afforded the opportunity to meet more of his extended family who still lived in England.⁴

According to Harris, his critique of Alexander's theory of emergence set an original precedent, as his adviser actually returned praise for the work. Harris confesses that Whitehead's philosophy was the most obscure work he had ever attempted to understand, but since there were no available authorities for him to consult, he felt it was a necessary ingredient in his thesis. When Harris submitted a draft of this critique, he claims Joachim was even more satisfied, calling him "the only person in Oxford who could understand

⁴ In previous years, Harris had managed to develop himself with Jujitsu, hiking, and rugby, and while at Oxford, he was able to add sailing to this list. Continuing to play rugby for fun, Harris was invited to participate in games of increasing seriousness until one game resulted in his fibula being broken. This required him to have a cast up to his thigh and remain bed-ridden for three weeks, which he recalls as a miserable time dedicated to reading, listening to classical music and watching "a gorgeous spring" emerge that could not be experienced first-hand. As an almost comical lesson in phenomenology, Harris recalls that "when the plaster was removed I had no feeling in my leg, which I gazed upon as an appendage that did not belong to me" (p. 65).

Whitehead” (p. 65). Harris began a rigorous study Hegel’s *Naturphilosophie* for the content of his final chapter, but was required to do so in the original German due to a lack of English translations. With less than a year until the completion of his thesis, Harris’s colleagues began pre-emptively congratulating him on obtaining his doctorate.

In its final draft, Harris’s thesis “had argued that the concept of evolution could build a bridge between traditional Idealism and Realism” (p. 176). While Alexander, Whitehead, and Spinoza provided a common means of going beyond reductionist and dualistic depictions of mind, Hegel’s system had provided a conception of nature as a whole.⁵ The results turned out so impressive that Joachim arranged for H.W.B. Joseph and Samuel Alexander to be present at Harris’s defence.

Harris presented before his review board for an hour and a half, speaking as loudly as possible for sake of Alexander’s poor hearing. Though he had prepared an elaborate defence of his appeal to Hegel’s *Naturphilosophie*, Harris recalls:

I was mentally exhausted, and at the very end the expected question was put to me about Hegel’s Philosophy of Nature. I was too disconcerted and too tired to recall the knock-down argument I had prepared and gave a rather feeble answer that was only my second line of defense. I was far from confident when I came out and feared the result, fears that proved all too well founded (p. 68).

Despite appeals from his adviser, when it was over Harris was only to be awarded a B.Litt., on account of Joseph’s stubborn belief that no student could complete work of such high standards so early in their career. “All my friends were incredulous when I told them I had failed, and I myself was devastated. What was I to do now?” (p. 68). Aside from meagre sympathy from his sisters and cousins, his family reflected that it was unfortunate but of his own doing, his own inadequacy; the B.Litt. he was awarded really held no weight at this point in his career.

Despite his efforts to secure a position at a British University, or a scholarship to continue his education at Harvard, nothing materialized. Thanks solely to his sister’s enquiry on his

⁵ After a lifetime of development, in its final form Harris’s metaphysics now bears many complex relationships with contemporary Whiteheadian philosophies. In his own works Harris made limited efforts to highlight the points at which he parted from Whiteheadian philosophy. As I am unable to address this issue in the present work, it is evident that a future proponent of Harris’s system must undertake this task. Toward this end, Eastman & Keeton’s (Eds) (2003) companion on Whiteheadian physics and Gaskill & Nocek’s (Eds) (2014) more general survey of Whiteheadian philosophy may provide sufficient grounds for beginning such a comparison.

behalf, Harris ended up settling for a position as a private secretary to William Senior, Minister of Mines in Southern Rhodesia. However, due to her own challenges to make ends meet in England, Gwenda took the only opportunity open to her at the time, which was to fill a position in America, not to be seen by Harris for another 22 years. “Then Enid and I embarked on our return to South Africa: she to rejoin my mother, and I to take up my new appointment. Thus the interlude, that had begun so well and had promised so richly, ended in a rather dismal anti-climax” (p. 70).

1.3 Academic Life Interrupted

Harris saw England as the hub of Western civilization and so was disheartened to seek the only available employment in Southern Rhodesia, which appeared to lay on the outskirts of civilization. Despite Harris’s significant frustration with his circumstances, in retrospect he recalls this period with a great appreciation for all the opportunities it afforded him, the people he was able to meet and the new skills he acquired.

Harris was first to be the secretary of William Senior – a purportedly racist politician with a distaste for academia and disregard for Harris’s efforts. As Minister for Mines, Senior employed black Africans to do the brunt of his house and mining work, speaking to them in their native language and discouraging their learning English. “Among his peers and political colleagues he was much admired and was very popular, but all who worked for him agreed that he was an intolerable employer” (pp. 73-74). After a long line of apparently irrational responses to Harris’s work, Senior eventually dismissed Harris for failing to produce a letter that was in a cabinet whose contents, he ordered, were not to be touched. After what had been only five months, without future prospects for employment, Harris was relieved to be done with that position, taking with him a newly acquired ability to type and an increasing abhorrence of African racism.

Harris took the subsequent period of uncertainty as an opportunity to visit his mother and sister in Cape Town, where – metaphorically suited for this stage of his life – he climbed the Devil’s Peak:

I diverged from the beaten track to attempt a climb up a broken rock face, though this time with more discretion. Half way up I suddenly and unaccountably lost my nerve and the courage to go further. Having rested on a ledge for a while I recovered my composure sufficiently to continue to the top of the ridge, only to discover that the route I had chosen would take me along a knife edge with a sheer thousand foot precipice on the south side. Wisely, I descended to a grove of pine trees

below to the north, and continued along the common path to the summit without further difficulty (pp. 78-79).

Soon thereafter, Harris was fortunate enough to be invited to an Oxford conference, for which he was to present a more confident and carefully constructed version of his D.Phil. viva. Though he believed his presentation was a success, it was even better than he knew at the time. Among those in the audience were Geoffrey Mure and Sir Malcolm Knox, philosophers who would later provide great support for Harris's work.

As Harris had arrived in England unemployed but had no intention of either returning to South Africa or clinging to his uncle for support, he soon found himself employment at the Kingsmoor private school. This position however would not start until the next school year, so to fill in the time he volunteered at the local Tubby Clayton's (Toc H) church. Here Harris was responsible for giving guided tours, for which he was provided a room basic necessities – to and from which he walked five miles per day. After only two weeks he was offered another 'vastly more rewarding' position as "assistant house father" attending to the athletic and academic needs of children from an associated orphanage.

With the dream of academic prestige still lingering in his mind, Harris made regular visits to Oxford. During one such visit, Harris was to meet face to face with Nazi youths who had come to discuss the philosophical ideology of their Führer:

The Nazis, finding their arguments in defense of Hitler's policies strongly opposed, maintained that we could not understand the German spirit, because we had not been brought up on Hegel and Spengler. I protested that I had indeed been brought up on Hegel, whose philosophy led me to conclusions directly opposed to theirs and had convinced me of the error of their ways (p. 80).

Having already been deeply influenced by the socio-political tensions in South Africa, long since committed to an anti-apartheid campaign, it is clear that Harris's early life was uniquely disposed with regard to historical events such as these that moulded what would become his life-long work toward universal equality and international peace.

At the Kingsmoor school, Harris makes first mention of a romance with a girl named Liselotte Rath (Lilo), a German Jew who, due to the Nazi influence, had fled to England just before completing her own Ph.D. in philosophy. Though the Headmaster frowned upon intimacy between members of the faculty, Harris recalls "I had really fallen in love for the first time in my life and found my endearments reciprocated, so I assured the Headmaster that our relationship was serious, and that he had no reason (and no right) to object, as long as we behaved discreetly in the presence of the pupils" (p. 81). Though he enjoyed the experiences

he had caring for the children, taking them hiking, etc., the uneven treatment of students by the other faculty proved too much for his morals and eventually compelled him to resign.

Soon thereafter when Lilo returned to Frankfurt for the summer, Harris found himself at a loss for what to do. He felt the previous year had been somewhat unfruitful and so set himself to work studying symbolic logic and other philosophical systems in which he was not yet proficient; all in preparation for an unknown opportunity he felt might arise at any moment. His bleak outlook persisted though and was further exacerbated by the events taking place abroad:

In Germany Hitler was now firmly in power, behaving tyrannically at home and provocatively abroad. Mussolini had invaded Abyssinia; the German-Italian Axis was being cemented, and the Spanish civil war had broken out. In Britain, Ramsay MacDonald's government had pursued a policy of disarmament, and foreign policy was weakened and hampered in its efforts to maintain peace through the League of Nations, which the Fascist powers were defying or ignoring, and which seemed without authority or power (p. 84).

Unsurprisingly, Lilo's invitation for Harris to come visit her a few months later was not joyously received. However, he considered this a great opportunity to travel the continent, gain greater proficiency in German, and he hoped, impress upon Lilo's parents that he would make a suitable husband. Upon arrival in Germany, Harris recalls being greeted with kindness by her family and richly entertained against a background of jaw dropping historical beauty of the Goethehaus, Rathaus, and the famous mediaeval Bruckegukel. Nevertheless, everywhere they went they were persistently faced with anti-Semitic propaganda. Harris recalls having lost his vitality, his energy, and confidence, finding himself unable to react in a manner befitting his character. Near the end of his visit Lilo went on to Berlin to meet her other male friends and Harris simply let her leave, unsure what action to take. Soon after he took his own leave, travelling through Neckar Valley and visiting all the historical sights he could along his way back to England, where Lilo was supposed to meet him.

Once again arriving in England without employment, Harris was lucky enough to come by an advertisement for a temporary appointment at Uppingham School, whose administrators jumped at the first moment of Harris's enquiry. Though he was offered a greater pay than ever before (six guineas a week) he was in charge of teaching history and scripture to a group of boys, all of whom had earned a reputation of being *difficult*. After his previous experiences teaching, Harris recalls having acquired a certain finesse in dealing with his students, even handed but ever pressing them to reach their potential. His first semester went smoothly,

managing to help many students individually and keep order in the classes. Though Harris felt he was once again in his element, it was not to last. One after another, his temporary appointments came to an end and he was forced once again to look for employment elsewhere.

Though he did not wish to return to Africa, one of the only opportunities he found was a school inspector in Basutoland. After consulting all the available opinions including family, friends, and his previous employers, Harris took his uncle's advice: "not to turn down a secure career in the Colonial Service, with a steady income and a built in pension at the end, for an uncertain and rather vague promise of a post at one of the lesser public schools" (p. 89). Lilo was to come to London to meet Harris just before his departure. Here Harris enthusiastically invited her to accompany him to South Africa. Lilo vehemently declined. Despite his arguments to the contrary, Lilo explained that she no longer saw them as a suited couple and that Africa was no place to raise a family. Soon thereafter, his sister Gwenda, responding to these unfortunate circumstances, assured Harris that Lilo certainly did not love him. Perhaps due to the infamous spell of first love, Harris wouldn't hear of it, deciding that he would write to Lilo regularly to reassure her as to the favourable conditions in Africa.

Quite surprisingly, and a testament to his undying sense of humour, even in the lower of times, Harris always took part in the ship costume parties going to or from London. On the previous occasion he was a lion tamer to a two man team dressed as a lion, but this time he was the "Mock turtle" from an apparently little known story of "*Alice*" that went unrecognized. Picturing him there dressed as a turtle, with the looming shadow of WWII on the horizon, there is a palatable tone of melancholy as Harris concludes this chapter of his life with "It was to be almost ten years before I next set foot in London" (p. 90).

1.3.1 Colonial and Military Service

Perhaps for reasons of necessity or admiration of his father's service, for some time Harris's life and work became embedded in the military. Though he never ceased to dream of academic success, his years spent in colonial and military service provided him invaluable first-hand experience dealing with diverse cultures, conflicts, and practical problem solving. These experiences undoubtedly provided his later philosophical work with orientation, inspiration, and grounding.

Starting around 1937, Harris's first appointment was as an education officer for the British Colonial Service. Having recently been rejected by his first love and finding few prospects for

companionship, Harris speaks of his mother and sister as having appeared in need of his care and attention just when he needed it. Since they were living in less than favourable conditions, Harris had Enid and his mother join him in his government-appointed home. Harris was however to be away from them for many days at a time as his position required that he ride on horseback, camping along the way to inspect the outlying schoolhouses of Basutoland.

Harris describes the schoolhouses as mostly consisting of mud brick or stones and corrugated iron roofs that were thatched with reeds. Fuel for fires was limited to cow dung and the Boers still threatened the area with an overwhelming military force. This was indeed a rough land in which to work or live. During these trips Harris spoke to the faculty and students of the schools he inspected about the standards they were supposed to uphold. Harris recognized however, the many challenges for both teachers and students alike to uphold these standards, from the funding needed to send a child to school (e.g. clothes), to the funds needed to keep the schools operational.

One of the problems for education in the territory was a corollary of the socioeconomic situation in South Africa as a whole. The majority of able-bodied young men were away from their villages most of the time working in the goldmines of the Witwatersrand. Traditionally the agricultural work, apart from plowing, was done by the women, and the boys herded the cattle, a task which kept them out all day on the field. It was consequently very difficult to get the boys to come to school, most of the pupils being young girls (p. 92).

Harris was nonetheless shocked on one occasion when, speaking about the dangers of witchcraft in place of medical care, he encountered a defence of the practice:

Lecturing on the teaching of elementary science, I stressed its importance in weaning children away from old-fashioned superstitions and witchcraft, counteracting the malpractices of witchdoctors. My audience [was] mission bred, brought up in Christian families and taught by ministers of Christian sects, so I was taken aback by the reaction of the majority, who, in the discussion after my talk, stoutly defended the witchdoctors and expressed firm belief in the efficacy of witchcraft, both beneficial and detrimental (p. 99).

It is certainly interesting to notice Harris's *surprise* in this situation, considering that his frustrated efforts are mirrored in the tedious work of medical anthropologists that continues to this day.

During his time off, Harris made every effort to travel, picking destinations that either ended or at least stopped by his previous academic acquaintances.⁶ On one such occasion he visited one of his M.A. examiners, Professor Hoernle, and discovered that he had for the fourth time just missed an opportunity for a university appointment. Harris recalls in any down-time philosophy remained heavy on his mind: “During the whole time that I was in Basutoland (and, in fact, throughout my time in the Colonial Service) I kept my philosophy books with me and tried in odd moments when other demands were not made on my time, to keep up my chosen subject of interest” (p. 102).

As was an apparent theme throughout his life, it didn’t take long for Harris to feel increasingly discontented. Even in the case of persistent hard work, either out of his own will or external circumstances, he became compelled to re-focus his efforts.

The Munich crisis occurred in 1938 [...] I had for years been a convinced pacifist, until I found myself reacting to the news of Hitler’s excesses with the subjective exclamation: “Why doesn’t somebody stop him?” It then occurred to me that the only way he could be stopped was by force [...] I must confess that I felt decidedly apprehensive as I filled in the form and realized that I had had no significant military training hitherto, and no special skill to offer. To join the infantry was not by any means a cherished desire, but I could think of no alternative (p. 100).

With his decision, Harris would leave to a successor the job (and cat) that he had grown to love; he would have to move his mother and sister to another less scenic, but more comfortable house in the Cape.

After a short interlude, Harris was transferred to Zanzibar. As sea travel was not permitted during wartime however, his only option was to drive himself across five countries to his new post where he was once again to act as a school inspector. It is clear from his extensive explanation of the region that within just one year of his stay, Harris had learned much of the economy, politics, and even the language of Ki-Swahili. Harris’s reflections on the politics and history of Africa reveal an amazing insight and empathy for the people of the region. He

⁶ Perhaps the single most comical event recounted in Harris’s autobiography (though it was likely not intended to be so) was his recollection of his earliest car. The first car he had purchased in Africa, a ‘Graham’ had never appeared to him as trustworthy given the rough condition of the local roads. One day his concerns were proven well founded when a fellow at his office came running to tell him that his truck, simply parked outside the office, was on fire! This provided him sufficient inspiration to upgrade to a trustworthier Chevrolet, in which Harris would have many adventures for years to come.

recognized the horrors that had been committed to both man and nature were due to the greed of warlords and cultural ignorance of colonial policies:

Possibly more could have been done by the imperial powers to encourage the development of modern democratic systems, and certainly much more effort might have been put into advancing education. But it would surely not have improved matters to subvert the traditional customs or to attempt to impose European ideas and methods in an alien environment. The professed aim was to prepare the colonies for independence, and the result gives scant evidence that the preparation was adequate (p. 115).

While he enjoyed the relative safety of his duties during this time, Harris still eagerly wanted to contribute to the war effort directly and felt his potential was not at all being utilized. When nearly a year had passed, Harris was granted release from the Colonial Service and transferred to Egypt as a lieutenant. Here he passed a three-week course on the war effort and became an information officer in the British military.⁷ Typical of his character, Harris recalls refraining from the drinking party that ensued with most of the recent graduates. Late that night however, in response to his abstinence two inebriated men barged into Harris's quarters intent on fighting him. While his bunkmate merely watched from a distance, with what he calls a slight knowledge of ju-jitsu, Harris claims to have kept both men at bay without anyone sustaining injuries. As an ironic turn of events, during a following lull between assignments Harris was to gain experience as a defense representative for men who were charged with the possession of alcohol. Though Harris's defendants lost, he recalls that these cases taught him valuable skills dealing with evidence and reason.

Eventually Harris was transferred to Cairo, where he was to console, educate and inspire the troops who were meant for the front lines. For this assignment Harris went above and beyond his call of duties, taking it upon himself to teach the illiterate African soldiers how to read and write. The curriculum he created for this purpose was so successful that Harris was able to train other teachers at his base and the British army would eventually implement his

⁷ Apparently one of Harris's more exciting (but non-philosophical) stories occurred during this trip. As he knew that the rainy season was nearly upon him during one 1000 mile transfer between bases, he drove as fast as possible in the attempt to beat the impending storms. Nevertheless, he wound up having to face the heavy rains at night, rendering his visibility almost nonexistent. When Harris finally arrived at the next hotel and mentioned to one of the employees the route he had taken he received a look of shock, as it was widely known at this point that a river had flooded creating an impasse for all motorists. Apparently, driving at top speed (50 mph) in the attempt to get to safety, he had driven straight through the river without realizing it – a story Harris would relish for many years to come (p. 114).

curriculum as a standard. At this post, Harris was confronted with a heavy dose of politics that caused him to reconsider and refine his own beliefs. Particularly common were the debates surrounding Marxism and Socialism. Though Harris had socialist sympathies for some time, he concluded that the theory of “dialectical materialism” appeared contradictory and he was unable to “accept the implicit suppression of individual personality in favour of class and proletariat” (p. 125).

For his Christmas leave Harris (quite suitably) travelled to Jerusalem.⁸ Harris had considered that the Catholic Church might accommodate his religious beliefs and consulted the advice of his unit’s Anglican Chaplain. Setting out his primary beliefs on paper, Harris recalls,

I had honestly confessed my unbelief in the miraculous aspects of the Gospels, considering them irrelevant to the question of Jesus’s divinity. That, I maintained (and still do), followed from his teaching, his personality, conduct of life and the manner of his death, and not from any alleged virgin birth or miraculous resurrection (p. 125).

Harris was informed that his denial of the miraculous character of the Gospels prevented him from being a full Christian. As he was not yet fully satisfied with this conclusion, questions regarding his religious home would occupy his reflections for years to come.

Upon returning to his post, Harris was raised to the rank of acting Captain. This new position provided him with his own truck and required that he inspect the education operations of other units. This assignment required him to transport soldiers from camp to camp, remaining ever vigilant of landmines that littered the roadways. On one fortuitous occasion, Harris was asked to give a last minute presentation to a “small” audience on the *Atlantic Charter* (1942), recently signed by Roosevelt and Churchill, and which was to become the basis for the modern United Nations. Harris agreed and promptly found himself in front of about 500 “unsympathetic men.” Harris was not at all pleased with this turn of events but made the best of it and the presentation went smoothly. Largely thanks to his

⁸ While in Cairo Harris was able to take leave and visit Alexandria – one of his most enjoyable times in the Middle East – and to explore the temples of Luxor and Karnak. As this was a time before the tremendous influx of tourism, Harris had to rappel into the unlit passageways. Harris recalls, “We walked among the ruins, gaping with astonishment at the remnants of a civilization, the character of which, but for our biblical knowledge, we could scarcely imagine” (p. 124). Interestingly, he notes that the paintings within the tombs were so vibrant at that time that they looked as though they had been completed the week before.

participation in a number of similar events, Harris was offered the opportunity to have another promotion.

Though he thought he would be sent to Italy – which was his motivation for accepting the appointment – Harris received the rank of Major in the Education Corps of the British Army and was sent to the *Middle East Military Education College* at Mt. Carmel, Palestine, where he was to be the Chief Education Instructor. After a short time and a lot of hard work, Harris had gained a strong reputation as an excellent instructor. The only female instructor recently transferred to the college, Junior Commander Sylvia Mundahl, had majored in history at Westfield College in London and understandably took a quick liking to Harris. Sylvia attended his lectures regularly and it became apparent that her interest was more than academic. Though Harris appreciated the attention, their relationship remained professional for some time.

By 1945 the war in Europe had come to a close with the defeat of Hitler and so the education initiative changed focus from political and strategic briefs to a concern for reintroducing officers into civilian life. Thanks to these changes, after having been moved through a long chain of various duties, Harris finally found himself lecturing on subjects of his personal interest. He made use of the library of the British Council and was once again able to immerse himself in more recent publications on philosophical topics. A short time later Harris recalls being “overawed” when he learned that the atomic bomb was detonated:

Human ingenuity had now released the ultimate force of nature, the power of the atom, against which there was no effective defense. Until Hitler’s intransigence had converted me, I had always been a pacifist, and now I saw that war with atomic weapons had become an intolerable and a self-defeating instrument of policy that it was imperative to eliminate from human affairs (p. 137).

Harris saw that the League of Nations had failed to prevent Nazism and the Second World War because it effectively had no power, its members being *mere sovereign states*. The only solution, Harris concluded, was the formation of a World Federation, an initiative to which he would dedicate much of the rest of his life. He began by writing pamphlets on South Africa and presented a lecture to students and colleagues on the logic behind a World Federation, but had to wait to pursue the project further until after he left the army.

Having been given the opportunity to mingle with generals in Beirut, it appears that at this point Harris had the option of either staying in the army with ample opportunity for professional development, or leave and face the unknown path of academia. Harris opted to go back to Britain and on his birthday, February 19th 1946 became demobilized from duty.

Returning to London, Harris encountered a city totally unrecognizable after the war. Though full of inspiration for philosophical projects, he was unable to secure a teaching position. As was common throughout his life, Harris reconsidered his beliefs in God and sought clarity from religious authority. It was C. E. Raven, from whom Harris heard what he considered a highly convincing reconciliation of science and religion. Apparently, Raven's work convinced Harris of where his convictions lay. Having settled his concerns with an unwavering assurance that scientific findings were in fact complementary with religion, Harris was baptized and became a member of the Church of England.

I accepted Descartes's (and Anselm's) proof, interpreting "that than which a greater cannot be conceived" to mean what Spinoza called Substance, and Hegel called Absolute Spirit. That this could be anything less or other than a self-conscious omniscient mind seemed to me to be unthinkable. Jesus, I believed, was the Son of God in the sense that in his teaching, his life, and the manner of his death – in his whole personality – he revealed to mankind the true nature of God as Love... (p. 141).

He goes on to explain that the very apt commandment requiring a love of God was actually one and the same as love of one's neighbour, and love of thyself. This was a conclusion that remained central to his metaphysics for the rest of his life.

Harris had vowed never to return to South Africa because it did not seem possible to even live comfortably without supporting the suppression and exploitation of the black Africans. Harris recalls his change of heart as follows: "Suddenly, out of the blue, a telegram arrived from Johannesburg offering me a position as lecturer in philosophy at the Witwatersrand University and asking me to name the salary I would require" (p. 141). He was to return to Africa, but with the intention of advocating against those policies he found so barbaric.

Having kept in correspondence with Sylvia since his departure from the College, when she returned to England to study for the bar, it was only a matter of time before she was able to visit Harris in Oxford. "I told her about the offer I had had from Johannesburg that I had accepted, and then I asked her the same question that I had put to Lilo nine years before: 'Will you come with me?' She replied, 'With you I will go anywhere in the world.' We embraced and decided to marry at once" (p. 142). After a quiet wedding with close family they were immediately off to Gilsland for their honeymoon.

1.4 Harris's Academic Career

Upon his arrival at Witwatersrand, Harris began teaching what he describes as a heavy

course load of four courses per semester in Ancient Philosophy, Ethics, as well as the histories of seventeenth and eighteenth century Rationalism and Empiricism. He also managed to catch up on recent works by Collingwood, Russell, Wittgenstein, Carnap, and Ayer, while writing his own book concerning “*International Politics after the atom bomb*”. Additionally, Harris could finally settle into married life with Sylvia in their new home (p. 146).

Ever (apparently) optimistic, Harris used his academic position to advocate for equal rights. This was an uphill battle however, as the majority of votes were held by the Nationalists who dominated the government and maintained Apartheid policies. Harris recounts that the situation was only to get worse until South African policies were made globally apparent through television broadcasts, resulting in international pressure from both the United States and Britain. Harris describes having witnessed blacks being hit by cars with no repercussions for the driver, knowing of physical abuse on nearby farms, and seeing a black man publically punched in the head for no reason. “Such a milieu of prejudice and injustice posed the difficult question how a well-disposed white citizen could, with a clear conscience, continue to live under a regime that automatically gave him or her privileges at the expense of the oppressed and maltreated African majority” (p. 149). These experiences inspired Harris to publish his first book, *The Survival of Political Man* (1950). Here, Harris drew upon Sylvia’s understanding of history and his own insights into international relations to outline what he thought were the principles of political order and reveal the obstacles to true democracy. Much to Harris’s dismay, though accepted by academics in both Africa and Britain, the work made no recognizable impact on the general public.

With their home finally established, in March of 1948, their first son Jonathan was born. Soon thereafter, Harris concluded that he needed to advance his academic standing by completing a Ph.D., for which he secured a fellowship at Rhodes College. Though leaving his teaching position at Witwatersrand meant he would put their philosophy faculty in a difficult position, Harris knew it was the only way he would be able to complete a work sufficient for a doctorate. After some deliberation, he and his family moved to the Rhodes college campus.

My plan was to get into draft my criticism of contemporary Empiricism, beginning by disposing of the current doctrine that the traditional philosophical problems were “pseudo-problems”, and then going on to demonstrate that the current theories were, in effect, repetitions of those of Locke, Berkeley and Hume, compounding their errors and shortcomings (p. 156).

This project was so ambitious that after a year it was only about half completed. Nevertheless, during this time, Harris was able to publish philosophical papers in both the *Scottish Philosophical Quarterly* and *The Review of Metaphysics*. At the same time, Sylvia became pregnant for a second time and on her birthday, the 30th of August, their second son Nigel was born.

Upon completion, Harris submitted *Nature, Mind and Modern Science* (1954) to the University of Witwatersrand and in 1953 received his D. Litt in philosophy. In this work Harris first established his position with respect to both the historical tradition and contemporary scientific theories. Here, Harris proposed five central tenets by which philosophy may progress:

- (i) that mind is immanent in all things; (ii) that reality is a whole, self-sufficient and self-maintaining, and that coherence is the test of truth of any theory about it; (iii) that the subject and object of knowledge are ultimately one – the same thing viewed from opposite (and mutually complementary) standpoints; (iv) that events and phenomena can adequately be explained only teleologically, and (v) that the ultimate principle of interpretation is, in consequence, the principle of value (1954, p. 206).

This work truly ignited his career, with the full repercussions still returning to him years later. In just three years, Harris was to become a professor, then head of the philosophy department at Witwatersrand. It was during this time, just as Harris's professional career came to fruition as his mother had (quite embarrassingly) assured everyone it would, she broke her hip and being too weak for an operation, died of pneumonia shortly thereafter at age 82. With Harris's new socio-economic stability however, he was able to purchase his first house just outside of the city and Sylvia soon gave birth to their third child, Hermione.

The government at this time was increasing its Apartheid campaign, uprooting entire communities to make designated regions exclusively for whites. These policies were then extended to the universities, but famously Witwatersrand resisted, fighting tooth and nail for equal education. Harris used his position as leverage, giving lectures and presenting motions to the Senate "condemning the Government's intention" (p. 169). Though the decision of the Senate had been confidential, Harris leaked the results to a reporter via private correspondence. Harris soon discovered however, that the student body did not support his position. It eventually came to his attention that his liberal position – advocating for democratic terms of negotiation – *was not radical enough*. The student body that was opposed to Apartheid was furious and in no mood for negotiations or empathy. Seeing first

hand for years that blacks were not even dignified as human beings brought both Harris and Sylvia to understand that liberalism was insufficient to catalyze the social changes that were needed and as a result, they reconsidered raising their children in South African society.⁹

Fortunately, the publication of *Nature, Mind, and Modern Science* afforded Harris increased attention and it didn't take long before the first of a long chain of offers were made for him. Harris received simultaneous offers from both Yale University and Connecticut College for a lecture position. As both were equally appealing, Harris managed to strike a deal with the two institutions in which he would be shared. It didn't take long for a house to be found and Harris was able to settle his family in the United States.

Now with personal matters settled, Harris was able to more fully develop his philosophical position and extend his voice into the ongoing discourse of his time. This began with a review of his undergraduate intuitions regarding Bosanquet's concept of the *concrete universal* as a system.

It now appeared to me that Collingwood's exposition of what he called "the philosophical universal" provided this development: i.e., a universal distinguished from the scientific universal (which Collingwood apparently identified with the abstract universal of formal logic) by the fact that within the genus, particular classes overlapped, constituting at one and the same time both distincts and opposites and degrees of adequate exemplification of the generic concept. It was clear to me that this description exactly fitted the Hegelian dialectic (p. 176).

These insights brought Harris to maintain that physics, biology, and psychology had revealed a holistic metaphysics and a world that was "itself a manifestation of the concrete universal particularizing itself as a scale of forms as Collingwood and Hegel had foretold" (ibid). To flesh out his position Harris was invited to participate in the Terry Lectures at Yale in 1957, addressing the relationship between religion and science. Harris's resulting five lectures were later published by Yale as *Revelation through Reason* (1958).

Despite this success, Harris's relations with Yale were increasingly dampened while Connecticut College continued to embrace him far more proactively, thus becoming his primary institution. After spending just a few years in the States, neither Harris nor Sylvia wished to return to South Africa, but as Harris still had obligations to Witwatersrand, he eventually felt obliged to resign from their ranks. At the same time, Harris's colleague and friend Robert Mack at Connecticut College, died of lung cancer, thereby putting Harris in a

⁹ Indeed, Sylvia was to write and eventually publish her own book on racism in South Africa: Mundahl-Harris, S. (1995). *The View from the Cookhouse Floor*.

position to become a tenured professor. Before he could take this position however, having been born in South Africa, unlike Sylvia, Harris faced unyielding visa regulations that required him to leave the country. After a long appeal, he was only given a one-year extension. Harris and his family used this time to travel to Colorado and visit his sister Gwenda, while Harris held a summer position at Colorado College. Upon their return, they purchased a house just across from the Connecticut College campus and soon thereafter Sylvia had their fourth child, Martin Trevor. Despite the ongoing efforts of Connecticut College to secure his visa, Harris was eventually forced to leave the country for at least two years.

From 1959-1960 Harris held a position as Professor of Logic and Metaphysics at Edinburgh University. To lecture at Edinburgh University was a dream-come true for Harris, as he had always wished to hold a prestigious position in a British institution. He recalls being immediately respected by the other members of the faculty and making many friends despite a wide range of deeply contrasting philosophical positions. Most notable of which, was the difference between Harris's position and the logical positivists such as Scot McGowan. The scientists too, such as C. H. Waddington and James Drever, were welcoming and open to extensive dialogue across disciplines. These interdisciplinary conversations proved especially helpful for Harris to further develop his system across logic, biology, psychology, and metaphysics. Indeed, Harris felt that Edinburgh had become a home for him and was warmly welcomed whenever he visited in later years.

When the first year came to an end, Sylvia and the children were able to travel back to Britain to stay with Harris for the summer, a visit that turned into a far more permanent arrangement than anyone had anticipated. Harris was able to send his eldest two boys to the Magdalen College at Oxford, and returned to Connecticut College, where he conducted research for a text about the metaphysical presuppositions of modern science. He explains his motivation for this work as follows:

The Positivists had maintained that only empirical science was the legitimate source of factual knowledge, so I turned to that source intending to show that what it revealed implied a metaphysical world view (Collingwood's "constellation of absolute presuppositions"). I therefore turned Kant's title back to front and decided to call my book 'The Foundations of Metaphysics in Science' (p. 191).

For this project Harris gained a greater knowledge of physics, which led to his argument that quantum mechanics implies a holistic world view that flies in the face of theses espoused by

Wittgenstein, Ayer, and Russell. He admits that he was not trying to do anything new in physics (as one of his editors Michael Polanyi had pointed out), but rather, his goal was to *reveal the implications of what science had already discovered*.

Working his way into the psychological discourse, Harris was fortunate enough to attend the joint meeting between the *Aristotelian Society* and the *Mind Associations* at Cambridge on the subject of perception. As the summer of 1961 drew to a close, Harris received an interview invitation from Glasgow and a simultaneous raise from Connecticut College. He was at odds as to which direction to go. Glasgow represented yet another British academic opportunity Harris had always dreamed of, but Sylvia's quiet disdain for Glasgow combined with the necessity to find a new residence and school for his children was heavy in his mind. In the end – though he later claimed that the opposite decision would have been even better for everyone – his family tipped the scales and they returned to New London.

At this stage of his research, Harris was able to pursue the biological aspects of his argument, taking full advantage of his position by gaining access to microscopes and collaboration with the Connecticut professor of Zoology Bernice Wheeler. As was common in Harris's career however, it didn't take long before another offer was made to him, this time from the University of Kansas. Harris explains, "I was in a quandary [...] Kansas University was not my idea of a very prestigious institution, being more renowned for its football team than its scholarship. But the terms of the appointment were so favourable that they provided a very tempting opportunity for the progress of my research" (p. 195). After considerable deliberation he accepted the offer on the grounds that it provided the best means of helping him finish his book, which he believed, would allow him to go wherever he so chose.¹⁰

In 1962 Harris became the *Roy Roberts Distinguished Professor of Philosophy* at the University of Kansas. Though he had taken sabbatical and even had an assistant help with his writing *The Foundations of Metaphysics in Science*, to his great frustration when it was finally published in 1965, made nearly no impact on the philosophical community. Nevertheless, for the rest of his career Harris believed that this was his most important work. Interestingly, in *The British Journal for the Philosophy of Science* (1966), W. H. Thorpe's

¹⁰ The only objection that Harris mentions from Sylvia was that the summers would be terribly hot so they were to look for a summer home elsewhere. Soon after their search had begun, a call came from Britain regarding the High Wray House the family had once stayed in. It appears that Harris had years ago, half-candidly mentioned to the owner that he would buy it if it were ever for sale and now, it just so happened to be on the market. Though it would take a year for the matter to even come back to him, his initial offer turned out to be the best and he ended up owning a house built in 1728, one in which he would retire during the last years of his life.

review maintained that few philosophers have gained a deep understanding of the recent explosion of scientific discoveries across disciplines, but that if more were to do so we would witness “great conceptual advance”. He goes on to write: “If this happens much of the credit will be due to the thinking of a small band of philosophers among which Errol Harris takes a high place” (p. 263).¹¹

With Vietnam and the Cold War filling the minds of both academics and the general public, Harris was compelled to give a series of lectures regarding the ethics of war and peace. For him, he says, this was a means of updating his philosophical position originally established in *The Survival of Political Man*. The result of which became a new work titled *Annihilation and Utopia* (1966), which again made no more of a splash than his previous works. At this point Harris turned his attention back toward academic opportunities in the East, but was turned down from at least three positions. Nevertheless, in 1967 Harris became President of the *Metaphysical Society of America* and was chosen to chair the 1968 Vienna meeting of the World Congress of Philosophy – the very meeting that established the *International Society of Metaphysics*. Having been one of the original founders of this society, Harris regrettably explains, “I have always felt that the International Society was my baby, although I was never asked to be its president” (p. 212).

During this time Harris published a text that he had been working on for years, which in its final form became an historical textbook, *The Fundamentals of Philosophy* (1969) – purportedly the only work from which he made any money. Never content with his accomplishments, Harris turned his attention to a study of neurophysiology. For this topic he met with many of the psychologists at Kansas University and was given a cubby at the library to conduct his research. All of these projects were for Harris, merely part of his grander goal of establishing and elaborating a metaphysics that could overarch the findings of empirical science.

1.4.1 Late Bloom and Frustrated Efforts

Despite his professional success, for some years to come, Harris was to face a string of challenges that in different ways, all appear to be the result of his being ahead of his time.

¹¹ Indeed, much of the present thesis takes a close reading of Harris’s (1965) *Foundations*, not merely because it is the fullest articulation of his thesis, but because it captures his transdisciplinary spirit to unify disparate theories, and may still provide a novel way of doing so today (as will be further considered in § 8.3.1).

For, in addition to encouraging conversation between scientific and philosophical world views, Harris was outspoken about human rights. While he recalls his students being enthralled by his work, many of his fellow instructors remained opposed to his approach to interdisciplinarity and political reformation.

When Sylvia's mother died the family saw it as an opportunity for change and moved back to their *High Wray* house in England.¹² While attending a meeting of the American Philosophical Association, Harris was opened to a different opportunity. Having been turned down from positions in the North East, when he heard of a potential position opening in Northwestern University he jumped at the opportunity for an interview. Much to the disappointment of his superiors at Kansas University, after just four years he left to become *John Evans Professor of Moral and Intellectual Philosophy* at Northwestern. Finding the environment particularly friendly and conducive to his research, Harris remained at Northwestern until his retirement.

Despite the lack of response from the professional community, Harris continued his personal research, determined to reveal what he felt were the unrecognized and unjustified metaphysical assumptions of empiricism.

My next task, therefore, was to examine empiricist theories of scientific method, and to investigate the actual practice of eminent scientists, to establish (a) whether the former were self-consistent, and (b) what the actual method of scientific procedure had been in the past and remained in the present. This was to be the subject matter of '*Hypothesis and Perception*', on which I had embarked when I moved to Northwestern (p. 211).

The heart of this work was to be a focus upon scientific practice as a critique of empiricism and a response to Kuhn's recent *the Structure of Scientific Revolutions* (1962), of which he was particularly sympathetic, but maintained that he could provide further clarification on the actual process of paradigm shifts. His intention had been to suggest an alternative to formal mathematical logic, in the form of a dialectical algorithm, one that proved itself ever elusive. He explains, "Only later did I realize, when I wrote '*Formal, Transcendental and Dialectical Thinking*,' that dialectical logic could not be formalized in any way, because it was the logic of internal relations, whereas the necessary presupposition of formal logic is that all relations

¹² Sylvia was to notice this conservative perspective much more than Harris however as she was privy to interactions with the parents of other children in their area. The narrow minded and in some cases cold hearted perspectives she encountered (such as one man running over Nigel's bicycle with his car) caused her to be very uncomfortable and never feel at home.

are external” (p. 216).

Since the philosophy department at Northwestern University was ever understaffed, maintaining an average of eight lecturers when they were supposed to have 13, the day eventually came when a new member had to be considered. This process is described as most tedious and academic politics at its best, as no candidate could be decided upon unanimously. However, one such candidate, Philip Grier demonstrated such impressive mastery of Rousseau’s philosophy that as per Harris’s recommendation, he was appointed. Harris explains that he “proved to be an excellent teacher – I have not known any better – and he became, not only a valued colleague, but a close and faithful friend of Sylvia and me – a friendship that has persisted to the present day” (p. 217).

As his age was beginning to catch up with him, Harris found himself afflicted with acute arthritis of his back, causing him to take six months off of his normal engagements. At this point he took up the task of following Spinoza to an increasing degree. With knowledge of Dutch and Latin, Harris undertook two simultaneous projects portraying Spinoza’s contributions to the concepts of human immortality and *Salvation from Despair* (1973). Though his research afforded Sylvia the opportunity to visit Amsterdam while Harris attend conferences on Spinoza, the resulting works were to be rejected from publishers without clear reasons for years to come.

Harris moved on, finding new topics of fascination and research. Having been invited by Clark University to take part in the *Heinz Werner Lecture Series*, Harris’s next subject was again to be perception. For this he criticized Merleau-Ponty, Heidegger, and Husserl, among others, so as to further develop his own position. After his lectures were published in 1974, Harris had a stroke of inspiration:

we would invite the most distinguished physiologists, psychologists and epistemologists, eight from each discipline, who would deliver papers that, with the recorded discussions, we would then publish in book form, a sequel to which I would myself write, formulating a theory of perception in the light of the findings of the conference. Through the Research Office at Northwestern I submitted an elaborate description of this proposal in application for financial support to the National foundations [...] But it was turned down because “the committee thought it would not be fruitful!” Without the necessary funds no such conference could be convened, so the plan came to nothing and I never got round to writing my own mentally projected book on the subject (pp. 222-23).

Clearly Harris was among the earliest philosophers who could see the importance establishing a “transdisciplinary” field of consciousness studies (Zelazo, *et al.* 2007).

Harris presented a lecture series at Tulane University that was published just two years later titled *Atheism and Theism* (1977), a work he considered the long-awaited sequel to *Revelation through Reason* (1958). Nevertheless, at the age of 67, Harris was forced to retire from Northwestern. Feeling very much willing to continue his work, he applied to other institutions until he was eventually *offered* a position as Distinguished Professor at Marquette University. As this was a Catholic and Jesuit institution, Harris was encouraged to fine-tune his work regarding the problem of evil and the nature of God. During a meeting of the Metaphysical Society that year, one interaction that Harris describes appears to characterize his professional disposition:

Richard de George (from Kansas) was also present at the meeting. He said to me, “I hear you have solved the problem of evil.”

“Yes, I’ll send you a copy of my lecture and you can tell me whether I have succeeded.”

When we next met I asked him if he thought I had indeed solved the problem.

“Yes,” he said, “but nobody will believe you” (p. 226).

To Harris’s knowledge he had attended the first official meeting of the Hegel Society in Boston in 1968, but official records indicate that while he had the date right, it began in South Carolina. Nevertheless, through some rather awkward internal policies Harris was elected – as what he believed to be the first – president by default and then replaced by a secondary vote. Eight years later however, he was elected president and held the position until 1978.¹³ During this time, he wrote and lectured as much as possible about human rights in general and the socio-politics of South Africa in particular. Unfortunately, his audiences “were distressingly small, either from lack of publicity or due to excessive competition from other attractions, and many of these efforts to enlist support for my cause left me with a dismal sense of failure” (p. 228). Despite this setback and his “retirement,” Harris secured a position as a research Fellow at Edinburgh University where he worked on what would become *Formal, Transcendental and Dialectical Thinking*. In this work Harris followed Whitehead, contending that while logic and science serve as excellent tools, “exactness is a fake” and so there is need for synthetic, transcendental, and dialectical thought. With Hegel however, he claimed logic “is inseparable from the structure of the actual world, as well as from our understanding of it” (1987, p. 2).

¹³ <http://www.hegel.org/>

Moving back into a study of Spinoza, Harris was invited to attend a conference on the tercentenary of the philosopher's death, which involved embarking upon a journey to Urbino Italy. After a brief return to Northwestern to assist in teaching some courses in Continental Philosophy, Harris made a concerted effort to learn German so as to teach the same subject in this language. Though the later arrangement fell through, throughout this time Sylvia was able to accompany him on numerous adventures through much of Europe.

To his great frustration, after all the arrangements had been made, Harris was denied employment to Loyola University (among others), due to his being over 70. At the same time, having been invited to contribute a chapter into what was to become a volume of essays on F. H. Bradley, Harris's contribution regarding Bradley's conception of Nature was cut from the compilation without explanation. Though Sylvia was unable to accompany him, in 1982 Harris was able to secure a position at Villanova University teaching Hegel's philosophy of religion. His lecture notes for this course were later written into book form but once again, publishers would respond with what he called "empty excuses" for their rejection, or with no explanation at all. In most of these cases, though the works would eventually be published, it would take a number of years and yield little fruit.

In the spring of 1983, Harris and Sylvia set off for Istanbul and the Ionian coast of Turkey, a vacation that he explains was their most beautiful and fulfilled Sylvia's dream of seeing the "remains of Troy (discovered by Schliemann), Ephesus, Pergamon and Miletus" (p. 240). When the two finally settled down, Sylvia took up gardening with a particular passion and singular attention. On one occasion, she worked herself harder than usual until finally being forced to call it a day on account of the unusually hot weather. Upon returning indoors she complained of great fatigue and a pain in her arm and (uncharacteristically) requested a doctor. Calling one hospital after another Harris eventually reached a doctor who, after many hours and a consultation with their primary, finally concluded that Sylvia had had a (rather unusual) heart attack. After spending the night in hospital she appeared to have recovered but before being discharged the following day, Sylvia unexpectedly died.

Harris explains, "as frequently occurred in times of crisis, my emotions became paralyzed and I had difficulty in realizing what had happened" (p. 241). To deal with his grief he committed himself to yet more work, first finding a position at Emory. This would however be his last teaching position as his age finally caught up with him and his memory began to decline. Nevertheless, moving ever further in the direction of physics, Harris gave a lecture at the Trent University called *Time and the World*. From this work he was inspired to consider the natures of time and evolution, leading to the possibility of what Teilhard de Chardin

(1959) has called the *Omega point* and in 1984 was offered to lecture at the Teilhard Center in London on *Omega and Evolution*. After significant expansions this lecture was later published as *The Reality of Time* (1988). For some time, Harris was inspired to continue exploring philosophical topics of physics and secured a Fellowship position at Boston University for this purpose.

In a work published some years later, Scott Kim recalls two summers he spent with Harris when he was 76-77. Having trained as a philosopher in the Anglo-American analytic tradition, philosophy Kim says, was “a method, hardly a way of life.” He goes on to say that for Harris, as was true for Spinoza, “true reason—true philosophy—is not only intellectually satisfying but also demands a love of God and neighbour. True intellectual satisfaction, true religious belief and true community are all one” (2009, pp. 9-10). In their conversations, Kim says that he tried to disagree with Harris in a way that would “provoke him” but found that Harris would respond “without being negative, without aiming to win an argument or to dominate the other. Even when he criticized someone, he said it in a way that sounded more like a description than a condemnation” (p. 10). Despite the modern world’s expectation of what Kim calls “relentless self-promotion even in academia”, Harris wanted nothing to do with this. Instead, Kim finds that Harris’s faith was based upon the truth of his philosophy:

Errol didn’t just write and teach philosophy. He *was* a philosopher. It was his way of being. I have never met a philosopher whose beliefs were more integrated with his life than Errol Harris. His beliefs, politics, relationships, and faith—they all cohered in him, and in the deepest and truest sense, he had *integrity*. Errol’s quiet confidence, unassuming and self-effacing yet dignified demeanor—they all arose from this remarkable center (ibid).

Despite his continued passion for the work, at this point Harris was unmistakably disheartened when it occurred to him that his career had come and gone.

If I had made any slight contribution to my chosen subject, it had gone unrecognized. Some of my pupils seemed to remember me with a degree of affection, but none of them had achieved much distinction in the profession and in no way could I claim that my ideas had “a following.” I had always wanted to devote my life to philosophical thinking, teaching and research, but now that I had done so, I wondered whether I would not have done better to remain in the Colonial Service trying to improve the standard of education and the conditions of life of poverty-stricken Africans (p. 250).

In spite of this outlook, in 1990 the Metaphysical Society of America awarded Harris the Paul

Weiss Medal for his contributions to the field.¹⁴ When presented with the award, Harris's impression was as follows:

I had asked myself why I should have been chosen for the honour, because if I had made so outstanding a contribution to metaphysics, other writers (whether critical or in agreement) would be referring to my work, which was very seldom the case, and that those who wrote on kindred subjects generally ignored what I had written (p. 256).

At the same time, thanks to Philip Grier, Harris was presented with a *Festschrift* written in his honor. Humble to a fault, when the project was first proposed to him, Harris claims to have replied with a warning to Philip, "that he would be undertaking an arduous, thankless and time-consuming task" (ibid).

Upon religious reflection, Harris had settled himself in the belief that although the majority of Christian scripture was symbolic, the Trinity displayed a strong underlying resonance with Hegel and Spinoza's articulation of God, i.e. that of "dialectic wholeness." This led him to a sense of solace in the prospect of dedicating himself to others, to truth and love. Once again feeling compelled to the Anti-Apartheid campaign, Harris contacted the office of Defense and Aid for South Africa at Harvard, as well as Archbishop Tutu, offering his services in any way possible. Unfortunately all this amounted to was a distinguished opportunity to type up news bulletins and fund-raise, though it seemed he was not even trusted enough for these tasks. Harris explains: "Consequently I felt frustrated in my endeavor to be useful. I believed I could do much more and that the use being made of me was relatively trivial" (p. 252).

Deeply concerned with world peace and the environmental crisis, Harris attended the CND and World Federalist meetings in England, but he explains, "nobody seemed willing to heed my arguments" (p. 252). Attending a meeting of the *World Constitution and Parliament Association*, Harris became convinced that it was the most effective organization of its kind and had great potential for working towards Federal World Government. After failing to start a chain letter with a book called *Planethood* that he had come across at this meeting, Harris was inspired to write his own book *One World or None* (1993), to help spread these ideas. Though he would attend other meetings, he claims to have been given little or no opportunity to engage the speakers, who would mostly placate him due to his age and credentials, but ultimately brush him aside.

¹⁴ Interestingly, a number of years later, Philip Grier discovered that (for whatever reason) the society had neglected to mention Harris in their list of recipients for the award and even required convincing of this fact! Nevertheless, his name now appears in their records: <http://www.metaphysicalsociety.org/awards.htm>

Even at this stage in Harris's life he committed himself to attend and on occasion present at physics symposia that regularly included the most famous names of the field. As will be the subject of chapter 4, this brought him in contact with Paul Davies' work on the 'anthropic cosmological principle' – the very issue Harris had been implicitly concerned with for most of his career. At the same time Harris had found an old friend Keith Ashfield, as a new ally at Humanities Press, and subsequently published six texts over the next few years. From 1991-2006, four texts were published that significantly contribute to the following discourse. Taken together, these works highlight the core of Harris's metaphysics, ranging through cosmology, evolution, consciousness studies, and science-religious dialogue. While undertaking these projects, Harris was simultaneously continuing his campaign for a federalist world government, publishing, distributing texts out of his own pocket, and networking with numerous organizations. Unfortunately, these efforts proved fruitless during his lifetime. Uncharacteristically, Harris confesses that whenever he was idle in waiting for responses from contacts or reviews, he would become increasingly depressed. As a result, each time he completed a project he would start another, or work on multiple projects at once so as to never face the down-time.

Harris's concern was that the most recent scientific research was not making an impact on the general public, while at the same time philosophers seemed unable to appreciate the implications of what had been discovered.

The twentieth century paradigm has been recognized and accepted only by scientists (and not all of them), but those in other disciplines, and the public at large, remain unaware of the revolution that has occurred in physics and biology. Consequently human thinking and behaviour is persistently at odds with global, and especially environmental, needs. My thesis was that until common habits of thought become more concordant with the new scientific paradigm the current desperate global problems are unlikely ever to be resolved (p. 259).

Through most of his works – especially *The Restitution of Metaphysics* (2000) – Harris has attempted to provide a framework for re-visioning the relationship between philosophy and science towards a more fruitful future for both. As Grier recalled years later:

Needless to say, most of Errol's philosophical ambitions ran strongly counter to the prevailing philosophical Zeitgeist in the English-speaking philosophical world at the time. He was always perfectly willing and very able to argue for his views in any context, but of course the general response of all too many of those outside the orbit of German Idealist philosophy, or of continental philosophy more broadly construed, was simply to ignore his work, a fact that occasioned endless frustration for him (2009, p. 7).

Approaching his centenary, Harris's efforts were dramatically dampened by numerous health problems, resulting in his reliance on a pacemaker and hearing aid. Nevertheless, Harris remained committed to developing his ideas and sharing them with others throughout the world. During his final years, Harris took up permanent residence at his High Wray house in Ambleside England, where he continued to work on various political and philosophical projects. Despite his professional frustrations, at the end of his autobiography Harris laments that the loss of his hearing was perhaps his deepest regret, but remained ever appreciative of what remained:

At one time, many years ago, music (despite my lack of technical knowledge and ability with any instrument) was almost a religion. It aroused quasi-religious emotion. Now hymn tunes can barely do so. I profit from consideration, help (when needed), affection and visits from my sons and daughter, as well as neighbours; so I can regard myself as lucky (p. 267).

1.6 Conclusion

From his biographical details it is clear that Harris's life was embedded in historically unique periods of social, political, and scientific revolution that significantly shaped his resulting metaphysics. Indeed, the dialectic remained so important for all his work because it first and foremost emphasized the very form of social interactions that he felt were so terribly lacking during his lifetime, e.g. the integration of differences, empathy, and *discovery* of mutual truth. Harris had essentially extended this principle to his philosophy of science, maintaining that development of knowledge will proceed via unity in and through diversity of methods, perspectives, and disciplines. In this way, he anticipated what are now the *transdisciplinary* approaches to consciousness and Nature.

It is no wonder then that his message was partially appreciated by subjective idealists and ignored by analyticians, but what must be remembered is that his system was intended to bridge the gap between these two camps. For Harris, the historical development of philosophy had *incidentally* resulted in the mechanistic system popular during his lifetime, but was inevitably moving toward a *dialectical logic*. Hence, he remained ever optimistic throughout his life that the narrow-minded trends he encountered in South Africa, United States, and Europe would inevitably be overcome. Toward this end, according to Harris, the scientific discoveries of the 21st century have implied a wholeness about Nature that requires a corresponding metaphysics. Harris dedicated his life to detailing the epistemology, ethics, and

conception of Nature that follows from just such a system. The results, he maintained, requires a worldview that unifies cosmology with biological evolution and conscious experience, while avoiding the conclusions of both subjective idealism and empiricism. The key to this system is Harris's conception of the "*dialectic whole*." In the following chapter I introduce this metaphysical concept, its epistemological consequences, and contemporary analogues.

Chapter 2

Harris's Holism and Contemporary Analogues

2.1 Introduction

In this chapter the fundamental principles of Harris's holism will be presented so as to permit comparison with contemporary theses from a range of differing fields. Here I aim not to defend Harris's system, but to demonstrate that Bohm's implicate order and enactivism in particular, rely upon the same concepts of dialectical relations and wholeness as Harris. In addition, I argue that each position applies these concepts to a limited extent and without recognizing their wider implications. In § 2.2, I begin with an introduction to Harris's conceptions of *internal relations*, *scale of forms*, and the *Concrete Universal*. Using these terms, I outline Harris's approach to the problem of consciousness, and epistemology. In § 2.3, I introduce the theories of *autopoiesis* and *embodiment* under the enactivist paradigm, which is the closest contemporary position to Harris's concerning the natures of life and mind. § 2.4 introduces David Bohm's *implicate order*, which offers a quantum mechanical basis for a theory of mind. Here I show that Harris's cosmology anticipated some of the metaphysical implications of Bohmian quantum mechanics. In § 2.5, I propose a synthesis of these three positions – Harris's conception of the natural world, Bohm's implicate order, and enactivism – a synthesis that sets the course for the following chapters.¹⁵

2.2 Harris's Holist Metaphysics

As we have seen, Harris's philosophical thinking certainly brought him career benefits, as well as appreciation and admiration from subjective idealists. Nevertheless, as his position was philosophically contrary to the dominant empiricist worldview of the day, his thinking was largely ignored during his lifetime. Although Harris's terminology and method will

¹⁵ In this chapter I draw primarily from works published in the later stages of Harris career because these works provide the clearest overview of his metaphysics. This means that insofar as Harris can be credited as having anticipated particular philosophical and scientific theories this will be sufficiently argued only in later chapters, where his earlier works are further discussed.

prima facie strike anyone of an analytic background as opaque, I argue that in the face of contemporary science, there are tremendous theoretical riches to be gained by studying his metaphysics. Common across most of his works, Harris begins by laying out what may be called a *phenomenological* foundation, an account of what he takes to be *synthetic a priori* first principles.

Harris proposes that certain propositions about wholeness are fundamental for both scientific observation and philosophical investigation alike. For Harris, such a synthetic whole provides Descartes's *cogito*, laws of thought, and rules for individuation. He maintains that without such presuppositions we would have no figure-ground distinction or object-focused attention. Responding to Kant's question 'what makes *a priori* synthetic judgments possible', Harris proposes "*a priori* synthetic judgments would be established by the demonstration of the existence of wholes with internal relations between their parts, for once the principle of organization is known, universal and necessary judgments about the structure and its parts would be possible *a priori*" (1987, p. 75).¹⁶ Metaphysics he says "is the comprehension of the whole and the exposition of the principle of structure by which it is pervaded" (1988, p. 11). The task of metaphysics then is to organize our experiences, both scientific and subjective, into a single unity, "not simply to reveal the presuppositions of science but also, and more significantly, to trace the process, and presumably, to detect the reasons, for their changes" (1988, p. 15).

A synthetic whole of the kind Harris has in mind will be instantiated iff five criteria are satisfied. I first summarize these criteria before addressing each in the following sub-sections:

- (i) The components are interdependent with one another within their system, i.e. the thesis of *internal or dialectical relations*.
- (ii) The whole is dynamical (a view known as *process ontology*).
- (iii) The whole must contain *different components* organized within a *medium*, what Harris calls a *system*.
- (iv) The components interact in accordance with, and give rise to what Harris calls a *unifying principle* (what is today called dynamical feedback).

¹⁶ At this point, Harris's conception of "coherence" can be understood as what many have called the "systematicity" or interrelatedness of physical laws. This is to say that investigation of phenomena on different spatio-temporal levels can fit together without contradiction (Swartz 2010, 1995; Weinert 1995).

- (v) As a result of i-iv, the whole undergoes a process of self-differentiation, what Harris calls *a scale* of increasingly complex *forms*.

2.2.1 Internal Relations and Process Ontology

For Harris, “dialectical logic” is the logic of *system*, the proper logic of science and metaphysics, one that both includes and surpasses transcendental and formal logics (1987, p. 131). Formal logic, according to Harris, can only posit external relations – relations that are external to their terms. This means the same terms can remain unchanged “in different external relations and the same relations can obtain between different terms” (1987, p. 132). Harris argues however that if relations are external, “they fall between their terms, and then they fail to relate them or to bring them together [...] a new relation must be sought between each of the terms [...] so relatedness degenerates into an infinite regress” (1987, p. 133). According to criterion (i), the thesis of *internal relations* maintains that “physical entities are [...] related in such a way that the nature of the terms depends on their mutual relations and *vice versa*” (1991, p. 24). For Harris, an internally related system is one whose relations determine and are reciprocally determined by the nature of their components. Hence, any changes in entities or internal relations are concomitant and thereby alter the system to which they belong.

In order to apply this thesis and flesh out its implications, it is important to understand what it does not claim. First, it is crucial to notice that Harris does not consider internal relations between individual entities but only within or among a system of entities.¹⁷ Second, this position is not claiming that *all* relations modify or in some way influence their terms, i.e. *that all relations are internal*.¹⁸ The latter would imply, “the idea that whenever there are some things, there exists a whole that consists exactly of those things—i.e., that there is always a *mereological sum* (or “fusion”) of two or more parts” (Achille, 2014). Here we can have a gerrymandered set of entities, in which case alteration of the set does not change the entities therein and vice versa – such a whole is conventional and *arbitrary*. Lastly, Harris

¹⁷ Providing general support for Harris’s thesis, Blanshard considers the relations between two entities A and B: “If the absence of that relation would leave A as it was, the relation is external. If, when the relation was absent, A would be different, or would cease to be, the relation is internal” (1989, p. 3). Note that this ‘difference’ must be fundamental to the phenomena in question, not arbitrary/ conventional. Additionally, it would be incoherent to speak of internal relations between two individual entities unless those entities themselves compose a *system*.

¹⁸ This was the very position that Moore (1919, p. 3) (perhaps unnecessarily) argued against.

would agree that any given relation such as X is taller than Y , is not going to somehow impact the nature of the respective terms (e.g. Y changes when X 's height is increased). These relations are indeed external and extrinsic.

Harris claims that within a whole, “the membership of each part will be conditioned by its relations to the other parts, and it will be the member it is because of these relations and because the other parts are as they are” (2000, p. 112). Internal relations are here understood to be *intrinsic to the nature of the entities* and according to Harris, all entities must have some such relations. One particularly important implication of this contention is that internal relations become necessary for identifying, and thus *individuating* an entity. In other words, it follows from Harris’s reasoning that what are typically considered intrinsic properties, obtaining just in case some entity exists, are in physical reality, *derived from a system of internal relations*.¹⁹ The argument is that any identifiable entity must be part of a system and that its nature depends upon certain relations within that system: relation R is internal iff it obtains between entity X and system Y , such that alteration of R results in an alteration of X and Y .

Importantly, what Harris says about internal relations is meant to be relevant for both *the world we observe and our observation of the world*. On the one hand, in his *Foundations*, Harris anticipated the *holomovement* (discussed below) maintaining that “The-rest-of-the-universe is a constituent of every quantitative assessment – in short, the whole is immanent in every part and determines the dimensions of the part” (1965, p. 107). He goes on to claim that quantum mechanics has shown us “[w]hole and part are mutually determining and no detail could be other than it is without making some difference, however slight, to all the rest” (ibid). Harris summarizes his philosophy of science as follows: “If the results of contemporary science are taken seriously we must acknowledge holism to be pervasive throughout the world, and all relations actually obtaining between real existents and their constituent parts to be internal” (1987, p. 133). On the other hand, Harris maintains that in the case of observation, isolated sensations are not even perceivable: “Only structures, the simplest of which is a figure-and-ground Gestalt, are ever cognized [...] Accordingly, the cognition of any object whatsoever requires a synthesis of a manifold – a grasping of a

¹⁹ It may also be noted that mass, a measure commonly referred to as intrinsic, is itself relational: the relative concentration of matter in a given inertial frame, the speed of which is again relative to light and other mass-bodies.

plurality in unity” (1987, p. 77). Of course these are bold claims and will be reconsidered in due course.

One of the earliest applications of internal relations to the philosophy of science was Whitehead’s *Process and Reality* (1978; 1929), by which Harris was considerably influenced. According to this early presentation of the theory, everything we consider to be concrete existence is more accurately understood as a process of becoming (Seibt, 2013; Hustwit, 2015). Similarly, this is what Harris has in mind with respect to criterion (ii), that there is a process of participation, whereby the nature of a given entity is continually brought forth in virtue of certain interactions the entity has that are necessary for its being.²⁰

The boundary of a whole, Harris claims, is the locus of conflict that arises between a given whole and its *other*, i.e. its background or whatever is not the system. This conflict brings about what Harris describes as a vacillation “between denying its other and affirming its inevitable dependence upon it...” (1991, p. 18). In any whole the elements into which the system differentiates are considered to be finite in that each is limited and defined by what it excludes and what negates it.

The result of this conflict is relative chaos and contingency in the unfolding of relations among the elements within a complex, which is overcome, and unity reestablished, only when identity in and through differences is acknowledged, so that the effort of the finite to maintain itself and to persist in its own being succeeds only when it reaches out (so to speak) beyond its own limits to embrace its other and unite with it in mutual complementation in a larger and more comprehensive whole (1991, p. 19).

This “dependence” upon the other is what Harris describes as “self-preservation.” While “self-preservation” applies either to a-biotic or living systems, unlike Whitehead, Harris rejects the idea of mind (or prehension) in abiotic systems.

The upshot of internal relations is that entities are dependent upon but also in conflict with the others within a common system. Reconciliation of oppositional and conflicting natures between wholes takes place through the development of new wholes, which leads to further differentiation. For Harris, internal relations can provide a paradigmatic frame by which structures of phenomenology and processes of nature may be more clearly understood. Harris

²⁰ Although most who invoke this thesis, including Harris, do so with the intent of making an ontological claim, at this point I only wish to emphasize the weaker, epistemic claim: if bodies, elements, or entities do not interact and relate in particular ways, we the observers cannot justifiably attribute any *properties* to them (nor can we be sure they exist).

has argued that one important implication of positing internal relations in nature is that the *dialectic* notion of “reconciling conflict” through “synthesis” can be extended to evolution in general (e.g. via symbiogenesis). In the following sections, this process is examined in greater detail.

2.2.2 The “Unifying Principle” and “Explicative Process”

In Harris’s system the unifying principle and explicative process are the most important terms to understand if one is to follow his arguments regarding evolution and the nature of consciousness. To do so it is imperative to understand his conception of the *Concrete Universal*. “Traditionally”, Harris claims, abstract universals are understood as “a class under which its particulars are subsumed”, while particulars are understood to be concrete, demonstrative qualities that compose individuals (1991, p. 23). For example, according to Newtonian physics and the empiricist philosophy, particulars were concrete and universals were abstract. If we are to maintain internal relations however, Harris claims that we must also posit a *Concrete Universal*: an overarching principle that specifies the physical relations that are possible and thus governs the evolutionary trajectory of the whole (1954, ff. p. 233; 1965, ff. p. 467). “A principle of this kind is universal because it prevails throughout the system and is universal to its parts. It integrates them into a single concrete whole...” (1991, p. 24).

Concerning criterion (iii), to be a *system* requires that components must exist within a “continuum” (i.e. any substance or framework organized into an interval), for without which, the respective elements could not interact, there would be no coherence, and thus no whole. Harris maintains no continuum can be homogeneous because homogeneity implies parts that are completely uniform and indistinguishable, which excludes the difference necessary for continuity of relationship. If the parts do not differ, at least in position, “space collapses to a single point; and a single point apart from and unrelated to other points is *nowhere*, and so no point in space” (1987, p. 138). Within say, a 2D series, there cannot be total irregularity: “For absolute irregularity means a total lack of continuity between the terms of the series, so that once again the continuum would be dissolved” (ibid). Positing such a system as *totally homogenous* or *totally random* amounts to what Harris calls the “fallacy of spurious homogeneity” (1965, p. 462). As a result, Harris holds randomness is always relative to order and so “order is prior to disorder; and the primary form of order is continuous seriality in a

heterogeneous but graded scale of overlapping terms” (pp. 139-40). This Harris claims, will be true for every system.

With respect for criterion (iv), in a genuine whole, the parts are adapted to one another in a way that conforms with what Harris calls a *unifying principle* – a “system”, “Gestalt”, “scale”, “field”, or “phase”, that is a partial instantiation (subset) of the Concrete Universal. Harris maintains the determination of the parts of such principles is the same as the determination of these principles by the overarching Concrete Universal. “If every element in the whole is a particular specification of its universal principle of order, they must all have something in common, yet equally they must all differ...” (1987, p. 135). Harris takes an abstract mathematical space, or ordered manifold as the simplest example of the unifying principle.²¹ Originally, Harris maintained that in mathematics “a function at once signifies the uniqueness and cohesion of the totality and regulates the distinguishing relations of the elements of which it is composed and in and through which the organizing principle is expressed” (1965, p. 83). A space of this kind is considered the simplest model of such a whole, as it “implies an interlock between parts that are systematically interrelated (as in a jigsaw), so that their mutual relations are governed by a principle of order or organization that pervades the entire structure” (1991, pp. 17-18).

Importantly, Harris remains *nominalist* about the unifying principle, thereby denying that such forms can really exist as abstractions. He writes, “this structural principle is nothing, or at best a mere abstraction, unless it is embodied and expresses itself in the multiplicity of the elements comprising the system” (1987, p. 144). For example, Harris appeals to the widespread proliferation of fractal geometry identified in the development of natural systems where, he argues, overarching forms are iterated across spatiotemporal scales (1991, ff. p. 35).²² Here the materially instantiated *form* and *function* of a system is identified as a *unifying*

²¹ For example, all shapes depend upon the system to which they belong for their properties to obtain, i.e. as in Escher’s (1989) *plane division*, there is an internal relationship between angles, faces, internality, and externality of an object. A more modern example is *cellular automata*. In this case, the nature or *state* of each cell depends upon its relations to an immediate neighborhood and that neighborhood further depends upon its relationship to the total system. The unifying principle can also be exemplified as the *update*. Here, each cell within the whole must interact with those in its neighborhood and the way in which they do so is determined by (and thus demonstrates) its overarching law(s). For further details see Wolfram’s Mathworld: <http://mathworld.wolfram.com/Manifold.html>; <http://mathworld.wolfram.com/TotalisticCellularAutomaton.html>

²² As will be discussed in later chapters, similar conceptions have been developed in general systems theory (GST) under the terms of *emergence*, *order parameter*, and *attractor* (Hooker, 2011).

principle in that it imposes an organization that determines the unity of its parts, but also depends upon the specific material manifestation of its parts. Only as materially instantiated systems can the unifying principle reflect the Concrete Universal to some degree of adequacy (2000, ff. p. 106). In this way, Harris’s holist metaphysics is compatible with a kind of *ontic structural realism* (OSR) that takes relations and their structures as fundamental and interdependent.²³

Concerning criterion (v), when applied to the whole of Nature, Harris maintains, internal relations avoid the infinite regress of external relations and result in a boundless progress, i.e. the generation of a *scale of forms*. The “self-differentiation of system” he writes, involves the “explication of a totality”, an “interplay of unity and diversity” that must be understood as “a perpetual dynamic activity”, but one “prior to all temporality and process because it is already involved in any succession or movement” (1987, pp. 144-45). In other words, Harris considers temporal change to be a facet, not an exhaustive depiction of this process. In this process, Harris claims, each whole that arises supersedes, includes, and transforms those beneath it, while implicating those that may yet develop: “progressing by successive steps, from a primitive element up the scale of degrees of more adequate manifestations of the universal principle, the totality that is immanent in every element and every phase of the process develops” (1991, p. 20).

One can imagine this progression as the formation of a picture in a jigsaw puzzle as convex and concave of its pieces are brought together. However, if all entities of internal relations “overlap”, Harris finds each relation has the potential of establishing a context within which new wholes may be generated (2000, pp. 108-9).²⁴ Harris argues that in nature, this process is ongoing; the immanence of a whole in its parts drives the components from contradiction to supplementation, augmentation, and completion – *the picture emerges with increasing clarity as more complex relationships come into being*. “So the process of successive unifications of opposites is propelled toward the generation and eventual achievement of greater wholeness” (p. 113). Harris holds that a “scale of this kind is

²³ For a recent argument toward this end see McKenzie, K. (2014, a/b). I will return to this topic in § 5.2 below.

²⁴ Though unrecognized by Harris, Whitehead’s (1978) concept of the “*society*” serves as an anticipation of his unifying principles. For Whitehead the “*society*” meant any (becoming) actual occasion (or interrelated *nexus* of entities) serving as a (layered) environment that influences the becoming of its constituents. The members or occasions of a “*society*” exist in virtue of the laws of their society and also *bring their laws into being* (p. 91). Likewise, Harris’s conceptin of evolution bears striking resemblance to Whitehead’s appeal to the *creative process*, but they differ in that the former endorses teleology, while the latter dismisses it.

dialectical because it proceeds through opposition and distinction which is at the same time complementary, interdependence and mutual identity” (1991, p. 20). The Concrete Universal (or the *form of all forms*), thus exerts a *conatus* that “differentiates itself” into each of its respective phases or unifying principles (p. 24).

Henceforth, the scale of forms is to be denoted the *explicative process* (€): The evolutionary process of self-differentiation attributed to the Concrete Universal whereby new *wholes* (or phases), permitting new forms of internal relations are generated. This Harris argues, is a common principle of cosmological and biological evolution, as well as psychological development (to be discussed in later chapters). Harris maintains that the following conception of material self-differentiation can be vindicated in contemporary science:

energy is matrix and its laws are the principles of motion in the physical world. It manifests itself as curvature in the space-time continuum [...] It manifests itself likewise as gravitation governing the movement of matter in space, the formation and the motion of the heavenly bodies, and the structure of the universe generally [...] in elementary particles, in atoms, in molecules, and in chemical bonds and affinities between diverse substances, right up to the complex macromolecules which make possible the self-reproductive chemical cycles typical of living activity (1987, pp. 151-52).

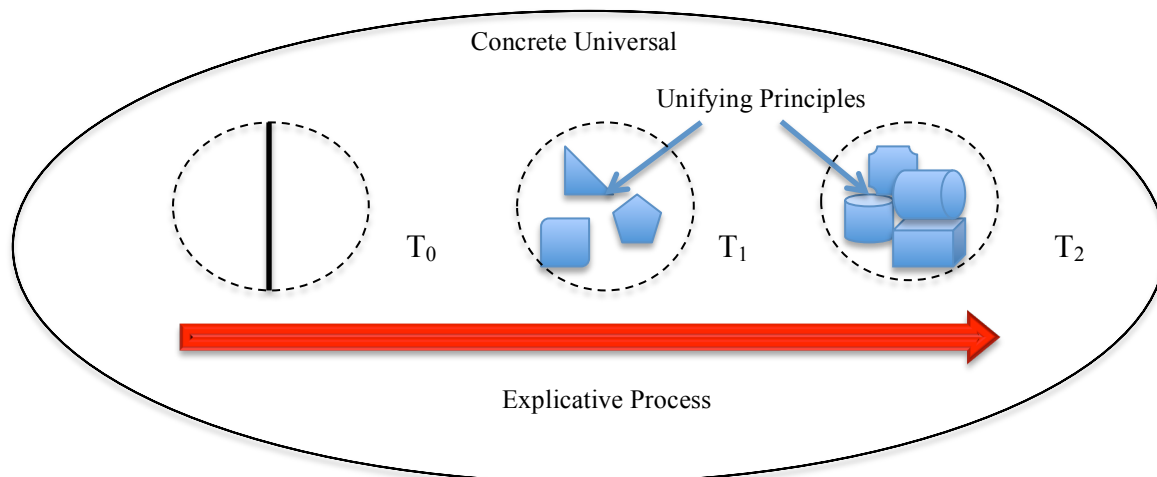


Figure 2 – Explicative process, unifying principle, and Concrete Universal. At t_0 Nature or Being is considered not homogenous but differentiated in a primitive way, here symbolized by a simple *asymmetry*. At t_1 differentiation establishes unifying principles characterized by structures and process of corresponding domains. At t_2 increasingly complex unifying principles emerge that build upon those of a previous stage. Harris refers to the transitions in complexity as steps in a scale of forms, each partially reflective of the whole, which he calls the Concrete Universal. The specification of a scale of forms through time is here denoted the explicative process.

Harris's prime example of a unifying principle is the self-organization of living being. In his *Foundations*, Harris proposes *auturgy* as a term distinguishing living from non-living systems by their adaptive capacity to do self-work (1965, p. 180).²⁵ Here for the first time in the scale of forms, "metabolic transformations" permit a system "to create and sustain individual structure, spontaneously adjusting itself to external circumstances and adapting its operation amid changing conditions so as to counteract influences that would otherwise bring the sustaining processes to an end" (1991, p. 64). This he calls "self-determination", and in agreement with Hans Jonas, "the first form of freedom" that "foreshadows consciousness" (ibid).

Crucial for later discussions, Harris holds that a direct implication of *auturgy* is *embodied cognition*, a conclusion that he derived from Aristotle and Spinoza. Accordingly, the mind and body are understood to be two aspects of one *living* system, i.e. the mind is the *form* of the body and (from the later philosopher) the body is the primary *object of intention* for the mind (e.g. 2006, pp. 98-99). Harris maintains that neither description of phenomenal experience, nor the actual neural discharge deserves primacy:

It is not merely a matter of describing one set of facts in two different ways, but of one reality manifesting itself in two different forms [...] Neither is reducible to the other. The entity which is both has two forms of being, just as (analogously) a triangle exists as three straight lines on a plane forming three angles, and as a distinctive three-cornered shape (1973, p. 84).

Harris claims that the "most widely canvassed theories of perception today seem to agree in rejecting the notion that the percept is an immediately given atomic and simple datum that can be isolated from all others and from other elements in experience" (2000, p. 85). Rather, Harris holds that perception is more appropriately understood as an "achievement", the end result of an active and "discursive process" that presupposes a given body of knowledge. This achievement, he argues, is not to be seen as intellectual, involving the manipulation of atomic

²⁵ Harris recognizes throughout his works that his philosophy of Nature, and conception of the whole can be originally traced back to Aristotle's *Scala Naturae* in which there are a series of phases whose relations are "for the sake of their form" (1991, p. 174). Notably, Harris (e.g. 1965; 1995) also drew this conception from Spinoza's monism in which there exist numerous *attributes* and *modes* of a single Substance (see Morgan 2002, *On God*; ff. p. 40). Likewise, Harris (1993) follows Hegel's (1977) conception of *Absolute Spirit* as implicit in each phase of Nature, but ultimately realized in self-transcendent consciousness. Harris follows Collingwood's (1933) development of a scale of forms "that specifies what he identifies as the philosophical universal and claims that it was in fact "what Hegel and his successors had called the concrete universal" (2000, p. 103).

symbols. Sympathetic to Merleau-Ponty, Harris maintains, “perception is a functioning of the body as a whole, and not just the sense organs” (2000, p. 87).

Harris claims that there is no zero or pure beginning in the scale of forms, but it does not continue on unfulfilled forever either. Rather, the Concrete Universal is implicit at each phase and becomes complete only when fully actualized in self-awareness. Thus, he maintains that consciousness of the Concrete Universal is itself an essential phase of the explicative process:

wholeness, by its very nature, involves dynamic and dialectical self-specification, by way of self-enfoldment (with consequent overlap of specific forms). It tends towards intensification of centreity, increasing self-sufficiency and widening comprehension, and culminates as an all-embracing awareness of an all-encompassing world (1991, p. 26).

Roughly, this is how Harris’s metaphysics encapsulates his theories of life and mind. While he refers to his position as *monistic*, as I argue below, by embedding consciousness in the scale of forms, Harris has effectively provided a means of re-visioning *neutral monism* (NM).²⁶

2.2.3 Implications for Epistemology

The central contention that made many of Harris’s mainstream contemporaries wary was his persistent criticism of the epistemology and methodology of empiricism. Harris claims the world-view of contemporary science contradicts the long-standing atomistic, mechanical, and dualistic theories about knowledge and nature. For Harris, scientific practice reveals an unavoidable commitment to a holistic metaphysics that contextualizes empirical observation. Consequently, the implicit assumption that formal and mathematical logic are the gold standards of reason is brought into question. He calls for a “scientific philosophy” to be “carried out conjointly by scientists and philosophers in collaboration” (1965, p. 32). The goal of this project is to critically assess the methods and fit disparate branches of science “into a coherent world-concept” (ibid). Following this line of thought, much of Harris’s career was devoted to proposing such a scientific philosophy, in which the appropriate world-view is dialectic, holistic, organismic, teleological, and hierarchical. This section is devoted to unpacking Harris’s “logic of system” (1987, ff. p. 131).

²⁶ For an introduction to NM see Stubenberg (2014). For a recent historical analysis and revision of this position see Banks (2014).

Harris claims the verification principle upon which empiricism has been built is “untenable” because sense perception does not and cannot be of immediate self-evidence.²⁷ In addition, he holds that appealing to abstraction so as to isolate terms of philosophical analysis cannot avoid this challenge. Harris’s reason for this is that perception depends on the identification of a context for its interpretive strength, one that is a result of thought’s *discursive activity*. Harris claims, “[e]xperimentation is, in fact, the question that the scientist puts to nature, and no question arises unless some theory is already being entertained.” Accordingly, even the simplest observation is also “interpretation in the light of prior knowledge” (2000, p. 13). Here Harris takes issue with the verificationist picture of scientific practice and maintains that classical logic is incapable on its own, to facilitate or reflect the development of scientific philosophy. He argues this is because no objects of experience are ever based strictly on *atomic observables*, but depend upon presuppositions and paradigm.²⁸

We must notice that this priority of structure to individuation is not just an empirical discovery but is essential to any and every principle of individuation. What distinguishes and defines individuals is their relations to one another; and every relation of whatever sort presupposes a background system appropriate to it (1965, p. 456).

For example, Harris takes a given “mark” on a given “body” (e.g. a thermometer) as having no meaning unless it is correlated with other bodies in a meaningful way, which presupposes an observer/experimenter with a finite complex of assumptions regarding relationships between elements of the *system as a whole*. Harris stresses that no direct observation is possible without a “connection between matters of fact and universal rules of correlation” (2000, p. 29). Importantly then, theories about the world are “*constructive* of system rather than either inductive or formally deductive, and it demands a logic akin to both yet identical with neither” (p. 20).

²⁷ Considering the history of science, Harris points out that not only some of the most important discoveries (e.g. those of Kepler, Galileo) have not been made by direct observation, because in many cases such observation was not possible due to technological constraints (1970, p. 183). On the contrary, many discoveries have come from theoretical inference as opposed to mere deduction from simple observable ‘facts’.

²⁸ Indeed the claim that “nothing exists except matter is not empirically verifiable...” (2000, p. 2). *Verification*, he maintained, consists in systematically assembling diverse and corroborative evidence, the interconnections of which make denial of the resultant theory “impossible” without resulting in a “breakdown of the entire conceptual scheme.” *Falsification* “consists in failure of corroboration, which demands either modification of the theory or discovery of new connections that will reconcile the conflicting evidence (2000, p. 93).

Laws (or principles of order) are considered *synthetic*: “General laws are not revealed by direct observation, and if derived from inductive inference, they cannot be confirmed by any one particular observation, nor are any number sufficient” (2000, p. 26). In this vein, by denying the possibility of *a priori* knowledge as empiricism has done, Harris finds we lose not only metaphysics but also any sort of organizing context. As a result, all propositions become tautological on their own terms and unrelated to one another. Without such a synthesis, theoreticians and scientists alike are no longer dealing with a ‘coherent reality’, are unable to appeal to past experiences, and lack a basis for their claims about the world. Again, to make his point clear, Harris maintained that the *unifying principle* is a structure of both knowledge (e.g. scientific theory) and the world (e.g. self-organizing systems):

A scientific theory is itself a principle or organization systematizing the observed facts within a specific field of experience. It formulates laws that determine and interrelate the facts, and it interrelates both facts and laws according to logical principles, so as to form a coherent whole. The logical principles are precisely those we are seeking: namely the laws of systematic and coherent thinking (1987, pp. 142-43).

A theoretical system then is an example “*par excellence*” of systematic order and its parameters are the logical principles upon which the theory relies. Of utmost importance for the process of scientific development, facts are always, “organized by a principle or law, or a set of such principles themselves interrelated according to some higher principle” (1970, p. 350). Principles thus designate the domain in which the facts are expected to obtain and “provides the rule of inference” (ibid). For Harris, the aim in scientific progress is to remove contradiction and continuously reveal the principle of order in a given domain, which emerges as a new theory. Certainty would require insight unto “a complete systemic whole of reality” (2000, p. 32), because in “any given situation the observable facts are infinite in number” (p. 88). Though this level of certainty is never reached, Harris maintains that human endeavors get ever closer to it as we achieve more holistic methods of observation and synthesis – that is, by accounting for a greater range of relations.²⁹

²⁹ When considered categorically Harris claims a theory, “is always partial, truncated, and incomplete. It is true only in a slight degree, for what it omits and fails to specify, when brought into the limelight, modifies, if only by explication, its intrinsic meaning” (1987, p. 205). An interesting example he provides of this is the precession of Mercury’s orbit, which was an anomaly for Newtonian physics, but could be accounted for in relativity and as a result “qualifies” the limits of the previous framework (ibid).

Scientific practice thus reveals the presupposition of theoretical or metaphysical scaffolding, which takes the very form of the internally related whole discussed in the previous sections. Over the course of continued application to observable phenomena, the form of this synthetic whole is overturned by increasingly coherent alternatives. An alternative is *preferable* insofar as it exhaustively encapsulates the former systems, thereby accounting for the limits of their organization. This is after all a *dialectical philosophy*, in that there is a continuous effort to reveal the foundations of rival camps and vindicate them to some degree, putting each in their rightful place within a hierarchical whole.

The most essential points of Harris's system established heretofore may be summarized thus:

- (1) Properties of natural systems (unifying principles) depend upon and are derived from processes of internal relation that they bear to the wider system to which they belong (Concrete Universal).
- (2) Every proper system is organized by a unifying principle that arises from and instantiates some set of internal relations upon its constituents.
- (3) Process ontology combined with internal relations results in the directed genesis of unifying principles (a *synthetic* scale of forms €).
- (4) The resulting "dialectical whole" is inherent in science, philosophy, and phenomenology, i.e. Harris claims this structure-process is fundamental to our knowledge (paradigms) and to Nature (ontology).

The remainder of this thesis is devoted to fleshing out implications for the anthropic principle, and the hard problem of consciousness that follow from Harris's system. Toward this end, I next take a preliminary exploration of what are today some of the most sympathetic positions with respect to Harris's holism: *enactivism* and Bohm's *implicate order*.

2.3 Analogies with Autopoietic Enactivism

Though enactivism is relatively new, first appearing in Varela, Thompson, and Rosch's work *the embodied mind* (1991), its primary tenets can be traced to Bertalanffy's (1950) *outline of general systems theory* (GST), Maturana and Varela's *cognition and autopoiesis* (1972), and a host of phenomenological theories developed since the early twentieth

century.³⁰ Today *autopoietic enactivism* (AE) can be characterized as endorsing a particular version of the “4-E thesis”:

- (1) *Enaction* – cognition is not a state or substance, but a self-organizing process. This thesis takes issue with *representationalism*, which claims that mind is composed of a symbolic manipulation system exhausted by the brain.
- (2) *Embodiment* – cognition obtains as a feature of an organism as a whole. This is a rejection of classical *modularity*, which posits cognitive systems (among others) as distinct and limited to the brain.
- (3) *Embedded thesis* – cognition depends upon *on-going* social and environmental interaction. This thesis rejects *nativism*, which maintains an individualistic and independent view of cognitive development.
- (4) *Extended thesis* – mind is (at least partially) constituted by environmental features, rather than being limited to computations of the brain as is the case for classical cognitive science.

Starting with Capra’s (1996) synthesis of autopoiesis and complexity theory, numerous works have either elaborated or contributed to a common 4-E foundation, including: *neurophenomenology* (Varela 1996; Thompson, 2006); *extended mind theories* (Clark & Chalmers, 1998); *participatory spirituality* (Ferrer, 2002); *collective mind theories* (Theiner, 2008); *extended neutral monism* (Silberstein, 2009); *organizational theory* (Magalhaes & Sanchez, 2009) *radical enactivism* (REC) (Hutto & Mylin, 2013); and *enactivist education theories* (Reid, 2014; Li & Winchester, 2014). While all of these branches of the *enactivist paradigm* (Stewart, *et al.* 2010) bear significant commonality with Harris’s system, the present thesis is devoted only to evaluating the extent to which Harris anticipates and broadens the metaphysical foundation for AE. Toward this end, in the following sections I

³⁰ Among the philosophers that have contributed to the historical development of this thesis, William James (1884; 1981), Edmund Husserl (1983; 1989), Merleau Ponty (1962; 1963), and J.J. Gibson (1950; 1979) have been invaluable. These philosophers remain important today in part because many of their theories and concepts have become useful in interpreting the results of scientific experiments. For this reason, it will be helpful to remember that in what follows many of the arguments to be examined have stemmed from one or more of these respective philosophers, but unfortunately (this being a contemporary argument) space prohibits sufficient discussion of their original arguments.

show that AE is built upon many of the same metaphysical presuppositions as Harris's holism, including analogues of *internal relations*, *process ontology*, and *unifying principles*.

2.3.1 The Unit of Cognition

The theory of autopoiesis (self-creation) is both a cornerstone and characterization of enactivism. I argue that this theory is the most significant modern manifestation of Harris's unifying principle in the philosophy of biology. Developed by neuroscientist Francisco Varela and his mentor, biologist Humberto Maturana (1972), the theory of autopoiesis was intended to describe and explain the self-emerging, self-maintaining operation of individual cells. Since its early use however, the theory has been applied to the organization of virtual processes, the living body, and social systems. The hotly debated implications of this theory are far-reaching but the most important for the present purposes concern what its proponents consider a "deep continuity of life and mind. According to this thesis, life and mind share a set of basic organizational properties, and the organizational properties distinctive of mind are an enriched version of those fundamental to life. Mind is life-like and life mind-like" (Thompson, 2007, p. 128).

According to Reid's (2014) synthesis of Maturana and Varela's works, the necessary and sufficient conditions of an autopoietic system are now: (a) *self-production* – synthesizing its own components; (b) *embodiment* – physically instantiated; (c) *self-organizing* – recurrently maintaining itself in a steady state; (d) *composite unity* – being distinguishable from a background medium; (e) *interactionally open* – exchanging matter and energy with its environment; and (f) *dynamic* – recursive and emergent (ff. p. 153). In concrete terms, this implies that the system maintains a semipermeable boundary, a reaction network within the boundary, and that the two are interdependent (Thompson 2007, p. 103).

Additionally, AE supporters maintain that when the reaction networks within such a system are interdependent with one another and coupled to an environment, the resulting dynamics are sufficient for *adaptivity*, which is believed to demonstrate minimal cognition *and* intentionality. This is because the system is considered to be *about* its own preservation. "Cognition" is therefore considered to be "behaviour or conduct in relation to meaning and norms that the system itself enacts or brings forth on the basis of its autonomy" (Thompson

2007, p. 126).³¹ To support this point, AE appeals to complex systems theory to explain the shift from chemical to intentional as a *dynamic co-emergence*:

Dynamic co-emergence means that a whole not only arises from its parts but that the part also arises from the whole. Part and whole co-emerge and mutually specify each other: A whole cannot be reduced to its parts, for the parts cannot be characterized independently of the whole; conversely, the parts cannot be reduced to the whole, for the whole cannot be characterized independently of the parts (Thompson, 2007, p. 38).

In *The Embodied Mind* (1991) Varela, *et al.* originally argued that an organism's world and respective biologic structure bring each other into being through *interactive coupling*. They hold that "organism and environment are mutually enfolded in multiple ways, and so what constitutes the world of a given organism is enacted by that organism's history of structural coupling" (p. 202). This means that the meaning generated by an organism is not only permitted by its physiological structure but also, constrained by its phylogenetic and ontogenetic *histories* that have established this structure. Sensory and motor structures are understood to be interconnected and interdependent, such that each influences the form and function of the other. Qualities of the environment do not exist independently of the organism, just as those of the organism cannot exist independently of their environment: *both organism and environment define each other through time*. The result is what can be called an on-going *sedimentation effect*, in which past modes of coupling to an environment provide the means for, but also constrain future coupling. Hence, the enactivist slogan that cognition is like "laying down a path in walking" (Thompson 2007, p. 180).³²

Thompson argues that organizational-operational closure generates a circular relation between an autonomous system and its milieu. This is to say that the part and whole cannot be analysed independently and that each arises from the other. In consequence, (following Merleau-Ponty), AEs argue that the organism cannot be understood as composed of mechanical relations, in which each part can be understood as decomposed "one-one unites", but only with "dialectical relations":

³¹ It is important to note however that natural whirlpools or the like are not autopoietic because *they do not create their own components*, nor do they maintain an internal environment of *lower* entropy than their external context. This is an issue to which I devote significant attention in chapter 6 below.

³² Autopoiesis will be compared with Harris's auturgy and their respective conceptions of intentionality and cognition will be more thoroughly discussed in § 6.2 below.

a dialectical relation is one in which (i) A determines B, and B determines A (bi-directional dependence or reciprocal determination); and (ii) neither A nor B is analyzable into discrete, causally efficacious elements that stand in a one-one correspondence (nondecomposability). Further, dialectical relations are dynamic, not static. Hence (iii) A alters B, and B alters A... (Thompson 2007, pp. 68-69).

Here we can plainly see that the AE appeal to dynamic co-emergence and dialectical relations in their theories of mind and life follows the same reasoning as Harris's *internal relations* and *unifying principle* (e.g. auturgy), which are crucial pillars in his own metaphysics.

2.3.2 Embodiment Theories

According to Wilson & Foglia's entry in the *Stanford Internet Encyclopaedia of Philosophy*, the embodiment thesis holds: "features of cognition are embodied in that they are deeply dependent upon characteristics of the physical body of an agent, such that the agent's beyond-the-brain body plays a significant causal role, or a physically constitutive role, in that agent's cognitive processing" (Wilson & Foglia, 2011). Proponents of the embodiment mind thesis maintain that rather than merely processing information, we make meaning of our world by projecting our bodies into it (despite this projection occurring mostly unconsciously). The body then can serve as a *constraint*, a *distributor*, and/or a *regulator*, of cognitive functions.³³ The remainder of this section introduces the kind of embodiment theory that AEs are poised to endorse.

In introducing embodiment theory, Shapiro, L. A. (2012) finds that, Gibson's *ecological psychology* (EP) concerning visual perception has provided significant motivation. "For Gibson, perception is strongly coupled with action, because most of the invariants within the optic array do not appear except against a background of change. Perceivers actively scan, move within, or otherwise manipulate the environment" (p. 121). EM thus rejects the "classic sandwich" of *information processing* consisting of (i) perception (input); (ii) cognition (information processing); and (iii) agency (output). Cognition is no longer understood as the use and manipulation of symbolic (brain-instantiated) representations of the external world

³³ These three terms appear especially apt for capturing a central AE notion that a given structure provides both *means* and *restrictions* for corresponding functions, perceptions, and observations. This insight will play an increasingly important role when I return to discuss Harris and AE embodiment theories in § 7.2 below.

(Vörös, *et al.* 2016, p. 191). Instead, cognition is described as a *meaning making* process resulting from whole living bodies actively *fitting* into their environment.

Accordingly, the world is not merely soaked up ‘as is’ by observation, rather observation involves active participation, and how the world appears depends upon how we conceive and feel our body through time. As Harvey, *et al.* (2016) maintain, embodied perception

depends not only on current sensation but also on the way sensation, and current movement, is systematically related to upcoming and potential sensory events, on the basis of the structure of the environment and the organism’s neuromuscular expertise [...] This expertise comprises anticipatory sensitivity to the contingencies of sensory events in relation to potential or ongoing bodily movement, and is developed by means of individually and socially regulated experiences during ontogeny (p. 236).

This is to say the sedimentation effect of sensorimotor feedback mentioned above is increasingly complicated, involving changes in biological structure due to environmental interactions as well as reinforcing influences from secondary reflection and emotional associations of one’s *remembered* history. This creates layers of reflexes with respect to a wide array of cognitive capacities.

Examples of such embodied memory use the term *conceptualization* to address how the body can be a part of one’s cognitive processing, while *replacement* addresses how the body produces cognitive abilities outside of traditional schema of cognitive science (Shapiro L. A, 2012). For instance, *deictic pointers* have been proposed in support of *replacement*. Ballard, *et al.* (1997) have found that subject’s eyes would jump to the position or *deictic points* corresponding to where original stimuli were presented within their visual field in memory tasks. In this case, subjects were attempting to recall the position of coloured blocks after a momentary presentation. Hence, an embodied theory of learning finds that memory tasks are more efficiently carried out with the aid of bodily cues. Sympathetic authors have concluded that while this doesn’t rule out representations, it does give credit to placing representational content in a secondary status relative to the physiological response, which can be seen as an adaptive function developed for the purpose of lessening the burden of working memory.³⁴

³⁴ Perhaps due to its (unnecessary) appeal to representations, the term *common-code* (Prinz, 1984) has been excluded from many recent discussions of embodiment, but it appears to lie at the heart of modern sensorimotor theory: deriving from William James’ *ideo motor theory*, it asserts that there is a common code underlying both perception and physiological response. The implication of this theory is, as James claimed in the case of

Again, this story conflicts with the classical positions that understands cognition as consisting “in computational operations on informationally meagre symbolic representations in order to produce new representations that serve cognitive functions such as perception, language comprehension, problem solving and so on” (Shapiro L. A. 2012, p. 122). By depicting cognition as characterized by bodily feedback loops, enactivists have characteristically attempted to walk a “razor’s edge” between solipsism or idealism on the one hand and direct or indirect (representational) realism on the other (Maturana 1992, p. 241). Embodiment theorists find that taking this path renders computational and representational approaches inadequate. Instead, they turn to *dynamic systems theory* (DST), which avoids reducing cognition to mere input/output processes. According to DST, “[i]nputs are described as perturbations to the system’s intrinsic dynamics, rather than as instructions to be followed, and internal states are described as self-organized compensations triggered by perturbations rather than representations of external states of affairs” (Thompson 2007, p. 11). Meaning is no longer seen as one-to-one structural correlations and causations posited by the representationalist, but is repeatedly redefined through living.

Although many AEs have appealed to Gibson’s theory of *affordances* to support their theory of perception, according to Fultot, Nie, & Carello (2016), careful consideration reveals an incompatibility between the two camps. They maintain situation *X* affords activity *Y* for organism *Z* on occasion *O* iff *X* and *Z* are *mutually* compatible on dimensions relevant to *Y*. As Chemero (2009) explains, this mutuality involves a symmetry of information between organism and environment:

the principle of symmetry is that (1) the environment specifies the information available for perception and the information available for perception specifies what is perceived, and (2) what is perceived specifies the information available for perception and the information available for perception specifies the environment (p. 120).

This means there is a “1:1 correspondences” between the environmental information and the information perceived. In virtue of its self-organized thermodynamic constraints, the *XYZO* system holds the primacy of agency – not the (autopoietic) organisms. Ecological psychology (and REC) maintains a *direct realism* about affordances and an observer-independent reality for *meaning*. Phenomenology thus becomes superfluous on EP’s account of consciousness.

confronting a bear, that we are afraid *because* we run, with the initial physiological response being a conditioned reflex that causes a specific emotional (and thus cognitive) response (James, 1884).

For AE proponents, however, this symmetry does not hold. Chemero explains that whereas the “environment-to-perception fit is at least partly causal, the perception-to-environment fit is primarily normative” (p. 121). That an environment causes the observation of a particular object in no way causes that object to exist, despite our being inspired to act on the basis of our perception. Building upon the notion of organism-environment *interdependence*, Thompson (2007) has argued for a middle way between behaviourism and cognitivism, maintaining that “as a skilful activity of the whole animal or person, perceptual experience emerges from the continuous and reciprocal (non-linear) interactions of sensory, motor, and cognitive processes, and is thereby constituted by motor behaviour, sensory stimulation, and practical knowledge” (p. 256). The environment then according to AE, is not *directly perceived* by the organism – as in Gibsonian *affordances*, REC, and *sensorimotor enactivism* – rather, organism and environment are enacted via sensorimotor and chemical *feedback loops* (I return to the notion of *world-enactment* in chapter 6). As a result, AE proponents have an extra step in naturalizing phenomenality, since there remains some kind of *intrinsic internality* for the subject and thus an *asymmetric* relation between subject and world.

Beginning with Varela, *et al.* (1991), AEs have maintained that the *explanatory gap* is a problem that arises in-and-through the prevailing philosophical paradigm. In the face of this problem, they have proposed a pragmatic methodology for ‘living away the problem’ called *neurophenomenology*. Their working hypothesis is that phenomenological accounts of the structure of experience and scientific accounts of neuro-cognitive processes can be mutually informative and equally constraining (Thompson, *et al.* 2005; Varela 1996).

Isomorphism suggests an epistemological parallelism in which the biological and phenomenological accounts run on parallel tracks, with no mutual interaction or influence. Neurophenomenology, following Merleau-Ponty’s lead, proposes a more daring idea – that biology and phenomenology can stand in a mutually enlightening, explanatory relation (Thompson 2007, p. 358).³⁵

Following Varela then, biology and phenomenology are not considered identical to one another, but as correlated dynamics, each contributing to an on-going means of accounting for

³⁵ For example, this type of methodology has revealed that phantom limb syndrome arises due to a failure of sensorimotor feedback, in that the brain sends signals to which the body cannot respond (Ramachandran, 1998). More specifically, it has been shown that by utilizing this feedback with the aid of mirrors to simulate the missing limb, it is possible to significantly alter one’s *phenomenal self-model* and correlated neural pathways, thus altering or even eradicating the phantom limb (Metzinger 2003, ff. p. 470).

otherwise unrecognized variables of the other. Given the results of § 2.3.1, EP's *reduction* of phenomenology and *direct realism about meaning* renders AE and Harris's holism incompatible with EP. As will be discussed in later chapters (7 & 8), I maintain that the neurophenomenological methodology and Harris's scale of forms can each provide invaluable insight into the other. Moreover, when taken together, I contend Harris's metaphysics and AE provide a sufficient ontological response to the "*explanatory gap*."

2.3.3 Embedded and Extended Theories

Going one step further than the embodied thesis – to what some proponents of enactivism contend are its logical implications – according to the *embedded* (or *situated*) thesis, "cognition deeply depends on the natural and social environment..." (Wilson 2011, p. 3). The embedded mind proposes that cognition relies upon elements of a subject's environment with which they are in constant interaction. Here, physical alterations of an environment (including the creation of tools and language) circle back to reshape our cognitive structures.³⁶ Again relying upon GST, proponents of the embedded thesis maintain cognition can be adequately understood only by connecting biological, psychological, and social-ecological accounts of perception and behaviour into an interconnected and dynamical whole (Clartcey 2009, p. 12).

For enactivists, this is more simply cashed out in terms of cultural influences. An important contribution toward this end originally came from Lakoff & Johnson's *Metaphors We Live By* (1980), in which they argued that individuals actively construct metaphorical conceptions of themselves in the world that stem from our physiological structures and functions. Examples include the use of a base-ten for our counting system (i.e. our fingers), English speakers thinking of the future as *ahead* and our past as *behind* us, and our moods as being *higher* or *lower*. They contend such metaphors are far reaching, biasing our perceptions to a largely indeterminate extent. Hence, the embedded thesis establishes a new version of the feedback loop emphasised in autopoiesis and embodiment, one that is both ecological and cultural.

³⁶ To my mind it follows from both enactivism and Harris's system that consciousness itself is an interruption or veto of our physiological responses. This point is more pronounced in the context of collective effects of social groups, i.e. consciousness is a perpetual integration of one's non-conscious *aboutness* that is formed by conditioning. The implications of this point concerning free will are not particularly emphasized by embodiment theorists or Harris and for this reason certainly warrants deeper discussion. Unfortunately, space prohibits my sufficiently addressing the issue in the present work.

The point is that just as a rake extends our reach and has the potential to extend our body schema, so language extends our capacities for thought and therefore can be treated as extending our mind schema. Insofar as language is itself socially manufactured and shared by linguistic communities, then to that extent our cognitive powers require for their very exercise the existence of a sociolinguistic environment. Our minds cross out of the skull and get supported in a shared sociolinguistic scaffolding (Noë 2009, p. 88).

Beginning with Clark & Chalmers (1998), proponents of the *extended mind hypothesis* (EMH) have argued cognition “is constituted by, temporally extended, interactive worldly engagements” (Hutto *et al.* p. 158). The extended mind hypothesis begins with many of the same premises as the embedded thesis, bringing attention to processes of either offloading information into an environment through intentional alteration (e.g. writing) or using environmental features as tools for cognition (e.g. a stick for balance) that reduces strain on the agent’s internal cognitive faculties. According to Rowlands (2010), for the enactivist, EMH is not an argument for identifying environmental structures with cognitive states, but rather including what we *do with* environmental structures (e.g. manipulations, exploitations, or transformations) in cognitive processes. “It is the manipulation of environmental structures that forms part of the cognitive process; and so these structures form part of the process only insofar as they are part of the process of their being manipulated” (p. 67).

As will be discussed in chapter 6, following this kind of reasoning, both AE (Thompson, W. 1988; Thompson, E. 2007) and Harris (1987, p. 254) have invoked some form of Lovelock and Margulis’s (1974) “*Gaia hypothesis*,” maintaining that the biosphere as a whole may demonstrate life and cognition. As a result, some have argued extension theories entail significant implications for what disciplines hold authority on mind research:

if extended cognitive science is an important component of scientific psychology, then neuroscience cannot subsume or replace scientific psychology. Because extended cognitive science consists in laws, generalizations, and regularities concerning brain-body-environment systems, neuroscience is not appropriate as a base theory (Chamero, *et al.* 2009, p. 71).

As will be discussed further in later sections, from the above introductions I conclude that both Harris and AE find common ground in a kind of *formal governance* that plays a central role in their theories of biology and cognition. For Harris, mind and life are depicted as instances of unifying principles, whereas for AE they are emergent phenomena instantiated by nonlinear feedback loops. By grounding his holist theory in a metaphysics of Nature however, Harris also extends his system into the philosophy of physics.

2.4 Analogies with Bohm's Holism

In this section I take a preliminary look at the *implicate order*, a philosophy of physics reliant upon common metaphysical theses as Harris and AE, but rather than cognitive science, takes quantum mechanics as its initial domain of departure. The implicate order was developed by American educated theoretical physicist David Bohm (1917–1992) in the early 1970's. Bohm's intent was to offer a holistic alternative to reductive and mechanistic frameworks of mind and matter.³⁷ In his *Wholeness and the implicate order* (1980) Bohm synthesized these ideas into a coherent metaphysics and for the following ten years, applied his system to a host of psychological topics. In this section, I first review the central tenets of the implicate order in quantum mechanics, before turning to the theory's metaphysical implications concerning the nature of consciousness.

Bohm maintained that contrary to its intended aim of rendering philosophical accounts based upon a contemporary scientific framework, *physicalism* now depends upon an outdated understanding of matter. As a result, any explanation of mind on this basis is inevitably and fundamentally flawed. The goal of his *implicate order* was to bring the contemporary sciences in line with an account of consciousness and in so doing, reinterpret the results of quantum experiments. In his synthesis and extended application of the implicate order, Pylkkanen's (2007) aptly explains the starting point for Bohm's position as a dissatisfaction with the disconnected picture of nature revealed by respective domains of natural science. For example, whereas relativity theory entails continuity, strict causality/determinism, and locality, quantum mechanics requires non-continuity, non-causality and non-locality. As a result, the basic concepts of the two most fundamental physical theories directly contradict each other. If we are to reconcile their differences and establish a new and more fundamental theory, Bohm maintains the "best place to begin is with what they have basically in common.

³⁷ The work Bohm completed in his early career was radical, finding many empirical applications, e.g. the theory of plasmas and "Bohm diffusion". It is particularly amusing that before Bohm was able to complete his Ph.D thesis, it was taken from him by the United States government because it provided assistance in the efforts of the Manhattan Project – he was awarded his degree anyway. Since his philosophy emphasized wholeness and *hidden variables* (discussed below) his position was counter the mainstream account of reality (i.e. the Copenhagen interpretation), so his system was largely marginalized. Due to Bohm's communist affiliation in the early 1950's, he was also unable to find work within the United States for many years. For further details concerning Bohm's personal and professional development see Junior (2015, ff. p. 17).

This is undivided wholeness. Though each comes to such wholeness in a different way, it is clear that it is this to which they are both fundamentally pointing” (1980b, p. 84).

To obtain such a holistic theory of nature, Bohm set a course balanced between Einstein and Bohr – the two contrary philosophical interpretations of physics for much of the early 20th century (Bohr, ff. p. 212). In its inception, the implicate order was intended to share Einstein’s conviction that an objective reality exists independently of us, but also retain sympathies for Bohr, who maintained that the meaning of an experimental result and the form of experimental conditions are an inseparable whole that requires our *participation*.³⁸ Pylkkanen explains that what Einstein and Bohm had in common was a particular dissatisfaction

with the extremely empiricist, ‘positivistic’ feature of the usual quantum theory, which did not allow one to discuss reality beyond the observations. Observations, in turn, were fairly limited (e.g. a spot appearing in a photographic plate), so it seemed that quantum theory was providing a truncated, fragmented view of reality (p. 14).

In line with Bohr, Bohm recognizes that our understanding of the world is confounded by how we look at it. More precisely, “our scientific instruments can affect our assumptions about perceivability; and these in turn can affect our assumptions about what is conceivable” (Pylkkanen, p. 57). So what is discovered is actually *derived* from the experimental system as a whole:

[D]escription of the experimental conditions does not drop out as a mere intermediary link of inference, but remains inseparable from the description of what is called the observed object. The ‘quantum’ context thus calls for a new kind of description that does not imply the separability of the ‘observed object’ and ‘observing instrument’. Instead, the form of the experimental conditions and the meaning of the experimental results have now to be one whole, in which analysis into autonomously existent elements is not relevant (1980, p. 169).

In his earlier work, Bohm considered whether probability in quantum theory (QT) is a result of our ignorance of what variables to use in describing the system, as is the case in

³⁸ The Copenhagen interpretation of QT consisting of Bohr’s philosophy physics as well as von Neumann’s later elaboration is considered the received or *orthodox* version today. Stapp (2011) claims that this view is fundamentally *subjectivist*, “in the sense that it is forthrightly about relationships among conscious human experiences, and it expressly recommends to scientists that they resist the temptation to try to understand the reality responsible for the correlations between our experiences that the theory correctly describes” (p. 13).

classical physics. He maintains that examining these classical situations may provide theoretical guidance concerning the ontology of QT:

For example, in thermodynamics we measure the pressure, temperature, and volume of a given system. In very small regions of space, especially near the critical point, we find that these quantities no longer obey an equation of state exactly, but instead exhibit large random fluctuations about a mean value that is predicted by the equation of state. Hence, the deterministic laws of thermodynamics break down and are replaced by laws of probability. This is because the thermodynamic variables are no longer appropriate for the problem and must be replaced by the position and velocity of each molecule, which are, from the viewpoint of thermodynamics, hidden variables (1951, p. 29).

For Bohm then, both quantum and classic quantifications are averages of “hidden variables”, whose causal laws cannot be observed by only lower-level methods, but require a description in terms of some higher-level structures.³⁹ Bohm first applied this idea to the behavior of individual particles and in later years used the resulting framework as means of explaining the nature of consciousness.

The *de Broglie-Bohm theory* (AKA, *causal, or hidden variables interpretation of quantum mechanics*) was first proposed by de Broglie (1927) and later adopted by Bohm (1952).⁴⁰ In this theory particles are described as evolving according to the Schrödinger's wave-function, but unlike the orthodox view, particles are also *physically guided* by this wave. Accordingly, the wave function evolves according to the Schrödinger equation and never collapses; it does not represent the states of systems, but the state of a quantum field (on a higher-dimensional configuration space) that influences the physical system. Contrary to Copenhagen QM, this renders the randomness of quantum phenomena a result of our ignorance, whereas reality is considered determinate in virtue of *hidden variables* of this *pilot wave*.

³⁹ Bohm thus depicts a theory of emergence via *phase transition*, to be discussed in greater detail in § 5.3 below.

⁴⁰ The EPR paper (1935) argued that the wave function was not a complete description of quantum phenomena. It was this argument that provided a launch pad for Bohm's project. According to Bell, von Neumann's proof that there could be no deterministic interpretation of QT was unreasonable, but it is this proof that modern physicists rely upon. Though he is often quoted as having given significant refutation of hidden variables, Bell (1987) later recognized that in Bohm's work the impossible was accomplished, i.e. a valid version of QT that did not rely upon reference to an observer and described its parameters as *deterministic*. Indeed, Goldstein (2013) claims that contrary to history, Bell was the primary proponent of Bohm's position until his death. Bell's analysis demonstrated that *any* (single-world) account of QT must be nonlocal.

What Bohm contributed to this interpretation was an ontology in which reality is composed of *explicate* and *implicate orders*. He argued that relations of the implicate order can be invoked to explain (observed) quantum phenomena in the same way that an “ensemble” of glycerine within cylinders can be invoked to explain the distortion and reformation of ink droplets through time (1980, ff. p. 186). Particles for example, are not continuous entities that move “through” time and space, but rather emerging explicate structures, cyclically unfolding from and enfolding back into a vast sea of background (vacuum) energy.⁴¹ Whereas the explicate order consists of relatively separate and externally related entities typical of classical physics, the implicate order provides an unseen and unified ground from which the *individuals* arise (Pylkkanen, p. 24).

To free us from the dominant mechanistic worldview, Bohm suggests that rather than conceiving the world as analyzed into individual parts via a lens, a “hologram” provides a holistic paradigm of nature (1980, pp. 224-25). He maintains that like a hologram, each separate and extended form in the explicate order is enfolded in the whole and in turn, the whole is enfolded in its forms, but “only in a limited and not completely defined way” (Bohm 1987, p. 193). Moreover, the way in which an explicate form enfolds the whole is considered essential to it and to how it behaves: “So the whole is, in a deep sense, internally related to the parts. And, since the whole enfolds all the parts, these latter are also internally related, though in a weaker way than they are related to the whole” (ibid). For example, Pylkkanen holds, “there is an internal relationship between an electron and its environment, or between two electrons in a non-local relationship” (p. 53). So the incident of an electron represents the explicate, while the form of an electromagnetic field is that of implicate order. Likewise, GTR depicts the universe “in terms of a unified field” (specified by non-linear equations); thus space-time cannot be analyzed in terms of separable points (Bohm 1980, pp. 158-59).

In sum, just as Harris and proponents of AE, the implicate order relies upon common conceptions of holism, internal/dialectical relations, and a balance between realism and idealism. Accordingly, “there is a kind of objective wholeness, reminiscent of the organic wholeness of a living being in which the very nature of each part depends on the whole”

⁴¹ White, *et al*'s (2016) recent work at the NASA Johnson Space Center involving *measurement of impulsive thrust from a closed radio-frequency cavity in vacuum* has demonstrated evidence in favor of EM drive technology that favors Bohm's realist interpretation of QM: “In short, the supporting physics model used to derive a force based on operating conditions in the test article can be categorized as a nonlocal hidden-variable theory, or pilot-wave theory for short” (p. 10).

(Bohm 1993, p. 177). Importantly Bohm's appeals to holography and enfolded information are really metaphors for guiding his readers towards his preferred theory of nature, what he called the *holomovement*.

2.4.1 € and the "Holomovement"

Harris was first introduced to Bohm's *Wholeness and the Implicate Order* when he attended a meeting of the *Southern Philosophical Society* in the mid 1980's. He recalls, "I had not read Bohm's book, but when I did, I was gratified to discover that a distinguished physicist had independently confirmed (apparently without knowing what I had written) the sustained thesis of my *Foundations of Metaphysics in Science*" (unpublished, p. 243).

Bohm's basic proposal "is that what *is* is the holomovement, and that everything is to be explained in terms of forms derived from this holomovement" (1980b, p. 86). His ontology is essentially considered a *movement* or cyclic process of development from enfolded potential to unfolded explication that then returns to implicate form.

This enfoldment and unfoldment takes place not only in the movement of the electromagnetic field but also in that of other fields, such as the electronic, protonic, sound waves, etc. [...] Moreover, the movement is only approximated by the classical concept of fields (which is generally used for the explanation of how the hologram works). More accurately, these fields obey quantum-mechanical laws, implying the properties of discontinuity and non-locality (1985b, p. 85).⁴²

As a result, the "particle" for example, is understood as an abstraction "from the more fundamental movement of unfoldment and enfoldment" (Pylkkanen, p. 70). The way in which this process unfolds is always constrained or guided by the form of a more inclusive whole or physical system in what many have called an '*infinite tower of pilot waves*'. Like Harris's €,

⁴² The central idea of Bohm's causal interpretation of QT is that, in addition to the classical potential (V), there is a new quantum potential Q. The difference between classical and quantum behaviour is thus considered the operation of Q and the classical limit is the point at which the effects of Q become negligible. For Bohm, particles are effected by the quantum potential. Specifically, because ψ is contained both in the numerator and the denominator for Q, it is independent of the strength or intensity of the quantum field but depends only on its form, which is a key difference from Newtonian physics. The particle is thus analogous to a ship being automatically guided by its sonar: the ship's power is independent of the power of the sonar but is deterministically guided by the sonar's form (1987, p. 185). This view is distinct from the Copenhagen account, in which there is no corresponding way to discuss such phenomena as it occurs *in the world*.

Bohm's holomovement is intended as a framework for both Nature and consciousness, each of which I briefly outline in this section.

Bohm's response to the EPR experiment characterizes his conception of holomovement. In the EPR experiment, each of two electrons that were previously combined in a *spin singlet state* are observed after they have separated and are far enough apart that they can be measured before light could pass between them and therefore (due to relativity) can have no causal relations. Upon spin measurement, particles nevertheless demonstrate non-local, non-causal correlations. For Bohm, the motion of a particle is guided by its pilot wave (quantum potential), which supplies "*active information*" of an environment as a whole, including its entanglements, thus permitting the correlated measurements (1990, p. 280). He explains the EPR experiment can be metaphorically understood by considering *two cameras* recording the *correlated* (2D) movements of a single (3D) fish within a tank. In the case of either particle or camera recording, each constitutes "a system as a projection of a 'higher-dimensional' reality" rather than individual phenomena (1980b, p. 96).⁴³

Providing an analogy (and possible elaboration) of Harris's € and Concrete Universal, Bohm proposes that there must likewise be a "super-quantum potential" (super-implicate order) that provides *form* (active information) to the unfoldment of the first-order quantum potential (implicate orders). If so, the first-order quantum potential would act only as an approximation when the action of the superquantum potential could be neglected. "One could go on to suppose a series of orders of superquantum potentials, with each order constituting information that gives form to the activity of the next lower order (which is less subtle)" (1990, p. 283). In Bohm's model, our (observable) explicate order is considered one such sub-whole obtained from a higher-level implicate order (1987, pp. 196-97).

Awarding primacy to an indefinable, immeasurable holomovement implies that there is "no meaning to talk of a fundamental theory, on which all of physics could find a permanent basis, or to which all the phenomena of physics could ultimately be reduced" (1980b, p. 131). Rather, we must always "be ready to discover the limits of independence of any relatively autonomous structure of law, and from this to go on to look for new laws that may refer to yet

⁴³ More specifically, as Collins (2006) notes, accounting for Bohm's EPR holism requires that "the quantum potential must be non-local, meaning that it cannot be thought of as a field spread throughout space – that is, with spatio-temporal parts. Instead, it is written as a field inhabiting the 3N-dimensional configuration space of particles in the system. (For example, assuming there are at least 10^{80} particles in the universe, it would inhabit at least a 3×10^{80} -dimensional space!)" (pp. 334-35).

larger relatively autonomous domains of this kind” (1980b, p. 86). This *holonomic principle* does not however preclude the relevance of analysis, indeed it grants the “possibility of describing the ‘loosening’ of aspects from each other, so that they will be relatively autonomous in limited contexts (as well as the possibility of describing the interactions of these aspects in a system of heteronomy)” (1980, p. 198). Nevertheless, the laws of respective sub-totalities are *abstractions* that may be surpassed by identifying the *origin* of their corresponding domain, which leads to yet *deeper laws*, none being inherent or of an ultimate level (Pylkkanen, pp. 91-2).

Extending the implicate order to biology, Bohm maintains that just as the elementary particle demonstrates an internal relationship with its environment, living systems too, are constantly exchanging matter and energy with their environment such that we are unable to make a sharp distinction between the two. The idea is that we find a common process of enfoldment and unfoldment that gives rise to different structures, depending on how an environment *informs* the entity (Pylkkanen, p. 86). For Bohm, as in AE, life is properly understood as a totality that includes relations of organism and environment. Specifically, Bohm maintains, the holomovement is “life implicit”, in that “it is the ground both of ‘life explicit’ and of ‘inanimate’ matter, and this ground is what is primary, self-existent and universal. Thus we do not fragment life and inanimate matter, nor do we try to reduce the former completely to nothing but an outcome of the latter” (1980b, p. 102). I return to this crucial contention in chapters 5 & 8 below.

Aiming to avoid Cartesian dualism, just as epiphenomenalism, Bohm is again in agreement with AE, but he goes even further to contend “the implicate order applies both to matter (living and non-living) and to consciousness” (1980b, p. 103). He goes on to write, “it can therefore make possible an understanding of the general relationship of these two, from which we may be able to come to some notion of a common ground of both (rather as was also suggested in the previous section in our discussion of the relationship of inanimate matter and life)” (1980b, pp. 103-4).⁴⁴ For Bohm, the notion of “active information” provides

⁴⁴ To support this point, in a few instances Bohm followed Pribram’s now largely neglected holographic theory of consciousness (1971), maintaining memories are recorded all over the brain rather than in a localized region. Hence, a response from memory ought to “fuse with the nervous excitation coming from the senses to give rise to an overall experience in which memory, logic, and sensory activity combine into a single unanalyzable whole” (1980 B, pp. 105-6). While this kind of holism has been retained in contemporary arguments against modularity for example, this conception of a “holographic consciousness” goes far outside the bounds of the present thesis.

“a rudimentary mind-like behaviour of matter, for an essential quality of mind is just the activity of form, rather than of substance” (1990, p. 281). The common principle of both mind and matter then, is considered the formative or governing force of “active information”, which Bohm maintains can serve “as a kind of link or 'bridge' between these two sides of reality as a whole” (1990, p. 282). With this move, Bohm’s theory of mind is perfectly compatible with the neurophenomenological methodology of AE in that cognition and matter can be conceptually unified by attending to their *common processes of organization*.

This depiction of mind and matter being constrained by a boundless series of implicate orders seems *prima facie* to imply that ‘freedom of will’ is out of the question, but this conclusion misses an essential point. The implicate order is at each point incomplete and perpetually unfolding, not merely actualizing potentialities that were somehow previously established, but defining itself through time. This Pylkkanen claims, makes “genuine creativity” possible and implies that any given change may result in a “fundamental and radical transformation” (p. 126). What purportedly makes this possible are the roles of “recurrence and stability” that permit the existence of “relatively independent sub-totalities.” Human beings are considered such ‘sub-totalities’, whose relative independence implies that the individual has some freedom. “Recurrence and stability are required if the sub-totalities are to have any independence and autonomy in relation to the holomovement. Otherwise, the unending flux of the holomovement would destroy any independence, including the one required for freedom” (ibid). So for Bohm, there is *relative* freedom for every sub-totality.

One formulation of such *relative freedom* can be seen in a joint unpublished work of Bohm and Pylkkanen (1990-1991), in which they proposed a theory of “overall coherence” applicable to both mind and nature. Pylkkanen explains that according to this view, truth implies “logical consistency”, but also “coherence of the state of being of the individual who is concerned with truth, as well as the environment” (2007, p. 154). Here, the domain of truth is not *either* internal *or* external to mind, but is a fundamental movement constantly overcoming incoherence that involves both domains: “As with consciousness, each moment has a certain explicate order, and in addition it enfolds all the others, though in its own way. So the relationship of each moment in the whole to all the others is implied by its total content: the way in which it ‘holds’ all the others enfolded within it” (Bohm 1980, p. 263). *Truth is thus how coherently a subject enfolds their world through time.* As Pylkkanen concludes, positing the holomovement as fundamental for mind and nature implies that although complete coherence may be unreachable, “movement toward coherence is possible,

and is indeed the essence of cognition” (p. 155).⁴⁵

From the above there appears clear agreement between the implicate order and Harris concerning dialectical relations, a balance between subjective idealism and scientific realism, process ontology, and the scale of forms. For AE and Bohm, the result of maintaining these tenets has been the formation of two partially overlapping holist theses of nature and mind. What Harris provides, in broader strokes, is a means of systematizing these and other complementary arguments across a range of domains. I now turn to deeper commonalities, both epistemic and ontological, that will serve as paradigmatic guides for the remainder of this thesis.

2.5 Towards a *Converging* Paradigm

At this point the theoretical similarities between Harris’s holism, enactivism, and the implicate order should be in reasonably sharp relief, but on the epistemic topic of individuation there is an even more profound commonality. Writing on the issue of body-based perception and learning, Gallagher (2014) articulates what may serve as an *AE theory of individuation*:

it is through our interactions with others that we learn what objects are significant or valuable. We learn to understand the world along these lines of significance and value, and often objects that fall outside of such lines don’t even register. In the same way that expert training hones the perceptual system so that experts are able to perceive things that non-experts fail to perceive, in some sense, we all become experts in everyday life through our interactions with others (p. 239).

This clearly implies individuation depends upon the social system within which we are embedded. So our brain “attunes to and responds to its environment in a way that enacts a meaning relative to the particularities of its embodiment” (p. 243). As a result, we find what enactivists have called a *reflexivity* underlying all our epistemic practices, which implies the impossibility of obtaining what Nagel (1986) calls “a view from nowhere.” AEs thus align themselves with the aims of *second-order science*, in positing a fundamental circulation

⁴⁵ As discussed in § 6.3.1, I suggest that combining Harris and AE philosophies of biology results in an argument for seeing minimal mind and evolution as processes of increasing coherence and freedom in a way that follows exactly from Bohm’s conceptions above. In § 7.4.1 I examine Harris’s appeal to Spinoza’s notion of embodiment and again find that the primary function of mind turns out to be coherence towards increasing freedom. Unfortunately space prohibits a direct discussion of the philosophy of free will.

between “lived experience” and “scientific understanding”, that attempts to *account for the observer and their writing of a theory, within the theory itself* (Vörös, et al. 2016, p. 191). The purpose of which, is to account for and (partially) *go beyond* the biases of our present theoretical constructs. Individuation of an entity is thus embodied and socially enacted, requiring that the process of this enaction is repeatedly called into question *ad infinitum*.

Indeed a similar notion is identifiable in Bohm’s works. Although the implicate order is considered fundamental to consciousness, we are less aware of it Bohm maintains, because we have become habituated to functioning in such a way that emphasizes the explicate order. He claims our emphasis on nouns, for example, has conditioned us to perceive a fragmented world of static objects. To counter this Bohm proposes the “*rheomode*”, a shift in semantic primacy from subjects and objects to verbs. Here his aim is to draw our attention to what he calls the *act of levation* – the way in which we raise an entity to relevance from its background.

So when relevance or irrelevance is communicated, one has to understand that this is not a hard and fast division between opposing categories but, rather, an expression of an ever changing perception, in which it is possible, for the moment, to see a fit or a non-fit between the content lifted into attention and the context to which it refers (1980, p. 43).

This implies that what appears to be irrelevant in a given context can be seen not only as useful, but eventually necessary for an *on-going process* of description, distinction, and definition of any phenomenon because the super-quantum potential (or implicate order) is an *undivided whole*.⁴⁶

In physicist Karen Barad’s (2007) *agential realism*, agency is addressed from a very different angle (postmodern feminist philosophy), but she has – without recognizing the connections to Bohm or enactivism – articulated the very point that binds the two systems and highlights an idea at the core of Harris’s epistemology. Following Bohr’s philosophy-physics, Barad maintains that *agency* is created through practices of “*diffraction*” that cut an entity

⁴⁶ For the last decade of his life, Bohm extended his system by developing dialogic tools to facilitate ways of communication that emphasized wholeness and movement over atomistic mechanism. Particularly, Bohm extended his system into what he called “sociotherapy.” This was considered a means of discovering ever-greater holistic and coherent truth among participants, e.g. *Thought as a System* (1992); *On Dialogue* (1996), Although these topics are not particularly emphasized by most contemporary writers of the implicate order, this sort of method basically falls out of Bohm’s metaphysics and clearly parallels both Harris’s emphasis on the dialectic as well as AE’s interest in interdependent coupling and empathy. Unfortunately, I lack the space within this thesis to address these very interesting commonalities.

from its background. The observed or diffracted entity is thereby inseparable from the diffracting observer and their apparatus of observation (pp. 118-19). “Reality is composed not of things-in-themselves, or of things-behind-phenomena, but of things-in-phenomena. Because phenomena constitute a non-dualistic whole, it makes no sense to talk about independently existing things as somehow behind or as the causes of phenomena” (p. 205).

In agreement with AE and Harris, according to Barad, objectivity can be achieved by reproducing marks on bodies left by an “intra-active cut”. This cut is determined by the diffractive system as a whole, that is, by relations among agents and tools (both marker and marked bodies) within which the object (or agent) of our investigation comes into being (p. 320).

laboratory manipulations, observations, interventions, concepts, and other human practices have a role to play, they do so as part of the material configuration of the world in its intra-active becoming [...] Hence [...] what is at issue is not knowledge of the world from above or outside, but knowing as part of being (p. 341).

She goes on to contend that by implication, all bodies, “including but not limited to human bodies, come to matter through the world’s iterative intra-activity – its performativity. Boundaries, properties and meanings are differentially enacted through the intra-activity of mattering” (p. 392).⁴⁷ Barad’s use of *diffraction* is thus the *experimental* counterpart to *social reflexivity* and *analytic levation*.

Whereas autopoiesis attributes agency only to a self-organized system that we might say, continually enacts, levates, or diffracts *itself* over time, for Barad agency can be attributed to non-organic, non-living and even totally inanimate objects as well. This is possible just in case *their identity, functionality and continuity is preserved (i.e. enacted) by their external entanglements/relations over time*. “Agency [...] is the enactment of iterative changes to particular practices – iterative reconfigurings of topological manifolds of spacetime-matter relations – through the dynamics of intra-activity” (p. 235). In line with Harris, Barad maintains the entangled *relations* of enacted phenomena hold both scientific and philosophic

⁴⁷ Indeed, I have neglected to mention any of the mathematical formalism or their implications regarding Bohmian mechanics as contrasted with agential realism. It is safe to say that there are undoubtedly many discrepancies between these systems as Barad draws from Bohr, whose ontological account is notoriously at odds with Bohm, whom attempted to maintain an objective reality with Einstein. This issue of direct realism versus construction will reappear in many of the following sections. Building upon Harris’s work, I offer a possible solution to this debate in chapter 8.

primacy (pp. 104; 141; 205-6). Taking all camps together, *diffraction* is really a broadening of enactivism as anticipated by Harris's earlier (1965 and 1970) works. Again, Barad's thesis relies upon analogues of dialectical relations, the unifying principle, and process ontology.⁴⁸

If the above may serve as the common epistemic points of convergence, the (preliminary) ontological implications may be outlined as follows. Concerning the metaphysical implications of AE, Silberstein & Chemero (2015) have argued that *individuals* in dynamic systems models can have parameters on each side of their boundary (e.g. skin), which means the non-linear behaviour of the agent is *coupled to and partially constituted by its environment*. Treating the brain, body, and environment as a single dynamical system over time, they argue, means the "phenomenological world of experience is neither in the 'head' nor in the 'external world' – it is fundamentally relational" (2015, p. 190).⁴⁹ They hold that "*extended neutral monism*" (ENM) provides an alternative means of naturalizing phenomenology that remains connected to natural science (p. 192). On this account, *neural correlates of consciousness* (NCCs) are insufficient for consciousness, there are no qualia, no fundamental self, no material substances, no representations, no categorical distinction between the mental (the subjective) and the physical (the objective), nor between intentional and phenomenal processes. "The subject/ object cut is a self-consistency relation, there is only one reality (the field of pure 'experience' as James might say)" (p. 193).

Although Silberstein & Chemero make significant progress fleshing out the metaphysical foundation of AE, they leave a number of issues unaddressed. For instance, they do not reconcile the significant conflict between emergence (upon which enactivism relies) and NM. More generally, their blind adoption of some vague version of NM takes with it a host of problems (from presumably James' version), such as the *admittedly* problematic conception of "pure experience." In this regard, they make limited effort in spelling out what the 'neutral base' is by positing a "relational" ontology, but much more is needed for this to provide a metaphysically satisfactory response to the explanatory gap.

Bohm (1980) has already established a more rigorous physics-based conception of just such a neutral ground in the holomovement. He maintained, "the more comprehensive, deeper, and more inward actuality is neither mind nor body but rather a yet higher-dimensional actuality, which is their common ground and which is of a nature beyond both"

⁴⁸ This epistemology is summarized the appendix § I.

⁴⁹ By this claim the authors endorse Silberstein's (2009) contention that AE can appeal to OSR. For an introduction to ontic structural realism see Ladyman, (2014).

(p. 265). Just like his interpretation of the EPR experiment, explicate mind and matter are again considered *correlated phenomena* that are abstractions from a common *implicate identity* in the holomovement. As Harris has partially recognized (1995, pp. 34-5), treating the holomovement as a “common ground” is deeply reminiscent of Spinoza’s system, in that mind and matter are *two aspects* of a common underlying *Substance* (here a process). As Pylkkanen recognizes, this implies that Bohm advocated for “*neutral-monism*” (pp. 37; 39).⁵⁰ In agreement with Silberstein, Bohm maintains that we can no longer regard human beings as individuals in the conventional sense. That is, we are now treating the human in the same way that we treated the individual particle – *as arising from a implicate system*:

if we are to give an adequate account of what actually happens and this must eventually include other people, going on to society and to mankind as a whole. So it will be ultimately misleading and indeed wrong to suppose, for example, that each human being is an independent actuality who interacts with other human beings and with nature. Rather, all these are projections of a single totality (1980b, pp. 116-17).

When I asked Evan Thompson of the possible metaphysical and cosmological implications of AE with regard for Bohm and Harris’s systems, he replied as follows:

(1) The enactive approach, as I see it, has its main home in cognitive science and is concerned to answer questions about the nature of cognition and how cognition requires autonomous agency. This viewpoint doesn't seem to me to presuppose any particular cosmology. That being said, the overall background conception of coupled systems arising through dependent origination could be taken as a cosmological view, or at least as a kind of principle that would need to inform an "enactive cosmology." (2) The enactive approach strikes me as based on or presupposing a metaphysics of process rather than a metaphysics of substance. And a metaphysics of process can naturally use as methodological tools the techniques of dynamic systems theory in physics (personal communication: 9-20-2013).

Here we clearly have a thesis of internal/dialectical relations and co-emergence based upon a metaphysics of process, what I contend are perfectly analogous to the principles of Harris’s

⁵⁰ Despite his recognition of Bohm’s neutral monist metaphysics, Pylkkanen (2007) is mistaken for maintaining that this system also permits “*panprotopsychism*” (pp. 63; 190). Bohm holds that our observations of the unbroken whole of reality reveal mental and physical poles with *active information* evident at every level. It must be remembered however, that such an analogy of the magnet in which there are ‘two poles’ is as he maintains, a result of abstract thought: “the deeper reality is something beyond either mind or matter, both of which are only aspects that serve as terms for analysis [...] To pursue this approach further might perhaps enable us to extend our knowledge of both poles into new domains” (Bohm 1990, p. 285).

holism. As mentioned above, Harris maintained that the synthesis of scientific data necessarily presupposes metaphysical tenets, the question is the extent to which the theorist is aware of these tenets, which ultimately culminate in some conception of *Nature as a whole*. I maintain that a closer inspection of Harris's system can indeed provide an "enactivist cosmology" and simultaneously clarify the "neutral monist" metaphysics to which AEs and Bohmians adhere.⁵¹

2.6 Conclusion

This preliminary investigation has shown that Harris's metaphysics (i.e. the marriage of internal/dialectical relations, embodiment, process ontology, emergence, coherence, and neutral-monism) bears a common framework with AE and Bohm's implicate order. In the following chapters I provide further evidence to the effect that while AE and the implicate order address the philosophies of cognitive science on the one hand and physics on the other, their inevitable metaphysical implications are the same and have already been significantly detailed in Harris's work. I propose the title "*dialectical holism*" not as reference to Harris's holism, but as an umbrella term for these three systems taken as mutually constraining pillars of a single metaphysical paradigm.⁵²

The primary goals for the remainder of this thesis will be to present the arguments for Harris's holism, evaluate their applications across a range of domains in philosophies of science and mind, and elucidate their implications. The result of this work will be to either vindicate or reveal possible weaknesses of a number of similar contemporary positions and establish whether such a dialectical holist paradigm can survive Harris's original formation. With Thompson's personal communication in mind, I claim that what follows works towards an "enactivist cosmology". To address these tasks, I next consider a number of topics in the philosophy of physics, with a focus on the *cosmological anthropic principle* in particular.

⁵¹ The metaphysical principles of dialectical holism are summarized in § II of the appendix below.

⁵² To my knowledge, Harris used the title only once in all his works: "we should not beg the question if we tested the metaphysic of empiricism by its coherence, nor if we appealed to experience for evidence of the truth of dialectical holism" (2000, p. 238).

Part II

Harris's Holism in Contemporary Cosmology

Chapter 3

Harris's Holism in Space-time and Particle Physics

3.1 Introduction

The aim for part II is to critically consider both the epistemic and ontological dimensions of Harris's holism in cosmology. In § 3.2, I assess Harris's appeal to relativity in support of dialectical relations and as an instance of the unifying principle. In § 3.3, I assess Harris's appeals to unity in the standard model of cosmology and entanglement in QM. I conclude that Harris's identification of the unifying principle at macro and micro scales of physics remains plausible and is echoed in contemporary works. However, Harris's conception of the Concrete Universal is at odds with the reductive unity espoused by proponents of the standard model. In § 3.4, I introduce Harris's appeal to anthropic reasoning. Here I clarify Harris's largely implicit motivations for linking the philosophical discussions of cosmos and mind. The purpose of this chapter is to provide the necessary conceptual tools for an analysis of Harris's participatory and teleological anthropic principles, to be addressed what follows.

3.2 Harris's Spacetime Holism

Harris claims that 20th Century paradigm shifts in physics called for a holistic metaphysics. In this section I reveal the extent to which Harris's conception of the unifying principle is supported by relativity theory and orient the resulting holism with respect to other holist theories in contemporary physics. Following scientists like Einstein, Bohr, and Maxwell, Harris maintains physics, "is no longer 'materialistic'." Matter, he claims, has been replaced by energy, which has been further transformed into space-time curvature. "The space-time (or material) field, moreover, is a structure of relations dependent on an act of thought..." or, an "arbitrarily chosen reference frame" (2000, p. 35). In this way for Harris, relativity reveals the

necessity to posit a synthetic whole, within which the observer is an inextricable *participant*.⁵³

Harris claims that according to special relativity, as mass increases with velocity and velocity approaches the speed of light, mass approaches infinity. The mass of a moving body then depends upon velocity and as velocity is relative to respective reference frames and the speed of light, there is no identifiable state of absolute rest. As an epistemic consequence “lengths, durations, and positions [...] are mutually determinant. No statement about any one of them is free from entailment of statements referring to some or all of the others” (1965, p. 51). The *principle of relativity* thus reveals, “laws of physics are invariant, with respect to the Lorentz transformations, for transition from one inertial system to any other” (1970, p. 120).

Measurements of either space, time, or velocity are here considered inseparable and interdependent, meaning “intrinsic physical properties of bodies are mutually dependent, and all physical relations are internal to their terms” (2000, p. 98). For Harris, this is to say that parameters such as time, location, speed, and mass, are all abstractions obtaining only as interconnected relations within a material whole. Harris argues that the formalization of Lorentz transformations between reference frames in SR and tensor calculus in GTR provides sufficient evidence to posit a unifying principle of space-time (1993, p. 144). “In short, space-time involves and imposes on its contents a principle of organization. One may say that space-time *is* such a principle, or is a system of such principles. Spatio-temporal relations are *organizing* relations, and without them there is no physical space-time at all” (1965, p. 79).⁵⁴

However, Harris maintains that “the space-time of physics is not the amorphous continuum of pure mathematics. It is the actual field of physical events and its geometry is revealed in the behaviour of the physicists measuring devices” (1965, p. 80). In this way,

⁵³ In his (1965) work Bohm likewise proposes there is an “irreducible participation of the observer” that arises in an analogous way to Heisenberg’s *indeterminacy principle*, in which there is a limitation to what can be known at any instant. In special relativity he explains, due to the *principle of relativity* (laws are isotropic in the universe) and the impossibility to transmit signals faster than light, “the observer is part of the universe” and “does not stand outside of space and time and the laws of physics [...] he is trying to study” (p. 137). Unfortunately, neither Bohm nor Harris further elaborated this idea of at this point of their discussion.

⁵⁴ Harris appears to anticipate what has more recently been called the *temporal exclusion principle* (Pike, 2009, pp. 51-52). Harris maintains that the most primitive kind of material difference requires a transition in time steps. He goes on to clarify that “time and change are identical, and as diversity manifests itself physically only either spatially or temporally, and spatial diversity is the infusion of time into space, time may be seen as essentially the principle of differentiation in the real” (1965, p. 471).

although Harris does not talk about the dynamical object of spacetime independent of our observation, he nevertheless considers this object a level of nature. Harris concludes that curved space-time demonstrates “polyphasic unity” in virtue of the contrasting values of the field and is thus “the primitive type of a scale of forms – a scale (or procession) of changes of direction (or some analogous structure of relationships) governed by a principle of order” (1965, p. 470). Hence, considering the spacetime field as an example of one particular unifying principle, Harris concludes that the physical world is to be understood as “a single whole [...] in which the primary principle of order determines all physical laws and governs all occurrences and relationships within it” (2000, p. 99). It must be remembered that in Harris’s dialectic approach, the space-time field arises from the interrelation of bodies, but as a unifying principle, this field also constrains the bodies within it. Though he does not emphasize his conclusion, as with all other unifying principles, the space-time field is considered a partial reflection of the Concrete Universal.

Concerning the structure of the universe, Harris contends that Faraday’s discovery of the electromagnetic field and Maxwell’s subsequent mathematical depiction of it provided a paradigmatic case of a unifying principle:

The electromagnetic field in principle fills the whole of space and in accordance with the general theory of relativity, space-time itself is regarded as the metrical field from which the measured quantities are inseparable, and in which the elements that have them are inextricably embedded. Energy and mass thus become degrees of curvature in space-time... (2000, pp. 98-99).

As a consequence, Harris believed that the curvature of space-time, due to the presence of matter, would bend the Universe upon itself to form a four-dimensional “hypersphere”, one with finite volume but no spatiotemporal boundary (2000, p. 99; 1991, p. 12).

3.2.1 Prospects for Interpreting Spacetime as a Unifying Principle

One of the central goals for the philosophy of physics is investigation of what fundamental kinds of things exist in the world. Establishing or dissolving ontological theories of spacetime understandably takes high priority. This means confronting the debate between “relationalist” and “substantialist” theories of spacetime. As Pooley (2013) explains, the difference between the relationalist and substantialist can be seen by their respective conceptions of the spacetime coordinate system being mapped onto \mathbb{R} . The substantialist contends the coordinates of spacetime refer to an actual entity that exists among the fundamental objects in the universe. The relationalist on the other hand, maintains the coordinate system assigns sets

of real numbers to material events rather than to points of spacetime, hence some sets of coordinates are not assigned to anything at all (p. 4). In addition to establishing Harris's position with respect to this debate, I consider *what kind of whole* he claims spacetime to be in light of three contemporary options: (i) *ontological holism*, (ii) *property holism*, and (iii) *nomological holism* (Healey, 2008).

In recent years numerous physicists and philosophers including Lange (2007; 2009; 2011), Morrison (1995; 2013), Yudell (2012), and Bangu (2013) have recognized higher order laws of nature in the form of symmetry principles that provide key ingredients for the *Standard Model of cosmology* (SM). For example Yudell states, "Symmetry principles are laws about laws, and they seem to constrain or govern the laws just as laws constrain or govern particulars, and hence seem to deserve the title meta-laws" (2012, p. 1). Indeed, Lange (2011) argues that "Einstein's special theory of relativity incorporates a meta-law" that is considered a "symmetry principle" because first-order laws must be "unchanged (covariant) under a given [Lorentz] transformation" (p. 1). To the extent that such meta-laws exhibit the sort of global self-organization proposed by Harris's unifying principles, his appeal to relativity may be justified.

However, Margaret Morrison's sustained thesis has been that history is ripe with examples of elegance and order being injected into nature via formalism without sufficient justification (e.g. the theories of Plato, Kepler, and Pythagoras are examples of this blunder). For example, "symmetries from which we are able to derive a particular conservation law are themselves exact symmetries of the equations of motion, the Lagrangian, rather than exact symmetries of nature itself" (1995, p. 176). This kind of scepticism as to whether such overarching order exists in the world or is merely a product of our formalism is paradigmatic of relationalists. Pooley notes the *kinematic argument* in support of this view:

Imagine a possible world W' just like the actual world except that, at every moment, the absolute velocity of each material object in W' differs from its actual value by a fixed amount (say, by two meters per second in a direction due North). W' is an example of a world that is kinematically shifted relative to the actual universe. Two kinematically shifted worlds are observationally indistinguishable because, by construction, the histories of relative distances between material objects in each world are exactly the same. The worlds differ only over how the material universe as a whole is moving with respect to space. Since substantival space is not directly detectible, this is not an observable difference (2013, p. 5).

Hence, if we are to take a conservative route, contemporary spacetime theories do not directly provide support for a unifying principle as ontologically conceived. On the other hand,

conceiving of spacetime as a unifying principle may be considered a valuable *a priori* posit insofar as it is utilized in viable spacetime theories. This would only grant the unifying principle (or meta-law) as an epistemic constraint, rather than an ontic level of nature.

Nevertheless, numerous authors have advocated for the substantivist position. Nerlich (2003) maintains “in GTR, space-time geometry and matter distribution constrain each other at each point in accordance with a fundamental law written $G=KT$ (roughly G encodes geometric structure and T describes matter and energy) [...] In GTR, space-time is a dynamical object” (p. 288). Likewise, following Maldacena, Clayton (2004) maintains, that “General relativity requires that space-time be treated like a four-dimensional fluid and not as a nonphysical structuring separate from what exists within it (such as mass)” (p. 581).⁵⁵ Rovelli (2007) elaborates, “GR is the discovery that spacetime and the gravitational field are the same entity. What we call ‘spacetime’ is itself a physical object in many respects similar to the electromagnetic field” (p. 1307). However, he says the gravitational field is dynamical, which “implies that physical entities – particles and fields – are not all immersed in space, and moving in time. They do not live on spacetime. They live, so to speak, on each other” (ibid). This is to say that general relativity does not deal with values at spacetime points, but with values of dynamical quantities at spacetime locations “determined by other dynamical quantities” (p. 1310). Entities are not all composed of, nor conceived as particles, but crucially include fields such as gravitation, and are localized only with respect to one another (p. 1313). Such substantivist accounts provide support for Harris’s internal relations and if sound, would provide a realist interpretation of (at least) one such unifying principle.⁵⁶

After a thorough review of the major arguments both for and against substantialism and relationalism, Pooley (2013) concludes that the former is “recommended by a rather straightforward realist interpretation of our best physics. This physics presupposes geometric structure that it is natural to interpret as primitive and as physically instantiated in an entity ontologically independent of matter” (p. 10). As implied above, he goes on to write, “the only strong consideration in favour of relationalism is Ockham's razor” (ibid). So, current theories can support a substantivist conception of space-time as instantiating a meta-law or unifying

⁵⁵ The interested reader may wish to see the following link for further details:

<https://einstein.stanford.edu/content/relativity/a11332.html>

⁵⁶ In response to Harris’s conception of the internally related whole is paradigmatically exemplified by spacetime, Blanshard (1986) has agreeably maintained that in GR: “every body is related to every other body in a four-dimensional space-time whole. No part of it, no part of such a part, no figure or size of such a part, would be what it is without its spatial and temporal relations to the other parts” (p. 6).

principle. For Harris however, conceiving space-time as “primitive” or “independent of matter” goes too far.

After an extensive historical analysis of space-time theories, Gunn (2011) maintains an interpretation of GTR that I propose is most adequately reflective of Harris’s position. On the one hand, he contends space-time is passive to matter since matter is the source of gravity, which dictates the dynamical metric field of space-time. By this account, space-time can be considered an “ideal” construction derived from matter. On the other hand Gunn argues,

the energy-momentum of non-gravitational matter cannot even be conceived independently of space and time [...] In addition gravitational waves require moving charges for the generation and the existence of their motion requires space-time to already exist. In these respects, then, matter would seem to be posterior rather than prior to space-time (p. 138).

Thus he concludes that there exists a “co-dependency of space-time and matter” (ibid). Gunn reasons that the “simultaneous reality and ideality of each with respect to the other, indicates that [...] both exist together in something else which unites them both, and relative to which they are absolutely ideal, something like thinking and extension are in Spinoza’s system” (pp. 138-39). Furthermore, he concludes that after relativity theory, it is no longer reasonable to treat field theory as *mechanical*, nor to treat its dynamical principle as *analytical*, “in so far as ‘analytical’ refers to an explanation of the whole in terms of its parts...” (p. 145).⁵⁷ Indeed Gunn’s identification of “ideal” and “analytical” (abstract) concepts mistaken for reality is precisely in tune with Harris’s (1974, p. 92) appeal to what Spinoza called the *confused idea*. (This issue is revisited in chapter 7).

Taking spacetime as an example, it is now possible to consider what kind of contemporary holism supports Harris’s unifying principles. (i) *Ontological holism* maintains that some objects are not completely composed of basic physical parts. Due to Harris’s apparent rejection of substantialism, the ‘higher’ scale cannot be different from its composition, since this would permit ontological *plurality*. Hence, ontic holism is rejected. (ii) *Property holism* maintains that some objects bear properties that are not determined by the physical properties of their underlying constituents. From Harris’s anticipation of meta-laws and paradigmatic appeal to internally related fields, the dialectical holist can agree with this thesis just in case

⁵⁷ Additionally, compare with Barrow’s (2007) likeminded account: “The geometry of space and the rate of flow of time are no longer absolutely fixed and independent of the material content of space and time. The matter content and its motion determine the geometry and the rate of flow of time, and symbiotically this geometry dictates how matter is to move” (p. 80).

“properties” be replaced by *relational processes*. (iii) *Nomological holism* maintains that certain phenomena instantiate laws that are not determined by fundamental physical laws governing the structure and behaviour of their underlying constituents. This fits with Harris’s unifying principle because while the overarching meta-law is a result of its composition, as a whole this composition instantiates a kind of order that is not found in its isolated parts and that cannot be deduced from an understanding of these parts. A consequence of Harris’s contention that GTR instantiates a unifying principle reflective of the Concrete Universe is that the *substantivist* versus *relationalist* debate may be avoided. This move is most adequately captured by Gunn, for whom matter, space, and time are abstractions from a more fundamental “self-determining” space-time field that is likewise an abstraction from something still more fundamental, i.e. what Gunn calls “*pneumetical force*” (largely analogous to Bohm’s *holomovement*).⁵⁸

Though viable when first proposed, recent research has shed a different light on Harris’s theory that the topology of space-time is that of a hypersphere. Current models are limited because they exclude details prior to *decoupling* (CBR era) and (obviously) from the future states of our currently expanding universe. As a result, theories concerning cosmic topology could be verified if we happened to be living in a “small universe” whose size were the same as, or barely larger than the observable cosmos. Unfortunately all “we can truly conclude is that the Universe is much larger than the volume we can directly observe” (NASA.gov, 2014). Our light cone thus creates an *epistemic glass ceiling*, by restricting what can be observed, beyond which any discussion becomes speculative. Cosmologists attempt to side-step this obstacle by extrapolating GTR to all of spacetime (Smeenk 2013, p. 2). After a thorough examination of spacetime topology, Manchalk (2013) concludes “general relativity allows for a wide variety of global spacetime properties”, including a range of possible topologies, and deciding among them remains an open issue (p. 12). According to the most recent WMAP data however, the universe is flat with only a 0.4% margin of error.⁵⁹ That is, observations from our *past light cone* have revealed a *Friedman-Lemaitre, Robertson-Walker*

⁵⁸ Despite their similarities, Gunn later contends that Hegel’s dialectic cannot be found in contemporary physics, though in these cases he is referring to (what is perhaps a miss-reading of) the *thesis, antithesis, synthesis* sense of the word. Unfortunately I do not have space to compare and contrast Gunn’s likely accurate understanding of physics with Harris’s *use of the dialectic* in terms of cosmological evolution. My elaboration of Harris’s notions of dialectic evolution and emergence in chapters 5 and 6 will have to suffice.

⁵⁹ http://map.gsfc.nasa.gov/universe/uni_shape.html

(FLRW) topology that is isotropic and homogenous. Hence, Harris's posit of the hypersphere is no longer in fashion and given recent data, is likely incorrect.

This section has shown that GTR can be interpreted so as to offer support for the thesis of dialectical relations, and provides an example of a unifying principle. In this case, the meta-laws that govern the spacetime system are however beyond empirical verification, rather acting as *synthetic* constraints upon our understanding of observable phenomena. As a result, Harris's claim that relativity theories provide evidence for an organizing principle can be granted only on epistemic (i.e. *a priori*) grounds. This is to say that in *discussing* physical phenomena of relativistic distances and speeds, such a principle is *pragmatically* invoked in order to account for the available observations.

3.3 Harris's Appeal to Unity and Irreducibility in QT

Towards a defense of the Concrete Universal, Harris appeals to the aim of contemporary physics to unify all known fundamental forces into the illusive *Theory of Everything* (ToE). Indeed experimental particle collisions performed by the *large hadron collider* (LHC) have provided increasing support for the Standard Model, encouraging many to believe that we may yet achieve the goal of unification. However, recent works have also raised substantial challenges to such unity and fierce debates continue in the philosophy of physics today. Harris also claims that QT requires a 'holistic logic' (as opposed to reductive analysis) that provides further evidence for a unifying principle, this time at a microscopic scale. I maintain these two contentions of reducibility and non-reducibility are clearly at odds with one another and so the purpose of this section is to clarify Harris's position.

According to Harris, QT provides evidence in favor of dialectical relations in a multitude of ways. Paramount among them is the guiding theme of the Standard Model that the fundamental forces have given rise to a family of particles, each relating to one another according to symmetry principles. Harris claims that this shows the "properties of each particle are a consequence of its relation to all the rest of the universe" (1965, p. 97). In support of his Concrete Universal, Harris claims contemporary physicists are now "seeking a single primordial force, which subsequently differentiated itself into those now known as primary (strong, and weak, gravitation, and electromagnetism) according to a single fundamental law" (1988, p. 56). He maintains that since the electro-weak and strong forces have been unified via "gauge theory", all that remains is for the *Standard Model* or a rival, e.g. string theory, to include gravity for a "final unification" (1991, ff. p. 39). However, as

implied above, Harris also claimed explanation of Nature requires not a mere reduction, but an *explication* of its respective unifying principles:

[S]elf enfoldment and new dimensions of complexification give rise to new types of whole and correspondingly new laws of action, so that different levels of integrated complexity produce different orders of reality, which may be mutually continuous without being mutually reducible. This is because the principle of organization in every totality determines its character throughout and in detail, and that principle is fully realized only in the completed whole. The ultimate key to explanation, therefore, is that which explains the most complex and highly developed, not that which applies only to the lowest level of complexity, even though the former is and must be, in a sense implicit or potential from the start (1970, p. 369).⁶⁰

Citing Max Planck's (1936), Harris holds there exists an 'inter-connection between parts of a whole', that emphasizes the importance of local context. Particles, he claims, "exist as distinguishables *only qua* features of the system and not as separate individual entities. They are not individuals and can be termed particular *distincta* only in terms of their participation in the articulated structure of the system to which they belong" (1965, p. 136). In addition, he maintained that the individual quanta are now more accurately understood as waves that cannot be considered in isolation but only as interdependent systems:

Even free-moving particles attached to no particular group, such as neutrons expelled from atoms under bombardment, are seen as wave packets, presupposing some wave field in which the waves have become superposed. As soon as one speaks of waves, one is committed to the concept of periodicity and ordered structure... (2000, pp. 157-58).

Such 'periodicity and ordered structure' is for Harris demonstrative of a unifying principle. Likewise, in the case of a quantum system, Harris maintains, the whole assumes "priority over determination of the exact position, or the precise momentum, of particles within it..." (1991, p. 31).

Harris endorses Bohm's theory of 'hidden variables' (1965, p. 123), and (as discussed in § 2.5) later cites Bohm's (1980) conception of the implicate order in support of his holist interpretation of QM. Accordingly he maintains, we must "regard what is measured and the measuring instrument as a single indivisible complex, within which what is measured comes to be" (1991, p. 32; see also 2000, ff. p. 100). For example, Harris invokes Bohm and Aharanov's modification of the EPR experiment as evidence that "events separated by a

⁶⁰ I return to this issue on many occasions and especially in chapter 8 below.

space-like interval are necessarily (even through not causally) bound together by faster than light influences” (1991, p. 33).⁶¹

This is all to say that for Harris (as for Bohm), the supposed *intrinsic properties* of parameters, events, and fundamental particles depend upon organizing relations within a system-as-a-whole. The “proper interpretation of quantum mechanics” for Harris is therefore likely to “depend upon the recognition that the physical real to which it refers is a whole or structured totality in which individuality is constituted by form, and particulate existence is only provisional, approximate, temporary and adjectival to the dynamic pattern in which it occurs” (1965, p. 139). Harris holds that given the above, “space-time and energy are seen to be inseparable aspects of a single reality, as are energy and matter, wave and particle” (1991, p. 38). On this account, he concludes that classical logic is insufficient to express the discoveries of 20th century science:

There can be no atomic facts and no atomic propositions. The logic that assumes their existence may still be of use – if the subject matter to which it relates is to be regarded (for theoretical convenience) as a mere aggregate, but to the system of the real world, as science now conceives it, such logic must be wholly inappropriate (2000, pp. 101-2).

3.3.1 Reductive Versus Synthetic Unity

In this section I show that despite various supporting points, some of Harris’s claims concerning the dialectical whole as overarching nature bear many more differences to the Standard Model than he was originally able or willing to recognize. On the one hand, a number of theorists, including Bangu (2013) and Carr (2006), are optimistic that experimental results, in combination with theoretical symmetry principles are getting us closer to a GUT.⁶²

⁶¹ Diagrammatically then, aperiodic effects of *quasicrystal* structures described by Penrose (1989) capture the kind of non-local unity Harris has in mind (1991, p. 33). Indeed the aperiodic, overlapping, and self-assembling nature of quasicrystals may serve as a paradigmatic example of Harris’s conception of the dialectical whole. For a technical overview see Samavat, *et al.* (2012); for an interesting consideration of quasicrystals creating an instance of *paradigm shift* see Ashkenazi, *et al.* (2014).

⁶² The simplest possibility for a GUT is based on the symmetry group SU(5): “In SU(5), we have 24 gauge bosons. In this scenario, SU(5) should be spontaneously broken to UY (1) $\hat{\sim}$ SUL (2) $\hat{\sim}$ SU(3) at “low” energies. Below the SU(5) breaking scale, the masses of 12 gauge bosons would be of the order the SU(5) breaking scale, while UY (1) $\hat{\sim}$ SUL (2) $\hat{\sim}$ SU(3) would remain the residual symmetry above the electroweak scale with 12 massless gauge bosons” (Bambi, *et al.*, 2016 p. 46).

For example Carr agrees with Davies' (1993) assertion of an organizing principle implicated by the coherence of the laws of our universe. He holds that there is an inherent beauty to the universe involving “mathematical elegance, simplicity, and inevitability.” He goes on to say,

all the laws of nature seem to be a consequence of a simple set of symmetry principles. For example, symmetrizing electricity and magnetism gives Maxwell's equations; symmetrizing space and time gives special relativity; and invoking gauge symmetries leads to the unification of the forces of nature (Carr, 2006 p. 147).

On the other hand, invoking symmetry appears to now require a bit more philosophical legwork (empirical observation being unavailable), to arrive at the kind of ontological conclusions Harris so confidently maintains. Morrison (2013) supports the interpretation that a grand unification in modern terms would mean the discovery that all known particles can be understood as “one and the same force” (p. 382). She cautions however that unification in the Standard Model is tenuous because of the use of *free parameters* “and the fact that the theory is an amalgam of three different symmetry groups $SU(3) \times SU(2) \times U(1)$ rather than a single group...” (p. 383).⁶³ As a result, it would appear that Harris was mistaken to believe that adding gravity to this system is a final step, because the weak, strong, and electromagnetic forces have yet to be reductively unified.⁶⁴

In considering the challenges to Harris's appeal to the Standard Model, it is instructive to realize that there are different kinds of unification. For example, Barrow (2004) considers a range of principles by which scientific theories unify and advance, the third of which is *reduction*: “the discovery that the value of one constant of nature is determined by the numerical values of others” (p. 407). In order to carry out a reduction of a given physical force, parameter, or phenomenon, we need already to know some likely set of constants Barrow says, then we “develop a broader explanation that links their domains of application” (p. 408) (see also Morrison 2013, p. 386). A common example of reduction in the number of constants that Barrow supports is the unification of *electromagnetism*.

⁶³ Symmetry types include: 1. Space-time/non-space-time; 2. Continuous/discrete; 3. Local (gauge)/global (ridged); 4. Geometrical/dynamical; 5. Discrete vs. continuous symmetry, e.g. square vs. circle “invariance” (Bangu 2013, p. 4).

⁶⁴ Moreover, gravity itself may not be a fundamental force as “there are no particles that couple to the gravitational field and act as force carriers; the effects of gravitation are ascribed to space-time curvature instead of a force per se” (Morrison, p. 383).

Indeed Morrison finds Maxwell's *electrodynamics* to be the first unified field theory of physics and a rare example of reduction. The laws of physics were understood to take "the same form in all inertial frames" and "the relationship between electricity and magnetism could be represented by the transformation properties of the electromagnetic field tensor [...]. Hence, the magnetic field appears as an effect of the transformation from one frame of reference to another" (pp. 393-94). The upshot is that in certain cases a single phenomenon can be mistakenly analyzed as two or more different kinds until a reductive unification provides a framework for understanding their *underlying unity*. Though Harris did not distinguish between kinds of "unification" in the philosophy of physics, he nevertheless appealed to electrodynamics as a case of unification in support of his metaphysics – thereby implicitly endorsing reduction.

Barrow's fourth principle *elucidation*, which is said to occur "when a theory predicts that some observed quantity – a temperature or a mass for example – is given by a new combination of constants. The combination tells us something about the interrelatedness of different parts of science" (2004, p. 408). Barrow's example here is Hawking's prediction of the evaporation of black holes, as this requires combining our understanding of thermodynamics, light, gravity, and Planck's constant. Morrison finds that most attempts at reduction of physical phenomena end up being cases of what she calls *synthetic unity*, in which the respective phenomena remain independent but are described within one overarching theory. In such cases there is no unification of the sort that would permit deriving the formalism of one theory from a more fundamental theory.

Morrison claims that synthetic unity can be characterized by the electroweak theory, but that such unity is "not possible with the larger Standard Model".⁶⁵ This is because in contrast to the Standard Model, the electroweak unification

was largely structural rather than substantial and as a result does not fit with the idea of reducing elements of the weak and electromagnetic force to the same basic entity [...]. The $SU(2) \times U(1)$ gauge theory [...] specifies the form of the interactions between the weak and electromagnetic forces but provides no causal account as to how the fields must be unified [...] the unity that is supposedly achieved results from the unique way in which these forces interact (pp. 399-400).

⁶⁵ The electroweak theory results from combining the $SU(2)$ group governing isospin/weak interactions (10^{-15} cm range) and the $U(1)$ group of electromagnetism (∞ range). The Standard Model results from the combination of Quantum chromodynamics (QCD, $SU(3)$ symmetry group) of the strong interactions with the electroweak theory.

The two fields are thus integrated under an overarching framework that results from the interaction of their independent symmetry groups. This unity resulted in a reconceptualization of the electromagnetic potential and positing of additional dynamics. Such a synthesis, she maintains, preserves independence for each domain while providing a broader theoretical framework within which their integrations obtain (p. 402). As a result, it is widely accepted that electroweak unification results from formal operations rather than the discovery of empirical unity.

Barrow's fourth principle, *enumeration* is considered the holy grail of physics: "the calculation of the value of a constant of Nature from first principles, showing that its value is explained" (2004, p. 407). Though it has yet to unify the known constants, Bangu (2013) remains encouraged by methods involving to mathematical symmetries. He maintains that symmetry is an indispensable tool for particle classification and prediction, e.g. our success in discovering the Higgs.

Their taxonomic function brings with it two main benefits. The first is that order can be imposed over a huge variety of elementary particles. The second comes from the use of these schemes of classification as guides toward the fundamental ontology: while the known particles neatly fitted the schemes, physicists also perceived "gaps" in the schemes, that is, positions for which no corresponding particle was detected. The existence of these gaps suggests that the physical particles that would fill them might themselves exist... (p. 290).

In this way the on-going revelation of symmetry in nature *implies* wholeness, and interrelations that run deeper than we can empirically observe.⁶⁶ However, jumping to conclusions about which interrelations obtain in nature would be hasty at this point.

Unfortunately, the Standard Model is ripe with "unnatural fine-tuning" of its parameters. For example, the mass of the Higgs was established because of fine-tuning, which was required to make it small enough for a number of other theories to remain consistent. This brings Morrison to conclude that despite the significance of the Higgs discovery, we still lack a truly cohesive and naturally unified model of nature. In this vein, new discoveries involving the Higgs at the LHC may overturn this model in favor of another.

⁶⁶ For example Bangu notes that the discrete symmetry – consisting of charge conjugation symmetry (S), parity (P), time reversal symmetry T(T), and spatial/antiparticle inversion (CP), resulting in an exact symmetry, or (CPT) – of particle groups has made many particle predictions and has been confirmed through experiment (Bangu, p. 294). QCD has also been used to predict quarks of various colours and hadrons (p. 302).

An examination of evidence from both experiment and theorizing suggests the following characteristics of unity: it is something that can be achieved in certain local contexts, it is characterizable in different ways, but cannot be extended to a “unity of nature” that is systematically defined (Morrison, p. 407).

She maintains that grand unification is possible but this will likely depend upon *effective field theory* (EFT) – incorporating only the particles and scales that are important for a given investigation – fundamental theories, and phenomenological models.

This section has shown that Harris was mistaken to appeal to the Standard Model as a means of supporting his holism. Aside from the interrelation of particle types – which may provide support for dialectical relations – the very notion of scales in nature that Harris advocated is not supported, but rather eschewed by this model. Whereas Morrison voices doubt that Nature can itself be unified in accordance with reductive theories, Harris went to great pains to show the necessity of utilizing synthetic (i.e. interdisciplinary) methods in providing a holistic theory of Nature (to be addressed in later chapters). His mistake then was adopting too many theories that appear “holistic”, without distinguishing among them. As a result, there is a danger that Harris’s conception of “unity” is vague enough to be trivial, or is threatened by contradiction to the extent that he both appeals to the Standard Model and maintains *irreducible emergence* of unifying principles (e.g. spacetime). In chapter 5, I return to a more thorough consideration of emergence and reducibility, but the following section provides a first pass of these issues in the context of QT.

3.3.2 Entanglement as a Purported Example of a Unifying Principle

In the first instance, to justify the central thread of Harris’s appeal to QT, only the most mainstream accounts need be invoked. According to Serway, *et al.* (2013), in contemporary QT the wave function is not merely associated with the particle, but “is determined by the particle *and* its interaction with its environment, so, like energy, it more rightfully belongs to a system” (p. 1087).⁶⁷ Similarly, when dealing with a pair of particles (or ‘composite system’) there are rules for understanding its state-space that adds further support to Harris’s holism. These rules tells physicists how the state-spaces (H_A and H_B) for two respective particles

⁶⁷ Indeed the simplest unit of information according to QT, the *qubit*, is itself understood as a physical system (Deutsch p. 100). For Zeilinger (2004), the qubit “could be any dicotomic, that is, two-valued, observable, for example an electron’s spin, [or] a photon’s polarization...” (p. 214).

obtains the state-space (or ‘tensor product’ $H_A \otimes H_B$) of the pair: (i) if H_A and H_B are Hilbert spaces, $H_A \otimes H_B$ will be as well; but (ii) The state of a composite system $H_A \otimes H_B$ is not uniquely defined by those of its components H_A and H_B . Thus, it can be argued that there is “non-trivial” knowledge about complex composite quantum systems that does not supervene upon the knowledge about their components (Jenann 2015).

More specifically, Harris’s holist interpretation of quantum phenomena appears in line with what is now called *relational physics*, supported by Rovelli & Smerlak (2007), Crane (1993), and Smolin (1997). For the relational quantum theorist, the respective values of Ψ (p , p' , p'' ...) are made determinate through the interaction of the quantum system with some external environmental system (O). Hence, “there is no meaning in saying that a certain quantum event has happened or that a variable of the system S has taken the value q : rather, there is meaning in saying that the event q has happened or the variable has taken the value q for O , or with respect to O ” (Laudisa & Rovelli, 2013). Thus concepts of absolute states, events, or values are denied, the isolated system becomes a meaningless concept, and the physical world is described as a net of relations across disparate systems.

In this way, Harris’s claims of irreducible systems in QT can be further supported by Teller’s (1986) *relational holism*, in which quantum systems exhibit relations irreducible to and non-supervenient upon their underlying components. Interestingly, relational holism has been adopted by AE as a means of establishing a general theory of *emergence*:

certain wholes possess emergent features that are not determined by the intrinsic properties of their most basic parts. Such emergent features are irreducibly relational. They are constituted by relations that are not exhaustively determined by or reducible to the intrinsic properties of the elements so related (Thompson 2007, pp. 427-28).⁶⁸

This account also retains close ties with Bohm, because as Unger and Smolin (2015) point out, theories capable of accounting for the nature and effects of “‘hidden variables’ could only be relational views: they would show how the particles, fields, and forces studied by quantum mechanics relate, through reciprocated action, to features of the universe that have remained outside its scope of inquiry” (p. 195).⁶⁹

⁶⁸ Philosophical issues and physical theories of emergence will be further discussed in § 5.3.2 below.

⁶⁹ For a technical treatment of Bohm’s argument for indivisibility of the EPR experiment see his (1980, ff. p. 117; 1993, ff. p. 134). For further details regarding the formalism of *hidden variables* see David (2015, ff. p. 116). For a philosophical introduction to *Action at a Distance in Quantum Mechanics*, see Berkovitz (2016).

For example, according to the property-assignment rules of orthodox QM, in the *spin singlet state* of the EPR experiment particles are entangled in an anti-correlational state that cannot be decomposed into a product of separate states (i.e. of L- and the R-particles with individual spins). Thus, according to Berkovitz (2016), (i) *state separability* fails; (ii) Teller's *relational holism* is vindicated because properties of the particle pair fail to supervene upon the intrinsic qualitative properties of the particles and their spatiotemporal relations; and (iii) *process non-separability* is vindicated because the process that leads to each of the measurement outcomes is likewise non-separable. As Barad (2007) explains, the apparent paradox of superluminal action at-a-distance

arises out of a mistaken belief in metaphysical individualism. That is, the paradox arises out of the mistaken assumption that there are individually determinate entities from the outset; this assumption, which is the basis for classical physics, is precisely what is being called into question here [...] in the EPR case the entities are not separately determinate individuals but rather inseparable parts of a single phenomenon (pp. 315-16).

In this case then, we are not dealing with pre-existing individually determinate entities with determinate spatial positions *communicating instantaneously at a distance* from one another, but “a phenomenon that determinately resolves the boundaries and properties of the entangled components in a way that gives meaning to the notion of individual” (ibid).

Even on an orthodox interpretation, the double slit experiment appears to depict a contradiction, the result of which Maudlin (2003) agrees there is an ontological and irreducible form of holism, for which classical logic is insufficient. Maudlin explains that in QT “a disjunction $[C (A \vee B) \wedge C]$ can be true even through neither disjunct $[(A \wedge C) \vee (B \wedge C)]$ is true, so classical logic fails” (p. 479). This is to say that in a double slit experiment, a particle must go through one of two slits, which is true, but also false because the particle does not go through either one or the other. Maudlin finds that we can avoid this contradiction if we understand that facts about unions are not reducible to disjunctions of corresponding facts about their parts. He concludes the deepest metaphysical innovation of QT “lies in the holistic nature of the wavefunction, and the fact that the quantum state of an entangled system cannot be recovered from the quantum states of its parts” (pp. 485-86).⁷⁰ This line of

⁷⁰ What *quantum logic* reveals is a logic of measurement-outcomes in closed subspaces of Hilbert space H forming an algebra called a *Hilbert lattice* $L(H)$, where not all measurements are commutable (Wilce, 2012). As a result, the standard distributivity law of propositions does not hold and “the set of projectors on a Hilbert space

reasoning demonstrates only that there is a constraint on how current formalism reflects “individuals” in the world, i.e. some phenomena cannot be decomposed into components but must be *treated as a whole*.⁷¹

This section has shown that Harris was right in appealing to a prevailing holism of QT (e.g. EPR entanglement) that requires logic contrary to the analysis of separable entities. In order to draw out further details regarding Harris’s philosophy of physics however, it is necessary to consider how he used the above contentions to discuss a wider class of natural phenomena. To this end, I next consider an issue at the foundation of Harris’s philosophy of Nature: the interdependence of cosmology and consciousness studies.

3.4 What Does Cosmology have to do with Consciousness?

Admittedly the results of this chapter have not been particularly surprising thus far and neither would Harris have expected them to be. What these results have done however is prepare the way for a consideration of what is a guiding theme of his system. As discussed in § 2.2, for Harris scientific practices must be seen as the application of a whole system, one that depends upon the coherent arrangement of all its parts. This means that if any one theory is inconsistent with the worldview, the system itself must be reconsidered, rather than the part alone. He reasons that the scientific method is a “systematic explanatory scheme”, a “whole” whose elements are “interdependent.”

Such a whole must be complete, and no scientific theory is complete until it embraces the entire universe. At this stage it becomes a cosmology [...] Every such worldview is a metaphysic; so the edict of empiricism against metaphysics is without a shred of justification, for intrinsic to all science and all experimental method a metaphysic is presupposed (2000, p. 21).

Unfortunately, Harris did not spell out in sufficient detail why cosmology is a metaphysic. Nor did he explain the importance of considering theories of mind and cosmos together, but merely demonstrated it in his methods of investigation and attributed the approach to Hegel’s

do not generate a Boolean algebra, but a more complicated structure, called an orthomodular lattice” (David 2015, p. 81).

⁷¹ Harris contends that “the theory of relativity gave precedence to the concept of the field over that of the particle” (2000, p. 98). Indeed, Earman (2007) has noted that in *quantum field theory* (QFT) “fields are the fundamental entities and particles are epiphenomena of field behaviour” (p. 1407).

dialectic phenomenology. Hence, the present and following section serve to fill in this gap so as to provide a clearer means of evaluating the merit of his later arguments.

Derived from its Latin origin Universe is composed of *uni* and *versus*, resulting in *universum*, meaning everything rolled into one. Hence, from its earliest Western conception the cosmos is a whole, as anything else becomes utterly *incoherent*. Philosopher of cosmology George Ellis (2007a) explains that cosmology involves the study of all that physically exists, not merely the study of all that we can observe, the aim of which being to delineate the overall structure and evolution of the Universe. “Thus cosmology is of substantial interest to the whole of the scientific endeavour, for it sets the framework for the rest of science, and indeed for the very existence of observers and scientists” (p. 1184). On this view, cosmology provides an ontological framework for all scientific practices and a theoretical foundation for naturalistic accounts of all phenomena, including life and conscious observers.

Smeenk (2013) further explains that “Cosmology confronts a number of questions dear to the hearts of philosophers of science: the limits of scientific explanation, the nature of physical laws, and different types of underdetermination, for example” (p. 607). However, before the 1960’s this discipline, much like metaphysics before 1980 (Loux, M.J. & Zimmerman, 2003), was characterized as unscientific and speculative at best. As Smeenk puts it, the challenge is: how can one formulate a scientific theory of the ‘universe as a whole’? He goes on to maintain that this field is a legitimate part of science despite it having its own unique challenges. Based on the great achievements cosmologists have made in discovering and confirming theories like big bang nucleosynthesis, Smeenk explains there “are no convincing, general no-go arguments showing the impossibility of secure knowledge in cosmology; there are instead specific problems that arise in attempting to gain observational and theoretical access to the universe” (Smeenk, p. 608). This restriction on our observational powers highlights the significance of what is known as our *selection effect*.

A unique feature of cosmology as a science is its inherently speculative and philosophical nature due to our inability to probe the very early and distant reaches of our universe (Carr 2007, pp. 3-4). Starting in the 1920s-30s, data were enriched by a widening of our observational spectrum from optical to ultraviolet, infrared, X-ray, etc. The cosmic background radiation (CBR) observations of COBE and the WMAP satellites have provided crucial evidence for the global topology of our universe. Today, astronomers use as many means of observation as possible (the widest spectrum as well as taking account of dynamicity through time). This is because objects are often detectable at certain wavelengths

but not at others. Hence the selection effect of cosmology highlights a lesson applicable to all of sciences: *our conception of reality depends upon our methods, tools, and disposition of observation.*

Additionally, Ellis explains, “philosophical choice will to some degree shape the nature of cosmological theory, particularly when it moves beyond the purely descriptive to the explanatory role...” (2007a, p. 1184). He emphasizes in this vein that cosmology is far more than merely choosing or determining a number of physical parameters, as some hardnosed physicists maintain: cosmology assumes that the universe is “expanding and evolving”, and that “the laws of physics are the same everywhere, and underlie the evolution of the universe” (p. 1185, emphasis omitted). Indeed the Standard Model of cosmology extrapolates local laws to the universe as a whole; a move that implies global-to-local constraints that are not yet adequately accounted for. However, because our observations are made from a region of the universe that is hospitable to the existence of observers this results in the biasing of any global theories we construct (Carr 2007, p. 15).⁷²

The important conclusion from this overview of cosmology has been anticipated by Harris’s reasoning and eloquently captured by Gunn (2011): “as a whole”, the Universe “is not an object of experience, nor can it ever become such” (p. 258).⁷³ Indeed Gunn goes on to argue that even if we could somehow “transcend” the Universe and “reengage it” our object would now only constitute part of the Universe proper. Hence, it remains “beyond all empirical determination” (ibid). In the following section I examine one implication of this conclusion that reads between the lines of Harris’s original framework for the study of consciousness.

⁷² Following convention, in the remaining chapters I will use the capital “Universe” to denote all that either has or will ever obtain in physical reality and I will use the terms “universe” or “world” to denote everything within our cosmic horizon, or as some region of the Universe that is distinguished by law-like parameters.

⁷³ In Husserl’s phenomenological terminology for the structure of experience, the situation may be understood as follows: “Anything that comes forth, manifests, or emerges does so in an open clearing or expanse, delimited by a horizon. The horizon of every possible horizon is the world. Yet the world-horizon cannot be the synthesis, totality, or mereological sum of all these possible horizons because it is pregiven or *a priori* with respect to any of them and thus is *sui generis*” (Thompson 2007, pp. 35-36).

3.4.1 Anthropic Reasoning

What can be understood about the nature of our universe from examining the presence of intelligent observers and the conditions of their cosmic neighbourhood? To address this question is to consider the *anthropic cosmological principle*, which says *observations of the cosmos must reveal physical parameters of a universe that are capable of supporting the emergence of its observers*. Typically, the anthropic principle is used to constrain our physical theories by taking into account the presence of and necessary conditions for observers. This principle was first used in cosmology by Robert Dicke (1961), who noticed the prevalence of very large numbers with respect to the combination of fundamental physical constants. Later, Brandon Carter (1974) introduced the term anthropic principle with respect for the *large number coincidences* (LNCs) and distinguished between strong and weak versions respectively.⁷⁴

Interestingly, all of these dimensionless LNCs – including the age/expansion rate of the universe, the gravitation/mass ratio of all stars, and the ratio of the Planck energy density to the (apparent) vacuum density – are related in that they are each some power of $N=10^{40}$. For example McMullin notes the following: “(1) the ratio of the gravitational to the electric force is $\sim N-1$; (2) the ratio of the mass of the universe to the mass of the proton is $\sim N^2$; and (3) the Hubble age of the universe in atomic units is $\sim N$ ” (2008, p. 71). What is further interesting about these respective ratios is that we appear to be in a unique location and epoch of cosmic history to observe them. For example, the time it takes for carbon to be cooked up in and dispersed by stars, the age of the universe, and the time it has taken light to travel to us since the Big Bang are all 10^{10} y (Carr 2007, p. 77). In addition, the matter density and vacuum energy density run through a different scale of values over the history of the Universe and as Vilenkin (2007) explains, there is only one epoch at which they are roughly equivalent according to the Standard Model – the one we are currently living in. This has resulted in what has been called the *cosmic coincidence problem*. The anthropic principle provides a number of ways to answer this problem by considering how we have become a part of the universe at this most auspicious time in history.

⁷⁴ Brandon Carter coined the term but later lamented that it was improper because it really has nothing to do with humans beings. More accurately, it refers to the relationship between complex systems and the physical conditions necessary and sufficient for the emergence of observers in a given space time region. Overlooking this distinction can lead to a number of unwarranted conclusions, like extending the principle to theological interpretations that give humanity a privileged position in the Universe (Carr, 2007 pp. 85-86).

Weinberg (2007) explains that *anthropic reasoning* (AR) makes sense for a given constant if its landscape of “possible” variation is large compared with its anthropically conducive subset of values (p. 33). Nevertheless, he considers it understandable why some find AR distasteful because such theories “based on anthropic calculations certainly represent a retreat from what we had hoped for: the calculations of all fundamental parameters from first principles” (p. 39). As discussed in § 2.3, Harris maintained that the unavoidable use of metaphysics in *scientific philosophy* requires that one take as first principles both one’s own existence and the Universe (the whole of which one is a part). The development of knowledge then proceeds as follows: “Self-awareness and reflection go hand in hand with an insistent demand for self-knowledge, for understanding of ourselves and our place in the world; and that demand carries with it the inevitable need to unify and systematize our experience of that world and of ourselves” (1988, p. 11). Hence, on Harris’s account, to have self-knowledge requires a systematized worldview, one which relies upon empirical observation and is organized by metaphysics. However, he also maintained that the “anthropic principle” is “scientific” and “if respected, can give rise to significant observational predictions crucial to the acceptance of cosmological hypotheses” (1991, p. 1). This is to say that recognizing inherent selection effects in what and how we conceive of the Universe is necessary for scientific progress. So while our view of the world is inherently biased by our selection effect, critically assessing this bias results in ever clearer depictions of both cosmos and mind.

Indeed this idea has been echoed by numerous cosmologists in recent years. Like Harris, Linde (2004) notes that our theory of physical reality has been so successful that we have forgotten that our starting point was our phenomenal experiences. Although the anthropic principle runs the risk of serving as a mere “painkiller” for our confusion if uncritically embraced, he considers many criticisms of AR to be unwarranted. He maintains this principle could “help us to understand that some of the most complicated and fundamental problems may become nearly trivial if one looks at them from a different perspective” (2004, p. 427). In a later (2007) work Linde maintains that “in order to answer the question of why we live in our part of the Universe, we must first learn the answers to the questions ‘What is life?’ and ‘What is consciousness?’” (p. 140).⁷⁵

⁷⁵ To my mind this is to invoke the coherence theory of truth Harris was so fond of, in that scientists must now ‘fit’ observers into their cosmological models. In this vein Livio (2008) cites four cosmological observations that deeply inform an investigation into the nature of emergent life in the universe: (i) The spectra of distant galaxies are red shifted; (ii) to a precision of better than 10^{-4} , the cosmic microwave background (CMB) is thermal, with

Following physicist John Wheeler's spirit, Gleiser (2004) points out that in asking "How come us?" by implication we are positing "the existence of (i) a universe capable of (ii) harbouring life which, furthermore, is (iii) intelligent enough to ask about its origins" (p. 638). The question thus "encompasses all three origins, of cosmos, life, and mind; they may be (and often are) treated separately, but they are part of an indivisible whole (ibid). Additionally – short of being realists about the mathematical objects comprising our theories – any sufficient theory addressing the nature of the Universe must include an explanation of how the theory fits into its own model, i.e. a theory of the structures of knowledge arising in minds.⁷⁶ As Nesteruk (2013) claims, in the effort to maintain a naturalistic epistemology, through the search for its own facticity, scientists are lead to a *transcendental problematic*: "the complete picture of physical reality must include the conditions of its explicability and constitution" (pp. 2-3).⁷⁷

For Harris there is a two-way street (i.e. a biconditional) connecting ontological *theories* of mind and the Universe (the whole to which mind belongs). On the one hand, the conditions of mind are precisely what have resulted in our selection effect, which must be accounted for in order to establish an adequate cosmological theory. On the other hand, statements about the necessary conditions of mind must be grounded in some background theory about what is not mind, that is, a theory about how the cosmos (natural processes) exclude and permit consciousness. This background theory (cosmology) changes depending upon where and how we draw the boarder that distinguishes the conditions of mind from the rest of nature. Thus, having a complete theory of mind is possible iff we acquire a complete theory of the Universe.

Implicit in Harris's works is the notion that any adequate theory of either consciousness or the Universe will be grounded upon theories of the other, i.e. that these theories are *epistemically interdependent*. This *a priori* contention is evidently derived from his process-relational ontology and dialectical methodology (as outlined in chapter 2), which posits that adequately speaking of a given phenomenon requires explaining its relationship to the system

a temperature of 2.73 K; (iii) Light elements like deuterium and helium, have been synthesized in a high temperature phase of the early universe; and (iv) Deep observations have shown that galaxies farther away appear younger (e.g. smaller with higher fraction of irregular morphologies) (p. 114). Taken together, these observations reveal good evidence that the universe is expanding and cooling; evidence he considers not proof of, but "consistent with the Hot Big Bang model" (p. 115).

⁷⁶ Harris was here anticipating the self-referential ToE, such as (CTMU) Langen (2002) and Rapoport (2009).

⁷⁷ To this issue I will return in § 8.3, but a great deal of terrain must be covered beforehand.

within which it occurs.⁷⁸ Quite simply then, if we wish to have an ontology of consciousness that is scientifically grounded, we are obliged to fit this theory within the total paradigm of the natural sciences. This system is organized by cosmology, and hence such a theory of consciousness is adequate only when related within an overarching theory of the Universe. Likewise, an adequate theory of the Universe requires that we account for the conditions of consciousness – our selection effects. The Universe however, is an object that is beyond the scope of direct scientific investigation; a unique object more adequately understood as a metaphysical concept or *idea*. This establishes a bipolar structure for the dialectical holist epistemology (at this stage) but its ontology remains to be seen.⁷⁹

3.5 Conclusion

In § 3.2, I have shown that Harris's appeal to relativity theory to support his conception of the unifying principle has received support from numerous authors. While these theorists have taken different approaches to the ontological interpretation of space-time, they make common appeals to interdependence, self-organization, and irreducibility of global order, more recently articulated as *meta-laws*. Harris's optimism concerning the unity of particle physics is another story. The discussions of § 3.3 have revealed that while such optimism is shared by advocates of the Standard Model, this model aims for reduction, which is counter Harris's system. Nevertheless, recent conceptions of EPR entanglement, synthetic unity (EFT) appear to support Harris's conception of the whole as self-differentiated into irreducible scales – an issue to which I return in chapter 5.

In § 3.4, I have clarified the foundation of Harris's AR and supported his contention that cosmology is dependent upon philosophical *choices* or presuppositions that (in line with Ellis 2007, ff. p. 1242-45) shape the details of our physical theories. Hence, metaphysics is inherently interwoven into scientific theory. One consequence of this reasoning is Harris's largely implicit argument concerning the interdependence of cosmology and consciousness studies. Although Harris has attempted to use this line of thought to arrive at ontic conclusions regarding mind and cosmos, at present the supporting evidence only permits a

⁷⁸ Note that for Harris this is not merely to posit the necessary and sufficient conditions of a given phenomenon (ontic individuation) but to *also* examine the epistemic system within which the phenomenon obtains.

⁷⁹ For a summary of this argument for the interdependence of cosmology and consciousness studies see § III of the appendix below.

dialectical holist to endorse epistemic interdependence between studies of mind and cosmos: *implicating central roles for anthropic and unifying principles.*

Given the above, an invaluable means of evaluating Harris's metaphysics is to consider the extent to which the anthropic and unifying principles may provide insight into the hard problem of consciousness. Toward this end, in the following chapter I examine how Harris's *a priori* conception of wholeness leads him to the stronger versions of the anthropic principle in light of main-stream discussions.

Chapter 4

Harris's Version of the Anthropic Principle

4.1 Introduction

In October of 1986 Harris attended a symposium at Colorado State University that was intended to address the question “Does the new physics need a new metaphysics?” Here Harris’s received his first inspiration for what would become *Cosmos and Anthropos* (1991). In the preface of this work Harris recalls that the scientists who participated “unanimously” called for a “holistic metaphysic” of the kind he had been working on for most of his career.⁸⁰ Further inspiration came when presenting a paper at George Mason University on the *Anthropic Principle*, which was so well received that Harris was inspired to elaborate his arguments on this topic. Having secured a fellowship position at Boston University for this purpose, the text that Harris produced was an application of his longstanding metaphysics to the anthropic principle.⁸¹

In this chapter, I examine Harris’s appeal to four versions of the anthropic principle in light of four recently developed multiverse theories that some cosmologists consider effective for avoiding the conclusions of stronger AR. In § 4.2, I introduce the weak anthropic principle and three kinds of *selection effects* that are implied by Harris’s reasoning. The purpose of this section is to elucidate Harris’s (phenomenological) means of avoiding multiverse theories. In § 4.3, I argue that a weaker version of Harris’s participatory anthropic reasoning can be revised and upheld by appealing to Bohmian QT and AE. In § 4.4, I contend the final anthropic principle is largely irrelevant with respect to Harris’s project and in § 4.5

⁸⁰ Two years prior, Grier noted that Barrow and Tipler’s (1986) discussion of the relation between the “cosmological anthropic principle” and the “tradition of teleological explanation” has been anticipated by Harris’s earlier work: “In Harris’s work, stretching back over several decades, one can find a very sophisticated philosophical defence of just such a development in scientific theory” (1989, p. xiii).

⁸¹ When this project was completed Harris was again driven to extend this portrayal of holism and his recent insights concerning the anthropic principle into social, moral, and religious domains, resulting in a following text *Cosmos and Theos* (1992). Alas, the space of this thesis is insufficient for unpacking any the lines of argument contained in this work.

these discussions culminate with the introduction of Harris's (paradigmatic) teleological anthropic reasoning. I conclude that dialectical holism avoids many appeals to multiverse theories as means of refuting/deflating stronger AR, but Harris's ontological conclusions must nevertheless confront numerous unforeseen challenges to be addressed in the following chapters.

4.2 The Weak Anthropic Principle

According to the Newtonian worldview, the Universe is a machine guided by the laws of physics that can be understood independently of observers. The *weak anthropic principle* (WAP) is essentially modern cosmology's revision of this worldview, stating that we can only observe a universe from a space-time location that is habitable by observers. According to Carter's original (1974) assessment, our region of the universe, the planet Earth within its stable solar system, must be understood as necessarily privileged. However, the WAP makes no claims about whether observation itself is necessary. According to Vilenkin, the WAP recognizes that there are certain values of some variable(s) (X) whose potentiality varies across spacetime and influences the chances of intelligent observers evolving: " $X_{\min} < X < X_{\max}$ " (2007, p. 164). Both the lower and higher values of X will not be observed because they are inconsistent with the development of observers. The WAP thus constrains our theories about where we are in space and time and thus constrains the predictions we make basis of what values of X an observer can potentially measure.⁸²

Importantly, unlike stronger versions, the WAP makes no ontic claim about the nature of observers within the Universe, besides the (seemingly) trivial point that the historical conditions of the universe have *permitted* observers to exist and we should expect to observe the universe from a habitable vantage point. Hence, the WAP has been widely considered by philosophers and physicists to be a basic epistemic principle for the logic of modern cosmology (e.g. Carr 2007; Tegmark 2014, p. 111; Ellis 2007b, p. 1254).⁸³

⁸² The WAP and Vilenkin's (2007) 'principle of mediocrity' are really two sides of the same coin. Whereas the WAP notes that we should expect our location in space and time to be 'fine-tuned' to the extent of being compatible with our own status as 'observers', the idea behind the principle of mediocrity is that we should not expect our location to be 'over-tuned', i.e. we should expect it to be no more privileged than necessary to explain our status as observers.

⁸³ For a summary of WAP reasoning see § III-a in the appendix below.

Appealing to the WAP, Harris claims that the discoveries in contemporary physics depict a universe in which life can now be “understood as a development continuous with the non-living; and the world is observed as providing conditions for the emergence of intelligent beings” (1991, p. 4). Harris maintains, “we exist because the universe is the way we observe it to be, so we could not observe it otherwise” (ibid). This is to claim that our existence in some sense constrains and is constrained by the world-as-it-is-observed. *A fortiori* he maintains, “[w]e can only imagine the universe – any universe – as it would appear to our observation, even if it were different from what we actually observe” (ibid). While this may *prima facie* appear to be a mere truism, Harris clarifies that “[w]hat we observe is conditioned not only by the fact of our existence, but also by the nature and capacities of our perceptive and intellectual faculties” (p. 5). In this vein, I propose three types of *selection effects* largely implicit in Harris’s system and invaluable for evaluating his appeal to AR:

- (i) *Epistemological selection effect* (ESE) – denotes the limitations of *a posteriori* knowledge resulting from the method of investigation and *choice of relevance*. A common *metaphor* is the mesh of a net used for fishing, which permits fish smaller than the mesh size to escape and therefore avoid being observed.
- (ii) *Physical selection effect* (PSE) – involves any force acting on material entities such that certain observations are restricted while others are made possible. The above metaphor is here taken literally as the *physical constraint* that some entity (e.g. a net) has upon a system (e.g. a population of fish). The PSE necessarily contributes to the ESE, but does not exhaust it.
- (iii) *Metaphysical selection effect* (MSE) – considers the impact that *a priori* presuppositions have on the form of the observer’s physical theories, e.g. rules of logic, the rules for mapping abstract terms onto objects of the real world, and *choice* of methodology. Here the constraint arises from our paradigm, which creates a limitation on how accurately physical entities can be *individuated*. The MSEs are a sub-category of the ESE.⁸⁴

In discussions of AR, multiverse theories may arise simply by authors remaining realist about the unseen and logically possible values of certain cosmological parameters X. This move is captured by Barrow’s seventh pillar of scientific advance, *transfiguration*: “the

⁸⁴ For a summary of these respective selection effects see § III-b of the appendix below. For further considerations of the typical selection effects in the philosophy of cosmology see Bostrom (2002, 2007).

discovery that our supposed constants are a small part of a vastly more exotic structure” (2004, p. 407). Barrow explains the constants of nature “may not be specified by the self-consistency of a ‘theory of everything’ and so they may be permitted to take on any (or a wide range of) values” (p. 411). As a result, transfiguration permits a number of multiverse theories, to which appeals have been made both for and against AR (discussed below).

Harris does not try to deny *a priori* that some multiverse might turn out to be a viable theory, but maintains such theories must be theoretically coherent, and experimentally fruitful. He states the “Universe is everything that is and ever has or will be; there can be only one. To speak of many Universes is therefore a misuse of the term” (1991, p. 11). This is a fair and apparently benign etymological reminder, but he goes on to explain a crucial implication. Each region (or *universe*) “must somehow, and in some sense, be mutually related; otherwise they could not be distinguished, or counted, or regarded as many” (*ibid*). Likewise, the totality must “constitute a single complex, within which there may be many distinguishable regions or epochs, but these would not strictly be Universes, even if between them no communication of information could pass” (*ibid*). He argues that if “we cannot observe them, for whatever reason, we must at least be able to infer to their existence from what we do observe, or else their postulation becomes scientifically otiose” (*ibid*).⁸⁵ Ultimately, Harris eventually concludes on metaphysical grounds that multiverse theories are of little consequence in the face of his teleological AR. To clarify Harris’s approach, in the following section I introduce two multiverse theories and exemplify the three selection effects listed above.

4.2.1 Level I & II Multiverses

According to Tegmark, the level I multiverse is totally uncontroversial, requiring only that *space and matter are homogenous beyond our cosmic horizon*. This kind of multiverse has the same effective and fundamental laws throughout, but random quantum density fluctuations give rise to an infinite *ergodic* space containing Hubble volumes of *all possible initial conditions*. This means that the probability distributions of events in any given volume

⁸⁵ Ellis (2007b) agrees, “the idea of a completely disconnected multiverse – with regular properties but no common causal mechanism – is not viable. Some pre-realization causal mechanism must necessarily determine the properties of the universe in the ensemble. What are claimed to be totally disjoint universes must in some sense be causally connected, albeit in some prephysical or meta-physical domain” (p. 398).

is the same distribution that we would find by sampling different Hubble volumes, i.e. everything that could in principle have happened here has or will happen somewhere else at some calculable distance from Earth (Tegmark 2004, p. 464).⁸⁶ Interestingly, Tegmark argues that this level dissolves the debate between free will and determinism:

If there are indeed many copies of ‘you’ with identical past lives and memories, you would not be able to compute your own future even if you had complete knowledge of the entire cosmos! The reason is that there is no way for you to determine which of these copies is ‘you’. Yet their lives will necessarily differ eventually, so the best you can do is predict probabilities for what you will experience from now on (2007, p. 104).

Tegmark contends that we can accept the existence of things that are at present unobservable on the basis that they are in principle observable under certain conditions (like a ship beyond the horizon) (2014b, ff. p. 100). In this way, our inference to the existence of this multiverse is by no means costly or ungrounded. Although Harris did not address this version of the multiverse directly, it certainly satisfies his requirement that such theories must have empirical import in order to be admissible.

Concerning AR, Tegmark and Carr agree that if quantum density fluctuations of the early Universe are to blame for the conditions that give rise to living observers, then they are contingent on accidental features of symmetry breaking arising from the initial conditions of our universe. In this case the WAP would be necessary to discern which initial conditions (our presumed PSE) have given rise to our Hubble volume out of a range of *possibilities* (derived from some MSE).⁸⁷ On the other hand, if a future ToE will determine all universes uniquely then there would (purportedly) be no room for AR, since it would be possible to derive the parameters of our universe from this theory (Carr, p. 83). Since this multiverse

⁸⁶ The Hubble parameter measures the expansion rate of the observable universe. The value of the Hubble parameter is called the Hubble constant and it is usually denoted as H_0 . Today $h_0 \approx 0.70$. The distance that light has travelled in 13.8 billion years (the oldest observable stars) composes a sphere whose radius defines our observable universe, or ‘Hubble volume’ and denotes our observable horizon. “Above the Virgo Supercluster, we find the visible Universe: it contains about 108 superclusters, which all together count something like 10^{11} galaxies, its total mass is $10^{23} M_{\odot}$, and its radius is about 15 [gigiparsec] Gpc” (Bambi, *et al.* 2016, p. 15).

⁸⁷ Likewise Weinberg concludes that the multiverse represents an approach to cosmology analogous to what natural selection provided for biology: “Just as Darwin and Wallace explained how the wonderful adaptations of living forms could arise without supernatural intervention, so the string landscape may explain how the constants of nature that we observe can take values suitable for life without being fine-tuned by a benevolent creator” (2007, p. 39). In chapter 5 below I argue this kind of *reasoning from randomness* is incoherent.

theory is relatively non-contentious, it is the later versions that will reveal much more about Harris's AR.

The level II multiverse posits an infinite set of level I multiverses as a result of *chaotic inflation*.⁸⁸ Level II bubbles arise from the same *fundamental laws* but contain different constants, particles (due to symmetry breaking), dimensionality, and starting conditions. The level II multiverse implies an endless Universe in space and time with no ultimate Big Bang to get it started, i.e. *the big bang is always occurring somewhere*. In further contrast to the level I multiverse, we could *never* observe or get from any one of the worlds in the level II multiverse to another because of ongoing inflation. Though more controversial, Tegmark explains that we have come to many theoretical insights that go beyond what we can *immediately observe* (ESE). Arguing from analogy he says that if a fish never left the ocean it might “mistakenly conclude that the properties of water are universal, not realizing that there is also ice and steam” (2007, p. 100). He claims likewise, “Space can ‘freeze’, transitioning between different phases in a landscape of possibilities, just like water can be solid, liquid or gas. In different phases, the effective laws of physics (particles, symmetries, etc.) could vary” (ibid).

Linde (2007) holds that inflation theory explains local homogeneity by suggesting that at distances beyond our light cone the Universe is completely inhomogeneous. Based on chaotic inflation, the level II multiverse appears as an intricate fractal that expands eternally, the structure of which predicted by *mathematical laws* (MSE). “The different parts of this fractal are enormous and may have dramatically different properties. They are connected to each other, but the distance between them is so large that for all practical purposes they look like separate universes” (p. 128). In a rapidly expanding universe such as the chaotic inflationary model, it is argued that a scalar field goes down slowly “like a ball in a viscous liquid, with the viscosity being proportional to the speed of expansion” (pp. 129-30). He goes on to say, when the field value becomes small, inflation ends and the field oscillates near the minimum and like

any rapidly oscillating classical field, it loses its energy by creating pairs of elementary particles. These particles interact with each other and come to a state of thermal equilibrium with some Temperature T. From this time on, the Universe can be described by the standard hot big bang theory (p. 130).

⁸⁸ For introductions to inflationary cosmology see Guth (1998) and Linde (2004, 2007).

As previously discussed, such a theory will by its very nature be beyond empirical proof. For Harris such theories are unavoidable and our only available strategy is to make sure that the theory is parsimonious and congruent with observations that are available. Likewise, Rees (2007) warns, “consistency is not enough; there must be grounds for confidence that such a theory is not a mere mathematical construct, but applies to external reality” (p. 64). He proposes that such confidence can be achieved by a theory of the Universe or Multiverse structure “accounting for things we can observe that are otherwise unexplained” (ibid).⁸⁹

What evidence is available for level II? Tegmark (2007) finds that since the Level II multiverse is a direct result of inflationary cosmology, evidence in favor of inflation should do the job of supporting this multiverse. He claims “cosmological measurements have confirmed two key predictions of inflation: that space has negligible curvature and that the clumpiness in the cosmic matter distribution was approximately scale-invariant” (p. 106). Tegmark (in agreement with Linde, 2007 p. 131) points out that Level II necessitates AR because in a multiverse with different constants, “physicists will never be able to determine the values of all physical constants from first principles. All they can do is compute probability distributions for what they should expect to find, taking selection effects into account” (p. 109).

One of the most important implications of chaotic inflation is *universality*, according to which, everything that is possible inevitably comes into existence at some point. Ellis (2007b) concedes that this scenario would validate the WAP but points out that the physics for this position relies upon the undiscovered inflation field(s) (PSE). Importantly, these fields arise from the universe itself at a fundamental level, acting as order parameters for the *phase transitions* (i.e. evolution) of the respective worlds. In this regard Ellis asks, “[w]hat determines what is possible?” (p. 1257). Importantly, what is *physically possible* in this sense (PSE) may or may not be identical with what is considered to be *logically possible* (MSE). Nevertheless, in either case Harris’s *Concrete Universal* appears to be retained. Hence, level I

⁸⁹ By analogy Rees (2007) contends that despite the fact that limitations in our current technology prevent the observation of many galaxies, they are still included in our cosmological discourse, on the basis of what knowledge we have about the observable universe. Hence, space-times completely disjoint from ours and perhaps even governed by different ‘laws’ are no less ‘real’ legitimate objects of scientific consideration than regions (e.g. with redshift 10) that never come within our horizon.

and II multiverses do not conflict with Harris’s system but much more remains to be discussed.⁹⁰

4.2.2 Weak Anthropic Reasoning

By my reading, Harris (1991, ff. p. 2) attempts to demonstrate both mischaracterizations (e.g. he cites Hawking 1988, p. 124) and what he considers to be the fruits of the WAP. Harris first considers whether taking our selection effects seriously implies that “our theories reveal more about their authors than about their subject-matter” (1991, p. 5). He admits that theorizing about the world is possible even in cases where observation is “confined within irremovable horizons” (e.g. black holes), via extrapolations from known laws (ibid). He recognizes that “[t]o speak of the selection effect is to presume a known (or at least ascertainable) range of facts beyond what is selected” (p. 6). This he maintains must be true of both our (present) sense faculties and our theoretical models. Aiming to avoid Kant’s transcendental idealism, Harris argues, if on the other hand, we consider our sense faculties to be “incorrigibly” afflicted by selection effects, we are destined for “subjectivism” and “epistemological disaster”, because science would no longer provide knowledge of the real world (ibid). The WAP is then “scientifically important because it indicates a significant selection effect must be treated with the utmost caution and restraint” (ibid). So for Harris, *selection effects* not only reveal that our observation is *consistent* with some presumed PSE, but also emphasizes our limitation in individuating the parameters of our physical world as a result of our ESE. In what follows, I fill out Harris’s reasoning so as to further inform his later arguments.

Towards an illumination of Harris’s AR regarding selection effects, Carr, Barrow Hawking’s explanations of the WAP provide important contrasts. Taking a conventional approach, Carr holds this principle “accepts the constants of nature as given and then shows that our existence imposes a selection effect on when (and where) we observe the Universe”

⁹⁰ Although Harris devoted chapter 4 of *Cosmos and Anthropos* (1991) to discussing evidence for ‘fine-tuning’ of the relevant cosmological parameters, this material appears to conflate different arguments over *a priori* AR and those for the physical nature of this fine-tuning. Unfortunately, while his summary of physical observations appears mostly accurate, I have found this material to add nothing to the central vein of his AR and so have neglected its discussion in the present chapter. For a summary of apparent fine-tuning in support of AR see Appendix § III – c. For further sources and discussion concerning fine tuning see McMullin (2008); Carr (2007); Rees (2007); Ellis (2007b), p. 388; Tegmark (2007), pp. 108-9; Vilenkin (2007); Barrow, *et al.* (2008).

(2007, p. 78). More specifically, Barrow maintains that our observations “must not be viewed as having been taken from some unconstrained ensemble of possibilities but from some subset conditioned by the necessary conditions for carbon-based observers like ourselves to have evolved before the stars die” (2007, p. 193). Going even further, Hawking (2007) takes a “top down” approach, in which the history of the Universe is given by the *Feynman path integral* that “allows every possible history for the Universe”, and is constrained by our present measurement surface. As a result, the “histories of the Universe depend on what is being measured, contrary to the usual idea that the Universe has an objective, observer-independent, history” (p. 97). Consequently, they each endorse at least one of the following three assumptions:

- (i) The constants of nature are sufficiently individuated within our current models;
- (ii) These parameters imply a corresponding space of physical universes;
- (iii) Our measurements impose a physical influence upon the history of our universe.

Evidently, Barrow, Carr, and Hawking are all committed to (i). For Carr and Barrow, taking the *relevant* physical constants as given implies that their logical manipulations reveal a material possibility space (ii). Hawking further endorses (iii) that the history of our cosmos is adequately individuated by the path integral, which is itself influenced by observers. The concern is that many arrangements of physical constants that are *logically possible* (MSE) might never *physically obtain* (PSE). Arguments are needed to justify either (a) the two conceptually distinct possibility spaces are not being conflated; or (b) they are coincident.

Barrow (2011) actually anticipates this concern with a sense of humility. He cautions that at present we do not know what it truly means to consider the counterfactual alteration of a given constant:

At present we can imagine the effects of changing rates of radioactive decay without worrying if there are consequences for gravity or atomic structure. A fully unified theory would reveal all those interconnections and ensure that a small change in one part of physics would have extra consequences elsewhere (p. 231).

More recently, Harris’s abandon of AR that invokes multiverse models has been supported by Smeenk (2013). Despite the purported explanatory power of chaotic inflation, Smeenk questions the theoretical integrity of the level II multiverse. His first worry is that “the detailed accounts of how the multiverse arises are typically beyond theoretical control” (p. 645). This he claims creates a risk that “the claimed multiverse explanations are just so stories

where the mechanisms of generating the multiverse is contrived to do the job” (ibid). He goes on to say that it is not at all clear why it is helpful to shift our attention from explanations of the apparent value of some parameter(s) X , which is contingent upon historic events of our universe, into questions about the location of our universe within a much larger ontological landscape where the parameter varies. “Analogously, the success of historical explanations in evolutionary biology does not imply the existence of other worlds where pandas have more elegant thumbs” (ibid). Emphasizing parsimony, it would appear that Smeenk finds no reason why in explaining X , we must posit the existence of multiple universes to house the alternative values for X . Such a multiverse may in this sense be an excessive ontological commitment.

While a great deal of scientific progress proceeds in an inductive manner, it would appear to become problematic in cosmology because in this case we assume that the Universe may be characterized by the parameters we observe, despite our *present* (likely insurmountable) inability to examine these constants from *alternative perspectives*, let alone a *view-from-nowhere* (i.e. from first principles). In this respect, Ellis (2007b) poses a further word of caution:

Reality is not fully reflected in either observational or theoretical models. Problems arise from confusion of epistemology (the theory of knowledge) with ontology (the nature of existence): existence is not always manifest clearly in the available evidence. The theories and models of reality we use as our basis for understanding are necessarily partial and incomplete reflections of the true nature of reality, helpful in many ways but also inevitably misleading in others. They should not be confused with reality itself! (p. 1247, emphasis omitted).

Two of the most important examples of this confusion that he offers can be seen in *computer simulations of reality* and *the laws of physics themselves being confused with our mathematical formalism*. Ellis concludes that because the supposed causal (or pre-causal) processes of multiverse theories are either unproven or untestable, they are not physics but rather metaphysics (p. 1263).

The upshot of the present approach to the WAP, I maintain, can be understood in much the same way as Bohm’s implicate order is applied to QT: As appeals to probability in QT are for Bohm due to our ignorance of an implicate order guiding quantum particles, appeals to multiverse cosmology can be used *as a crutch* for our inability to sufficiently individuate the necessary parameter(s) X (of a super-implicate order) that instantiates observers. Consequently, appealing to a possibility space that *explains* the occurrence of observers

commits a *hysteron proteron* by presuming precisely what we do not and may never have, i.e. sufficient *empirical* knowledge of nature-as-a-whole that permits *proper derivation (individuation) of X parameters and their relation to observers* (\exists^R). In lieu of empirical experimentation on the universe itself, appeals to multiverse cosmology may therefore conflate two selection effects – the coherence of mathematical systems and the physical organization of the Universe – resulting in an *MSE-PSE fallacy* (MPF). I maintain that this (rather ironically) reveals the true philosophical fruit of the WAP.

So while the WAP may not appear impressive, merely proclaiming that we will find ourselves in a galactic region suitable for (consistent with) observation, it also reveals the antiquity of an objective worldview. Additionally, on the dialectical holist account, the WAP reveals that theories about the Universe must confront the same challenges as efforts to establish a foundation in metaphysics. Central to Harris's system is the importance of accounting for the biases inherent in our individuation (diffractive/levative) practices in our efforts to establish such a foundation.

Towards this end, Harris's claim that 'we could not observe the universe besides how it is revealed to us' requires further elaboration and investigation into the *strong anthropic principle* (SAP). The SAP in its original form was conceived by Carter as saying that "the Universe (and hence the fundamental parameters on which it depends) must be such as to admit the creation of observers within it at some stage" (1974, p. 294). Beginning with Barrow and Tipler (1986), arguments for the SAP concerning vitalism and design have been significantly elaborated. Though widely discussed in subsequent years, the SAP has been mostly criticized by scientists and invoked by theists. In the following sections I consider three means by which authors have maintained the *necessity* of observers despite our inability to acquire knowledge of the trajectory and initial conditions of the cosmos. These are the *participatory*, *final*, and *teleological anthropic principles* respectively. I maintain that arguments for the participatory and final anthropic principles are weak at best, but that each may be subsumed by Harris's teleological anthropic principle, which has not yet received an adequate evaluation.

4.3 The Participatory Anthropic Principle

The participatory anthropic principle (PAP), first articulated by Wheeler (1983) proposes that observation is required for the universe to come into being (Wheeler and Zurek, ff. p. 182). Harris aims to defend the PAP in an extreme but particularly nuanced form that makes

use of both orthodox and Bohmian QTs. In this section I orient Harris's PAP among some alternatives and evaluate its likely implications for dialectical holism moving forward.

Harris first introduces the PAP by appealing to the orthodox QT conception of uncertainty, from which it was originally developed. He maintains the uncertainty imposed by Planck-level influence upon measurements of quantum systems is not just a feature of our knowledge, but of nature itself.⁹¹

The Psi-function describing the state of the system defines only a probability amplitude for such quantities, so that the system has no determinate properties until a measurement is made, when the probability amplitude collapses, and only then can the property disclosed be assigned to the system as determinate and actual. Observation and measurement thus become prerequisite to the actuality of all determinate properties of quantum entities, without which they do not exist in reality but are merely potential [...] It then follows that intelligent beings, through their observation and measurements, must participate in the actualization of the universe at large (1991, pp. 6-7).

Experimentation is by this reasoning necessary to bring about a switch from an abstract possibility of quantum formalism to physicality. Hence, by appealing to the collapse of the wave function, the PAP begins with an epistemic qualification about how we can speak about quantum phenomena and attempts to distil an ontology about how observing beings relate to nature (\exists^R).

Harris recognizes that this interpretation may result in a circularity given that it took billions of years for observers to arrive on the scene. He considers it incoherent to maintain a mutual dependence, such that “[i]f physical reality depends on the existence of mind, and mind depends on the prior existence of physical reality, neither can exist unless both can come into being simultaneously” (1991, p. 7). Harris also rejects a Berkeleyan subjective idealist interpretation, criticizing that it will inevitably lead to solipsism. On the one hand, he endorses the Copenhagen interpretation for purportedly maintaining that particles are “latent, or potential, before they are observed” (1991, p. 146). In a later work he maintains that the

⁹¹ Heisenberg's *uncertainty principle* (more accurately *indeterminacy principle*) states the following: “If the position of a particle is known with an uncertainty Δx , its momentum can only be known with an uncertainty Δp_x such that the product of the two uncertainties is never smaller than $\hbar/2$: $\Delta x \Delta p_x \geq \hbar/2$ where $\hbar = h/(2\pi)$. That is, it is physically impossible to measure or know simultaneously the exact position and exact momentum of a particle. The uncertainties Δx and Δp_x do not arise from imperfections in practical measuring instruments. Rather, these inescapable uncertainties arise from the quantum mechanical nature of matter” (Serway, *et al.*, 2013, p. 1089-90).

measuring instrument and what it measures constitute “a single indivisible complex, within which the measured property comes into being. What the measuring instrument registers, however, has meaning as a value only when (and as) read by an investigator” (2000, p. 100).

On the other hand, Harris’s appeal to Bohmian hidden variables is consistent with his emphasis on indivisible wholeness and (qualified) realism. According to Harris, Bohm’s theory shows we can “no longer insist upon strict individuation of particles and must therefore acquiesce in their dependence upon the energy system for their properties and behaviour” (1965, p. 138). He goes on to say,

The proper interpretation of quantum mechanics, therefore, may depend upon the recognition that the physical real to which it refers is a whole or structured totality in which individuality is constituted by form, and particulate existence is only provisional, approximate, temporary and adjectival to the dynamic pattern in which it occurs (p. 139).

Harris appreciated Bohm’s implicate order because he claims it “maintains the holistic conception of a physical reality that requires dialectical explication [...] the system only becomes clearly explicit when cognized and expressed in scientific terms, so that the Participatory Anthropic Principle still holds” (1991, p. 147).

Despite his apparent sympathies for Bohmian holism, Harris attempts to remain agnostic claiming that in one form or another QT can justify both claims that, (1) observer and measurement are “inseparable from the very actuality of elementary particles”; and (2) “reflective awareness, in the guise of observation and interpretation, is constitutive of the very being of the universe” (1991, p. 145). While Harris recognized that the two systems are incompatible, he made no attempt at synthesis nor did he decide between orthodox and Bohmian QT. Crucially, to establish a PAP of Bohm’s QT is a task that neither Harris, nor (to my knowledge) anyone since has explicitly undertaken. Hence, questions remain concerning what such a “dialectic explanation” entails and which QT is most accommodating of Harris’s metaphysics. Toward a clarification of these issues I next highlight Bohm and Harris’s mutual dismissal of Everettian QT.

4.3.1 Level III Multiverse

According to Tegmark, the Level III multiverse is a result of Everett’s (1957) *many-worlds interpretation* of QT (MWI). This interpretation grew out of dissatisfaction with Bohr’s *Copenhagen interpretation*. Advocates for Everett’s view such as Mukhanov (2007), complain that the timing for the collapse of the wave-function is not derivable from the

equations of orthodox QT. Moreover, orthodox equations are so overly complicated that when applied to the Universe, appear as a “joke”. To avoid having to contend with “schizophrenic” superpositions, Everett argued that there is *no collapse of the wave-function* and at these points the universe splits into respective probabilistic outcomes or *worlds* instead.⁹²

Counter the PAP Mukhanov maintains in MWI, we can preserve the classical conception that there is a “one-to-one correspondence between reality and the mathematical symbols which are used to describe it. We also return to the idea that physics describes not only ‘our knowledge and perceptions’ but also the world ‘out there’, which *existed* and *will exist* without any observers” (p. 270). As Vaidman (2014) explains, while quantum events appear random, according to MWI, the wave-function evolves *deterministically* in a 3D Hilbert space, whose state vector branches into all possible outcomes. The *temporal evolution* of this structure thereby provides a foundational ontology. Hence Hogan (2007) maintains “the cosmic wave-function never collapses, but only appears to collapse from the point of view of observers who are part of the wave-function” (p. 227).

Importantly, Tegmark (2007) notes, the Level III branching effects may be found in level I, with the key difference that in level I, the “branches” are far away in spacetime, whereas in level III, they exist in a Hilbert space. Moreover, according to Wallace (2013) within this Hilbert space, the terms or coefficients in QT (branches) can interact, reinforce, and cancel out.⁹³ He goes on to say, instead of indefiniteness, in MWI microscopic quantum superpositions are cases in which one or more definite thing is occurring at the same time. Wallace explains this plurality consists of two parts:

⁹² Though maintaining determinism, in Carter’s (2007) revision of the Everettian view (called the micro-anthropic principle of QM) he concludes that his view is in accordance with Ockham’s principle and he claims (unspecified) *Eastern philosophies* within Hinduism and Buddhism (p. 308). In this theory “the number of distinct perceptors which can most economically be postulated” is “just one”. While he admits that this conclusion is devoid of scientific implications it carries a strong ethical impact in that “the injunction to ‘love one’s neighbour as oneself’ acquires a new significance when one recognizes that the ‘neighbour’ may be another incarnation of ‘oneself’” (p. 318). As will be discussed in greater detail in chapter 8, such a view is in striking accord with Harris’s ontology of mind. Unfortunately however, the details of Carter’s theory are too technical for a rigorous comparison with Harris’s system within the present thesis.

⁹³ Interestingly, according to Wallace, most physicists are inclined to opt for a change to the philosophy of QT, as per Bohr’s interpretation in order to account for the seemingly contradictory experimental results; while most philosophers opt for a change in the physics with Bohm in order to save “objective reality” (hidden variables).

a contingent physical postulate, that the state of the Universe is faithfully represented by a unitarily evolving quantum state; and an *a priori* claim about that quantum state, that if it is interpreted realistically it must be understood as describing a multiplicity of approximately classical, approximately noninteracting regions that look very much like the “classical” world (p. 465).

Tegmark argues that the same reasoning also applies to Level II, except that at Level III the “process of symmetry–breaking did not produce a unique outcome but rather a superposition of all outcomes, which rapidly went their separate ways” (2007, p. 113).

Hence, Hogan maintains AR is built into MWI at a basic level: “Viewed from a disinterested perspective outside the Universe, it is as though living beings swim like salmon up their favorite branches of the wave-function, chasing their favorite places” (p. 227). In this weak sense it is relevant to consider our selection effect to establish what branch we inhabit. However, supporters of MWI would not claim that observation serves as some sort of ‘higher level’ causal force as in the PAP. Indeed, a proponent of MWI can contend that the conditions required for the existence of intelligent observers emerge from quantum fluctuations and since every possible fluctuation is actualized, observation plays no special role in the process.

Harris contends that MWI “violates wildly Occam’s principle of parsimony, *entia non multiplicand sunt praeter necessitate...*” (1991, p. 13). Though he did not recognize that MWI retains one of the simplest QT formalism on offer, Harris finds the theory metaphysically excessive. He argues, to the extent that these parallel worlds are “inaccessible to inspection” and incapable of “mutual communication”, they appear to be “cosmological lumber of no scientific use” (ibid). He thus concludes:

At best (if “best” is an appropriate word), they are things-in-themselves, whose existence is postulated without means of verification. They are, in the worst sense, “metaphysical entities.” Much less can the theory remove the objections to an anthropic selection effect, or to any of the four versions of the Anthropic Principle (ibid).

Here Harris maintains that MWI cannot surpass our selection effects via a view-from-nowhere and that the theory cannot avoid his stronger AR. Importantly, It has been widely recognized that while Bohmian mechanics “philosophically” achieves more than the MWI, it does so “at the price of adding the non-local dynamics of Bohmian particle positions” (Vaidman, 2014). This means Harris’s appeal to Bohm’s *realist holism* of the EPR experiment (§ 3.3) marks a metaphysical disjunction separating him from MWI; but this is a

choice based on consistency and taste, not parsimony. Nevertheless, his claim that MWI cannot escape his stronger AR may yet be vindicated.

For his part, Bohm (1993) recognizes that some may well consider the greatest advantage of MWI that “everything can be put in some correspondence with Hilbert space” (p. 316).⁹⁴ So his alternative interpretation of QT is arguably superior to MWI not for its parsimony, but for more technical reasons. He claims his view provides an explanation of why QT “implies a relatively autonomous domain in which the quantum potential can be neglected so that an approximately classical behaviour will result” (p. 314). Additionally, he claims his approach provides an “intuitively understandable account of how quantum processes take place” (p. 315). In agreement with Harris, Bohm maintains it “defies the imagination to grasp intuitively” how both world and awareness “could split into many parts that are not aware of each other, and even more so how awareness could be, in effect identified with some part of a vector in Hilbert space” (ibid).

4.3.2 Participatory Anthropic Reasoning

Returning to the origins of the PAP, Davies (2004) maintains that observation entails “meaningful information” and that “[m]easurement implies a transformation from the realm of mindless material stuff to the realm of knowledge” (p. 8). It was this idea that led Wheeler to conceive of the participatory universe:

one that makes full sense only when observers are implicated; one that is less than fully real until observed. He envisaged a meaning circuit, in which atomic events are amplified and recorded and delivered to the minds of humans – events transformed into meaningful knowledge – and then conjectured a return portion of that meaning circuit, in which the community of observers somehow loops back into the atomic realm (ibid).

One way this circuit can be completed is with the wave/particle dual nature that is effectively “decided” by an experimental arrangement. Davies points out however that the PAP does not

⁹⁴ It follows that while we are directly aware of the explicate particle aspect of nature via the senses, the subtler wave function aspect is inferred. So Bohm’s approach does not assume that all we are aware of are particles as in MWI, but maintains “at least in science as we know it thus far, all information comes ultimately through the manifest level (recalling that it comes not only through the particles, but also through the classical limit of electromagnetic field beables)” (p. 314). Bohm holds that another advantage of his interpretation is “we do not have to assume the relation $p = |\psi|^2$ *ab initio*, but that we are able to arrive at this as an equilibrium distribution resulting from chaotic processes” (1993, pp. 314-15).

claim that “the universe doesn’t exist unless it is observed”, but rather that past states do not possess “a full set of physical attributes, such as all particles having a definite position, motion, etc.” (p. 10).⁹⁵ In this way observers in the present are believed to determine the actuality of the past, but observation itself is not bringing Nature into being.

With these strictures in mind, if the dialectical holist were to invoke orthodox QT in defending the PAP, Stapp’s (2011) proposal for the *mindful universe* seems a likely source of refuge. Stapp argues that the conscious choice of an observer is an irreducible and necessary component of physical reality, however (contra Harris), Stapp recognizes that orthodox QT is “intrinsically dualistic” (p. 49; ff. p. 79). Following von Neumann’s orthodox QT, three processes are required:

Process 1 – the act of intervention that partitions a system by experimental arrangement and entails an “acquisition of knowledge”;

Process 2 – the evolutionary process governed by Schrodinger’s equation that unfolds as “a representation of this acquired knowledge”; and

Process 3 – the result of 1 and 2, in which we receive some form of phenomenological *data*, e.g. a Geiger counter reading (p. 24).

Stapp maintains that “process zero” is the free choice of the experimenter that ties together physical and psychological aspects of reality into one “whole” quantum event.

Following what Stapp calls “Whiteheadian quantum ontology” he considers real what Bohr accepted only pragmatically, namely that our conscious intentions are the cause of our actions and the psychological correlate of a process 1 action.

⁹⁵ On an orthodox account, Dyson (2004) explains that quantum probability consists of preparation, transformation, and measurement. However, the past can only be in the form of classical particle physics whereas the future is conceived as a probability or wave-function (Ψ). (p. 83). Hence, QT pertains only to the future. This Dyson asserts, is the role of the observer, to “draw the line” between the two. “What really happens is that the quantum mechanical description of an event ceases to be meaningful as the observer changes the point of reference from before the event to after it” (p. 84). Likewise Zeilinger (2004) highlights the pitfalls of idealistic interpretations of QT, noting that the experimentalist’s “choice of apparatus” can determine what quality becomes reality in the experiment, and so “is constitutive of reality”. He warns however not to take a “subjective interpretation of the role of the experimentalist or the observer” because “the consciousness of the observer does not influence the particle at all, in contradiction to a widespread but unfortunate interpretation of the quantum situation” (p. 209).

Within orthodox thinking, the physical process 1 action results from, as von Neumann's words emphasize, an intervention from outside the physically described domain. This process has, according to contemporary quantum theory, no sufficient causal roots in the physical alone. The experimenter's 'free choice' participates in the selection of the needed partition that physical processes alone are unable to achieve (p. 108).⁹⁶

Note that Stapp's position amounts to an argument from ignorance for free will (i.e. orthodox QT cannot account for experiment choices), but does not detail any ontological relationship between observation and the cosmos: (i) *The meaning made by us may be an essential part of reality*, but this requires its own argument and even if it were true, in no way does it imply (ii) *that the meaning we make influences reality beyond the empirical results of our experimental arrangements*. So far neither view is justified. Consequently, a dialectical holist PAP remains unsupported by orthodox QT unless one is willing to admit dualism.

Expanding upon the implications of QT for the nature of information, Zeilinger (2004) argues that any theory about reality must be based on "information we receive" and so "the concept of a reality without at least the ability in principle to [...] obtain information about its features is devoid of any possibility of confirmation or proof. This implies that the distinction between information that is knowledge, and reality is devoid of any meaning" (pp. 218-19). Zeilinger here contends that it is meaningless to speak of a world that we are in principle incapable of observing and likewise, what we can take to be 'real' is knowledge based upon our worldly engagements. The aim of these points is to deflate the orthodox PAP and render meaningless the distinction between phenomenal and noumenal domains. Admirable as they are, I maintain these moves are achieved at the expense of also glossing over any prospect of *theoretically* accounting for present or future *selection effects*. That is, we cannot maintain both that the world-as-scientifically-observed establishes knowledge (i.e. is real) and admit

⁹⁶ Stapp argues that repeating process 1 intervention in rapid succession, for example answering 'yes' to raising one's arm, the mixed quantum state evolves into a discrete state. In this way, mental effort increases a sequence of "identical intentional acts", which then causes what he calls the "template for action" to be sustained. This template for action is said to produce the brain activity that permits a given intended feedback (p. 36). This he calls the *quantum Zeno effect*, the mechanism by which the mind is believed to have a downward causation to the brain and body (p. 114).

that indeed any one of our theories may be wrong in the face of future discoveries *accounting* for present selection effects (i.e. *what* is determined to be “*real*” at any particular time?).⁹⁷

Initially in agreement with Zeilinger, Bohm (1980b) maintains, we risk rendering our explanandum meaningless if the observing apparatus is divided from what is observed “because the content of the observed fact cannot coherently be regarded as separate from modes of observation and instrumentation and modes of theoretical understanding” (p. 124). Following Bohm, Pylkkanen (2007) notes, “we do not check a preexisting property of the observed system without influencing it” (p. 196). As science progresses, Bohm holds a “new whole” is comprehended with a new range of relevant aspects that will itself doubtlessly “be revealed as an aspect in yet another new whole” (1980b, p. 137). Consequently Bohm maintained, “the observing apparatus and the observed system [...] each participates in the other to such an extent that it is not possible to attribute the observed result of their interaction unambiguously to the observed system alone” (1990, p. 275).

Just two years after Harris published his work on the anthropic principle, Bohm wrote the following passage without ever mentioning AR, but nevertheless provided some indication of what his response to the issue would be:

In a certain sense we could say that the overall quantum world measures and observes *itself*. For the classical ‘sub-world’ that contains the apparatus is inseparably contained within the subtle quantum world, especially through those nonlocal interactions that bring about the classical behaviour. In no sense is the ‘observing instrument’ really separate from what is observed. The relative autonomy of the classical level [...] is then what makes it possible for the total quantum world to manifest and reveal itself within itself in a measurement. Thus in contrast to the classical notion of measurement we should regard a quantum measurement as a manifesting process (Bohm & Hiley, 1993, p. 179).

While Harris agrees that reality exists prior to observation, with Bohm he further contends that the very conception of “particle” is (dialectically) inseparable from an experimental arrangement that includes observer *participation*. As Bohm’s analysis reveals however, we are continually accounting for and thus moving beyond any given means of observation. Additionally, Bohm, like Harris, maintains that we will never achieve an exhaustive account

⁹⁷ As will be addressed further in § 8.3, there is a further concern that we as yet have no means of knowing at what point we have transcended or safeguarded against all *relevant* errors in empirical theory. Although this also presents a problem for Harris, I believe his metaphysics can provide a sufficient response.

of how respective means of participation *explicates* the world, i.e. *thereby transcending our selection effect(s)*.

Further clarity of such a “dialectical” interpretation may be found in Barad’s ‘agential realist’ account. Barad’s point is not merely that knowledge practices have material consequences, but that “practices of knowing are specific material engagements that participate in (re)configuring the world. Which practices we enact matter – in both senses of the word” (p. 91). The construction of knowledge is more than establishing facts, but is about “making specific worldly configurations – not in the sense of making them up *ex nihilo*, or out of language, beliefs, or ideas, but in the sense of materially engaging as part of the world in giving it specific material form” (ibid). Knowledge then is generated as part of the world, meaning it is subjective, but does not presume “the preexisting distinction between object and subject that feeds representationalist thinking). At the same time, objectivity cannot be about producing undistorted representations from afar; rather, objectivity is about being accountable to the specific materializations of which we are a part” (ibid). As a result, “matter” is reconsidered as a “process of materialization” that is neither a social construction, nor a term corresponding with something outside of the subject (p. 210).

Likewise, according to Nesteruk (2013), the PAP may be maintained on “*phenomenological*” grounds. He explains, the physics discoveries of the 20th century led Wheeler towards “a phenomenological stance” that situated the human observer at “the centre of disclosure and manifestation of the world” (p. 2). He goes on to say that Wheeler

attempted to approach physical reality not as something “out there”, which is passively described by observers, but to see it as a genesis through conscious dialogue between observers-participants and physical reality, so that the universe emerges as a special articulation of the relationship between human intelligence and physical reality (ibid).

He contends that in the PAP, meaning emerges through a “dialectic relationship between man and the world” and that it is a mistake to say that meaning of one ‘first’ comes from the other (p. 6).⁹⁸ “Embodiment”, he claims must be the starting point of any discussion on corporeity, space, time, etc. This is “living being in relation to other beings and to the world, in whom

⁹⁸ I maintain Harris’s approach to the anthropic principle and cosmology in general is essentially phenomenological. This appears to be an approach to the philosophies of science and nature that, with few exceptions, has been largely ignored (e.g. Rosen, 2008, considered below). Perhaps the only work to explicitly connect phenomenology and anthropic reasoning is Nesteruk’s (2015) *Sense of the Universe*, which deserves to be brought into discourse with dialectical holism in the future.

this relation is announced and articulated by the way of its sense reaction and its comportment, or its action in situation” (p. 11). By this reasoning, knowledge about objects in the world arises in and through relations to this very embodiment that may be considered our primal ESE.

The above sympathetic reading of Harris’s PAP reveals that his (1) claim, that the observer is inseparable from the very nature of elementary particles has received sufficient support on *epistemic* grounds. This is to say we are *epistemically* restricted from positing *objective* elements external to a whole system partially constituted by observer participation because without which, the supposed information in such a system would no longer be grounded upon *meaningful relations*. This line of reasoning thus reiterates the findings of § 3.4.1 concerning the epistemic interdependence of Universe and mind. Here an indivisible loop is posited from the constrained information we receive from the world (ESE), to our synthetic theories about this world (MSE), which demands a *participatory qualification* on our conception of what *physical conditions* (PSE) have made this conception possible. The resulting PAP does not support the subjective idealistic conclusion that *only* what obtains in and as mental is real, and neither does it maintain with Kant that the *world-in-itself* is unknowable. Rather, this principle maintains that the world we discover is grounded upon and *inseparable* from embodied and *participatory relations* – not representations or mere constructions, but biological, social, and technological enactments of the world.

Bearing in mind the above discussion of § 2.5, this interpretation once again establishes an isomorphism between Harris’s thesis (through Bohm) and AE conceptions of *reflexive meaning-making*, *dynamic co-emergence*, and now what Varela, *et al.* have called the *groundlessness of experience* (1991, ff. p. 217). Consequently (for the dialectical holist), counterfactual physical alteration of the parameters (X) *as they are presently individuated* becomes *inconceivable* insofar as observations of the resulting uninhabited universes would not be possible *even in principle*. This implies, rather than possibly *true or false but irrelevant* (as Harris originally believed), multiverse theories are on the present phenomenological account considered meaningless. Nevertheless, Harris has not yet found contemporary support for his (2) claim of an efficacious force (PSE) of observation, i.e. there is as yet no justification for labeling observation a PSE. The ontological question remains as to how (if at all) *observation* itself alters the Universe. To this issue I return in § 8.3. Remaining with the task of elucidating Harris’s AR, I next consider prospects for a *post-humanist future*.⁹⁹

⁹⁹ For a summary of the a priori argument for the dialectic PAP see Appendix § III – d.

4.4 The Final Anthropic Principle

Whether appealing to our as yet unlimited technological potential (Hoefflinger, 2012; 2016), our intellectual development, or human-computer interfacing (Graumann, *et al.* 2010) the *final anthropic principle* (FAP) claims “Intelligent information-processing must come into existence in the Universe, and, once it comes into existence, it will never die out” (Barrow & Tipler p. 23). This is to say that the lineage following present observers and/or their technology will evolve to such a degree that observation and information processing are maintained indefinitely (Barrow 2007, p. 190). In this section I clarify Harris’s appeal to the FAP only to set it aside for reasons that will become clear anon.

Typically, those who invoke the FAP rely upon a *singularity* (Vernor, 1993) of some kind that will presumably permit humanity to transcend our biological (i.e. mortal) constraints (More 2013, p. 361). Such views are maintained most rigorously by authors such as Shanahan (2015), Kurzweil (2013), and Tipler (1996), who consider the different forms that such a singularity might take as well as the moral, socio-political, and technological complications they entail. Some of the most popular means by which we are suspected to reach the singularity are via the potential development(s) of *artificial intelligence* (AI), *artificial life* (AL), and/or the *transhumanist* dream of transferring a human mind into software and thus achieving *immortality*.¹⁰⁰ Thus we find the FAP appealing to our sense of anthropocentrism as well as our fear of death, in postulating that irrespective of the evolution of the universe – likely ending in *heat death* (Davies 2013, p. 24) – our collective ingenuity will equip us with the means to persevere indefinitely.

For proponents of this stance, moving from the SAP to the FAP depends upon a fundamental assumption that “*information processing*” is a necessary function of the Universe (i.e. it must come into being and proliferate). To defend this particularly strong move, some consider the universe as a kind of computer (Zenil, 2012). Without regard for the FAP, Lloyd (2013) lends support to this move. He argues that as long as the laws of a given universe support *universal quantum computation* (PSE) all that is needed is access to *free energy* and a range of increasingly complex, information processing systems will be

¹⁰⁰ It is worth mentioning that of all the anthropic principles, aspects of the FAP have certainly received the most scientific attention. Perhaps this is because it has the most immediate and tangible implications for contemporary research: the transcendence of nature and immortality are apparently desirable.

generated. In a similar vein, Carr maintains that careful study of the Big Bang theory can support a cosmic history of increasing organization in which “Heat death is avoided because local pockets of order can be purchased at the expense of a global increase in entropy, and, if the Universe continues to expand forever, intelligent beings may be able to delay their disintegration indefinitely” (2007, p. 86).¹⁰¹

Futurists like Kurzweil take the exponential increase of information processing as given and predict that within a few generations, humans will have fused with technology to transcend our biological constraints. Tipler (1996) on the other hand, takes a pseudo religious approach in appealing to an “*Omega Point*”. He hypothesizes that beings of the far future could have infinite computing power acquired through the final stages of a Big Crunch. Consequently, he maintains these beings would have “unlimited subjective time” and the ability to (re)create conscious beings of their own.

Initially, Harris expresses caution against enthusiasm for AI manifesting in ‘von Neumann-probes’, or self-replicating biotechnology that could live on indefinitely. Such a claim, he says, “seems rather speculatively ambitious and smacks of over-confidence” (1991, p. 8). Harris considers it a real possibility that due to our “greed, short-sightedness, and imprudence” technological achievements may bring about the extinction of humanity far sooner than its “transcendence.” Moreover, Harris reasons that unless such technology achieves self-reflectivity, (conceiving oneself as part of the universe) it could not be considered a success of the FAP.

Numerous recent authors have raised similar criticisms. Copeland and Proudfoot (2012 a and b) argue that futurists such as Kurzweil tacitly assume that the mind is *Turing computable*. This is the pivotal step that would permit the kind of psycho-technological interface required to transcend our biophysical constraints. Unfortunately, they point out, there is as yet no evidence that downloading a mind is, or will ever be possible. Similarly, Bostrom (2002) holds that if reframed as a hypothesis about the future of intelligent observers, there may be some value to the postulate, but as a principle he agrees with

¹⁰¹ Susskind (2007) explains one well known means by which heat death can be overcome is that even after thermal equilibrium, over enough time ($T_r = \exp S$, in Planck time units) *Poincare recurrence* shows that in any closed system large fluctuations will occur such that “the phase point will return over and over to the neighbourhood of any point in phase space, including the original starting point” (p. 254). Faced with this scenario, he claims string theory and AR become a favourable solution: “With nothing favouring one vacuum over another, the Anthropic Principle comes to the fore, whether or not we like the idea. String theory provides a framework in which this can be studied in a rigorous way” (p. 262).

Gardner's (1986) criticism that it is pure speculation and more accurately dubbed the “*completely ridiculous anthropic principle*” (CRAP).

In defense of the FAP however, Harris maintained that the generation of complexity (or scale of forms) could not continue forever, but that it would inevitably reach a final culmination. In at least partial agreement with Tipler, Harris advanced his own view of the *Omega Point* (1988) and later fleshed out what he thought were the theological and moral implications of this end-directed explicative process (1992). These works however were not based upon any speculations about the future abilities of consciousness or technology, but came more elegantly from his *a priori* conception of nature-as-a-whole.¹⁰² Barring AI, Harris reasons that under certain conditions the FAP would be inescapable:

If the universe as a systematic whole can only achieve completion in reflective consciousness, so that such self-awareness is, as it were, built into its implicate order, the emergence of intelligent life must be intrinsic to its very nature. In that case, the extinction of humanity in this planetary system will simply stimulate the development of intelligent creatures in some other, as the plucking of dead heads from a rose bush encourages the blossoming of new roses (1991, p. 158).

Although Harris is appealing to a metaphor, this passage does further illustrate the kind of relationship between consciousness and the Universe that he has in mind. Harris is at this point in line with some of the more extreme futurists in so far as he considers self-reflective awareness to be an irremovable function of the universe. Unfortunately however, Harris's defense of the FAP relies upon the collapse of the wave function brought about by an observer, a move that has already been shown to be incompatible with dialectical holism. Since he makes no further use of ‘information processing’, something else would be needed to validate a dialectical holist appeal to the FAP.

Putting the above speculations aside, despite Harris's stern and repeated assertion that there must be a culmination to the explicative process, recent observations paint a much more desolate view of the universe's evolutionary future.

At ≈ 1 second, the Standard Model describes the universe as filled with matter and radiation, where the latter initially has much higher energy density. Because the energy density of radiation

¹⁰² Harris was particularly dismissive of AI. He holds that some commit an equivocation between “the manipulation of ‘bits’ of information by mechanical means” of computers with the “self-reflective reason” of ‘rational thinking’ (1991, p. 156). He claims that there is no evidence that AI can achieve the latter even if it one day writes its own programs, correct errors, and reproduces. This issue concerning the criteria of consciousness is a digression at this point and will have to wait until Part IV for further consideration.

dilutes more rapidly than that of matter, the initial radiation-dominated phase is followed by a matter-dominated phase that extends until the present. Current observations indicate the presence of “dark energy” [...] with properties like a Λ term. Supposing these are correct, in the future the universe will eventually transition to a dark-energy-dominated phase of exponential expansion, given that the energy density of a Λ does not dilute at all with expansion (Smeenk 2013, p. 612).

Although this principle was important to Harris, when we consider his faulty reasoning, I maintain that beyond this point it adds nothing to an understanding of his system that cannot be gained by an analysis of teleology. Hence, I set the FAP aside and move on to an analysis of the latter topic that will take center stage in the discussions to follow.

4.5 The Teleological Anthropic Principle

The *teleological anthropic principle* (TAP) states “[t]here exists one possible Universe 'designed' with the goal of generating and sustaining 'observers'” (Barrow & Tipler, p. 22). Following Aristotle, the telos or ‘final cause’ is that “for the sake of which a thing is done” (*Physics* 2.3). This means that an end goal directs a series of events as their superordinate purpose. Here, the means is not necessarily important, only the result or end product. Though the Aristotelian view of nature held sway for nearly two thousand years, with the rise of Newtonian physics in the early 18th century, nature was reduced to a chain of efficient causation with no room for *purpose*.¹⁰³ For many authors, the TAP is either immediately dismissed for its *unwarranted appeal to 'design'*, or invoked to support such design. Inherent in Harris’s conception of the dialectical whole is a specific brand of teleology that does not require Godly intervention, and if adequately understood, provides complete insight into the structure of his metaphysics.

From those who address the TAP, a number of objections have recently arisen.

- (i) Teleology is unscientific on the grounds that it posits some future event that causes a present or past event.

¹⁰³ However, Newton himself can be understood to have invoked a curious version of the TAP with his belief that god was required to ‘wind up the universe’ from time to time so as to keep it from ending in gravitational catastrophe. This we must find just a bit ironic considering the philosophico-historical application of his physics that excludes any but efficient causation, objective observation, and mechanistic explanation.

- (ii) Teleology depends upon an external force that guides material processes to a desired end.¹⁰⁴
- (iii) Positing purpose to inorganic and non-conscious processes is anthropocentric and ignores firmly established explanations of efficient causation in modern science.

If Harris (or a subsequent dialectical holist) is to justify teleology, adequate responses to the above concerns must therefore be provided. Invoking a brand of teleology derived from Kant and Hegel, Harris clearly dismisses the first two concerns: “Explanation would be ‘teleological’ if it made the parts of a whole intelligible in terms of the organizing principle that constituted them a totality, or processes understandable in terms of the dynamic system to which they belonged” (1965, p. 262). Denying (i), he maintains that in his teleology, the principles that direct the activity “are not to be identified wholly with the final event in any series of effects” (1965, p. 262).

With regard for (ii), Harris disputes super-natural determination by holding, “[i]t is the immanence of the principle of order in the parts of a structured whole that constitutes its teleology” (1991, p. 168). Importantly, when Harris says the parts are explained “in terms of the whole”, he means a “teleological process is one in which the whole being generated determines the stages by which it comes to maturity. It is a process directed by the organizing principle of the whole” (1991, p. 27). Possible forms, relations, etc., are considered implicit throughout the evolutionary process, which renders the whole “inadequate” at each stage until its *possible* forms become actual. Like the completion of a painting, the development of a seed into a tree, an embryo into an adult, or the enactment of a musical score, for Harris the aim is not the final state, “but the symphonic whole” (1991, p. 168). What these metaphors purportedly exemplify is that “the activity is the goal in the making, and the goal is what the activity is all the time generating” (2000, p. 135).¹⁰⁵ Harris’s TAP therefore maintains that some set of later (or higher level) laws and their corresponding material systems (e.g. life) are determined by the Concrete Universal.

¹⁰⁴ On this point Bostrom (2002) points out a seeming inconsistency in that “anthropic reasoning could rather be said to be anti-theological and anti-teleological, since it holds up the prospect of an alternative explanation for the appearance of finetuning...” (p. 48).

¹⁰⁵ Particularly relevant for later discussions, concerning teleological description more generally construed, Harris contends that if “a process is teleological in the sense described, no explanation will be complete that omits the principle regulating its variations and its course as a whole, or that overlooks the structural totality it is generating” (2000, p. 138).

At this point it warrants further emphasizing that extending Bohm's ontology into cosmology almost completely mirrors Harris's TAP. Bohm holds that a "super-implicate order" unfolds into "an infinite number of levels" that "objectively and self-actively differentiates and organizes itself into independent sub-wholes, while determining how these are interrelated to make up the whole" (Bohm 1987b, p. 46). Harris adds that the Universe "must tend to explicate itself in and as an intelligent experience" (1991, p. 28). In this way, teleological explanation is invoked not in the sense of causation by a final state, but rather, by progressing through a scale there is a "satisfaction" in having made the process complete. As Harris's response to (iii) is the most complex however, consideration of this concern will have to wait until chapter 5. I next introduce Tegmark's *mathematical universe hypothesis* (MUH) so as to bring to the fore a number of issues latent in Harris's TAP.

4.5.1 Level IV Multiverse

With the Level IV multiverse we must confront one of the oldest debates in philosophy, between the Aristotelian and Platonic interpretations of reality. According to the Aristotelian, mathematical formalisms are merely abstract approximations to reality. On the other hand, the Platonist views formal systems such as hypothetical laws, functions, sets, spaces, and operators, as actual. While Tegmark aims to defend this Platonic view as it applies to the mathematical formalisms that describe non-actual worlds, Harris has attempted to subsume Platonic and empirical theses within his own metaphysics. Arguing from the mathematical notion of *equivalence* Tegmark proposes the MUH:

if some mathematical equations completely describe both our external physical reality and a mathematical structure, then our external physical reality and the mathematical structure are one and the same, and then the Mathematical Universe Hypothesis is true: our external physical reality is a mathematical structure (2014b, p. 217).

In addition to endorsing this hypothesis, Tegmark maintains that every sufficiently coherent mathematical system is identical to a universe. The resulting set of universes is the 'Level IV multiverse'.

Importantly, by appealing to the Level IV multiverse, Tegmark maintains there is no distinction between mathematical (MSE) and physical (PSE) structures. The Level IV multiverse subsumes the previous multiverses (Levels I-III), since it entails that all exists as mathematical structures. By implication, as long as our statements are mathematically consistent, we are describing structures of reality; the question is whether we are describing

our world or another because across Level IV universes, “even the fundamental laws are different” (p. 250). Level IV multiverses contain alternative mathematical structures, what is *possible* is no longer limited to what we *presently* deem logically consistent.¹⁰⁶

Here Ellis (2007a) poses a valuable criticism that in discussing the Universe, any mention of probability becomes deeply problematic (p. 1218). He claims that in order to discuss a multiverse we first need to define the *possibility space*, which “means making some kind of assumptions about physics and geometry that will then apply across the whole family of models considered possible in the multiverse, and excluding all other possibilities” (p. 1260). He contends, we would need “a distribution function $f(m)$ of actually realized universes” (p. 1261, emphasis in original) and it is currently unclear how or if we will ever have access to such information. Consequently he considers the multiverse an untestable philosophical proposal and not a scientific theory.

Direct observations cannot prove or disprove that a multiverse exists, for the necessary causal relations allowing observation or testing of their existence are absent. Their existence cannot be predicted from known physics, because the supposed causal or pre-causal processes are either unproven or indeed untestable. However some self-consistency conditions for specific multiverse models can be tested (p. 1263, emphasis omitted).

While Ellis’s contention would be welcomed by Harris and appears well warranted with regard for Levels II and III, at Level IV this criticism loses traction. One powerful but counterintuitive argument in support of Level IV also replies to Harris’s requirement of parsimony. Concerning elegance and simplicity, Tegmark contends an entire ensemble of universes is simpler than any one of its members:

The algorithmic information content in a number is, roughly speaking, the length of the shortest computer program that will produce that number as output [...] the set can be generated by a trivial computer program, whereas a single number can be hugely long. Therefore the whole set is actually simpler (2007, p. 123).

He goes on to say that the “lesson is that complexity increases when we restrict our attention to one particular element in an ensemble, thereby losing the symmetry and simplicity that were inherent in the totality of all the elements taken together” (ibid). Tegmark maintains that Level I removes our need to specify initial conditions, while at Level II we no longer need to

¹⁰⁶ In this way, the Level IV multiverse subsumes and goes considerably beyond David Lewis’s (1986) modal realism, the main difference being that Lewis’ worlds are all spatiotemporal, whereas Tegmark’s need not be.

specify physical constants, and Level IV requires no specification at all, i.e. there is no difference between mathematical possibility and true existence.¹⁰⁷

The Level IV multiverse hereby provides a means of bypassing Ellis’s concern that multiverse theories are philosophy rather than physics since mathematical possibility is reality. Moreover, Tegmark avoids what I have previously dubbed the MPF – concerning the unjustified conflation of metaphysical and physical structures – by maintaining that our task is to identify the maximally stable set of mathematical structures obtaining within our universe (i.e. our *cosmic postal address*) (2014, p. 253). Although this would clearly hold an important role for the WAP as outlined above, Tegmark’s response to the TAP requires further elucidation.

4.5.2 Teleological Anthropic Reasoning

What has been key (albeit implicit) throughout the present and previous chapters is the need to posit a synthetic form beyond what is observable that accounts for the regularity of (and our relation to) all observable phenomena. Discussing the balance between necessary and excessive metaphysical postulation, in Bangu’s (2013) final analysis he advocates for Wigner’s *superprinciple* (or “principles of invariance”): “That is, just as the laws constrain what events might take place in the world, such a superprinciple would constrain or determine the laws – in other words, it would have the role of a meta-law which would somehow explain the laws” (Bangu, p. 311). In his own words, Nobel laureate, Eugene Wigner asserted:

it is hard, if not impossible, to believe that the laws of nature should have such complexity as implied by four or five different types of interactions between which no connection, no analogy, can be discovered.

¹⁰⁷ Davies (2008) cautions against the typical method of positing a multiverse that contains some biofriendly subspace within which our parameter(s) X obtain(s). While a future theory might render all parameters “fixed” so they have no freedom to vary independently, “a final theory that contained no free parameters would be a curve in the M-dimensional space that would pass through the biofriendly volume. This curve would define a particular multiverse model, being the ensemble of universes corresponding to the points on the curve. A different curve would define a different multiverse model characterized by a different final theory” (pp. 110-11). Requiring an explanation for why *our* curve takes on biofriendly values it does, Davies claims we are liable to posit a series of such curves, thus shifting “the problem up one level, changing the question from Why this universe? to Why this multiverse?” (p. 111). Interestingly, the MUH is immune to this problem.

It is natural, therefore, to ask for a superprinciple which is in a similar relation to the laws of nature as these are to the events. The laws of nature permit us to foresee events on the basis of the knowledge of other events; the principles of invariance should permit us to establish new correlations between events, on the basis of the knowledge of established correlations between events (1963, p. 10).

It is from Wigner's proposal that contemporary discussions of meta-laws have developed. Harris (1954; 1965) appears to have independently posited its analogue in the form of his Concrete Universal, the philosophical implications of which guide his entire metaphysics. Harris holds that however conceived, the overarching form of Nature and its component worlds "can be imagined only on the basis of what we already know. If they can be imagined at all, and if they can be legitimately postulated, the Anthropic Principle is relevant to them in the same way as it is relevant to the region that we inhabit and the epoch in which we live" (1991, p. 11). As a result, he claims this makes "any such Anthropic Principle applicable to our world automatically applicable to the Universe of which it is inevitably a part" (ibid). At first glance this means that just as we expect to observe our world from a life-habitable spacetime location, so too we should expect to find ourselves in a life-habitable Universe. More importantly however, Harris is not maintaining that if there are many, all universes will necessarily give rise to life. Indeed citing *prevalence of life* (whether high or low) is a *red herring* concerning Harris's TAP. Harris means to argue that even if we admit such a multiverse mostly devoid of intelligent observers, what matters is identifying the unifying principles therein, those that have been necessitated by the presumed Concrete Universal.

As Ellis (2007b) points out, in discussing the multiverse we make a set of assumptions, the most important of which is the (either explicit or implicit) posit of a meta-law that provides a space of possibilities within which our observed universe obtains: "The very description of the space M of possibilities is based on an assumed set of [...] meta-laws that determine the laws of physics" (p. 390). In another work Ellis (2007a) adds however that the concept of a unique law of physics that applies only to one object is "questionable" (p. 1217). This is because unlike effective laws, this law cannot be deduced from anything else, meaning the Universe is not a *class of entity* that belongs to a larger super-set. So Ellis concludes, "we cannot establish higher-level effective laws that apply to all universes and determine their structure, as we can at all other levels of the hierarchy of complexes" (2007a, p. 1217). Nevertheless, Ellis argues some such superprinciple or meta-law is required to establish "regularities of properties across the class of universes" and provide a common "generating

mechanism” and causal connection (even if it functions across distributed spacetimes), otherwise we could not even describe the Universe, let alone calculate a distribution function (2007b, p. 398).

Tegmark (2014) recognizes that while the different mathematical structures in the Level IV multiverse are not connected physically, “at the meta-level” they bear a range of important relations. “For example [...] one can be the combination of others [...] one structure can in a sense describe another: the elements in the first structure can correspond to the relations in the second, and relations in the first can describe what happens when you combine relations in the second” (p. 254). Conveniently, “initial conditions” are rejected because a ToE positing that everything just “started out” in an unspecified state is considered an incomplete description (p. 262). Responding to Ellis’s worry regarding our requirement of a distribution function, according to the MUH, “physical reality is a mathematical structure that is completely specified” by its place within what Tegmark calls a “master list” of all possible (computable) structures (ibid). This implies the Universe could “be simulated by quite a short computer program”, and if our world is such a computable structure, then “these computations don’t evolve our Universe, but describe it by evaluating its relations” (p. 269). Evidently this atemporal conception of mathematical realism conflicts with Harris’s process ontology, but the issue of teleology remains to be seen.

Towards this end, it is instructive to briefly consider Lange’s (2009) eloquent metaphor for discussing laws of nature. The laws, he maintains, fail to supervene on the *Humean mosaic* (local matters of fact), just as

the rules of a game fail to supervene on the moves that are actually made on one occasion (or every occasion) when the game is played. If neither player ever castles in the course of a game like chess, for instance, then the moves they make leave undetermined whether castling was permitted (p. 52).

Lange maintains that laws can be externally related such that some may never be instantiated, while others could have been counterfactually absent without influencing the Universe.¹⁰⁸ The dialectical holist would immediately take issue with both claims of unrealized possibilities on one hand and counter-factuality of laws on the other. It is important to realize

¹⁰⁸ For example he argues, “the fundamental dynamical law $[F=ma]$ would still have held, had the world been populated by different kinds of forces or different kinds of fundamental particles, or had the strengths of those forces or the characteristic properties of those particles been different” (Lange 2009, p. 39). For the dialectical holist this demonstrates a clear MPF as per the reasoning of § 4.2.2.

that the rules of a chess game supervene upon the superordinate social system to which they belong. It is possible therefore to claim that the rook and king *could have* castled after what might have been the only game ever played, but this is only because we can define chess through media beyond the bounds of the game, e.g. we can write down *possible* moves. *In the case of the concrete Universe, there is nothing external to which counterfactual appeals can be made unless one is willing to permit realism about subjunctive (abstract) possibilities.*

For Harris, it is nonsense to consider the counterfactual deletion of laws insofar as these laws are dialectically related and serve to explicate the Universe. In his earlier (1965) work addressing teleology and counterfactuals Harris argues,

there are no causal chains but only causal networks and proliferations, and that events are linked not in successive pairs but in interlacing complexes. In every case the determining factor is the structure of the system, and necessity arises from the impossibility of altering a single nexus without subverting the entire system. Not two of the distinguishable relata depend upon themselves alone for their relational web. Within this web, and given the law of its construction, it is never possible that any nexus could be other than it is and the rest remain the same (p. 475).

Here, Harris assumes (for now) that the Universe is the total space of dialectical relations among its unifying principles or “nexes” (chess pieces *and* their moves), each dictated by and expressions of the Concrete Universal.¹⁰⁹

Tegmark evidently has no problem maintaining that unrealized *moves* are possible, because for him, there is no difference between possibility and reality – as mathematical structures, *everything that is possible just is*. This however does not in itself respond to Harris’s TAP. Getting to the heart of the matter, one of the most interesting implications of Tegmark’s MUH is an implicit appeal to dialectical relations, for what amounts to the same reasoning as Harris provides above (see § 2.3):

The MUH solves the infamous infinite regress problem where the properties of nature can only be explained from the properties of its parts, which require further explanation, *ad infinitum*: the properties of nature stem not from properties of its ultimate building blocks (which have no properties at all), but from the relations between these building blocks (2014b, p. 210).

Tegmark further claims that according to his MUH, “[r]egardless of whether anything seems random to an observer, it must ultimately be an illusion, not existing at the fundamental level, because there’s nothing random about a mathematical structure” (2014b, p. 262). If this is to

¹⁰⁹ Much more will be discussed regarding such issues in chapter 5 below, which will focus upon arguments for the explicative process and its constituent scales respectively.

say that such structures are necessitated given the *form* of the system within which they obtain, then Tegmark's MUH may inevitably support Harris's notion of teleology.

In sum, four important points should be remembered: for Harris's TAP, it is irrelevant whether (i) intelligent observers are *described* as a natural kind, mathematical structure, etc.; or if (ii) any, all, or none of the respective multiverses obtain; (iii) what matters is whether observers may be characterized as unifying principles and thereby bear a dialectical relationship to the (heretofore *presumed*) Concrete Universal. What remains to be examined concerning Tegmark's system is whether he does indeed posit consciousness as one such 'structure' in a manner similar to Harris's 'unifying principles' – an issue to which I return in chapter 8. (iv) Nevertheless, dialectical holism takes issue with Tegmark's claim that it is possible to establish our *cosmic postal address*, because the former camp cannot endorse the metaphysical assumption that mathematics may be *identified* with a universe or any *part* of it.¹¹⁰

4.6 Conclusion

The above overview of Harris's appeal to AR has brought to the fore a number of issues with import for the philosophies of science and mind. In spite of his apparent disregard for the multiverse, § 4.2 reveals that Harris's conception of the Concrete Universal actually supports at least the level II multiverse theory, in that each bubble of chaotic inflation may be governed by their own principle of order. While level I and II multiverses might be unavoidable if chaotic inflation is an accurate theory, these levels nonetheless imply our reliance upon the WAP. Following Harris, as our ESE confounds our ability to make large-scale claims regarding the nature of our universe, unverifiable projections of theoretical structure (MSE) onto nature-as-a-whole become necessary on both scientific and philosophical grounds. Working from this foundation however entails a great limitation on how we individuate the constants of nature, meaning their counterfactual multiplication and alteration on a theoretical basis cannot be justified on a phenomenological basis – thereby resulting in the MPF.

Although Harris's reasoning concerning the *orthodox* PAP is demonstrably at odds with the rest of his system, in § 4.3 I have attempted to show that his reasoning supports a weaker

¹¹⁰ This clearly creates significant demands on how (if at all) the dialectical holist can establish mind's ontic relation to the cosmos. I return to this issue in chapter 8 below.

'phenomenological' version of the PAP. I have shown that the level III multiverse is discarded on Harris's account and indeed the majority of his system supports Bohmian QT. Accordingly, the observers' inability to exhaustively account for their selection effect(s) makes it impossible to coherently conceive of the Universe independent of our *biased* relation to it (\exists^R). Positing a universe in which this relation is void undermines the coherence of at least AE epistemology, i.e. such a universe is *meaningless*. The resulting *reflexivity* of mind and Universe thus justifies the PAP on epistemic grounds. The question remains open however as to whether this reflexivity can be ontologically interpreted to provide a full PAP.

The above analysis has shown that none of the multiverse theories pose a significant challenge to Harris's AR: regardless of whether a particular multiverse obtains, it is irrelevant in the face of his TAP.¹¹¹ In this vein, it no longer matters whether we describe the essence of the world to be mathematical or material, what matters is rather what unifying principles can be identified. For Harris, the Concrete Universal is expressed as the full space of forms that are instantiated and (as will be discussed below) he argues consciousness is one such form. Concerning the level IV multiverse, I have shown that despite his Platonic sympathies, Tegmark's implicit appeal to dialectical relations can be interpreted such that Harris's TAP is inevitable. Given the above, Harris's TAP may be the simplest and most fundamental (foundation for) what Barrow has called a cosmological *transfiguration*. As Harris aims to establish his theory in ontological terms however, his reasoning for how the development of unifying principles may be empirically observed and theoretically justified must be critically assessed. The remainder of this thesis is devoted to this task. Towards this end, in Part III I consider a range of contemporary theories concerning cosmological and biological evolution that both support and further elucidate Harris's system.

¹¹¹ For a summary of the resulting TAP see the below appendix § III-d.

Part III

Harris's Anticipation of Contemporary Philosophies of Evolution

Chapter 5

Levels of Complexity in the Cosmos

5.1 Introduction

In opposition to the classical paradigm that considers both knowledge and nature to be ultimately composed of externally related basic entities, Harris proposes a framework of process, dialectical relations, and a self-directed series of irreducible unifying principles. These principles characterize a metaphysics that he claims to *most* adequately account for self-organization in contemporary sciences. In Part III I discuss how a number of disparate, though mutually informing contemporary theories can further elucidate Harris's original proposal for the nature of evolution (€).

In this chapter I examine in greater detail Harris's conception of cosmic evolution that he claims follows from the postulate of the Concrete Universal in support of his TAP. In § 5.2, I begin with a sketch of Harris's conception of *cosmogensis* as characterized by self-organization. In the following sub-sections I assess how Harris's reasoning dovetails with various contemporary metaphysical and scientific theories. In § 5.3, Harris's arguments for the *scale of forms* will be critically examined and *updated* in light of current theories of chaos, complexity, and emergence. My aim in this section, as in the previous sections, is to develop a sympathetic reading of Harris's system and demonstrate the extent to which he anticipated contemporary works. The primary questions to be considered in these sections are as follows:

- (1) What current theories support Harris's conception of €?
- (2) What are the necessary and sufficient conditions for something to be a scale in Harris's system?
- (3) To what extent do Harris's depictions of € and the scale of forms provide an adequate conceptual bridge from cosmological to biological evolution?

5.2 Cosmogenesis (€)

As discussed above, Harris begins his depiction of cosmic evolution by positing a single “field”, or “matrix”. He claims that as the field expands, it differentiates into a series of contrasting forces that further manifest as a range of waves and particles, energy and matter (1991, p. 42). Harris claims that atomic physics “shows individuation to be secondary to system.” In this case, what Harris means by “individuation” is that the differentiation of a system into respective forms is always the result of some pre-existing order. He goes on to argue that “if the principle of organization is prior to the discrimination of units, what produces order cannot possibly be the random shuffling of those units” (1965, pp. 148-49). In a later work he elaborates this contention:

The whole, with its principle of structure is, therefore, prior to the parts. It is the universal or pervasive influence of this structural principle that makes the distinguishable and diverse elements what they are, that determines their relations to one another, and adjusts one of them reciprocally to every other. It is the universal principle which the differentiations are manifestations or (as we shall shortly see more convincingly) exemplifications (1987, p. 143).

By *reductio* he reasons, “a possible world without physical laws could be conceived [...] even if it were total chaos”, but to do so would “strain the meaning of possibility intolerably; for [...] pure chaos is a self-destructive notion, chaos being always parasitic on order of some kind...” (1991, p. 50). In earlier works Harris develops these ideas more fully, arguing that the more frequently order is reversed, the more random or chaotic the system: “as the frequency increases to infinity so the continuum approaches homogeneity” (1970, p. 325). He goes on to claim that complete homogeneity is impossible and order is thus “marked by its degree of departure from complete homogeneity” (ibid).¹¹² Identity is by this reasoning based upon ‘recurrences’ and ‘periodicities’ within a ‘manifold’, relations that “serve as clues to the principle of order fundamental to the structure” (ibid). Consequently, order involves change and difference but also requires “some element of sameness, similarity or recurrence” (p. 326). Harris argues that if we take abstract homogeneity to obtain in nature and thereby

¹¹² Interestingly, Harris’s point may be exemplified by the relationship between symmetry and the phenomenon of ferromagnetism. As Rosen (2008) describes, “If a magnet is heated, the many small magnets of which it is composed become agitated and begin jiggling about erratically. When this happens, the mini-magnets lose their common orientation and their axes become randomly distributed. With no preferred orientation, the many different orientations can be described as “canceling each other out.” It is this overall absence of difference that is said to constitute symmetry” (p. 182). More will be said of this point in the following sections.

consider it *real*, we become victims of what he calls “the fallacy of spurious homogeneity” (1965, p. 462). Ultimately then, Harris is identifying total chaos with homogeneity and considers it contradictory to attribute such a state to Nature because any conception of Nature must involve some principle of order.

Harris hereby models cosmogenesis as a process by which the *prior* organization of the whole directs the evolution of its respective phases. By this reasoning, *being* and *non-being* are empty concepts when considered independently. This demands “Being” be reconsidered as “a dynamic and not a static concept, and in its dynamic opposition and interchange with nonbeing it issues as Becoming” (1987, p. 174). By “Becoming” Harris means “subsumation” (1965, p. 283), “sublation” (1987, p. 180), or “*Aufheben*” (1993, ff. p. 50), a genesis of increasingly complex systems over cosmic history guided by a “*nisus*” akin to “Spinoza’s doctrine of the *conatus in suo esse perseverare*” (1965, p. 154):

the advance seems constantly to result from a kind of self-enfoldment of the simpler form: if a field of force (energy) is curvature in space, matter is a higher degree of such curvature – a superposition of curvatures [...] – and the atom is a convolution of fields – the bending in upon itself of the wave-packet which constituted the electron around the complication of nuclear fields (ibid).

To Harris’s mind, the series from energy to matter, from the simplest to the most complicated molecules, demonstrates a continuous differentiation and merging of opposites: “each develops from and incorporates its predecessor [...] energy (waves) opposed to matter (particles), which nevertheless overlap as wave packets, proton (positive) opposed to electron (negative), each excluding yet complementary to the other” (1988, pp. 58-59). In this way, considering the numerous kinds of atom, molecules, and chemical compounds, he holds that each step of the series “is not only more complex but also more comprehensive in content than its predecessor” (1965, p. 154).¹¹³ For Harris, all events within the Universe are to be understood as “the infinitely various specific manifestations of the principles of order implicit in this whole – that is, of the laws of physics – and the temporal process is simply the self-differentiation of the whole” (1988, p. 58). These passages are key because they show that for Harris, rather than existing eternally, laws emerge through cosmogenesis.

¹¹³ An example that Harris finds in support of his case is the versatility of carbon, second only to hydrogen, that forms an astonishing number of compounds. This is significant, Harris claims, because carbon is capable of storing more information than any other element and “the generation and reproduction of information is the essential characteristic of life” (1991, p. 56).

Although contemporary science has not yet identified the supposed *nisus*, Harris finds that recent discoveries depict “a gamut of evolving physical forms, that manifestly grow out of one another in increasing complexity in a manner which demands explanation in terms of some persistent tendency toward self-enfoldment, self-differentiation and self-elaboration” (1965, p. 155). In other words, Harris argues the genesis of diverse forms and processes within the Universe requires teleological explanation because each is the consequence of the whole performing some function upon itself. At the time, Harris suspected the “proper science” to study the underlying “teleological mechanisms” that drives the explication of scales “would be cybernetics – the science of regulation or governance” (1965, p. 265).



Figure 3 – Aperiodic quasicrystal. To understand this account it is helpful to set aside the well-known model of the universe exploding outward and instead, to imagine one system undergoing a kind of self-differentiation as an ever widening range of structures/processes manifest upon its topology. In line with Harris’s reference to Escher’s plane division (1987, ff. p. 140) and his appeal to these same structures above (§ 3.3), *quasicrystals* provide a useful means of visualizing €. In *aperiodic* quasicrystals, identifiable 2 and 3D patterns (like the above) can be projections from a higher 6D structure (Steurer & Deloudi, 2009 ff. p. 61). For Harris (in line with Bohm), in the case of Nature, the totality of this higher dimensional process remains *hidden* from view. Penrose tiling recreated with permission from Jos Leys: http://www.josleys.com/show_image.php?galid=238&imageid=7197.

By this reasoning, Harris attempts to establish a continuum, a common language from particles differentiation to social complexity. On this account there will be identifiable dynamics underlying evolutionary processes at every spatiotemporal scale in virtue of their common source, namely the function of the Concrete Universal (€). If Harris is correct, then cosmic evolution will demonstrate a propensity for self-organization and enfoldment of one element or system into the next, on a trajectory of increasing complexity towards life and

mind. This however remains to be seen. In the following sections I consider responses to Harris's thesis from the contemporary philosophy of complex systems.

5.2.1 Metaphysical Implications of GST

To what extent is Harris's metaphysical posit of € supported by contemporary conceptions of cosmic evolution? A brief examination of the metaphysical underpinnings of AE may reveal further clarification of Harris's approach. Opposed to the classical view that finds low-level efficient causation sufficient to provide exhaustive explanations of all phenomena, an increasing number of *general systems theorists* have maintained that such reductivism has serious limitations (Hooker, 2011). They instead find it necessary to appeal to formal and final causation (discussed below) in the analysis of complex and non-linear systems. If this kind of reasoning can be extrapolated to the universe at large (the topic of § 5.2.2), Harris's conception of teleology could find significant theoretical and empirical support.

In establishing the philosophical basis of enactivism, Thompson (2007) appeals to complex systems theory and argues for a form of holism not dissimilar from Harris's. Thompson contends that emergence through collective self-organization has two aspects: "One is local-to-global determination, as a result of which novel macro-level structures and processes emerge. The other is global-to-local determination whereby global structures and processes constrain local interactions" (p. 61). Thompson bases AE in terms of "emergent process" rather than "emergent properties" because, he reasons

it does not make sense to say that a property emerges, but only that it comes to be realized, instantiated, or exemplified in a process or entity that emerges in time. Emergence is a temporal process, but properties (whether considered as universal or as linguistic abstractions) are atemporal) (p. 418).

On Thompson's view, emergent processes are part of networks whose "coupled elements have nonlinear interactions" that are "nonadditive or nonproportional", producing "systems whose activities cannot be derived aggregatively from the properties of their components" (p. 419). For Thompson, complex systems are non-decomposable, such that parts emerge from the whole, but the whole also depends upon the relations of its parts through time.

However, Thompson considers *downward causation* a misnomer. As introduced above (§ 2.3.1), rather than *lower level entities* being affected by *higher*, there is what Thompson calls "*dynamic co-emergence*", in which "part and whole co-emerge and mutually specify each

other” (2007 p. 431).¹¹⁴ In complex systems however, there is “reflexive global-to-local influence that happens in a system that has dynamic global coherence in and through collective self-organization” (p. 434). Hence, in this scheme, the emphasis is on self-organization as a global *function* that both emerges from and also *constrains* the *spatiotemporal* relations of its composition (e.g. Thomson cites *attractors* p. 419).

Examining the metaphysical implications of GST, Bishop (2011) clearly endorses a metaphysical view akin to Thompson’s, arguing that the “analysis of determinism in complex systems is complicated by the fact that there are additional forms of causation arising in such systems that must be taken into account” (p. 125). To this end he explains that “in complex systems the formation of control hierarchies often comes about when a new form of dynamics arises that exhibits downward constraint on system constituents and is self-sustaining...” (p. 127). Like Harris, Bishop further realizes the unfortunate tendency of analytic philosophers to completely ignore the formal in preference for efficient causation. Such ignorance he adds, misses many of the dynamical relations relevant to complex systems analysis. For example, concerning laws of nature, he argues we should not appeal to either efficient or formal causation as primary in our explanations. Rather, in accordance with a relational scheme: “Sound explanations of complex systems are likely to involve both appeals to causal mechanisms and ordering/constraining structure via the interrelationships among the lower-level and higher-level dynamics” (p. 130). Again, he maintains “[h]ierarchies and wholes in complex systems act to constrain or direct the possibilities made available by lower-level laws as opposed to somehow violating those laws” (ibid).

Given the above, Silberstein’s (2009) contention that AE essentially relies upon OSR appears vindicated. Indeed, AE’s appeal to complexity renders relations, rather than *entities of a particular scale*, as fundamental. More specifically however, both AE and Harris appear to side with McKenzie’s (2014a) revision of OSR, where “*fundamentality*” in the philosophy of physics is granted neither to structures (abstract symmetry relations) nor to their relata (kinds of physical entity): “If we conceptualize priority in terms of ontological dependence, then, rather than symmetries being more fundamental than particles the two seem to be on an

¹¹⁴ “A dynamical system is a collection of interdependent variables that change in time. The state of the system at any time t is defined by the values of all the variables at that time; it can be represented by a position in an abstract ‘state space’, whose coordinates are the values of all the variables at t . The system’s behavior consists of transitions between states and is described geometrically by a trajectory in the state space, which corresponds to the consecutive positions the system occupies as time passes” (Cosmelli, *et al.* 2007, pp. 733-34).

ontological par” (p. 1101). She goes on to conclude that this latter assessment should sit well with those whose “hunch is that physical symmetries cannot exist independently of physical objects—any more than that there can be laws of nature without anything to behave in accordance with them” (ibid). Likewise, Wolkenhauer *et al.* (2011) state, “[i]n systems theory objects and relations between objects have identical ontological status” (p. 355).

For AEs and Harris however, this position is motivated by a prior appeal to *dialectical relations* and *process ontology*.¹¹⁵ As Capra clarifies, in systems theory neither structures nor relations correspond to independent units in the world, rather “every structure is seen as the manifestation of underlying processes” (2014, p. 81). Likewise, according to Thompson,

there is no bottom level of basic particulars with intrinsic properties that upwardly determines everything else. Everything is process all the way “down” and all the way “up”, and processes are irreducibly relational – they exist only in patterns, networks, organizations, configurations, or webs (2007, p. 440).

Here Thompson is claiming that according to systems theory, nature is composed of co-emerging structures and irreducible relational processes with no fundamental level. Bickhard (2011) has agreeably argued that complex systems theory relies upon *process metaphysics*. In agreement with Harris’s contention that chaos presupposes order, Bickhard argues “process has whatever causal powers that it does in part in virtue of its organization [...] organization cannot be delegitimated as a potential locus of causality without eliminating causality from the universe” (p. 95). Consequently, Bickhard maintains that in physics fields are granted primacy over particles and as a result, any “return to a substance or particle framework is precluded by the empirical confirmation of multiple non-localities, and dynamic space-time and vacuum effects. Such phenomena are not consistent with the local independence and fixedness of particles and substances” (p. 97). By turning to a process metaphysic, he maintains, many of our traditional assumptions concerning boundaries and individuation are brought into question. Informed by the analysis of complex systems, “boundaries that do exist, or are at least posited, must be explained in terms of their natures, origins, and forms of maintenance” (p. 98). Extrapolating this view to the cosmos would therefore mean endorsing Bickhard’s contention that a “process metaphysic” is not only central to systems theory but “is arguably the only framework that offers a viable orientation for the scientific future” (p. 102).

¹¹⁵ For an introduction to *process philosophy*, see Seibt (2013).

This brief overview of the metaphysical commitments of systems theory has provided further illumination of the commonalities between AE and Harris. In this framework, the emphasis is on *formal-governance* and self-organization (or constraint and co-emergence). The upshot is that – in opposition to classical conceptions – contemporary science reveals that nature does not consist of “basic particulars”, but rather “fields and processes”, which implies that understanding self-organization is no less important than understanding efficient causation. Under this paradigm the cosmos as a whole is regarded as being a self-organizing system such that each form that develops is determined by and is a reflection of the whole, yet this does not conflict with the efficient causation of local interactions.¹¹⁶ I maintain that this “constraint” on efficient causation may be identified with what Harris calls “*nisus*”. Harris therefore appears to have foreshadowed in his metaphysics how the now well-established conceptions of GST can be applied to the Universe as a whole. If this is right, a plausible way of vindicating Harris’s TAP would be to argue that if some sufficient criteria of complex systems (e.g. Bishop, p. 112; Yin, *et al.* 2011, p. 404) can be extrapolated to the Universe, it would be reasonable to posit such governance upon the evolution of its *constituent forms* (€).¹¹⁷ What remains to be seen however, is support from cosmologists and physicists that the evolution of the universe can and should be understood as such a self-determining complex system.

5.2.2 Empirical Evidence for €: Towards an Enactivist Cosmology

According to Harris’s metaphysics it should be possible to identify common principles guiding the evolution of complexity in both living and nonliving systems. In this section I consider two theories in particular that may serve this end: Karakin’s (2011) *self-organizing fractal theory* (SOFT) and Brender’s (2013) appeal to *symmetry breaking*. I show: (i) that these works provide empirical support for Harris’s original conception of cosmic evolution; (ii) these works reveal a number of cosmological consequences implied by *AE metaphysics* as outlined in the previous section.

¹¹⁶ Indeed this thesis further agrees with Gunn’s (2011) contention that fundamentally matter is “pneumatical”, which he defines as self-moving, holistic, and self-creating. While much of his argument would lend support for Harris’s thesis at this point, Gunn’s extensive analysis of the history of philosophy of physics is too technical for anything but a passing recognition of the evident parallel between their respective works.

¹¹⁷ See the below appendix § IV for a summary of this reasoning considering the universe as a complex system.

Kurakin begins by considering an apparent conflict between the second law of thermodynamics and the evolution of complex systems. He maintains that this conflict only exists if we assume that

the energy/matter comprising the Universe is near equilibrium and that it evolves toward an equilibrium state via disorganization and disordering, obeying the laws of equilibrium thermodynamics. The conflict disappears, however, if we postulate that the energy/matter making up the Universe is far from equilibrium, that it exists as an evolving flow, and that the energy/matter flowing through and comprising the Universe evolves from simplicity and disorder to complexity and order via self-organization, in accordance with the empirical laws of nonequilibrium thermodynamics (Kurakin, p. 2).

Providing a theoretical foundation for Kurakin's project, Brender (2013) argues for a paradigmatic use of *symmetry breaking* as a means of explaining the emergence of complexity. Here symmetry is considered invariance under transformation, which means the greater the transformations that maintain invariance, the greater the symmetry.¹¹⁸ Contrary to intuition but in line with Kurakin, greater symmetry does not imply greater order or structure but rather a *structureless uniformity*. Crucially then, form only arises due to a *symmetry breaking* that introduces differences. Disorder, Brender explains, is more symmetrical than order: "Thus the question of the genesis of form is not how symmetry arises out of disorder, but rather how the symmetry of disorder gets *broken* in determinate ways to produce the characteristic *asymmetries* of the forms we find in nature" (p. 267).

Contrary to the classical view that attempts to conceptualize the emergence of form by appeal to identity, where each difference is caused by a prior equally complex effect, Brender finds this approach inadequate in its linearity and addresses the issue via nonlinear systems theory. Here he claims, we can have "the emergence of behaviours that are less symmetrical than their causes" (p. 268). The patterns of convection rolls for example, are said to arise 'for free', not with the addition of some imposed order, but through the '*subtraction*' of symmetries that results in the apparent form.

In perfect alignment with Brender's paradigmatic appeal to symmetry breaking, Kurakin describes an example wherein a temperature gradient gives rise to self-organization:

¹¹⁸ To make his point Brender exemplifies 1. a hexagram, 2. a circle, and 3. a uniform field (homogenous space). He maintains that 1-3 increase in symmetry but decrease in rotations and reflections: 1. six reflections, 2. infinite reflections, to 3. unbounded reflections (p. 266).

When the temperature gradient is relatively weak, heat propagates from the bottom to the top by conduction. Molecules move in a seemingly uncorrelated fashion, and no macro-order is discernible. However, once the imposed temperature gradient reaches a certain threshold value, an abrupt organizational transition takes place within the liquid layer, leading to the emergence of a metastable macroorganization of molecular motion. Molecules start moving coherently, forming hexagonal convection cells of a characteristic size. As a result of the organizational transition, conduction is replaced by convection, and the rate of energy/matter transfer through the layer increases in a stepwise manner (Kurakin, p. 4).

Importantly, a flow of energy/matter through an open physicochemical system of interacting components will “spontaneously” result in the coupling of gradients, which in turn results in a self-organizing, non-equilibrium systems (e.g. *Belousov-Zhabotinsky reaction* and *Benard cells*).¹¹⁹ Macrostructure processes that emerge in far-from-equilibrium systems “display both configurational dynamics and flow dynamics”, constraints that connect everything within the system, mediating its evolution, transformation, and the organization of its internal structures (ibid).

Following this line of reasoning, both Kurakin (2011) and Chaisson (2013) have independently made the same point about the evolution of complexity. Chaisson aims to defend the thesis that “specific energy flow” itself can help us to understand the nature of evolution in general. His working hypothesis is that the energy rate density (ϕ_m), “the amount of energy flowing through a system per unity time and per unit mass” is the most fundamental process “capable of building structures, evolving systems, and creating complexity in the universe” (p. 71, emphasis omitted). Anticipating Chaisson’s thesis, Kurakin argues that what guides the evolution of complex systems is the relationship between the system’s level of complexity and *rate of energy flow*:

A relatively higher degree of complexity and order requires and, at the same time, supports a relatively higher rate of energy/matter flow. Increasing the rate of energy/matter flow normally leads to a stepwise increase in relative complexity and order within an evolving nonequilibrium system. Conversely, decreasing the rate of energy/matter flow results in organizational relaxation via a stepwise decrease in relative complexity and order (p. 4).

¹¹⁹ The resulting *emergence* of global order is due to a self-organized *phase transition* when the system passes a critical threshold of energy/matter flow rate. Theories of emergence and phase transition will be discussed in greater detail in §§ 5.3.2 and 5.3.3 respectively.

By Chaisson's analysis, "energy flow as a universal process helps suppress entropy within increasingly ordered localized systems evolving amidst increasingly disordered, surrounding environments" (p. 73).¹²⁰ While earlier stars and galaxies demonstrate the lowest energy rate densities, our galaxy, the biosphere, and human societies he claims, have the highest known. However, despite their lower complexity he finds galaxies have nearly the same degree of "adaptability" and "metabolic" capacity as life forms. Chaisson proposes that this theory depicts evolution as a "universal phenomenon" and stands as "a unifying principle throughout natural science." He goes on to conclude:

Energy is a common currency; energy rate density (ϕ_m) generally correlates with system complexity and may drive, at least in part, the process of evolution itself.

Selection and adaptation are ubiquitous in Nature; the emergence, maintenance, and fate of all complex systems are often determined, again partly, by their ability to utilize energy (Chaisson, p. 78).

Kurakin further develops this line of thought in a way that renders Harris's anticipation painfully evident. Kurakin argues that if the "Universe is far from equilibrium", then the evolving flow of energy/matter through the "Universe spontaneously self-organizes into self-similar (fractal) structures-processes on all scales" (p. 5).¹²¹ Moreover, these "scale-specific" forms are "interconnected and co-evolve as a nested set of self-organizing and interdependent structures-processes" (ibid). Providing a concrete example of what actually undergoes symmetry breaking in cosmological evolution, Kurakin proposes a general nonequilibrium model of *electron transfer* (ET). He maintains ET chains can provide "scale-invariant" and "universal principles" applicable to any structurally adaptive, living or non-living medium:

¹²⁰ Chaisson's account of ϕ_m is not unlike David Ingram's (2007) conception of "entropy management" (p. 103) as a framework for understanding a range of phenomena. Incidentally, Ingram – a former graduate student of the University of Canterbury – also demonstrated particular sympathy for GST and enactivism more specifically.

¹²¹ Though unnoticed by Kurakin, Smolin (1997) has made a very similar argument: "if there is no time at which the universe will come to equilibrium, then it might be useful to view it permanently as a self-organized nonequilibrium system" (p. 159). Moreover, and like Harris, this line of reasoning led Smolin to contend that life is expected to proliferate throughout the history of the cosmos and that the theoretical underpinnings of this self-organization justifies the Gaia theory (discussed in chapter 6). It should be further noted that although cyclic cosmologies are usually mutually exclusive, many appear compatible with the basic premise of the Universe as an open thermodynamic system, e.g. Rosen's *self-evolving cosmos* (2008, p. 206); Penrose' *conformal cyclic cosmology* (2010, p. 147); and Unger & Smolin's *proposal in natural philosophy* (2015).

- (1) Different environments will favour different ET chains. As a result, environmental and internal changes in energy/matter flow will drive the emergence, evolution, and adaptation of the ET chains.
- (2) In instances of local relaxation, individual chain components will compete for the momentarily viable pathways of the existing chains, which will lead to encouraging and/or dissolving the chains that are available.
- (3) Following global relaxation, alternative ET chains will compete until some of the chains are optimized for efficient electron transport under the environmental circumstances.
- (4) The system of ET as a whole will *co-evolve* with the constraints of its environment and thus, the ET chains that are most efficient, adaptive, and stable will persist. Consequently, if the universe is a complex open thermodynamic system, it is expected to give rise to new and increasingly complex systems over time (Kurakin, p. 16).

According to Brender, following symmetry breaking to its wider metaphysical conclusions provides a means of reconciling our dichotomous conceptions of “being and non-being” as well as “form and matter.” He goes on to say, “Being is no longer defined by self-identity, but rather by self-differentiation. The opposite of being is not non-being or negation, but rather the absence of negation; uniformity or indifference” (p. 269).¹²² In combination with Kurakin’s ET model, Brender’s conception of symmetry-breaking seems to have reconciled the apparently paradoxical contention that whole and part arise from each other, while the whole is nonetheless prior to the parts. Brender has thus offered a tremendous insight into conceptions of Harris’s \mathcal{E} and AE’s *dynamic co-emergence*. However, Brender seems to have simply not noticed Harris’s by now, all too familiar warning: It is anti-naturalistic to posit that our *physical* Universe under some condition could have such homogeneity as to be *formless* or *absolutely disordered* since these terms are abstractions at best and contradictions at worst (from §§ 2.2.2 and 5.2). In the following section I examine this issue more closely with respect to one way natural order can be conceived in dialectical holism.

¹²² If we apply the concept of symmetry breaking to the history of the universe we find one system with high symmetry (low order and low entropy) in its early phase, lowest symmetry (highest order and medium entropy) in its middle phase, and a return to high symmetry (with low order and high entropy) in its late phase. I thank Stephen Pike for helpful discussions on this issue.

Implications for the “Law(s) of Nature”

Although Harris at no point in his works explicitly posits a theory of laws of nature, I argue that some very clear implications for how laws ought to be conceived in dialectical holism can be derived from what has been said above concerning cosmic evolution. The purpose of this section is to assemble some recent works that demonstrate roughly how this line of reasoning can run.

Beginning with the above conception of meta-laws (§§ 3.2 & 4.5), the dialectical holist clearly appeals to Ellis’s contention that “laws may depend on the boundary conditions of the universe” and the cosmos itself may “influence the *nature* of local physical laws, rather than just their initial conditions” (2007a, p. 1239, emphasis in original).¹²³ Contrary to Descartes’ story of an orderly world created out of disorder then (one that would by definition have *no initial constraints*), whatever phenomena arises, requires some kind of prerequisite order and must be consistent with the parameters of our universe throughout its history. Ellis calls this prerequisite order a *possibility space*. As novel physical phenomena emerge over the course of cosmic history their very existence,

is allowed by the boundary conditions provided by the universe for local systems, together with the possibility space generated by the underlying physics. While their physical existence is novel, every new thing that comes into being is foreshadowed in possibility structures that precede their existence (2007a, p. 1242, emphasis omitted).

Interestingly, the Universe is the only system that necessarily sets its own boundary conditions with no prior constraints. On the other hand, excluding the presupposition of an ordered physical superprinciple or Concrete Universal has permitted physicists like Laurence Krauss to conceive *A Universe from Nothing* (2012). As Vilenkin (2006) has previously warned however, the very process of a universe tunneling into existence from *nothing* would be “governed by the same fundamental laws that describe the subsequent evolution of the

¹²³ Ellis (2006b) argues that top down action can be seen in the relationship between the Universe as a whole and variables like the arrow of time. He argues that the arrow of time is not determined by fundamental physical laws but by the boundary conditions at the beginning and end of the universe that “select which solutions of the fundamental physical laws are accepted as physically allowed solutions” (p. 90). Ellis reminds however, the “reasons underlying the choice between different contingent possibilities for the universe (why one occurred rather than another) cannot be explored scientifically. It is an issue to be examined through philosophy or metaphysics” (Ellis, 2007a, p. 1236, emphasis omitted).

universe” (2006, p. 205).¹²⁴ It follows, he argues, that the laws must be understood to exist “prior to the universe itself.” He goes on to say that without space, time, and matter, the laws are expressed in the form of mathematical equations, but the medium of mathematics is the mind, and thus we are left with the (unwanted) question of whether mind precedes the universe (ibid).

Though Vilenkin may have gone too far in believing that this line of reasoning results in presupposing mind before Nature, it is clear that such speculation must face either some form of idealism or an infinite regress. While this kind of reasoning might be permitted by those who invoke nomic necessity about laws (e.g. Lange 2009), for Harris and AEs alike, such an explanation will not provide scientifically or philosophically satisfying answers concerning the origins or nature of complex systems. The reason for this dissatisfaction is that nomic theories reduce physical laws to abstract rules that *just are the case*, independently of both observers and matter. As Harris has argued above, in a physical condition of *absolute disorder* no principles, patterns, or laws can obtain. Likewise, a state of perfect symmetry is one that lacks all contrasts, patterns, and regularity, i.e. order. To posit a state of Nature is to distinguish an instance of order, because positing such a state devoid of order is tantamount to saying that Nature is *no-thing*, or abstract homogeneity. Therefore, nature can never be in, nor arise from a state of absolute randomness or perfect symmetry, i.e. disorder presupposes order.¹²⁵

Harris’s posit of a Concrete Universal is meant to account for this presupposed order. By a sympathetic account of Harris’s reasoning, even the highest level of symmetry in nature must also be governed by an overarching order that specifies the (concrete) possibility space and constrains the process of symmetry breaking that follows. Harris has consistently maintained that the

influence of the universal is transmitted uninterrupted, through forms of growing complication and self-enfoldment, along a scale of increasing degrees of adequacy in its exemplification, which guarantees that life is the fruition of what is already potentially present in the physical. Its

¹²⁴ Brading & Castellani provide a particular example vindicating Harris’s claim of non-random emergence, holding that a theory with constraints involves constraint equations that require initial data and evolution equations: “In GTR, four of the ten field equations connect the curvature of the initial data hypersurface with the distribution of mass-energy on that hypersurface, and the remaining six field equations are evolution equations. To sum up, in a theory with constraints, the initial “disorder” cannot be so disordered after all, but must itself satisfy constraints set down by the laws of the theory” (2007a, pp. 1352-53).

¹²⁵ For a summary of this *argument from absolute chaos*, see the below appendix, § IV-a.

emergence is simply the continuation of an already-evident tendency to build more integral, more versatile, and more self-maintaining wholes (1991, p. 61).

To my mind, the monistic picture of cosmogenesis that has been laid out thus far leads directly to a dialectical holist theory of laws. Supportive of Kurakin's SOFT and Harris's TAP, Gleiser (2004) proposes his own principle that characterizes just such a theory:

[T]he set of physical laws is also an emergent property of the cosmos, together with the cosmos itself [...] it may be meaningless to talk about physical laws before the existence of a physical reality where these laws are enacted: I propose that the laws and the material reality they describe can only exist together. The emergence of cosmic order may be the result of an optimization process rooted on the evolution of complex material structures, resulting from random experimentation between form and functionality. The laws we use to describe nature are a consequence of this optimization process, not its cause. That is, the only truly fundamental principle in nature is that of economy of performance, what could be called a cosmic optimization principle, or COP (2004, p. 641).

In apparent agreement with Harris, Gleiser suggests that a result of this principle is that to some (unspecified) degree, the universe could not have been different. For Harris, the reason the universe could not have been different is strictly because what obtains ultimately consists of material relations – thus it is nonsensical to claim that either the Concrete Universal or its constituent material forms/relations can be altered without altering the other.¹²⁶

In a number of different works bearing striking resemblance to this line of reasoning, Davies has argued that the principle that underlies the evolution of complexity in the universe “can be traced to symmetry breaking” (2013, p. 27) overarched by a *Cosmic Blueprint*, and specified into a series of “organizing principles” across a range spatial scales (2004a ff. p. 152). Davies argues for the “*predisposition thesis*”: “the laws of nature are such that matter will inevitably be led along the road of increasing complexity toward life. In the same vein, the existence of intelligence and conscious beings is also regarded as part of a natural progression that is somehow built into the laws” (p. 201). Davies likewise claims that this theory “receives support from those experiments that show how complexity and organization arise spontaneously and naturally under a wide range of conditions” (p. 202). In agreement

¹²⁶ Nevertheless, there remains a possible discrepancy depending on what exactly Gleiser meant by “random.” As mentioned above, Harris considered randomness to be something that appears within and between the kinds of phenomena that arise, but not among them.

with Harris, Davies claims that in a model of this kind, the general pattern of development is ‘predestined’, but the details are not (ibid).

Davies’ teleological conclusion depends upon an argument for the non-duality of laws and matter. As he has persistently argued “[i]f one accepts the idea of evolving laws then the distinction between fundamental and phenomenological laws fades away. As new and ever more elaborate physical systems come into existence with time, so might the laws that apply to them” (1995, p. 262). His thesis of evolving laws comes from a dissatisfaction with (i) the common dualist tendencies to depict laws as the software of physical events; (ii) any objectivist picture of nature; and (iii) intuitions that there is a fundamental level to laws of nature. “If one were to pursue this as far as cosmology, it would imply that the universe is a sort of gigantic feedback system where the laws that apply today depend on the details of cosmic history” (p. 263). In this vein, laws are inseparable from the self-organizing systems whose regularities they enact.¹²⁷

Why should we believe that the non-duality of laws and matter result in what Davies (2007) describes as an *unavoidable teleology of life and mind* (p. 499)? Appealing to analogy from cellular automata, Davies argues that the state of a given cell depends not only on the state of its neighbour, but also upon the “global state”. He explains that in this scheme, “physics and biology co-evolve under the action of a (precise) principle operating at the multiverse level, in such a manner that teleological behaviour emerges” (p. 500). A key difference between this model and Darwinian evolution is that there is a causal link between laws and product states: “Thus life is neither a statistical fluke in an indifferently random set of laws/universes, nor is the Universe designed in an *ad hoc* way for life. Instead, life and mind, laws and universe, are common products of an overarching principle” (p. 503). Hence, in accordance with the conception of the complex system noted above, he claims there must be a “self-consistent, self-supporting loop” between the composite systems and their “overarching principle” (ibid). In line with Gleiser’s COP and Harris’s TAP, in a later work Davies concludes, it is possible that the state of the world evolves in a way that reflects “law-like optimality rather than any optimality in the intrinsic property of the states themselves”

¹²⁷ Again, Smolin’s recent work *The singular universe and the reality of time*, apparently agrees with these points: “Laws evolve. Our most important point is that taking laws to be mutable and subject to evolution rather than timeless and immutable brings questions as to the choices nature has had to make about which laws govern the single universe within the domain of scientific explanation” (2015, p. 358). In this way Smolin, like Davies, emphasizes the presupposition of order or ‘choice’ at the level of the universe as a whole, which leads to a model of evolving laws of nature.

(2013, p. 39). It is in this sense he considers the universe “fine-tuned for life, mind, and comprehension...” (ibid).

Extrapolating the *developmentalist perspective* (of GST) to its limit, Coffman (2011) has articulated a view of laws and causation that is naturalistic, yet anti-reductionistic:

[T]he ultimate arbiters of causality, the ‘laws of physics’, are themselves no more than organizational constraints produced by (and contingent upon) the early development of the universe. The causal relationships that define chemistry and biology are more highly specified organizational constraints produced by later development (p. 287).¹²⁸

More specifically he claims “systems develop within systems that evolve over time, an iterative, bootstrapping process wherein the organization that emerges developmentally within a given system is constrained by the information (regulatory networks) that developed previously in a larger, more general system” (p. 300). These “organizational constraints” appear to be analogous to Harris’s unifying principles or scales (to be further discussed in the following section).

Coffman finds that given the evidence, it can be argued that a model of this kind “may even characterize the birth of our universe...” (p. 301, emphasis omitted). Consequently, *far from equilibrium complex systems* create autocatalytic cycles that create their own evolutionary trajectory by constraining future dynamics at each stage of development. Coffman claims, they first

create information by selectively organizing a system, which in turn establishes attractors that constrain the flow of energy toward producing specific outcomes [...] this process ultimately leads to a senescent state that lays the groundwork for the emergence of new systems that develop even higher levels of specification (p. 302, emphasis omitted).

In line with Harris and Brender’s symmetry breaking, ‘evolution’ Coffman maintains, ‘leads to individuation’ and he thus finds it appropriate to invoke Aristotle in summarizing the developmentalist perspective of causality: “stochastic events constrained by the

¹²⁸ Interestingly, Coffman defines information as a *decrease in symmetry*: “that which brings about a reduction of uncertainty or indeterminacy. Information is a manifestation of asymmetry (i.e., reduction in degrees of freedom, mutuality between events, or expectation of one thing given another, and is the basis of predictability, the holy grail of the scientific enterprise” (p. 292, emphasis omitted). Formally he defines it as $I = H - H_r$, where H is *a priori* uncertainty and H_r is the residual uncertainty after measurement or the ‘development of a system’. Logically then it follows that the max information is also the maximum a priori uncertainty, what he terms $I_{max} = H$.

organizational context of a specified flow network provide circumstances (formal causes) that generate specific developmental attractors (final causes) which entrain the effects of physical chemical mechanisms (material and efficient causes)” (p. 302). Again, if the universe can be depicted as an open thermodynamic system as Kurakin and others have argued, then the developmentalist model supports Harris’s \mathcal{E} .¹²⁹

At this point I only hope to have revealed: (i) the extent to which Harris anticipated what are today a number of interrelated (though mutually unrecognized) theses concerning cosmological evolution premised on self-organization; and (ii) that when brought together, this picture of cosmic evolution follows directly from some of the founding principles of AE – namely, nominalism, process ontology, dialectical relations, and symmetry breaking. Nevertheless, Harris’s notion of teleological scales or unifying principles requires further clarification. In what follows, I critically assess and develop Harris’s theory of the *scale*, which will serve to ground his later discussions of life and mind.

5.3 Updating Harris’s Scale of Forms

In the interest of evaluating Harris’s TAP, the previous sections of the present chapter have been devoted to revealing the extent to which his \mathcal{E} can be identified in modern theories of cosmological evolution. The remainder of this chapter more carefully examines Harris’s conception of the Levels of Nature. Harris maintained that chaos theory provides a non-reductive paradigm through which to view natural phenomena across a wide range of sciences

¹²⁹ Barrow (2008) has argued that in a chaotic system small perturbations can result in exponential amplification of trajectory uncertainty after each collision, which prima facie, would seem to support Gould’s conclusion that the evolutionary process should have a different outcome if history were to be replayed with a slightly different starting point. However, if the motions of molecules in a room are chaotically unpredictable, “despite this unpredictability in the small, we have Boyle’s Law in the large, linking the pressure, P, volume, V, and temperature, T, of the gas by the simple relation $PV/T = \text{constant}$. Thus, although the individual molecular motions are chaotically unpredictable, their average behavior is entirely predictable and satisfies a particular probability distribution (the Maxwell–Boltzmann distribution). Quantities, such as the temperature that appear in Boyle’s Law are measures of the average speed of the molecules. If we reran the ‘tape’ of the history of our gas, we would find essentially the same average behavior, in accord with Boyle’s Law, even though the individual trajectories of the molecules would be quite different” (p. 146). Barrow’s appeal to Boyle’s law has essentially the same structure as Harris’s argument for the primacy of order/ \mathcal{E} .

and has become integral to his defence of *unifying principles* (henceforth ϕ). For example, in one of his later works he argues as follows:

The same conviction of holism has emerged from the study of turbulence in what has come to be known as chaos theory, which has revealed the delicate sensitivity of complex, dynamic systems to initial conditions and the unexpectedly intricate and beautiful patterns of order underlying what seem at first sight to be chaotic processes. The discovery of what came to be called “strange attractors” operative in turbulence led investigators to seek patterns amid apparent randomness rather than local mechanisms [...] So the study of complex, dynamic systems has persuaded its pursuers that no reductionist program in science can produce genuine explanations, and that only a grasp of the entire system can render the details intelligible (2000, pp. 100-101).¹³⁰

Here he makes explicit appeal to the notion of patterns arising from apparent randomness (e.g. the butterfly effect), to provide evidence for emergence and ontological hierarchy. Specifically, Harris appeals to chaos theory and fractal geometry to make five central claims in defense of his scale of forms:

(1) Harris argues the *self-specification* found in fractal geometry can be connected to Bohm’s articulation of the implicate order, which “is enfolded in the ‘holomovement’ of physical activity, such that an organizing principle is implicit in every point in space-time, as in a hologram – the whole immanent in each part” (1991, p. 35). He later writes, the “concrete universal [...] is a self-representative system, dialectically structured, like a fractal curve in complex dynamic systems theory” (1993, p. 238). Bearing in mind the discussion of § 5.2, Harris appealed to fractal geometry as empirical evidence for a self-specifying Concrete Universal that is differentiated into a series of levels, each reflective of the whole.

(2) Harris maintained ϕ s are irreducible, for example “physical and chemical properties” are “consequences of the structure as a whole, and are determined by its organizing principle of unity and not by a simple summation of the properties of its several constituents or parts” (1965, p. 166). Additionally he found, “Problems of phase transitions (e.g., between solid and liquid, liquid and gaseous states, the magnetizing of metals [...]) proved tractable when treated in terms of fractals, revealing that they all obey the same rules” (1991, p. 35). In these instances (and others) it is clear that Harris believed phase transitions could provide a way of not only identifying, but also *systematizing* what he considered the *irreducible scales of Nature*.

¹³⁰ As can be imagined, Harris had an affinity with (and high hopes for the soundness of) Gleik’s (1988) sentiment that chaos was to usher in an end of reductionism.

(3) By the terms of § 2.2 above, Harris maintains that *attractors* are proper wholes and so ϕ s should involve attractors. He claims there is “a periodic repetition of similar patterns on different scales”, which he takes to be indicative of “a universal law governing ‘strange attractors,’ which turn out to be, or at least to involve, fractal curves” (ibid). This is to say *attractors* are *indicative* of ϕ in virtue of being “a dynamic structure toward which all motions in a complex dynamic system tend at specific degrees of energy flow” (ibid). Harris maintained that the strange attractor demonstrated that “the whole” has become of utmost importance for science, “apart from which it is futile to examine and try to understand the parts” (1991, p. 36).

(4) With regard for the relationship between scales, Harris goes on to say that “[t]hresholds governing phase transitions are the boundaries between the pulls of strange attractors, and these boundaries are themselves fractal forms, which (as it turns out) correspond to the shapes and dispositions of natural objects...” (1991, p. 36). With this claim, Harris attempted to supply evidence that each ϕ will be dialectically related (i.e. they should appear co-emergent or interdependent) and that *their boundaries will appear fractal in nature*.

Towards an elaboration of ϕ , it will be instructive to consider one instance in which Harris explicitly discussed emergence. Harris considers attempts by analytic philosophers such as Kim (1984) to preserve downward causation “by giving it a conceptual interpretation: that is, as referring to concepts rather than phenomena or properties in the real world; by describing them in different languages” (2006, p. 167). Harris argues that such epiphenomenal or conceptual distinction amounts to paying epistemic lip service to different Levels of Nature. With this complaint, Harris is making it clear that mere conventional or epistemic emergence is too weak.

Harris suspects that a particular hindrance to typical analyses of emergence is the presumption that such phenomena are externally related to their background. In accord with Thompson’s comments above, Harris claims this mistake arises directly from the philosopher’s tendency to abstract natural phenomena until what remains are a-temporal *properties*.¹³¹ Harris claims that proper examination of nature reveals a series of self-organizing forms, each dialectically related to the rest, so what the analytician neglects is “the central condition for the emergence of new qualities [...] the *holism* of the configuration from which they emerge” (2006, p. 168). Appealing to dialectical relations, he claims, means that

¹³¹ Indeed, Thompson (2007, ff. p. 430) appears to be well aware of this mistake and like Harris (2006) devotes the better part of his own appendix to criticizing Kim for similar reasons.

“downward causation never occurs except in the sense of *final* causation, which, properly understood, is the regulation and determination of the parts or elements of a complex structure and the process of their development by the configuration of the whole” (2006, p. 169).¹³²

(5) By this reasoning, Harris is again (albeit implicitly) led to the conclusion that laws evolve and are characterized by respective kinds of self-organization (ϕ) via the ‘interlock’ and ‘cooperation’ of components:

Kim and his Analyst followers, therefore, have simply missed the main point of the Emergentists’ doctrine: that special configurations of entities at one level of development give rise to new wholes on a higher level, in which the interlock of the constituents modifies them so as to cooperate to produce a new entity with new properties inexplicable by the laws that govern those at the lower level [...] The lower level constituents are necessarily involved, but in the new configuration are transformed so as to cooperate according to higher level laws to which they are not subject in isolation, or in causal collation, at their own original stage of development (2006, p. 169).

What is *ontologically emergent* then are the lawful regularities instantiated by ϕ . Note however that just as a different set of unifying principles could not be identified with the same Concrete Universal, each ϕ or mode of self-organization, likewise, cannot be instantiated by totally different underlying ϕ s. This does not however mean that Harris is poised to argue against multiple-realizability (e.g. of identifiable relations or functions), only that a given ϕ is to be defined by some necessary and sufficient “cooperation” of composite ϕ s.¹³³

Harris’s argument for the nature of ϕ s (which have been discussed above as meta-laws or unifying principles) can be considered on epistemic, ontological, and empirical terms:

- (a) Ontologically speaking, each instantiate unique (meta-)laws characteristic of particular spatiotemporal scales;

¹³² As noted in the previous section, the strange attractor has indeed been understood to enrich conceptions of *causation*. For example, Coffman has argued, “an attractor is a final cause accessed by the regulatory network, which is in turn a formal cause established by organization that developed via the selective agency of autocatalytic cycles” (2011, p. 300).

¹³³ To my mind, this move of equating scales with forms/systems appears necessary to evaluate Harris’s appeal to a *scale of forms*. It should be mentioned however that Harris does not state this to be his argument, though it appears to me to follow from the form of his metaphysics as a whole.

- (b) In epistemic terms, each is expected to resist reduction to any other level; and
- (c) The *boundary* or *limit* of each scale should be marked by phase transitions appearing fractal in their interrelations with one another.

In consideration of Harris's proposal for a scale of forms, the questions we must ask are: (i) Does modern physics provide necessary *and* sufficient conditions of disparate scales in accord with or in contrast to Harris? (ii) What if any bearing does Harris's view of scales provide in conceiving of typical spatiotemporal *scales*? (iii) What bearing does this thesis have on the current debate concerning emergence? (iv) To what extent can the respective scales be rendered necessary with respect for Harris's TAP? I now examine what replies to Harris's claims may be found in current literature concerning scales and emergence.

5.3.1 What is a Scale?

Toward establishing a more adequate understanding of scale and emergence, an invaluable first step is to dispel some long held misconceptions about both of these concepts. To do so, an examination of the *scale* of classical mechanics will serve as an invaluable starting point. Wilson (2013) points out that our epistemic state of affairs is far more tumultuous than many might expect:

the thesis emerges that physics cannot begin its descriptive task until it has first indulged in a preliminary degree of *essential idealization*: smallish portions of materials must be credited with patently incorrect characteristics. After we reach a complete modeling, we can throw away the idealized ladder we have climbed, for our final equations will describe materials that behave identically at every scale (p. 101, emphasis in original).

He later elaborates, a result of this "idealization" is that if one were to look for the "foundation" of classical physics "we are likely to feel as if we have become trapped in a novel by Kafka, with particular branches of a vast bureaucracy claiming greater authorities than they truly possess and, when challenged, shunting us off to other departments that assist us no further in our quest" (p. 104). This however is just what one would expect of a dialectically related system of the sort articulated by Harris, Bohm, and AE, in which each level depends upon its relations within the system-as-a-whole.

Contrary to the orthodox interpretation, a purported advantage of Bohm's (1993) *ontological interpretation of QT* is that it implies "an approximately classical behaviour for objects containing a sufficiently large number of particles (which means that there is a

classical level that is essentially independent of measuring instruments)” (p. 160). *Prima facie* his account appears reductive because “autonomy” arises “wherever the quantum potential can be neglected”, meaning the classical domain “is actually an abstraction from the subtle quantum world” (p. 177). However, Bohm argues the action of a quantum potential depends on its form and not on its magnitude, which implies it can have dominant effects even when its intensity is small. As a result there is

a strong nonlocal connection of distant particles and a strong dependence of the particle on its general environmental context. The forces between particles depend on the wave function of the whole system, so that we have what we may call ‘indivisible wholeness’. This means that for different wave functions we can have radically different connections between particles (not expressible, for example, in terms of a predetermined interaction potential) (ibid).

This is to argue that the classical world is irreducible to the quantum and the quantum world actually “contains an approximately classical ‘sub-world’ that gradually emerges...” from its own “nonlocality and undivided wholeness” (p. 178).¹³⁴ As previously discussed, Bohm goes further to maintain that the quantum is itself an abstraction contained within the *super implicate order*: “Evidently we could go on indefinitely to higher levels of implicate order. Since each is related to the one below, as the one below is related to the one still further below [...] we have an order of implicate orders” (p. 380). At this point the reader will do well to remember the discussion of § 2.4.1, in which I noted Bohm’s resistance to *fundamentality in physics*. With this in mind, his contentions here reveal that the influence of “hidden variables” may come from either “above” or “below” the scale of a given phenomenon. So for Bohm, it is a mistake to seek a *first scale* at some microscopic level, rather, higher and lower distinctions are abstractions from a unified holomovement whose

¹³⁴ Writing on the relation between classical and quantum domains from an orthodox perspective, Joos (2006) agrees that macroscopic properties “emerge from, or are created by, irreversible interactions with the environment. In this way the local classical properties with which we are so familiar have their origin in the nonlocality of (entangled) quantum states” (p. 71). In line with Bohm and Wilson, Joos goes on to argue that “micro- and macro-objects are so strongly dynamically coupled that we do not even know where the boundary between the two supposed realms could possibly be found” (pp. 74-75). McGivern & Rueger (2010) likewise maintains the “occurrence of classical behavior at a macro level from a quantum mechanical micro level is another standard candidate for emergence. Here “classical behavior” is considered “novel with respect to the quantum mechanical base. In our classification, this would be a case of synchronic emergence, and, indeed, the mathematical treatment of the relation between the levels involves taking the ‘classical limit’ $\hbar \rightarrow 0$ of the Schrödinger operator $\frac{\hbar^2}{2m} (\partial^2 / \partial x^2)$ ” (p. 229).

self-differentiation gives rise to quantum and classical domains – in agreement with symmetry breaking (€).

Addressing reductionism and scales, Batterman (2013) holds a view that properties at one scale indeed depend upon “dynamical changes” that take place *between* others. He explains that the macro properties of steel for instance, cannot be reduced to the micro alone (p. 258). He contends that it is even “naïve” to believe that “one can, in any straightforward way derive or deduce from atomic facts what are the phenomenological parameters required for a continuum model of a given material” (p. 272). The result is that neither the quantum, nor the classical scales can be derived from the other. Instead, as Batterman maintains, we need to recognize the interdependence of numerous levels of description:

Bottom-up modeling of systems that exist across a large range of scales is not sufficient to yield observed properties of those systems at higher scales. Neither is top-down modeling. After all, we know that the parameters appearing in continuum models must depend upon details at lower scale levels. The interplay between the two strategies – a kind of mutual adjustment in which lower scale physics informs upper scale models and upper scale physics corrects lower scale models – is complex, fascinating, and unavoidable (p. 283).

So when carefully examined, the very notion of an objective chain of efficient causation at the classical and continuum levels becomes an idealization. With this in mind, the notion of *intrinsic properties* identified on any particular level of nature may at least be called into question and could even become antiquated given further investigation. Instead (when we retain *phenomenological honesty*), identifiable properties that serve to characterize a given scale appear only in virtue of relations *across spatiotemporal levels*. In the dialectical holist spirit, Batterman concludes a later work by noting that there has been too much focus in the reduction/emergence debate on “what is the actual fundamental level and whether, if there is a fundamental level, non-fundamental (idealized) models are dispensable. I am arguing here that the focus on the ‘fundamental’ is just misguided” (2015, p. 133).¹³⁵

¹³⁵ Capturing the issue in brilliant clarity Meyer-Ortmanns (2015) concludes her argument concerning reduction as follows: “whenever reductionism is pushed to its extreme, it will exact a price from us. It is as if hidden subtleties pop up and take revenge for the decomposition into simple constituents, so that the effort required of us is kept constant” (p. 33). She argues (in part) that it is not a matter of computational power to exhaustively account for higher scale phenomena with fundamental laws, but that such a final theory may be impossible *because* of our reliance upon idealization (ff. p. 36).

In order to better understand how one might distinguish between respective scales it is instructive to consider emergence. According to Bishop (2011) *emergence* may be characterized as follows:

When the behaviors of the constituents of a system are highly coherent and correlated, the system cannot be treated even approximately as a collection of uncoupled individual parts ('the whole is *different* than the sum of its parts'). Rather, some particular global or nonlocal description is required taking into account that individual constituents cannot be fully characterized without reference to larger-scale structures of the system (p. 114).

How, the reader might ask, is it helpful to appeal to emergence to distinguish scales when the very definition of emergence relies upon a distinction of scale? This question brings us closer to realizing the point at issue: the notion of spatio-temporal scale is only intelligible with reference to *significant* and identifiable spatio-temporal differences in structure, efficacious relations, and dynamics of material systems, i.e. emergence. In the following section I orient dialectical holism among four orders of emergence more specifically.

5.3.2 What Kind of Emergence?

First-Order Emergence

This level of emergence is typically invoked with the expressed intention of maintaining ontic reductionism, while preserving respective levels of description. As Davies (2006) notes, for many working scientists the motivation for invoking this type of emergence is to permit a final ToE that explains the fundamental constituents of matter and thus, the natural world in toto (p. 35). This *weak* emergence is characterized by "systems for which the micro-level laws in principle capture the entire physics of the system, but for which nothing less than inspection of the real system, or simulation, would reveal its behaviour" (p. 37).¹³⁶ Or in Silberstein's words, "X bears predictive/explanatory emergence with respect to Y if Y cannot (reductively) predict/explain X" (2006, p. 786).

¹³⁶ Empirical examples include the surface tension of liquid, laminar flow, viscosity, the generic properties of gases, liquids and solids, chemical bonds such as H₂O, conductivity, and heat capacity. Boyle's Law for instance states that the absolute pressure of the mass of an ideal gas is inversely proportional to its volume if the temperature and amount of gas remains constant in a closed system, which provides knowledge of a global level of description. While this law (PV=K) follows from the underlying constituents, it cannot be known *a priori*, but only from considering the micro constituents.

Deacon (2006) describes this level as non-recurrent and instantiated by the *relational* qualities of higher-order (but nevertheless *simple*) thermodynamic phenomena. Weakly emergent phenomena occur precisely because of the way a group of entities fit together to give rise to relations at a higher spatial scale. Ellis (2006b) further explains, at this level we find bottom-up action plus boundary conditions leading to higher-level generic structures not directly implied by the boundary conditions, but no “higher-level complex structures or functions” (p. 99, emphasis omitted). Gillett (2006) offers one necessary criterion towards the distinction of weak or epistemic emergence:

A property instance X, in an individual s, is W-emergent only if (i) X is a microphysically realized property instance; (ii) the law statements (and/or theories and/or explanations) true of X cannot be derived from the law statements (and/or theories and/or explanations) holding of the microphysical properties which realize X; and (iii) all microphysical events are determined insofar as they are determined, by the laws of physics applying to simple systems (p. 808).

In this way, first-order emergent phenomena *supervenes* upon the lower level – the higher level is over-determined by the lower level, which means a change in the former depends upon a change in the latter.

This kind of emergence is also exemplified by chaotic systems and fractal geometry in virtual models. In this case, emergence results from *sensitive dependence to initial conditions* (SDIC) that restrict our ability to make accurate predictions about a system’s behaviour despite knowing that the system is determined by some underlying mechanism(s), e.g. equations or laws. Importantly, this implies that one cannot derive a later state from an earlier state, but must compute each and every composite state.¹³⁷ For a concrete example, Wallace (2013) claims that this kind of weak emergence can be seen in cases where “there are structural facts about many microphysical systems which although perfectly real and

¹³⁷ A primary quality of chaotic systems is that they are “holistic”. Following Kellert (1993), Bishop (2009) maintains three primary distinctions between chaotic and classical explanations: (i) Due to SDIC chaotic explanations are predictions of qualitative behavior rather than quantitative detail. (ii) This is a description of geometric mechanisms rather than causal processes. Since Chaotic explanations are resistant to reductive analysis, models and systems that exhibit similar patterns of behavior are grouped together without regard for their underlying causal differences. (iii) These include patterns (e.g. bifurcation points, attractors, and fractals) rather than law-like necessity. “Chaos explanations do not rely on nomic considerations at all; rather, they rely on patterns of behavior and various properties characterizing this behavior. In brief, chaos studies search for patterns rather than laws” (Bishop, 2009). Chaos does not propose any revision to laws in the same manner as QT and GR. Debate continues as to whether chaos is a product of the world, or only our models of the world.

objective [...] simply cannot be seen if we persist in analyzing those systems in purely microphysical terms” (Wallace, p. 472). For example Wallace claims this may occur in statistical mechanics:

the temperature of bulk matter is an emergent property, salient because of its explanatory role in behavior of that matter. (It is a common error in textbooks to suppose that statistical-mechanical methods are used only because in practice we cannot calculate what each atom is doing separately: even if we could do so, we would be missing important objective properties of the system in question...) (p. 473).

In sum, instances of first order emergence are additive and *synchronic* in nature, present in cases that require that our descriptions of phenomena are distinguished by boundaries and shapes, but these ‘higher levels’ remain *supervenient* upon and *reducible* to their microphysical base. Nevertheless, I propose that at the threshold of first-order emergence PSEs may be identified. In the interest of elucidating Harris’s conception of scale (to be addressed in the final section) I propose that Hans Jenny’s (2001) *triadic phenomenology* can be extended to the respective orders of emergence presently considered.¹³⁸ Specifically, in such cases of chaotic models and global thermodynamic phenomena, what emerges at this level can be characterized by Jenny’s first parameter of static *structure*, which distinguishes respective *spatial* levels of description. Clearly Harris’s claims imply a version of emergence that is non-supervenient, prospects for which I now consider in the second-order.

Second-Order Emergence

Second-order emergence is believed to occur when simple thermodynamic dispositions (e.g. the tendency for entropy of a system to increase) are overridden by structural regularities *as a function of time*. Deacon (2006) eloquently describes this order of emergence as *simple-recurrent* and claims that it introduces *morphodynamics*. By these terms he means we find “a deviation-amplifying dynamic that propagates throughout the system” (p. 130). At this order, it is argued, chaotic and self-organized dynamics can introduce regularities and unpredictable global relations typically initiated by *phase transitions* and *symmetry breaking*.

¹³⁸ *Triadic phenomenology* was originally devised as a theoretical framework encapsulating a range of phenomena in *cymatics* – that is, the *structures*, *kinetics*, and *periodicity* that arise by passing sound waves through a material medium.

In the case of crystallization for example, we discover shape-determined dynamics in which microscopic interactions cascade throughout a system to instantiate an organized lattice structure. Likewise, bearing symmetry breaking in mind, in Benard instability the “global system ‘harnesses’ the local forces, but at no stage is there a need for an extra type of force to act on an individual molecule to make it comply with a ‘convective master plan’” (Davies 2006, p. 38). The resulting hexagonal structure arises and is sustained because it most uniformly distributes the dissipation of heat in liquid, i.e. all the other forms were selected against by entropy (Deacon, ff. p. 131). At this order however, reference to the global features and environmental context (such as boundary conditions) is required in order to provide a satisfactory account of local dynamics, but there is no need to invoke two (local and global) causes respectively.

Crucially, this order of emergence is characterized by *feedback loops*: a circular causal process in which some portion of a system’s output is fed back into the system’s input, creating autocatalytic (self-generating) phenomena. According to Thompson (2007), feedback is captured by collective variables known as *order parameters*, which

constrain or govern the behavior of the individual components, entraining them so that they no longer have the same behavioral alternatives open to them as they would if they were not interdependently woven into the coherent and ordered global pattern. At the same time, the behavior of the components generates and sustains the global order (p. 62).

More specifically, Snyder, *et al.* (2011) define two types of feedback as follows: “Negative feedbacks act to stabilize the system, decreasing a new output change. In contrast, positive feedbacks act to destabilize the system, increasing or amplifying a new output change” (p. 470). They go on to explain that, one implication of feedback in the case of weather systems is that what emerges cannot be predicted in terms of the constituent components one level below the target phenomenon (ff. p. 473).¹³⁹

¹³⁹ Further examples include sand dune formations, magnetism, cellular automata, autocatalytic cycles, gravitational structure formation, and laser physics. In these cases statistical physics becomes inadequate (Ellis, 2006, p. 99). Davies (2006) cites Mach’s principle as an example of whole-part influence: the force of inertia captured by a local particle derives from gravitational interactions with all the matter within the universe. Likewise, the second law of thermodynamics requires that we appeal to the global concept of ‘closed system’ to posit the conditions by which entropy can never go down: “implicit in the second law is some sort of global constraint (or compulsion) on what happens locally” (p. 41). Davies also includes the phenomena of condensed matter physics; global restrictions in the instance of a black hole, whose event horizon prevents a ‘naked singularity’; closed timelike lines that prevent time travel into the past; and *Pauli’s exclusion principle*. Wallace

Feedback loops of second-order emergence are particularly important for permitting a new categorical distinction of natural phenomena. In his introduction to the *philosophy of complex systems* Hooker (2011) maintains it is “most useful to consider self-organisation to occur where (and only where) a system bifurcates, sufficiently under its own dynamics, so as to bring to bear an additional system-wide constraint (or at any rate an additional multi-component, that is, relatively macro, constraint)” (p. 27). Such a macro constraint he claims establishes “a new level proper in the system” (ibid). Hence, associated with this level of emergence is a non-linear, non-additive, and “intrinsically global coherence” that in addition to limiting dynamical trajectories of the system’s state space, also enables certain states that were otherwise unavailable (pp. 28-29). Hooker reasons, “since self-organisation involves a new dynamical form, it is reasonable to say that it obeys new dynamical laws characteristic of that form” (p. 38). In apparent agreement with Harris, Hooker finds that this emergence of laws includes and surpasses first-order or *epistemic emergence*:

trying to simplify the problem by leaving out globally organized constraints, when they are central to functional characterization, much less by ignoring organization entirely, is to aim at capturing a physics-centered class of cases at the expense of missing much of the special importance and challenge of complexity (p. 40).

Among others (O’Connor & Wong, 2005), Bickhard (2011) concludes that supervenience does not apply to diachronic emergent systems because “local versions of supervenience cannot handle relational phenomena...” (p. 101). For example, he notes that far from equilibrium processes of organization, such as a candle flame, requires persistent exchanges with its environment in order to maintain their existence. In these instances, there is no fixed set of particles that exhaust the phenomenon, but can only be understood as a holistic organizational process (p. 102).

Important for later discussions, second-order emergence also appears to be manifest in the phenomena of *soft matter*. This class of material includes classical and chemically active systems composed of polymers (e.g. plastics, proteins, and DNA), fluids (e.g. solvents, paints, and soaps), gels, elastomers, colloids, foams, and membranes. Here unique symmetry breaks result in *liquid crystal* (anisotropic materials) forming layers of molecules such as polymers aligned in a *translational order*. Specifically, while a crystal is fixed in space along *X*, *Y*, and

(2013) adds vibrations of QT crystals (quasi-particles). Accordingly, QT “crystal vibrations are described in terms of photons; waves in magnetization direction of a Ferromagnet are described in terms of magnons, collective waves in a plasma are described in terms of plasmons, and so on” (p. 473).

Z, axes, a liquid crystal is only constrained along some coordinates (e.g. *X* and *Y*) involving layers and vertical orientation.¹⁴⁰ Consequently, soft matter can undergo reversible topological distortions of several hundred percent and in contrast to the broader category of *condensed matter*, soft matter gives rise to *dynamics* that cannot be easily predicted from the underlying atomic or molecular constituents because of their propensity for self-organization (Bouligand 2011, ff. p. 56).

Taking the above sentiments together, at this order of emergence new laws can be identified as a result of feedback loops across underlying constituents of a system. This line of reasoning can be traced back to Hans Jenny's (2001) *triadic phenomenology*, in which what emerges can be characterized by structures combined with the additional parameter of *kinetics* and has inspired Deacon's label of "*morphodynamic emergence*" (p. 136). Indeed, numerous arguments from philosophy and physics maintain that at this level of emergence we find self-organization and symmetry breaking, by which the lower-level laws are not violated but are overarched by *diachronic* forms of governance, i.e. what will be considered *formal governance* henceforth. In line with the findings of § 5.2.1, second-order emergence appears to minimally characterize the metaphysical underpinnings of AE, but issues remain concerning how higher-order phenomena are to be classified.

Third-Order Emergence

Purportedly exemplified by living, evolving, and possibly even conscious systems, this level is characterized by causal influences that are not wholly determined by their microphysics. Gillett (2006) has argued that this level of emergence has been unjustly dismissed throughout much of the 20th century due to unrecognized metaphysical assumptions in scientific theory. This reductivist paradigm posits the '*completeness of physics*' in the hope of discovering a ToE that shows all "microphysical events are determined, insofar as they are determined, by prior microphysical events and the laws of physics" (p. 815). In the face of this reductive explanation, Davies captures the motivation of

¹⁴⁰ A great deal of theoretical work has been devoted to accounting for this geometric *elasticity* universal to sufficiently soft solids. These characteristics have apparently been utilized in biological evolution and development to give rise to innumerable forms and functions. For example, the surface of the human brain may have formed because the cerebral cortex grows faster than the interior and results in the more efficient gyri folding patterns as a result of its composite soft matter dynamics <http://www.softmatterworld.org/>; <http://www.durhamemergenceproject.co.uk/understand/3>.

many who invoke third-order emergence, contending that “a final theory would not in practice provide a very useful account of much that we observe in the world [... it] would not explain the origin of life, nor have much to say about the nature of consciousness” (2006, p. 35). I maintain third-order emergence is a paradigmatic corner stone of both AE and Harris’s metaphysics alike. As Silberstein (2006, p. 217) notes, at this order of emergence the following three theses are disputed:

Completeness of Physics (CoP): All physical events are determined by prior physical events, the physical laws that govern them, and efficient causation at each time step.

Physicalism (PHY): All phenomena are *exhaustively* constituted by and identical to their microphysical parts.

Causal Inheritance Principle (CIP): The causal powers of all higher level phenomena are identical with, or determined by, the causal powers of their lower-level base.

Third-order emergent systems are comprised of at least two interconnected morphodynamic processes (autocatalysis and self-assembly). Whereas autocatalytic cycles concern the cyclic processes of chemical reactions, self-assembly involves the crystallization of molecules that assemble into geometric structures. In addition to the emergence of feedback constraints noted above, the third-order involves some form of information storage and/or ‘memory’ structures such as DNA in the context of a cell, adaptivity, and evolutionary learning. For example Gregersen (2006) claims this order instantiates ‘self-reference, self-organization, and autopoiesis’. The result is that causality is extended across time and space in virtue of memory.

In systems that are third-order emergent there is an “additional loop of recursive causality that transcends and encloses the second-order recursive causality of self-organized systems” (Deacon, p. 137). Like morphodynamics of the second-order, such systems provide biases of cancellation, amplification, and selection of the system’s own influences. Along these lines, Yin & Herfel (2011) define complex adaptive systems by three criteria:

1. diversity and individuality of components,
2. localized interactions among those components, and
3. an autonomous process that uses the outcomes of those interactions to *select* a subset of those components for replication or enhancement (p. 394).

Such sampling causes the influences to be selectively reintegrated back into the system over time (one non-equilibrium process that converges to a stable pattern and is then reinforced), resulting in a “higher-order” stochastic process over time. As Deacon claims, descriptions of such systems rely upon a “combination of multi-scale, historical, and semiotic analyses (analyses based on the relationships between signs)” (p. 139). This is to say that third-order emergent systems essentially *produce* and *use* first-order structures and second-order processes *toward some end*.

In sum, third-order emergence denotes systems whose self-organization, and self-reference creates new laws and provides unique *contexts and constraints for the further emergence of novel structures and functions*. With this feature in mind, I claim that the third-order of emergence can again be traced to the third level of Jenny’s triadic phenomenology, being *periodicity*.¹⁴¹ Thus analysis of these phenomena requires reference to concepts of representation, adaptation, information, and function. In agreement with Ellis (2006b, ff. p. 100) and Silberstein’s defence of emergence in AE (2006, p. 218), Deacon further claims that these features of third-order emergence are to be understood as *teleodynamic* (p. 143). As AEs and Harris appeal to this kind of emergence in their respective arguments for life, evolution, and consciousness, I now end this brief overview only to return to these issues in later sections. What remains for any proponent of dialectical holism is to defend the irreducibility of third-order emergence and (my next task) to explain its philosophical boundary.

Fourth-Order Emergence

Unlike first-order emergence but just as third-order, this thesis maintains there are no bridge laws connecting the higher and lower levels (Silberstein 2002, p. 91). Also known as *ontological emergence*, fourth-order emergence refers to high-level causes that fundamentally change the system from which they arise and whose components are insufficient for said force.

In contrast with the previous orders, Gillett (2006) holds that in ontological emergence “A property instance X, in an individual s, is O-emergent only if (i) X is instantiated in s, where

¹⁴¹ The relevance and importance of connecting the particular theory of emergence endorsed by dialectical holism with triadic phenomenology will become increasingly evident in the following sections, but is especially germane for my discussions in chapter 8.

this individual is either constituted by microphysical individuals or is a non-physical individual; (ii) X is an unrealized property; and (iii) X is causally efficacious” (p. 809). What he means by X’s being “unrealized” is that X is not found in the compositional hierarchy of the natural world but is granted causal efficacy. Similarly, Ellis finds that the structures of human creativity and culture indicate the existence of free conscious agents on the one hand (2006b, p. 100) and a Platonic realm of rational ideas on the other (2007a, p. 1272). Neither of these, he maintains, can be reduced to any other level of explanation. They instead exist as *independent* and *efficacious* possibility structures in their own right (2016, p. 422).

This kind of top-down efficient causation may more fittingly be described as *emergentism of the gaps*. That is, this thesis has been the go-to for various authors, e.g. Bergson (1911); Alexander (1929); Peacocke (1993, 2006); Clayton (2004) hoping to insert a soul, God, *elan vital*, etc., into the gaps of scientific understanding. Such *ontological emergence* is then an explicit means of positing, or has the unrecognized implication of dualism. Hence, rather than enriching science or philosophical understanding, appeals of this sort draw a veil of mystery over prospects of naturalizing knowledge and mind.¹⁴² Given the discussions of §§ 3.2, 3.3, and 5.2, in which I have maintained that Harris supports relational holism and nomological holism, but not ontological holism; insofar as a (neutral) monistic position is to be maintained, fourth-order emergence could not be endorsed by a proponent of dialectical holism.

To keep these issues straight the reader should bear in mind that for Harris, nature is to be subdivided into respective forms or unifying principles, each reflective of the Concrete Universal via characteristic *laws*. As I have argued above, third-order emergence is the paradigmatic corner stone of enactivism and Harris’s holism alike. This means that the validity of *dialectical holism* in the context of cosmology rests upon the soundness of this type of emergence: If supposed empirical instances of such emergence can be reductively interpreted, then extrapolation to the Universe (as per § 5.2.1) becomes increasingly problematic. The consequence for my evaluation of Harris is that his appeal to teleology would potentially fail and the scale of forms (while possibly remaining irreducible for epistemic reasons) could not be considered ontologic and necessary by any empirical means. Thus a remaining task for anyone in the dialectical holist camp is to show that life and mind are indeed third-order emergentist phenomena. Toward this end, in the following section I

¹⁴² This issue of naturalizing knowledge, Platonic realism, etc., will be revisited in chapter 8 below.

exemplify ϕ in contemporary terms before examining Harris's application of this theory to an analysis of life in the following chapter.

5.3.3 A Clarification of Harris's Unifying Principle

As previously discussed (§ 3.2), Harris considers the space-time field – distinguishing the *scale* of our universe – as an example of what now appears to be second-order emergence. Likewise, the quantum scale, he claims can be distinguished by *Pauli's exclusion principle* (PEP), which prohibits any two like particles in a system from having the same state (1965, pp. 131-32; 1991, p. 31).¹⁴³ As Harris explains, due to the PEP:

Under appropriate conditions, molecules coalesce to form crystals, within the so-called leptocosm of which they are arranged in accordance with the same laws and principles, exemplifying the original universal at a higher level. More complex molecules combine into polymers, and the scale proceeds to organic substances, such as proteins and nucleic acids, necessary for the emergence of life (1991, p. 43).

For Harris, crystalline structures are another example of one such level of nature, as their form depends upon an underlying constraint, involving the “interlock” (e.g. chemical bonds and the *exclusion principle*) of atoms and may obtain within a range of phases depending upon the parameters (e.g. temperature and pressure) of their environment. Consequently, each unifying principle is not considered a *basic unit* of nature, but is described as a “polyphasic unity” (1965, ff. p. 166). This means each ϕ both contains and depends upon such constraints from larger and smaller *scales*.

Towards an argument for the necessary and sufficient conditions of ϕ , Thompson's (2007) criteria for AE emergence provides an invaluable starting point. He maintains a network (*N*) of interrelated components in nonlinear dynamics (*D*) demonstrates an emergent process (*E*) with emergent properties (*P*) iff:

¹⁴³ Indeed, the PEP states “No two electrons can ever be in the same quantum state; therefore, no two electrons in the same atom can have the same set of quantum numbers” (Serway, *et al.*, 2013, p. 1127). Both Davies (2006) and Clayton each exhibit this principle for the same reason as Harris. For example: “PEP specifies that no two electrons of an atom can have the same set of four quantum numbers. Thus a maximum of two electrons can occupy an atomic orbital. This requirement on the way electrons fill up orbitals is basic for understanding modern chemistry [...] A rather simple principle thus has as its outcome the complex chemical distribution of the elements” (Clayton 2004, p. 581).

- (1) E is a global process that instantiates P , and arises from the coupling of N 's components and the nonlinear dynamics, D , of their local interactions.
- (2) E and P have a global-to-local (“downward”) determinative influence on the dynamics D of the components of N .

And possibly

- (3) E and P are not exhaustively determined by the intrinsic properties of the components of N , that is, they exhibit “relational holism” (p. 418).¹⁴⁴

In this passage (1) specifies what kind of component dynamics will be necessary for a emergent whole, whereas (2) characterizes the (at least second-order) formal governance itself. Concerning the transition to (3) however, it can be argued that the identification of a dynamical nonlinear *system* is *synonymous* with that of an emergent whole. As Davies (2004b) maintains, “In a non-linear system the whole is much more than the sum of its parts, and it cannot be reduced or analysed in terms of simple subunits acting together. The resulting properties can often be unexpected, complicated and mathematically intractable” (p. 25). Additionally, with respect for dynamic co-emergence and relational holism, it appears more appropriate to replace *properties* (P) with *relational process across spatio-temporal scales* (R). Hence, given 1 and 2, R will not be exhaustively determined by the endogenous relations of N .

Taking a sympathetic reading of Harris’s line of reasoning and building on AE co-emergence implies that when theorists and scientists appropriately identify a scale of nature, they are always distinguishing characteristic space-time dynamics that obtain through global constraint(s) imposed by a self-organizing material system as a whole. Importantly, each ϕ is what it is in virtue of R , and is hypothesized to ‘reflect’ a more general whole to which it belongs. In the remainder of this section, I consider two empirical research projects concerning *phase transitions* and *soliton waves* respectively, which may provide support for the present conception of ϕ .¹⁴⁵

¹⁴⁴ For a recent logical analysis of the enactivist proposal of dynamic co-emergence see Wu, R. (2016).

¹⁴⁵ It is worth noting that the present consideration of scales satisfies the typical criteria of *natural kinds* (1) Members of a natural kind should have some (natural) properties in common; (2) Natural kinds should permit inductive inferences; (3) Natural kinds should participate in laws of nature; (4) Members of a natural kind should form a kind; (5) Natural kinds should form a hierarchy; and (6) natural kinds should be categorically distinct (Bird & Tobin 2015, pp. 3-4). However, I have found the discussions concerning natural kinds to be particularly torturous and in need of revision, hence the formal meeting of scales and natural kinds will have to wait until a later work.

A number of theorists have recently recognized the philosophical utility of *effective field theories* (EFTs) and symmetry breaking for not only establishing a theory of emergence, but also redefining unity in physics. The common practice in physics has been to consider the appearance of singularities to be an indication of modelling failure and that in order to learn about the physical system we must rid the theory of such *information sinks*. Batterman (2011) argues that a potentially finite theory that is devoid of these infinities (typically found in quantum field theory and condensed matter physics), cannot explain the existence of what he calls “emergent protected states of matter” (p. 1032). Likewise Morrison (2013) maintains the most significant hindrance to reductive unification is the modelling of *emergent phenomena* seen in condensed matter physics (including superconductivity and superfluidity). Such emergent phenomena mark what she calls a “decoupling of physics at different energy levels” and to be described, require choosing a relevant length scale while ignoring others (p. 383). This is because the “defining feature of these phenomena [...] cannot be explained, predicted, or reduced to their micro constituents and the laws that govern them” (p. 384).

Appealing to *renormalizable group theory*, Batterman argues, when a critical temperature is approached “there is a breaking of symmetry”, which causes the order parameter of the system to undergo “a discontinuous jump from zero to nonzero values...” (p. 1038).¹⁴⁶ At these critical points we find singularities in our models that are key signatures of “*the emergence at different scales of distinct and apparently ‘protected’ states of matter*” (p. 1039). These “protectorates” are considered effectively “decoupled and largely independent of physics at shorter length/higher energy scales” (p. 1040). He explains the correlation length (ξ) “is the typical distance over which the behaviour of one microscopic variable or degree of freedom can be correlated with the behaviour of another” (p. 1042). At the critical temperature of phase transition (T_c), the correlation length “diverges” to infinity: $\xi(T) \rightarrow \infty$ as $T \rightarrow T_c$, at which point many degrees of freedom become coupled, i.e. thereby instantiating a constraint. He concludes, if such decoupling of scales is related to the existence of emergent protected states of matter, it is natural to expect infinities and divergences to be involved in our understanding of how those protectorates are possible. So Batterman holds the identifiable infinities provide answers to “why” questions about the stability of protectorates that more fundamental theories devoid of such divergences are incapable of answering.

¹⁴⁶ Such a phase transition can be seen when at temperatures above a superfluid transition a substance will assume random values (as in the orientation of a paramagnet), but if it is cooled through the superfluid transition phase the arrows align (as the ferromagnet).

Emergent protectorates are thus considered to be regulated by higher organizing principles that are independent of microscopics, which Batterman considers “the universal behaviour of lower energy protectorates” (p. 1041). What renormalizable group theory does is to relate what Batterman calls an “intractable problem” concerning an infinite correlation length to a tractable problem characterized by a correlation length reduced by some factor. In this way we may reduce coupled degrees of freedom but in the process demonstrate “scaling or self-similar behaviour” (p. 1042). Concerning unity in physics, Morrison has argued that this theory shows “phenomena at critical points have an underlying order. Indeed what makes the behaviour of critical point phenomena predictable, even in a limited way is the existence of certain scaling properties that exhibit ‘universal’ behaviour” (p. 413). In other words, when various systems (e.g. liquids, solids, paramagnets, ferromagnets and superconductors) approach a phase transition they bear a common “cooperative behavior” irrespective of their microscopic constituents or spatial scale, and so belong to the same *universality class*.¹⁴⁷ Morrison points out that this kind of unity has no reliance upon analysis of “microstructure” and is in this way, quite different from reductive unification. To my mind, this is one way of exemplifying the kind of *fractalesque unity-in-diversity* characterized by phase transitions that Harris was attempting to articulate.¹⁴⁸

Considering Harris’s contention that the respective Levels of Nature should reflect one another and some higher-level unity, Gleiser’s (2013) proposal of the *oscillon* is particularly fitting. Gleiser claims that progress regarding the generation of spatiotemporal complexity can be made by discovering the “fundamental properties of non-linear field models which are common to several areas of physics...” (p. 113). Towards this end he proposes the *soliton wave*, whose partial differential equations appear in many areas of physics.¹⁴⁹ For example, “symmetry-breaking during phase transitions can give rise to solitons” (p. 114). He argues that if we ‘relax’ our criteria to include time-independent but spatially localized systems; we

¹⁴⁷ Morrison offers one example of which being “liquid-vapor systems whose correlation lengths appear to diverge in precisely the same way as ferromagnets” (ibid).

¹⁴⁸ For a critical assessment of both Batterman and Morrison’s arguments for emergence see Crowther (2015). Though she presents a positive account of emergence, she proposes that counter philosophical discussions, the physics do not reveal that emergence obtains in opposition with reductionism. Rather, the issue concerns “dependence” and “independence” between high and low energy physics.

¹⁴⁹ A famous benchmark in the history of science, Scottish engineer *John Scott Russell* was first to observe and describe solitons. In 1834, Russell found that within canals, a wave could be generated that remained robust against perturbations and would thus conserve its energy for miles (Scott 2007, ff. p. 43).

find “oscillating soliton like structures” or “*oscillons*” in a wide class of fundamental models including “symmetry breaking in elementary particle physics, cosmology, and in condensed matter systems” (p. 115). He defines the oscillon as “any long-lived, oscillating coherent field configuration found in non-linear field models in arbitrary spatial dimensions. These can involve a single real scalar field [...] or several interacting fields...” (p. 116).

In line with Harris’s suspicion that scales will involve self-organized attractors, Gleiser shows that mathematically such oscillon systems “evolve into an attractor configuration” and “emerge spontaneously as a system attempts to regain thermal equilibrium after a sudden change in the nature of its interactions...” (p. 117). He goes on to say that “[i]t is during the early stages of this evolution to a new equilibrium state that self-organized oscillon-like patterns emerge...” (p. 122). It is because oscillons tend to emerge in phase Gleiser argues, that they act as “bottlenecks to equipartition”, meaning that oscillons “lock within them long-wavelength modes, impeding them from interacting with shorter wavelength modes and thus from reaching equilibrium with the rest of the system” (p. 123).

Considered together, Morrison’s appeal to “universality classes”, Batterman’s “protectorates”, and Gleiser’s “oscillons” all agree with Harris’s conception of “ ϕ s” insofar as each depicts at least second-order emergence, and reflects a common capacity for instantiating laws at particular spatiotemporal scales. Hence, a way of further evaluating the applicability of ϕ is to consider the extent to which oscillons and phase transitions may provide a means of modelling and unifying the dynamics of a range of phenomena including gravitational fields, cells, ecosystems, brains, and societies.¹⁵⁰ It must be noted that at this point it remains an open question as to whether respective ϕ s are ontological or merely designate the epistemic joints of our theoretical and cognitive capacities, an issue to which I return in chapter 8.¹⁵¹

¹⁵⁰ Interestingly, the soliton has already provided a solution to Einstein’s field equations in Belinski, & Verdaguer’s (2001) *Gravitational Solitons*, and in recent years Tomizawa & Mishima (2014) have applied soliton solutions to Faraday rotation and black holes. As will be discussed below, soliton models have likewise proven useful for recent theories of cellular and neurodynamical phenomena.

¹⁵¹ Though it is to my awareness not mentioned by any of the above authors, *autocatikenetics* is perhaps the oldest and most general theory of self-organization. I do not mention this theory any further however because those who appeal to it (e.g. Swenson 1991, ff. p. 215; Davis & Turvey 2016, pp. 331-32) tend to misunderstand and inappropriately dispute autopoiesis. As will be argued below, autopoiesis does not result in relativism and can fit into many such theories of self-organization.

5.4 Conclusion

From the above discussions, I conclude that Harris's depiction of a necessary scale of forms is alive and well, albeit spread throughout a number of scientific and philosophic views. As discussed in § 5.2, Harris's appeal to process metaphysics, dialectical relations, self-organization, and monism to describe cosmogenesis has anticipated various philosophical and scientific theories of complexity involving symmetry breaking, teleology, and evolving laws. In § 5.3, I have proposed that Harris's conception of the ϕ can be identified in a number of interrelated theses concerning the interdependence of scales, second- and third-order emergence, the oscillon, protectorates, and universality classes in physics. As a consequence of this metaphysics being founded in GST, I have also proposed that the synthesis that has resulted from the above discussion can be considered the logical extension of AE into cosmology.

Combining the lessons of these two sections it should be clear that Harris's conception of cosmic evolution (\mathcal{E}) is one of symmetry breaking, in which each bifurcation is characterized by a unique mode of governance (ϕ) that is literally a partial *reflection* of the whole (Concrete Universal). According to dialectical holism, it should be possible to trace this proposed scale of forms from the abiotic to the biological and the cognitive, revealing an uninterrupted chain that by Harris's reasoning, could render life and human consciousness continuous with the organizing principles of matter. In the following chapter I examine the extension of ϕ and \mathcal{E} to theories of life and evolution respectively, so as to lay a foundation for addressing Harris's response to the hard problem of consciousness.¹⁵²

¹⁵² For a revised criteria of scales, see the below appendix, § IV-b.

Chapter 6

Harris's Teleonomic Philosophy of Biology

6.1 Introduction

In the previous chapters I have outlined Harris's contention that the Universe must be conceived in terms of the dialectical whole. In chapter 4, I have discussed Harris's TAP concerning his argument for the *a priori* necessity of consciousness. In these sections I have revealed significant empirical support for the unifying principle (or meta-law), but I have also shown that despite his ontological conclusions, Harris's reasoning has thus far only permitted epistemic restrictions in how consciousness and the Universe can be discussed in certain philosophical camps. In chapter 5, I have argued that Harris's original conception of cosmogenesis anticipates numerous theories in the philosophy of physics in general and reveals wider implications of AE metaphysics in particular. In this chapter I assess Harris's success in extending his conception of unifying principles (ϕ) and explicative evolution (ϵ) to biological phenomena.

In § 6.2, *The scale of life*, I set out Harris's necessary and sufficient conditions for life and in subsequent sections I compare these contentions with a number of contemporary accounts. The central issues to be discussed in this chapter will be whether the notion of the unifying principle (ϕ) can be applied to the simplest unit of life and if so, what if any further philosophical insight this provides into the natures of life, evolution, and mind. In § 6.3, *Dialectical evolution*, I outline and assess Harris's argument that the explicative process ϵ subsumes and broadens contemporary conceptions of biological evolution. The crucial question in this section is whether, *formal governance* in collective living systems provides teleological direction to biological evolution. In the final section I show that for both Harris and the AEs, positing formal governance across a range of biological systems implies the *Gaia theory*. The goal of this chapter is to present and clarify the dialectical holist stance on key topics in philosophy of biology so as to lay a theoretical bridge to Harris's metaphysics of mind, to be discussed in the remaining chapters.

6.2 Harris's Scale of Life

It is widely accepted by biologists today that self-organization is explicable in terms of physical laws and chemistry, whereas self-preservation remains resistant to this kind of analysis. This difficulty has led to arguments that living systems cannot be understood mechanistically and so demand to be framed along the lines of either third-order emergence or (fourth-order) “irreducible complexity” as introduced above. In the present section I will show that a wide range of research in contemporary biology now supports Harris's push for a paradigm shift concerning the nature of minimal life not as irreducibly complex but as *naturally teleonomic* and *holistic*. Specifically, I argue that Harris anticipates recent arguments for what can be called *formal governance* endorsed by AEs and GST biology more broadly.

For Harris, biological self-preservation is an invaluable topic that any philosophy of Nature is required to address because if neglected, we are left with a glaring chasm between accounts of cosmos and mind. For Harris, self-preservation is both the mark of minimal life and also closes the gap between *is* and *ought*. In other words, life is considered yet another phase in the scale of forms that is characterized by *norms*. Anyone who follows this line of thought is charged with providing arguments for the following: (1) the necessary and sufficient conditions of life; (2) an explanation as to why satisfying these conditions should introduce norms; and (3) a systematic account of life as an instance of ϕ .

In his attempt to identify the primary qualities that distinguish living from non-living systems, Harris notes four possible criteria but then adds that each can also occur in the case of non-living systems: (i) specific bodily form and structure (e.g. crystals); (ii) growth and development (e.g. ice); (iii) metabolic change, or continuous exchange of energy and chemical transformation within a stable form (e.g. fire); and (iv) reproduction (e.g. viruses) (1965, p. 163). Living systems he contends are both “self-regulatory” and “adaptive” (1965, p. 164). Following Schrodinger, Harris holds that in the scale of forms the growth and replication (i.e. self-organization) of “aperiodic crystals” such as chromosomes provide the transition step from the inorganic to those that distinguish living systems (1965, p. 171). These structures establish “new principles of combination” that are “selective and directive in special ways” (ibid). However, the line between living and non-living phenomena is marked by “process rather than simply of spatial pattern” (1965, p. 172) and denotes an “open

system” involving continuous matter and energy flow (1965, p. 173).¹⁵³ For example, systems as simple as a Paramecium “actively pursues and accumulates energy supplies” (1965, p. 178). Here he recognizes that the system maintains lower entropy within its boundary than that of its external context; the key questions are how and why does the system do so?

Harris claims the “principle of order” (ϕ) for living systems is one of “self-maintenance” that at this stage is “termed functional”, in that “structure becomes secondary and instrumental” (1965, p. 180). His original proposal runs as follows:

I propose to use the word ‘auturgy’, now rarely seen, to indicate the capacity of the living system to ‘work upon itself’ and spontaneously to adjust its own internal processes to external conditions so as to maintain its systematic coherence. I shall call an organization of chemical processes auturgic the interrelations of which are regulated according to an overriding principle of order in such a way as to maintain the system in being as an integral whole despite variations in external conditions. The activity of an auturgic system is regulated so as to maintain a steady state, and the system is nothing more nor less than the active process, mutually adjusted within it, that constitute this steady state. The various phases and aspects of these constitutive processes are in consequence mutually ends and means. Anything less than a system of this kind fails to qualify as an example of life (1965, pp. 180-181).¹⁵⁴

In other words, the function is considered one of *adaptation* via “negative feedback” in the face of environmental forces that would otherwise destroy the system (1991, pp. 64-65).

Harris claims that the living system is a “polyphasic unity” that achieves “self-maintenance [...] not by eliminating or abolishing physico-chemical and thermodynamic laws, but by using them...” (1965, p. 182). Consequently, he holds we will not attain an adequate understanding of minimal life through analysis of a system’s parts, but must attend to its function. To do so he begins with the conception of a whole and its relations with an

¹⁵³ With this statement Harris appears to be emphasizing what is today the *nonlinear relationship between organism and environment*, widely regarded as a dynamic state *far from equilibrium*, e.g. Clayton (2004); Shutz (2011); Dehmelt & Bastiaens (2011); Kauffman (2013); Hooker (2011).

¹⁵⁴ Harris’s purposes that initial emergence of living from the non-living may have been due to a “non-local faster than light influences” akin to the EPR experiment, which at “some threshold in the concrescence of convoluted polymers may have occurred in the primeval seas, which spontaneously initiated the generation and fecundation of living bacteria” (1991, p. 68). Harris made this appeal so as to defend his conclusion that living unity is implicit within and *necessitated* by prior processes of QM. Though this line of consideration is beyond the scope of the present thesis, Harris appears to have anticipated what is now a flourishing area of research concerned with the *Quantum Aspects of Life* (Abbott, *et al.*, 2008).

environment. Here the “whole is *ab initio* prior to the parts, and the nature and interrelation of the parts are explicable only by reference to the systematic structure of the whole” (1991, p. 68). This of course is an epistemic point about part and whole. In ontological terms Harris later makes two further claims: (i) there is “a constant interchange of energy and material between the living organism and its surroundings, so that strictly it is impossible to draw a sharp distinction between them; they are in organic interrelation” (2000, p. 121); and (ii) the “dominance of the whole over its constituent parts is more obvious and marked than in any of the inorganic forms. The organism is a dynamic, open system in which none of the metabolic processes can maintain itself, or even exist, apart from the totality” (ibid).¹⁵⁵

This is to say that directing our attention to the system’s boundary (fuzzy as it may be), affords a means of distinguishing and possibly characterizing the living via its functions not found in the inorganic. Claiming the whole is “more marked” in the living system than lower forms is to further emphasize that the living whole is its own scale in virtue of this function. In accordance with the scale of forms, life is thus “a new type of organization more fully and successfully exerting the general tendency of things in nature [...] to form and elaborate wholes of ever-increasing stability and integration” (1965, p. 184). This capacity of auturgic systems he considered to be “a higher degree of self-reference and individuality...” (1991, p. 64). By “self-reference” Harris means that metabolism and “self-determination” are linked in the organism and “foreshadow consciousness”:

Within the organism, structure and functions are merely two aspects of a single process, constructive of the organ in the course of its functioning. The function, meanwhile, is always and only contributory to the maintenance and integrity of the system. Consequently, it is the system or whole that determines the nature and activity of the parts, and not *vice versa*, and it is this that constitutes the self-determination (or freedom) of the organism and distinguishes it, as a successor and further degree of wholeness to any simply physico-chemical entity... (1991, p. 66).

In considering these claims it is important to remember that for Harris, wholeness at any scale is a process of relation. Hence, we may understand the ‘function of the organism’ to be

¹⁵⁵ Ayn Rand (1961) is among the first to have made a similar point with explicit reference to single celled systems (e.g. an amoeba, p. 4), claiming that the very existence of the living establishes value: “In answer to those philosophers who claim that no relation can be established between ultimate ends or values and the facts of reality, let me stress that the fact that living entities exist and function necessitates the existence of values and of an ultimate value which for any given living entity is its own life. Thus the validation of value judgments is to be achieved by reference to the facts of reality. The fact that a living entity *is*, determines what it ought to do. So much for the issue of the relation between ‘*is*’ and ‘*ought*’” (p. 5).

the system's mode of relation, one that is to Harris's mind, for the sake of the organism's 'maintenance'. This means the organic "activity" is an on-going distinction of the system from its background *for sake of itself*, thus introducing '*the first form of freedom*', or self-determination. Hence, it is in virtue of the adaptive self-governance that the activities of the organism are believed to "transcend" those "processes occurring below the organismic level" and to provide an explanation of the organism's parts (1965, p. 192).¹⁵⁶

In line with discussions from the previous chapter, what Harris here considers the simultaneous complementarity and opposition of organism and environment may now more elegantly be considered a further symmetry break in the scale of forms. He later adds, "the existence of feed-back is always a sure sign of auturgic wholeness and integral, polyphasic organization" (1965, p. 224). Harris is claiming that the living system, no matter the degree of complexity, must maintain its homeostasis by way of negative feedback, whereby disparate states can be identified and counteracted with respect to a 'norm' or steady state specified by the whole.

Organism and environment are at one and the same time mutually continuous and mutually complementary, while also in opposition and conflict [...] Life relates to the non-living as opposite, and equally as complement, and also as a new and higher degree of specification of the universal organizing principle of reality, now manifesting its unity in its own active and auturgic self-maintenance at a higher level of self-sufficiency and individual self-determination (1991, p. 75).

For example, "living growth is never the mere accumulation of material, but is always nicely regulated to fit the requirements of the total system" (1991, p. 69). Life then is considered a complexification and enfoldment of a pre-existing self-organizing *nisus* of Nature as a whole, i.e. adaptive freedom marks the ϕ of life.

To Harris's mind, it follows that auturgic wholeness introduces its own "nisus", one directed "towards self-elaboration" (1965, ff. p. 208). He claims examples of this kind of *adjustment* include reconstructive processes in response to organic damage and removal of systemic components. Processes such as morphogenesis and embryogenesis he holds, not only begin but (perhaps more importantly) also stop in such a manner that mere efficient causation is inadequate for their explanations (1965, pp. 210-13). By Harris's lights these are

¹⁵⁶ With this assertion, Harris (1991, p. 64) and later Thompson (2007, p. 152) follow Hans Jonas (1966), who articulated this very conception of freedom.

example of form that gives primacy to the field over the constituent effects of DNA, providing support for formal and final causation in individual organisms.

The higher-level morphogenetic field restricts the probabilities of the lower levels. Accordingly, it would seem, not only are the structures hierarchical, but also the formative causation. Thus, in the case of developing structures, such as organisms, the higher-level morphic units (the system in its more complex forms) will exercise a directive influence upon the simpler and more germinal forms. In short, the causation is *final*, the efficient causation being provided, presumably, by physico-chemical activity (1991, p. 73).

Additionally he suggests, “the strange attractor, with the forms it generates (of which the Mandelbrot set is the compendium), is the same thing as the morphogenetic field. Biological forms were, in fact, just what these scientists succeeded in generating in their computer graphics” (1991, p. 74). This is to claim the forms of life, just as an unfolding fractal, differentiate in in accord with an overarching principle of order.¹⁵⁷ Ultimately he reasons, “we may regard self-maintaining systems, and explanation in terms of organizing relations, as teleological without ceasing to be scientific” (1965, p. 263). Thus Harris extends his *teleological explanation* discussed in the context of cosmology to living systems.

As is discussed in the following sections, Harris’s broadening of causation in biology finds sympathy in current philosophical and scientific theories. Nevertheless, his theory of the living system as a scale of nature has certainly left a number of gaps that although partially addressed by AE, still require a great deal more argumentation to arrive at Harris’s conclusion.

6.2.1 The Nature of Living-Being

Towards an understanding of the nature of life it is instructive to begin by examining some of their necessary and sufficient conditions. Beginning just below the threshold of life, Dehmelt & Bastiaens (2011) have argued that “organization based on information stored in templates, blueprints, or recipes, such as the base sequence in DNA [are] not related to self-organization. In contrast, self-organized processes display global pattern formation, based on

¹⁵⁷ To this end Harris follows Rupert Sheldrake’s speculative postulate of the *morphogenetic field* in combination with a marriage between chaos and biology (1991, p. 74). Since the connection of fractal geometry to biology has already demonstrated itself to be a fruitful (e.g. Wolfram, 2002; Scott, 2007; Hooker, 2011; Hancock, 2014), Sheldrake’s postulation of a (metaphysical) morphogenetic field appears redundant to the extent that it succeeds and excessively speculative to the extent that it posits as yet unseen forces of nature.

dynamic interplay and teamwork of lower-order system components” (p. 220). They go on to say that in such a self-organizing system the “organization is not imposed from outside”, rather what we may consider a second-order emergent pattern at the global level results from the rules specifying dynamic interactions among the system’s lower-level components using only local information (*ibid*). For this reason they contend such a global pattern (e.g. calcium waves, sand ripples, termite colonies, or Benard convection cells) can be understood as increasing the complexity or information of the system just in case it is open and far from equilibrium because energy is needed to sustain the global patterns that are created.

However, Dehmelt, *et al.* continue, external regulators, receptors, and growth factors can be understood to execute pre-determined or template-based processes: “The information stored in the base sequence of genomic DNA is used to generate a complementary sequence of messenger RNA, which is then decoded to generate a protein. In that way, the genomic DNA can be understood as a recipe for generating a protein...” (p. 221). Self-organization is thus a prerequisite for living systems and their composite functions such as DNA transcription. If self-organization can be understood as wholly bottom-up processes as many authors maintain, the complex functions of living systems may eventually be reduced to the relations among what has been described above as first- and second-order emergent phenomena. However, what appears to be missing in analyses of this type is an account of *periodic feedback* that arises between the emergent form and the underlying constituents.

Gleiser contends that life may be identified when “a certain level of morphological complexity is reached that allows for the spontaneous unfolding of functional complexity” while the function itself arises from form and again, “optimization may indeed play a key role” (Gleiser, 2004, p. 642). He goes on to say that over time “Living organisms must also keep their coherent structures, their ‘identities’” (*ibid*). He apparently agrees with both Thompson (2007, p. 212) and Harris (1991, pp. 65-66) that replication is clearly required for a species to survive but not for an individual organism to be alive: “Preservation of biochemical identity and interaction with the environment seem to suffice” (Gleiser, 2004, p. 643).¹⁵⁸ As a precursor to replication and genetic influence, Gleiser proposes, “some of the

¹⁵⁸ The most lucid argument to this effect is offered by Wolpert (2013). Embryogenesis, he contends, is a clear example of an increase in biological complexity over time, but one that reveals why evolution cannot be held responsible. “At best, one might argue that the embryo’s increase in complexity arose via competition occurring in the past, between its ancestors and their antagonists. This is a rather torturous connection between a current rise in complexity of a system and the process of natural selection. It also doesn’t address the possibility of

key physical mechanisms of living systems may be modelled with oscillon-like structures” (2013, p. 127). For example, oscillons demonstrate longevity and coherence of spatiotemporal structure in the face of environmental perturbation. Additionally, he points out, in the theory of phase transitions a perturbation can lead to nucleation, which permits the formation of crystals and bubbles, which can grow, fission, and fuse. This he believes would provide a “metabolism first” framework for protocells, within in which “more complex chemical reactions can occur” (2013, p. 127).¹⁵⁹

Following his SOFT theory (see § 5.2.2 above) Kurakin (2011) proposes that living and non-living systems can be understood as respective *phases of matter* characterized by the system’s ET chains. Under far-from-equilibrium conditions Kurakin says there is competition between alternative electron-conducting pathways and respective conformations within the intervening media. The pathways and conformations that are actually “selected and stabilized” within the animate media further depend upon the environment and internal state of a particular conducting medium. He argues that in a stable environment, the pathways and conformations that are optimized via electron transfer (ET) efficiency will persist longer than those that have proven to be less efficient:

in order to persist and grow in size and complexity, any living organization must be coupled to a source of and a sink for energy/matter. Moreover, to survive and prosper in conditions of continuous competition with other living organizations and life forms for energy/matter flow, any living organism/organization will strive to couple to its environment, both physical and social, in such a way as to maximize the rate of energy/matter flow through its internal organization, while minimizing the cost of maintaining and managing this flow (p. 26).

Accordingly, living matter originates from a plasma-like *organizational phase* and preserves essential characteristics of this phase as it develops and expands over ever larger “spatiotemporal scales in the form of an evolving multiscale hierarchical organization of energy/matter flow/circulation” (p. 56). Kurakin finds that both living systems and electrons move between ionized centres that are situated close enough to influence their nearby

hand-crafting an artificial embryo so that its complexity will rise in an artificial womb, without that womb having any ancestors” (p. 247). In other words, biological self-organization whether of an individual cell or development through ontogenesis is presupposed by natural selection rather than its effect.

¹⁵⁹ Towards a metabolism-first model, Davies (2008) considers the ‘citric-acid cycle’ to be one example of an autocatalytic system serving as a self-organizing precursor of living beings, “which forms the basis of intermediary metabolism” (p. 109). More recently, Zeravcica and Brenner (2017) have made great strides towards such a model with their research on soft-matter self-organization involving colloidal spheres.

neighbours, which in both cases leads to collective dynamics. Based upon his principle of scale-symmetry, electrons passing between ionized centres in far-from-equilibrium conditions are believed to be responsible for the central characteristics of living systems. To illustrate this scale-free process shared by living and non-living alike, he notes that the plasma lamp is a common example of this very phenomenon.

Plasmas are ionized gases, whereas living matter can be conceptualized as an ionized fluid-like condensed phase. Plasmas are electrically conductive, whereas living matter appears to exhibit both insulating and conductive properties and, thus, can be conceptualized as a disordered conductor... (p. 57).

In clear support of Harris's aim of modeling life as continuous with the cosmological ϵ , Kurakin argues further that if the difference between living and nonliving matter is that of organization, then "life is a natural consequence of the evolution of nonliving matter. In other words, life is likely to be a rule rather than an exception in the Universe at large" (p. 26).¹⁶⁰

Similarly, Nikolai, *et al.*'s highly acclaimed (2014) paper advanced the argument that it is possible to identify a "general tendency in driven many-particle systems towards self-organization into states formed through exceptionally reliable absorption and dissipation of work energy from the surrounding environment" (p. 1). They find that while this tendency is independent of self-replication and natural selection (p. 14), physical systems with sufficient energy input should be expected to develop towards adaptation and life. They contend that the structures that are most likely to form are the result "of competing pressures to fall to lower internal energy, to further increase heat dissipation through work absorption, and to dissipate that heat as reliably as possible" (p. 11). Thus their model purportedly shows

why driven systems should tend preferentially to traverse organized states that have exceptional properties in terms of the reliable absorption and dissipation of energy for the particular driving environment they experience [...] the driven system progresses to states that are better adapted to the drive over time, and it is clear that this emergent adaptation should be accompanied by

¹⁶⁰ In this vein Ball (2009) has argued extensively that among other phenomena, lightning, convective roll cells, and river networks are structures "that arise because they offer 'channels' for relieving energy stress and producing entropy efficiently". Following a number of predecessors, he goes on to write, "life itself is an example of non-equilibrium regularity and structure", what he considers one of a number of "inevitable ordered forms, waiting to burst forth as soon as the universe gets the chance" (p. 208). Additionally see de Duve's numerous works (e.g. 1995 - 2008), in which he considers *life as a cosmic imperative*.

organization into particular special shapes whose physical properties would appear to us to be tailored to the features of the particular environment (p. 14).¹⁶¹

Concerning self-organisation from the standpoint of complex systems theory, Hooker (2011) finds that in many cases there is no self that is doing the organizing, e.g. the emergence of crystal lattices in iron or convection rolls. He finds that while all living systems are “ipso facto non-linear, irreversible, open, self-organizing, globally constrained”, non-living systems may also manifest one or more of these qualities (p. 35). However, as discussed above, Hooker claims the macro constraint of biological systems results in intrinsic global coherence, meaning functions of the system as a whole – such as the metabolic and chemotaxing processes of a cell – are irreducible to the kind of analysis found in (what I call) first- or even second-order emergence.

Though the detail, especially the dynamical boundaries, vary in graded ways across living organisms, this autonomy requirement picks out all and only living individuals – from cells, to multicellular organisms to various multi-organism communities, including many suitable organized business firms, cities and nations. But because only autonomous systems have their functions serve their own physical regeneration, in turn supporting their functioning (they are ‘recursive self-maintenant’ [...]), they represent a distinctively new category of complex system organization (ibid).

Walker (2014) has elaborated upon this premise, providing an argument that biological systems are a unique class of physical system characterized by their manner of creating and managing information. This conceptualization of living systems provides a novel way of framing the emergence of living from non-living, which she believes can be understood as a transition in *causal information flow*. Accordingly, living systems do not passively store information but they also process and use it to influence the physical world and themselves. Moreover, Walker argues that insofar as living systems are capable of “universal construction” that is, recreating all of their own components, the living being is “self-

¹⁶¹ They contend that “an endless variety of far-from-equilibrium many-particle Newtonian systems are capable of exhibiting self-organization phenomena in which strikingly patterned structures emerge in the presence of dissipative external drives” (Nikolai, *et al.*, 2014, p. 23). The types of phenomena they have in mind include sand dunes, snowflakes, hurricanes, spiral bundles of protein filaments, and motors, a list that appears redundant after the above discussion concerning emergence. Indeed the “nonequilibrium world offers many test cases for the general hypothesis that organized, kinetically stable structures emerge and persist because their formation is reliably accompanied by extra work absorption and dissipation” (ibid).

referencing” (p. 427). Taking these points together, she contends the influential aspect of information flow provides a top-down causal structure for the living system.

Walker notes that “while information is abstract, in the sense that it involves one entity symbolically representing another, it is nonetheless physical and only exists when physically instantiated (it therefore holds similar ontological status to energy...)” (p. 430). So top-down causation by information control is purportedly achieved via the flow of information among and between the systems’ primary functions and has the goal of conserving these very functions. “Top-down causation operates through functional equivalence classes. Functional equivalence occurs when a given ‘higher-level’ state leads to the same high-level outcome, independent of which ‘lower-level’ state instantiates it” (p. 430). This means that there is a “decoupling of ‘software’ (information controlling the dynamics of the chemical system) and ‘hardware’ (the chemical substrate)” (p. 435). She claims this decoupling signifies the transitions in the complexity of chemical systems that “enabled the emergence of new layers of control architectures (feedback from state to dynamics or top-down causation from ‘software’ to ‘hardware’)” (p. 436).¹⁶² Thus Walker concludes, living systems are considered “a unique state of matter” characterized by self-creation, top-down causation, adaptive selection, and information control.¹⁶³

The research cited in this section has shown a number of mutually reinforcing ways that the processes characteristic of living being can be understood as an instance of third-order emergence. More specifically, these processes evidently make use of second-order emergent structures and as a result, life has been widely considered a (potentially inevitable) “phase of matter” resulting from processes of energy dissipation. These findings clearly agree with many of the founding premises of Harris’s theory of auturgy as a scale and are consistent with the arguments of the previous chapter. Specifically, Walker’s proposal for living process to be depicted as a ‘phase of matter’ that introduces functionality (multiple/universal realizability) fits with the above line of reasoning in that the ‘decoupling’ of higher and lower levels via

¹⁶² In agreement with Harris’s above line of reasoning, Goodenough & Deacon (2006) contend, many have misunderstood this situation, claiming that in such simple semiotic systems, “the genes are driving the system, that genes are ‘selfish’, that genes rule [...] Genomes are in fact the handmaidens of emergent properties, not the other way around” (p. 859).

¹⁶³ Walker’s (2014) theory is in line with Tononi’s integrated information theory of consciousness (IIT). In either case, she holds “ ϕ quantifies how much information is generated by a physical system when it enters a particular state through the causal interactions among its elements, above and beyond the information generated independently by its parts” (p. 433). I discuss this theory at greater length in chapter 8 below.

functional equivalence may be considered a further symmetry break, continuous with previous levels of complexity. While, Walker's conception of information flow fits with Harris's claims that organic form instantiates a *nisus*, there remains a deeply puzzling question about the *agent* of causation: In what way can the organism as a whole be understood to *use information*? It is this issue to which I turn in the following section.¹⁶⁴

6.2.2 Agency and Formal Governance

In equating living systems with a scale, what Harris has claimed is that we must recognize a new level of (formal) governance characterized by *freedom*, *adaptation*, and the instantiation of *norms*. To more precisely evaluate these claims, I now turn to a number of contemporary works that either explicitly or implicitly posit a theory of living systems in these terms.

In a later work Harris (2006, pp. 118-19) follows Kauffman (2000) arguing that the transition from autocatalytic (or self-organizing) to living process is to be distinguished by 'actions made on one's own behalf', that both writers are happy to call agency. For example, Kauffman (2004) considers it reasonable to say a bacterium swimming upstream in a glucose gradient, "is acting on its own behalf in an environment", it is what he calls an "autonomous agent" (p. 654). Positing agency, he maintains, demands something beyond the mere analysis of efficient relata. He claims that even in understanding matter, energy, entropy, and information we still cannot adequately account for this "organization of process" (2004, p. 656). Apparently unaware of AE, Kauffman holds that in discussing cellular construction, propagation, and division, "we have, as yet, no developed language in physics, chemistry, or biology" (p. 661).

For his argument, Kauffman has since appealed to Kant's view of the organism, for which parts exist in virtue of their whole and vice versa. He holds that "the function of a part is its causal role in sustaining the existence of the Kantian whole" (2013, p. 168). However, the simplest kind of Kantian whole, *collective autocatalytic sets* (CAS), Kauffman maintains, cannot be captured by mechanistic Newtonian and efficient laws. Rather, he concludes, "the

¹⁶⁴ In agreement with Harris and the present above systematic assessment, Banavar & Maritan (2008) summarize seven characteristics that all living systems have in common: (i) building from the bottom up; (ii) uses a few themes to generate many variations; (iii) organizes with information; (iv) tends to optimize rather than maximize; (v) is opportunistic; (vi) competes within a cooperative framework; and (vii) is interconnected and interdependent with its environment (pp. 225-226).

theory of the spontaneous emergence of collectively autocatalytic sets is a new kind of law: a formal cause law” (2013, p. 171). Kauffman’s sustained thesis has been that positing agency on the basis of formal causation has significant implications for scientific explanation. For Kauffman, the autonomous agent introduces “a new state of matter”, in which the “function of a part of an organism is a subset of its causal consequences” (2004, p. 664). The very postulate of ‘function’ thereby depends upon the context of a self-creating, non-equilibrium system, which bring us for the first time (over the course of cosmic evolution) to consider “doings” rather than mere “happenings”. To understand the function of an organism’s agency, he concludes, “we must study the whole organism in its environment”, which he recognizes implies “an unavoidable holism to biology...” (ibid).¹⁶⁵

Articulating a position that is to my mind more precise than either Harris or Kauffman, and following Varela, Thompson (2007) defines an autonomous system as one in which “the constituent processes (i) recursively depends on each other for their generation and their realization as a network, (ii) constitute the system as a unity in whatever domain they exist, and (iii) determine a domain of possible interactions with the environment” (p. 44).¹⁶⁶ According to AE, the simplest systems to count as living such as prokaryotic bacteria cells, are *more specifically considered autopoietic*: the system is *thermodynamically far-from-equilibrium* (constantly exchanging matter and energy with its surroundings), *organizationally closed* (the system is self-referential circular and recursive), *operationally closed* (the products of the system are reentrant) (p. 45), and *coupled to an environment* (the system’s motor activity loops through its environment to affect and enable its sensory capacities) (p. 49).

In alignment with Harris’s understanding of wholeness as a process of completion, Thompson follows Varela and Goguen’s (1978), for whom the wholeness of a system is “embodied in its organizational closure”. In this vein, the whole is not the sum of its parts but

¹⁶⁵ The apparent inability of physics to account for the dynamics of living systems is responsible for inspiring Bertalanffy (1950) to first articulate general systems theory. See Hofkirchner & Schafranek (2011) for an excellent historical introduction to the paradigm.

¹⁶⁶ Whereas an ant colony may be autonomous, it is not autopoietic because the components do not bear a circular causal relationship with its boundary. Similarly, *allopoeitic* systems such as ribosomes or vesicles are not autonomous since they lack this circularity, their end product being different from themselves. Viruses are exemplified as systems that are also non-autonomous because outside of a host they “do not exchange matter or energy with the environment” and are “completely inert [...] subject to the vicissitudes of the environment” (p. 123).

rather, the “organizational closure of its parts” (Thompson 2007, p. 449). For example, accounting for how the system orients itself with respect to sugar concentrations, “the local molecular effects happen as they do because of the global organizational context in which they are embedded. And it is this global level that defines the bacterium as a biological individual and sucrose as food” (p. 75). So, he continues, self-preservation instantiates a relation “between organism and environment that is meaningful and normative” (ibid). This may also be taken to mean the system is *adaptive in maintaining autopoietic coupling to its environment*. Additionally, Thompson endorses teleology as follows: (i) because an organism is a self-organized being (being both cause and effect of itself), it is “intrinsically teleological”; (ii) teleology, he claims cannot be subsumed under efficient causation or mechanism of non-living systems, since the two are “incommensurable in principle”; and (iii) any extension of efficient causes in biology would still have to be understood within the context of the teleological organism (2007, p. 130).

Hence, *environmental coupling* implies an instantiation of *meaning* and norms in all living systems for both AE and Harris. Considering the above, this is a conclusion that Kauffman should likewise be willing to endorse. However, this does not yet provide a clear response to Walker’s above conception of top-down causation in living systems. In agreement with Harris and AEs (though citing neither), Walsh (2008) maintains “[u]nreduced teleology is a legitimate, wholly natural explanatory mode; moreover, it is not only available to evolutionary biology, it is indispensable [...] It is naturalistically acceptable, metaphysically unimpeachable, and explanatorily autonomous” (p. 113). In the case of living systems he argues, because the organism is the cause and consequent of its own self-organization, self-reproduction, and self-nourishment, such *goal-directed processes* “cannot be accounted for by pure mechanism alone. Teleology is needed to account for the distinctive characteristics of organisms” (p. 115).

Concerning the relationship between parts and whole of the organism, Walsh actually endorses dialectical relations and scales without recognizing it. The parts of an organism, he holds, are created by the organism itself and have the properties they do “because of the goals of the organism that it subserves [...] each part is explained by the overall functioning of the organism, and the function of the organism is realized by and explained by the parts” (ibid). Walsh proposes formal causation as a means of retaining teleological explanation in biology: “The matter of which an organism is constituted is organized by the form. At the same time, the form of an organism is realized in, and constrained by, its matter. In biology, as in any other natural science, one must know both the form and the matter” (p. 119). By implication,

individual functions cannot be used to prescribe teleology to a system. Rather he contends, ‘adaptiveness’ affords the irreducible teleological description (p. 130). While statements of this kind are in agreement with Thompson, Kauffman, and Harris’s notion of teleology, the physical locus of organic causality remains unclear.

In apparent agreement with the above, Hooker (2011) holds that the functions of a living system are both cause and effect of itself, which requires appealing to “holistic, organisational features” including “autonomy” that are “central to being alive” and “cannot be captured by analysis into machine mechanisms” (p. 45). Nevertheless, he voices reservations with respect to autopoiesis on account of its strict requirement of *operational closure*. These concerns are however with reference to much earlier articulations of the theory (e.g. Maturana 1981, § 2.2) that did not emphasise *adaptive meaning making* or *environmental coupling*, which implies an additional *openness of dynamic states*.¹⁶⁷ In clear agreement with current AE conceptions, Hooker holds “[a]utonomous self-regeneration constitutes the fundamental mental basis for normative evaluation because it is the *sine qua non* and reference point for all else” (pp. 46-47). Moreover he claims, meaning depends upon adaptivity, which is the system’s “capacity to alter its specific traits in mutually coordinated ways so as to [...] satisfy autonomy in, a wider range of life-environments than its current one” (p. 47).¹⁶⁸

Hooker’s latter point is indeed quite loaded and will require further consideration in the following section, but at this point it is useful to consider whether the present account is descriptive or if it provides explanatory value as well. Recent works concerning adaptation and learning in relatively simple organisms may provide an example of explanatory import, or rule it out. For example, Mitchell *et al.* (2009) have argued that anticipation analogous to “*Pavlovian conditioning*” has been identified in single celled organisms and acts as an adaptive trait. Their research purportedly demonstrates that over the span of a few generations, *E. coli* can be conditioned to anticipate changes of sugar types within their environment by activating the agentic pathways appropriate for metabolism based upon a learned response to otherwise unrelated stimuli:

pre-exposure to the stimulus that typically appears early in the ecology improves the organism’s fitness when encountered with a second stimulus. Additionally, we observe loss of the conditioned

¹⁶⁷ Thompson recognises the confusion that has resulted from conflating operational and organizational closure, pointing out that Varela did not distinguish between the two (2007, p. 448 end note 4).

¹⁶⁸ Harris’s response to these conceptions of mentality and the purported *openness* of autonomous or autopoietic systems will require further consideration in the following section.

response in E. Coli strains that were repeatedly exposed in a laboratory evolution experiment only to the first stimulus [...] Our work indicates that environmental anticipation is an adaptive trait that was repeatedly selected for during evolution and thus may be ubiquitous in biology (p. 220).

To my mind, this is precisely what should have been hypothesized on either Harris or AE's account. Insofar as further evidence can be provided in support of such adaptive anticipation or 'learning', the organism may be understood to exert a dynamic downward constraint on its internal functions on the basis of recognized stimuli.

Getting to the heart of the issue, considering the organization of living systems Tabaczek (2013) calls for pluralistic causality. By Tabaczek's lights (and in agreement with Thompson's above remarks § 5.2.1) the *downward causation* (DC) of living systems cannot be understood in terms of efficient causation without conflicting with the efficient causation already apparent at lower levels. The way beyond this impasse is to hold that the causal influence of an emergent system on its components is not efficient but formal, in that the form of a system *constrains* the interactions of its constituents. However, "the higher level is not a concrete substance, but an organizational level [...] understood by analogy to the concept of 'attractor' in a dynamical system that is a steady state toward which the system may evolve" (p. 396).¹⁶⁹

Taking Hooker, Tabaczek, and Mitchell *et al.* together appears to provide a possible dialectical holist response to Walker's above comments on top-down causation and information flow. The steady state may be established not just through organic response to recognizable information, but rather, the information and maintenance of the steady state would have to reciprocally define and create one another. This is to say that the organism *makes and uses* information in "meaningful" or "normative" ways precisely because it is *sensitive* to and may make adjustments *for the sake of* its steady state. This steady state can further be considered the *form or organisational closure* of the system that specifies a viable space of environmental coupling, beyond which the system dies. Again, this means the organism does not supervene upon its lower level constituents or efficient causal chains because as a whole, the *living system only exists in and through time* as an open-ended (4D) trajectory specified by its steady state.¹⁷⁰

¹⁶⁹ For technical details concerning chaos and attractors in individual cells see Grytsay, & Musatenko, (2013).

¹⁷⁰ Though space prevents my further discussion of the issue, Bohm's extension of the implicate order to the nature of living systems is largely in agreement with the contentions of this section and the previous. For further details see Pylkkanen (2007, ff. p. 84) and Bohm (1969a/b).

It should be clear at this point that Kauffman, Thompson, Walsh, Hooker, and Tabczek's arguments are really clarifications of third-order emergence, as introduced in § 5.3. Positing unique forms of governance for the living system, each thesis offers support for Harris's contention that the living system can be considered a scale characterized by minimal *freedom* and *norms*. With these perspectives to consider, the living process may be more intimately related to non-living systems by instantiating a higher order of self-organization and downward constraint, i.e. what Harris considered another instance of ϕ . Although much more discussion is needed to assess this possibility, it can be concluded that Harris finds significant support in contemporary philosophers of biology concerning agency, self-organization, and self-preservation. What must now be considered in greater detail are conceptions of *sentience* and *goal directed behavior* in simple living systems.

Conceptualizing Minimal Cognition and Intentionality

In this section I aim to reconcile what appears to be an un-intentional *contradiction* committed by Harris in discussing the relationship between life, intentionality, and minimal cognition. According to AE, an autopoietic (or auturgic) system demonstrates minimal intentionality and cognition in virtue of adaptation and discrimination (as previously discussed in § 2.3). I claim that although he initially disagrees with this conclusion, Harris's own reasoning leads him to the same conclusions. To reveal this contradiction I examine discrepancies across Harris's earlier (1965, 1991) and later (2006) works and compare his reasoning with Thompson's (2007) arguments.

In some of his earliest remarks on the issue Harris claims that the existence of a simple type of sensation can be established on the basis of behavioural analysis.

In its most elementary form, conscious behaviour is that which depends upon sensitivity. It is response to a stimulus and the behaviouristic formula S-R, is [...] a tacit admission of the presence at least of sensation, for what is not felt cannot stimulate behaviour. In a mere chemical reaction there is neither stimulus nor response but only interchange of matter and energy (1965, p. 296).

For Harris, rather than a state of consciousness, he considers that "feeling" broadly "covers sentience of every kind prior to discrimination of modalities or the distinctions between sensation, emotion and pleasure-pain tonality" (p. 310). From the above we obtain the argument, *if there is behaviour there must be some kind of feeling*. Additionally, Harris appears content to extend behaviour to any living system that acts on its own behalf, e.g. a

Paramecium swimming toward oxygen (1991, p. 107). Thus for Harris, if a system is living and acting on its own behalf it is endowed with feeling.

In later writings Harris reserves the term *intentionality* for referring to higher levels of conscious awareness and deliberate choice (e.g. 2000, p. 85; 2006, p. 40). Harris reasons that because “in primitive sentience there is no discrimination of feeling, self and other (subject and object) [...] there is no intentionality” (1991, p. 107). Harris argues that “[i]f sentience is a higher degree of unity than physiological organicism, it will transform physiology into behaviour, which is a single activity of discriminative response to a presented situation...” (p. 108). He contends that with primitive sentience, “the organism has internalized the diversity of the physical and biotic world as a single and confused whole of feeling [...] what may be called the *psychical field*” (p. 109). Importantly, this ‘*primitive psychical field*’ is believed to be ‘non-discriminative’ and ‘homogenous’ until attention is introduced (p. 110). He reasons that a primitive sentient system “being indiscriminate, is necessarily pre-perceptual, which means that it is precognitive” (p. 111). With these remarks Harris is arguing that if sentience introduces a further degree of wholeness to the scale of forms, it should be identifiable by an increase in functionality. Such systems endowed with primitive sentience are non-intentional and non-cognitive.

In the following passage Harris establishes a more in-depth definition of attention as a requirement for intention and cognition:

Because sentience has a diverse and variegated content that (as merely sentient) is indiscriminate, it is in contradiction with itself. On the one hand, its unity demands the amalgamation of its constituent qualities into a whole, while, on the other, its wholeness implies and requires differentiation. The contradiction needs to be resolved, and the sentient organism fulfills this need by turning its sentient activity back upon itself. The felt impulse of the organism to maintain its systematic coherence, differentiated as it is into specific urges, directs the sentient activity upon special features that answer to its present demands, so that it concentrates itself in the selective operation of attention (1991, pp. 111-12).

Here Harris is arguing that attention, while differentiating a field of sensation, serves to unify the sensing organism into a self in contrast to the outside world. By Harris’s view such attention is the hallmark of some degree of consciousness. He further qualifies this point: “Only after a minimal figure-and-ground complex has been singled out by attention from the sentient field can the experience be described as cognitive” (1991, p. 113). Harris’s claim that consciousness requires cognition of one’s self (the subject-object distinction) appears unobjectionable. However his separation of figure-ground distinction from the primitive

sentience of living systems simply does not follow from his previous remarks. For if behaviour is linked with a ‘discriminative response’ to a sensed situation and simple living beings are understood to be capable of *goal-directed behaviour* on the basis of *self-preservation*, they already meet Harris’s conditions for intentionality and cognition.

The “pull in the direction of self-maintenance” constitutes what Harris calls a felt interest for the system to direct “attention to the relevant element in the psychological field” (1965, p. 326). This is to say that attention acts as the means of organizing the field and provides what he calls an “auturgic nisus that directs the organization of the living system as a whole” (ibid). He concludes that “[a]ttention, felt want or appetite, leading to desire, are the expressions of auturgy raised to the psychological phase [...] They are, as Spinoza averred, the *conatus in suo esse perseverare*, expressing itself on the level of life and mind” (1965, p. 328).

In a later text, Harris appears to realize that he had previously created an unnecessary gap between phases of life and mind and grants this very conception to all living systems. He proposes that “attention” is “agency operating on the psychological level. If this is correct the innate ability to direct attention to arresting sensations is neither more nor less than being alive. It is the innate urge to self-preservation” (2006, p. 119). Hence, in all cases of living systems he maintains, there must be some level of attention to a diversity of feelings in response to internal and external stimuli:

On the hypothesis I am putting forward, it would be legitimate to presume that even a single celled animal, being already a highly complex, integrated organic system, might be in some degree sentient. If so, a presumed feeling of privation and discomfort in *Paramecium* might be assuaged by chance contact with a bubble and the protozoan, being alive, might be capable of “learning” by association of this feeling of relief with bubbles (ibid).¹⁷¹

Ultimately, the *contradiction* Harris identifies at the biological level is here not the same as that of his dialectical scales. This contradiction is only in his use of terms. Indeed discriminative sensation and action are exactly what the paramecium above is claimed to achieve and consequently, it meets Harris conditions for cognition. In addition the system

¹⁷¹ In all his works, we find only one instance in which Harris mentions autopoiesis. He makes reference to Maturana and Varela’s (1980) *Autopoiesis and Cognition*, to which he remarks that it is by no means new, originating from Aristotle, but that it is certainly in line with his understanding of the irreducibility of an organism to its parts. Nevertheless, he finds fault with the theory on account of its being potentially *relativistic* concerning how such a system makes meaning (2006, p. 171). See (1965, pp. 327-28) for Harris’s nearest anticipation of this theory.

may be understood to be *about* the sensed differences of its environment on the basis of its self-preservation, thus instantiating minimal intentionality.

According to AE, all living systems are said to exchange matter and energy with their environment and orient themselves according to what they sense. Moreover, what they sense is said to depend upon how they are able to orient themselves within their environment. This sensorimotor feedback loop establishes the self-world distinction:

Whereas autopoietic closure brings forth a minimal “bodily self” at the level of cellular metabolism, sensorimotor closure produces a “sensorimotor self” at the level of perception and action. In the one case the passage from network closure to selfhood (and correlative otherness) happens at the level of an active semipermeable boundary or membrane, which regulates interaction with the outside environment. In the other case it happens at the level of behavior and intentional action. In both cases we see the co-emergence of [...] selfhood and a correlative world or environment of otherness... (Thompson 2007, p. 49).

By this reasoning, adaptive living systems satisfy the necessary and sufficient conditions of autopoiesis, thus fulfilling the criteria for mind: “First, the instantiation of the autopoietic organization in an actual, concrete system entails a cognitive relation between that system and its environment. Second, this cognitive relation reflects and is subordinated to the maintenance of autopoiesis” (p. 124).¹⁷² Certain aspects of the organism’s environment hereby count as *relevant* cues for the alteration of its behavior, i.e. *the organism as a whole is informed*.¹⁷³ This means cognition “is behavior or conduct in relation to meaning and norms that the system itself enacts or brings forth on the basis of its autonomy” (p. 126). Thompson later summarizes:

- (i) Autopoiesis entails the emergence of a bodily self;
- (ii) The emergence of a self entails the emergence of a world;
- (iii) The emergence of a world is equated with sense making/enaction; thus

¹⁷² *Minimal autopoiesis* consists only of this maintenance of identity in the circular process of material exchange but it lacks a metabolic network. Autopoiesis plus adaptivity (i.e. active monitoring of internal homeostatic or homeodynamic mechanisms) are required for meaning making according to Thompson (p. 148-49). As he further admits, a living material system requires the proactive quality of the latter (e.g. searching for food). To my mind this terminology is excessive in that the former may just as well be considered *autocatalytic*.

¹⁷³ In clear agreement with autopoiesis (though it remains un-cited), Shapiro contends that “[l]ife requires cognition at all levels” (2011, p. 7; pp. 143-44). Also see Shapiro (2007) and Spiro (2009).

- (iv) “Intentionality arises from the operational closer and interactive dynamics of autopoiesis” (p. 159).

Hence for AE, meaning-making (cognition), and intentionality are believed to be indispensable in describing the functionality of the living system. It can thus be seen that both Harris and AE agree that if minimal sentience is the regular response of a physical self-organized system to elements of its external environment, then minimal intentionality is no more or less than such a system’s capacity for differentiated response to elements of its environment on the basis of self-preservation. Rather than an intrinsic property of a system, cognition is constituted by a necessary and sufficient *dynamical* (and *dialectical*) *relation* between a living system and the wider system to which it belongs. Importantly, as AE maintains, there exists an “interactional asymmetry” between organism and environment because the former can adaptively “modulate” its coupling to the environment (Thompson 2011, p. 121). Illuminated by Harris’s metaphysics, intentionality of living systems (i.e. the co-emergence of self and *Other*) can be understood to introduce a further symmetry break in accord with €.

To my mind, the most sympathetic interpretation of Harris’s line of thought regarding the natures of cognition and intentionality is twofold: First one should exclude his earlier conclusion that non-discriminating, non-intentional sentience may be found in auturgic systems because this claim is inconsistent with the rest of his system; and second, permit Harris’s later claims regarding differentiation of “attention” and “feeling” to extend to any behaving, living system as per his (2006) assertions. For Harris, at a certain level of functional complexity we find the emergence of purposeful discrimination on the basis of self-preservation, whereas for AE linking this discrimination to self-preservation in its simplest physiological instantiation entails that minimal cognitive intentionality is attributed to all living systems. I maintain that Harris is most charitably understood as agreeing with AE on this point and so dialectical holism remains consistent.

6.3 Dialectical Evolution

Extensive debates surround the nature, parameters, mechanisms, and possible trajectory of biological evolution. With this in mind, in clarifying dialectical evolution (as with previous sections) I confine myself to explaining Harris’s ideas and elucidating connections these ideas bear to contemporary research. More specifically, I aim to show that various conclusions

regarding the unit of selection and teleological evolution (i.e. formal governance) follow from Harris's depiction of the emergence of living systems (§ 6.2) and are consistent with recent works in systems biology. For Harris, the goal of this stage of his thesis is to reconsider € in light of biological processes in order to establish a seamless bridge from cosmological to biological evolution. Harris's strategy to address the increase of biological complexity takes a number of steps that ultimately conclude with his proposal for directed evolution.¹⁷⁴

(1) *Mechanisms of evolution* – From the outset Harris argues against Neo-Darwinism and the notion that random variation and natural selection are sufficient to create the life forms we observe today. As with the rest of his philosophical discussions, Harris maintains we must begin by positing a dialectical whole, which in this instance is the self-organizing auturgic system. He claims the “presumption of its existence must be made before we can speak of mutation or selection or even of accidental change” (1965, p. 230). It is by careful examination of this presupposed system that Harris believes we might arrive at a more accurate understanding of evolution. Harris holds, “selection by itself cannot produce specific changes. Only mutation can do that” (1965, p. 227). Though mutations do occur randomly, he maintains that not all known mutations are random and we have yet to establish all the causes of mutation. In this vein Harris argues that if natural selection presupposes reproducing organisms capable of “inherent adaptability [...] however much may be effected by random mutation and natural selection, they cannot be the only determining principles in the evolutionary process” (1965, pp. 232). He points out that, if mutations were to occur independently they would likely be deleterious to the organism at each step and selected against. Moreover, he considers it improbable that mutations “should occur one by one *in the right order*, even if interspersed with disadvantageous modifications...” (1965, p. 235).¹⁷⁵ Such stepwise random development he claims, would have taken far longer than the time available over evolutionary history and so some other mechanism is needed.

(2) *Information* – For Harris, considering the relationship between information and the organism provides insight into the nature of evolving forms. “Information is equivalent to

¹⁷⁴ In this section, as with those above, the central argument I am depicting on Harris's behalf was originally posited in his 1965 work and I have included citations from later works only to supplement further details of his reasoning.

¹⁷⁵ For example, Harris argues that “in embryogenesis (which often recapitulates evolution), the retinal nerve stimulates the development of the lens long before it is ever exposed to light, implying that neither is due to an independent chance variation” (2000, p. 122).

form. It is technically defined as negative entropy (or order) and corresponds, in general, to structure or organization. That the organism is a system with a specific form means that it contains information” (1991, p. 66). This information, Harris maintains is what natural selection acts upon and importantly “without specific form there would be nothing to select...” (1991, p. 66). Harris understands Neo-Darwinian selection as a negative force, whereby the unfit is eliminated but “makes no positive contribution” to the organism that is ‘fit’ (1991, p. 80). The negative selection effect of Neo-Darwinism, he claims, “applies only to the occurrence of disadvantageous variations [...]”, but selection must also provide “a positive effect in making successful varieties predominant in the population, so that fresh mutations will occur, for the most part, in forms already best adapted to the environment” (1991, pp. 80-81). Towards this end he contends that the genome influences traits as a whole system, which precludes piecemeal random mutations being responsible for the increase of complexity. “Geneticists have established that single genes do not control or determine single characteristics, but that the chromosome functions as a whole, as does, in fact, the entire genome” (1991, p. 84. See also 1965, p. 243; 2000, p. 123). In this way he proposes that the information or form of an organism provides a directing constraint or positive/physical selection effect (PSE) on future mutations.

(3) *Neo-Lamarckianism* – Concerning the “interplay of structure and function” he claims, a “mutation affecting any aspect of either must *relevantly* affect some fact in the other for the system to work” (1965, p. 237, emphasis added). He maintains that heredity of adaptive traits is not limited to genetic material but crucially involves behavior, e.g. *Venusia Veniculata* tucking its antennae so as to aid in camouflage (p. 238). According to Harris what is utterly missing from the Neo-Darwinist picture of ‘random mutations and selection’, is a process of integration and diversification, a “principle” that is present for the “organism as a whole” in relation “with its environment” (ibid). Here, Harris intends to unify his conceptions of self-preservation and development with evolution under the guiding notion that the same principles apply, albeit on different scales: “the process of evolution, like metabolism, growth and development [...] may be described as a process giving rise, for the most part, to progressively more highly organized systems, more diversified yet more closely unified, more efficient and auturgically self-maintaining” (p. 242). Harris admits that by this reasoning “Lamarckian evolution is simulated” (p. 246). This means that an organism’s acquisition of traits through adaptive environmental interaction (intentionality) plays a central role in evolution.

(4) *Collective Organization* – By this view, “reproduction” is considered another “process of self-maintenance”, through which selection (of another form) can operate (1965, p. 247). Harris argues that what is selected are the systems that “decrease entropy and increase information. As this goes counter thermodynamic trends, it requires for its explanation some *nisus* towards greater order and complexity, some organismic principle” (1991, p. 84). In a later work he finds that the arrival of multicellular organisms is an example of just such an increase in wholeness and information. He argues that as evolution proceeded,

to maintain themselves more effectively, single cells collected together in colonies and adjusted their functioning one to another. The colonial creatures subsequently become more organically integrated as multicellular individuals with organs functioning mutually as means and ends one to another and each to the whole (1988, p. 67).

Harris says mutations are “integrated” into their wider ecosystem and then “what is selected is the more efficiently self-maintaining and self-determining whole” (1991, p. 84). In the case of multicellular systems this means that we are witnessing the emergence of a higher order constraint, i.e. a new unifying principle (ϕ). As with individual cells, self-determination of a collective system is characterized by an increase in “versatility and freedom” in virtue of the organism’s “behaviour” (*ibid*). Behaviour is again considered “informed” and “purposive” activity in the service of increasing coherent wholeness (1991, p. 90).

(5) *Gaia* – Harris extends this reasoning concerning the wholeness of an individual cell to the biosphere, originally advocating for “*biocoenosis*” (1965, ff. p. 251; 1987, p. 195). He claims that the ecological niche within which organisms live is itself to be considered a biologic whole (1988, p. 76). In addition the “world of life as a whole is thus a single system of interlocking life-processes [...]” and he maintains that the biosphere “supervenes in time”, rather than space, upon the concentric inorganic levels of the earth (1965, p. 252). Organisms thus “belong to larger and more comprehensive biological unities in the sphere of life, just as in that of physics we find an over-arching polyphasic unity composed of members which are themselves polyphasic unities, and these are so united as to form a hierarchy” (p. 253). Evolution then, is an “on-gong directional process” involving the “continuous self-organization of an entire world” (*ibid*). Harris concludes that “organism and environment are inseparable, and in the last resort we are dealing with a single totality – the biosphere – the morphology of which is generating and incorporating focal organisms in a single process” (p. 277). Ultimately Harris recognizes that just as each living system is in a “symbiotic”

relationship with its environment, the same must be said of individual ecosystems, thus he endorses the “*Gaia theory*” (1991, ff. p. 94).

In a later work Harris summarizes his conclusion, stating that at the scale of biological evolution we again find the same unifying principle considered heretofore: “the concrete universal which differentiates itself into its own particulars. The process of life, of metabolism, reproduction and evolution, all mutually continuous, constitute a single indivisible process of self-differentiation of one whole, in effect, a cosmic organism” (1988, p. 78).¹⁷⁶ Hence, for Harris, evolution may be understood as an instance of the same self-organizing cosmic process, now manifest across individual and collective levels of living systems. To vindicate his contentions then, requires identifying common self-directing principles of individual organic behaviour and ecological constraint that supports the sort of Neo-Lamarckian feedback loop Harris has in mind.

6.3.1 Evolution According to Systems Biology

The goal of this section is to consider the impact of systems biology upon the traditional Neo-Darwinian view, and to assess what bearing the paradigm has in relation to Harris’s line of reasoning as outlined in the previous section. Towards this end it is instructive to begin with a summary of the prevailing account of *Neo-Darwinism* (Hewlett 2006, p. 175; Lennox 2007, p. 80; Schuster 2011, p. 45):

- (1) There are several mechanisms of evolution including natural selection, random genetic mutation, and genetic drift.
- (2) Characteristics are inherited as discrete entities called genes and population variation is due to different alleles of a gene.
- (3) Changes in genes are due to mutations that occur *randomly*, i.e. they are unpredictable.
- (4) The traits of an organism (phenotype) are the direct expression of difference in genetic information (genotype), i.e. adenine, cytosine, thymine, and guanine.
- (5) Natural selection acts on the information of genes composed of base pairs that make up chromosomes by excluding those genetic variants with lower reproductive fitness from succeeding generations.
- (6) Speciation is due to the (typically gradual) accumulation of individual genetic changes in accordance with natural selection.

¹⁷⁶ For a summary of the resulting argument for *dialectical evolution*, see the below appendix, § IV-c.

The changes that occur are believed to have no inherent directionality and are constrained only by the requirement that they produce viable organisms. The upshot, Newman (2011) claims, is that the “possible evolutionary steps that can be taken in any lineage, therefore, are only those phenotypic modifications that occur as a consequence of genetic variation” (pp. 235-36).

Arguments have begun to accumulate however that the Neo-Darwinian picture of evolution by these mechanisms is antiquated. Shapiro (2011) finds that this view has been retained by contemporary writers not for scientific, but for philosophical reasons. In place of this view he maintains, we must make room for the paradigm of systems biology as supported by the most recent empirical research. Accordingly, genetic variation is not the only factor influencing phenotype modification and genetic change along with other mechanisms can occur after the organism’s primary form and functions have developed. This implies the relationship between the whole system and its environment plays a crucial role in an adequate understanding biological evolution. In this vein, theoretical chemist Peter Schuster (2011) holds that while reduction is a necessary *methodological* tool for understanding complex biological phenomena via molecular mechanisms, ontological irreducibility reigns in contemporary biology (p. 46).

Appealing to systems biology, AE has gone some way to embracing this paradigm and in doing so resonates with Harris’s original thesis. Thompson maintains, rather than seeing the gene as information, “information is what counts as information for some process at some time” (2007 p. 191). Likewise, Hutto, *et al.* (2013) note that instead of being “directed by information” in genes, “the relevant structures become manifest only through a developmental process in which factors belonging to the organism and factors belonging to its environment play equally important roles” (pp. 33-34). In this vein, AE agrees with and elaborate upon Harris’s view of information. Specifically, Thompson explains that this means “information is context-dependent and agent-relative; it belongs to the coupling of a system and its environment. What counts as information is determined by the history, structure, and needs of the system acting in its environment” (2007, pp. 51-53).

By extension, Thompson recognizes the chicken and egg state of affairs we are left with concerning DNA and proteins: “proteins can arise only from a DNA/RNA “reading” process, but this process cannot happen without proteins.” He goes on to say that “the DNA “writing” and “reading” processes must be properly situated within the intracellular environment, but

this environment is a result of those very processes” (pp. 55-56). As a result he contends that the information of DNA is *embodied* in autopoietic unity:

it is unacceptable to say that DNA contains the information for phenotypic design, because this statement attributes an intrinsic semantic-informational status to one particular type of component and thereby divests this component of its necessary embedding in the dynamics of the autopoietic network. It is this network in its entirety that specifies the phenotypic characteristics of a cell, not one of its components, and it is this network as a whole that serves as the precondition and causal basis of DNA replication [...] information exists only as dynamically embodied (p. 57).

Central to an AE critique of Neo-Darwinian, or ‘genocentric evolution’, is the claim that evolution will continue just in case there are heritable traits, irrespective of the mechanisms (p. 176). For example, phenotypes can be transmitted via mechanisms other than DNA replication, called “epigenetic inheritance systems.”¹⁷⁷ Indeed, as he points out, many organisms including humans, pass on their symbiotic bacterial partners directly to their offspring.¹⁷⁸

Concerning the software/hardware metaphor for information and phenotype, Thompson finds that while the two can be considered independent in a computer, in the case of living systems the hardware must preexist the software. In addition, according to autopoiesis, the hardware and software must reproduce one another reciprocally. “DNA replication and gene activation are entirely dependent on the autopoiesis of the cell. They contribute enormously to this process, but they also owe their existence to it” (2007, p. 180). Hence, AE stresses that the network as a whole “specifies the phenotype characteristic of a cell”, functioning as the “precondition and causal basis of DNA replication and protein synthesis” (p. 182). In this way, appeal to information *of* or *in* DNA results in an *unconfessed dualism* (p. 187). This dualism results from the act of *abstracting* the supposed information (e.g. DNA) from the rest of the system (i.e. from the informed) and then applying some sort of intrinsic value to it. In this way information is understood to preexist the system and as Thompson says, pass through bodies, affecting them while remaining unaffected itself. This he calls a “reification

¹⁷⁷ These include a steady-state inheritance system (consisting of self-regulating and gene-regulating elements); structural inheritance (e.g. cytoskeleton characteristics being passed on through mitosis/meiosis); chromatin marking (e.g. methylation patterns on DNA); and social structures including symbiotic functionality (Thompson, pp. 176-77).

¹⁷⁸ Bacteria outnumber human cells 10 to 1 but compose only a few percent of our body mass, while their number of genes outnumber human genes by 360 times. (<http://www.nih.gov/news/health/jun2012/nhgri-13.htm>). Hence, far from being straight-forwardly individuated, the human being is an ecosystem by definition!

that has no explanatory value. It is information idolatry and superstition not science” (2007, p. 187).¹⁷⁹

Similarly, Moreno, *et al.* (2011) hold that the reductive geneocentric approach to biology has hit a dead end, requiring that biologists change their focus from “a program inscribed in DNA analysis to a new distributed (namely, more holistic) program in which DNA, RNA and protein components operate alternatively as instructions and data” (p. 315). In direct contrast to the traditional reductive view that claims a one-to-one mapping of genotype → phenotype, this approach requires positing multiple levels of self-organization, each with their own evolutionary influences:

evolution does not operate upon an abstract functional phenotype space but through a highly constrained (occasionally discontinuous) space of possible morphologies [...] whose formation requires acknowledging the environmental, material, self-organized and often random processes that appear networked at different scales (p. 320).

Newman (2011) points out an interesting implication that there can be “more than one phenotype for organisms of a given genotype, or the same phenotype for different genotypes, i.e., one-many and many-one relationships among levels of organization...” (p. 236). Schuster (2011) elaborates upon this point claiming that current molecular biology reveals epigenetic mechanisms are what make possible the inheritance of characteristics “that are not encoded by the DNA of the individual [...] epigenetics and environmental influences provide additional effects that are indispensable for understanding and modelling the relations between genotypes and phenotypes” (pp. 56-57). Far from the geneocentric view, the origin of complexity in evolution, he claims “results primarily from genotype-phenotype relations and from the influences of the environment” (pp. 76-77). Hence (reiterating third-order emergence), the systems biological paradigm requires that we de-couple the *one-way* efficient causal chains of genotype and phenotype:

¹⁷⁹ In line with this sentiment, Lineweaver and Davies (2013) emphasize that information *in* DNA should be understood as *being about* its corresponding niches (i.e. like the organism it is context dependent) and that it has even come from those same niches via natural selection. Davies contends that a gene is “a coded set of instructions for a ribosome to make a protein. Instructional information is clearly more than a mere bit string. There has to be a molecular milieu that can interpret and act on those instructions. In other words, biological information is contextual [...] Context is manifestly a global property. You cannot tell by looking at the local level whether this or that base pair in DNA is instructional information or just junk” (Davies, 2013, pp. 33-34). Dehmelt, & Bastiaens (2011) provide further sympathetic accounts to this end.

The solution of long-standing evolutionary puzzles concerning the rapid appearance of body-plans and organ forms with conservation of a molecular toolkit and the apparently abrupt recruitment to unprecedented functions of novel tissue motifs and protein complexes, can be advanced by incorporating evidence for a causal disconnection between phenotype and genotype. This includes recognition that developmental systems and proteins (and their complexes) each have inherent dynamical properties that are only loosely related to the genes associated with them, and that each type of system is capable of undergoing changes in their form and function, often in a discontinuous fashion, through means other than genetic variation (Newman 2011, p. 348).

Supporting this view, recent research has shown that the genome is no longer to be understood as *read-only memory* (ROM), but a *read-write* (RW) information-processing network (Shapiro 2011, pp. 25-26). This distinction means that individual organisms preform what Shapiro calls “natural genetic engineering” (NGE), which involves all the biochemical mechanisms (i.e. *retrotransposons*) cells use to cut, splice, copy, repair, polymerize or otherwise manipulate DNA:

RNA + protein + chromatin \longrightarrow new DNA structure and sequence (retrotransposition, retroduction, retrohoming, diversity-generating retroelements)

Protein + ncRNA + chromatin + signals + other molecules + structures \longleftrightarrow phenotype & genotype & epigenotype (p. 26).

Hence, NGE purportedly occurs via complex chemical feedback loops across levels of DNA, RNA, proteins, and phenotypic function, in direct conflict to classical Neo-Darwinism. This can involve cells manipulating their own DNA molecules, transporting DNA from one cell to another, or acquiring DNA from the environment. Though for some reason unnoticed by AE or Shapiro, this line of reasoning supports a kind of Neo-Lamarckianism, for which evidence has been steadily accumulating.¹⁸⁰

¹⁸⁰ For example, Koonin & Wolf (2009) have found that both Lamarckian and Darwinian views are important and capture *different* modalities of evolution: “in principle, the backward flow of specific information from the phenotype – or the environment viewed as extended phenotype – to the genome is not impossible owing to the wide spread of reverse transcription and DNA transposition. Highly sophisticated mechanisms are required for this bona fide Lamarckian scenario to work, and in two remarkable cases, the CASS and the piRNA system, such mechanisms have been discovered” (p. 8). Additionally, Sarkies & Miska (2014) have proposed that mobile RNAi may provide short-term adaptation sufficient for the heritability of acquired characteristics (p. 532). Unfortunately, space prohibits further consideration of Lamarckian connections to the present discourse.

Thompson (2007) finds that a further implication of systems thinking is that the dichotomous view of “nature and nurture”, “innate versus acquired”, etc., are replaced by an ontology of process and dialectical relations. He writes that

life cycles propagate from one generation to the next by constructing and reconstructing themselves like a path laid down in walking), instead of unfolding according to any transmitted, genetic blueprint or program. The process of reconstruction involves numerous interdependent causal elements, which relate to each other reciprocally as process and product, rather than belonging to the dichotomous categories of genetic nature versus environmental nurture (p. 188).

Information then is not passed from one generation to the next, but is reconstructed in and through development. From this vantage point, we are to understand organism and environment as “product and process” that reciprocally select each other, as opposed to a dichotomous conception; hence *natural selection is not an external force acting on organisms*. Similarly, Moreno *et al.* (2011) have noted, “it is not the environment that poses problems for genetically instructed phenotypes to solve, but a complex organism-environment interaction process that defines the adaptation and survival of an organism...” (p. 320).

In sum, according to the systems view of evolution the organism’s self-organization and functionality at numerous spatiotemporal levels provides a necessary contribution to not only the process, but also the trajectory of evolution. Thus there exists a measure of verification for Harris’s argument that auturgic *behaviour* directs evolution above and beyond the mechanisms of random mutation, natural selection, drift, etc.

The Telos of Mind and Life

In this section I elaborate upon the above results with respect to conceptions of teleology and value in living systems. I argue that Harris’s line of reasoning is in agreement with the AE contention that there exists an inherent relationship between autopoiesis, teleology, self-transcendence, and value. In addition, I consider one means by which the above conception of cognition may be integrated into a systems theory of evolution.

In evolution Harris maintains, modifications that provide “improvements” to the system (i.e. increasing its “fitness”) introduce “value” to the system (1965, p. 249). Value here consists in the modification contributing to the organism’s “external adaptiveness and (*ipso*

facto) to its internal wholeness” (1965, p. 250).¹⁸¹ In other words, he is claiming that the system values being ‘fit’. Selection is thus considered a consequence of adaptation and value, not their cause. The cause is rather, “the auturgy of the living system which exerts a constant *nisus* towards integration and order...” (1965, p. 251). Harris thus contends that the cause of selection, adaptation, and value is the auturgic *nisus* of all living systems.

In a later work Harris asserts that “recognition of values is consequent upon purposive activity, which is characteristic of life...” (1987, p. 245). However, he goes on to say that these

values are the goals of purposive action, and purposes derive from desire, which is the conscious phase of natural appetite and instinctive impulse. But these again are no more (nor less) than the expression of the urge intrinsic to all life to maintain itself [...] all purpose is the endeavor to realize a design or structure of activity – the fulfillment of a whole (ibid).

On the one hand, purposeful behaviour is considered basic to all life because it is the very maintenance of organic being. On the other hand, Harris has it that purposes derive from desire, which is characteristic of consciousness. This creates a contradiction. To reconcile this conflict he could either (i) maintain that value obtains only in later stages of consciousness; or (ii) permit that all living systems act on value.¹⁸² I maintain Harris has once again made the mistake of relegating qualities (in this case value) to later stages of consciousness than befits his own system, thus the reconciliation requires the latter strategy in accord with § 6.2.2.

As discussed above, the inherent adaptiveness of organic being is for Harris the very same telos, or “universal pressure toward increasing wholeness” discussed heretofore (1965, p. 273). Harris claims evolution likewise appears progressive “from simpler organisms to more complex” (“orthogenetic”), only insofar as there is a global tendency “towards integration and co-ordination” of form and function (pp. 274-75).¹⁸³ In a later work he writes:

¹⁸¹ Harris defines adaptation as a “harmonious co-ordination and integration of functions within the organism with reference to its environment. It is at once internal coherence and adjustment to external conditions” (1965, p. 250).

¹⁸² In other works he elaborates that to be aware of value changes appetite into desire, for example: “Appetite is thus transformed in the light of self-consciousness, for to desire an object, we must be conscious of ourselves as seeking satisfaction in its attainment” (2000, p. 136).

¹⁸³ Though not emphasized by Harris, it appears to follow from his articulation of “freedom” that as the species or ‘swarm’ increases its specific capacity to alter an environment; over time it establishes a positive selection effect for specific functions in future generations. In this vein, Harris’s position seems to assert that organic

Sentience then becomes the means of assimilating and in some measure domesticating the environment [...] as living beings evolve they are able to penetrate further afield and they develop distal sense modalities [...] so progressively the organism assimilates wider and wider regions of its surrounding world. The environment is thus progressively inwardised (*wird erinnert*) (2006, p. 147).

Taking these points together, the simplest form of mind is instantiated by purposive action toward *fulfilment of appetite*, which renders the living system cognitive, intentional, and now imbues its activity with value. The “assimilation” or “inwardization” to which Harris refers is constituted by both environmental (domestication) and biochemical alteration in response to *recognizable* stimuli. Hence, behaviour on the basis of value results in what Harris considers a progressive broadening of the organism’s sensitivity to stimuli and capacity for environmental alteration. What must now be understood in greater detail is how this process of *inwardization* can be conceived in both phenomenological and scientific terms.

Taking a phenomenological approach to biology, Thompson (2007) maintains “[m]ental life is animated by an intentional striving that aims toward and finds satisfaction in disclosure of the intentional object. In this way, intentionality is teleological” (p. 24, emphasis omitted). This same principle is later extended to all living systems: “living beings embody an immanent purposiveness and this purposiveness manifests itself in the two complementary modes of autopoiesis (the intrinsic teleology of self-production) and sense-making (the projective teleology of adaptivity and cognition)” (pp. 148-49).¹⁸⁴ It is this “twofold purposiveness” of identity through self-production, and sense-making through adaptivity and cognition, that makes and reshapes the sensed environing world.

In phenomenological terms Thompson argues, “[i]f the organism must change its matter in order to maintain its identity, then the organism must aim beyond itself, beyond its present condition or point-identity in the here and now” (p. 155). This he recognizes, is precisely what Spinoza called “*conatus*, the effort and power of life to preserve itself; to stay in existence” (ibid). The consequence has been that, “the horizons of biological space and time have been greatly expanded over the course of evolution...” (ibid). Following Jonas (1966), this expansion, he claims, has been due to the organism opening “outward into space because

systems, both individual and collective, work toward transcending their own environmental and biological constraints by establishing their own. This issue will be further addressed in the following section.

¹⁸⁴ Thompson elaborates, the difference between extrinsic and intrinsic functions is that the former presuppose and supervene upon the larger context of a system (e.g. the *purpose* of a frying pan or car rely upon social context), whereas intrinsic purposiveness is a feature of the organization of the system itself.

its metabolism propels it forward in time, and this forward trajectory is fueled by want, concern, and need” (p. 156). Thus Thompson extends existential phenomenology as an “incessant self-transcendence” to the very root of mind and life (p. 157) and later concludes, “Living is a process of sense-making, of bringing forth significance and value” (p. 158).

For AE, adaptive self-preservation is *the response to what is sensed in the world on the basis of what is sensed within the system’s bounds*, which is considered inherently teleological and self-transcendent. In other words, the symmetry breaking of self and world is not merely to be considered a structural distinction, but an ongoing and self-transcendent process. Since it is this nature of life that is responsible for the broadening of phenomenological horizons, it appears reasonable to conclude that this conception is congruent with Harris’s “*environmental internalization*” – what may now be considered the *sentient explication of the world* for dialectical holism. Of course, projecting phenomenological descriptions to the living process may result in a greater philosophical cost than payoff since phenomenology itself remains to be naturalized.¹⁸⁵ Even if only a heuristic at present, I claim establishing continuity across scales is key for Harris and more specifically, linking cognition and evolution is a consequence of AE. Thus I consider one means by which processes of cognition and evolution may be unified.

Taking a strictly scientific approach to evolution, Krakauer’s (2013) proposal goes some way towards accommodating the kind of teleology and cognition supported by Harris and AE. Krakauer contends that there is something “fundamentally lacking” in a definition of evolution based solely upon the mechanistic change in frequencies of genotypes over time as a result of fitness (p. 229). Krakauer considers organic complexity, “a measure of inferential or predictive capacity: the ability for a population to store adaptive responses to a variety of states of the environment” (p. 231). He reasons that new information can only be acquired through mutation and fixation, “but the greater the rate of mutation p , the lower the total

¹⁸⁵ Towards a defence of this attribution of phenomenology to life, Gaitsch (2016) argues *modern anthropomorphism* (MA) “legitimizes itself as a methodological procedure by the insight that the ‘experiential dimension’ is accessible only from a first-person (and, furthermore, second-person) perspective. This inextricability already tells us something about its ontology. But the point here is that MA is not a reckless practice of attribution [...] but a rigorous matter of access. Second [...] MA does not take it for granted that the features accessed by first-person experience are strictly speaking ‘human,’ as lived experiences do not come along with any name badge. MA takes the risk of specifying features of life by reflecting on one’s own experience as a living and lived body in order to ‘attribute’ them to other living bodies” (p. 220). For further discussion on phenomenology and anthropomorphism see Villalobos & Ward (2016) and their response articles.

storage capacity of the genome L . This is an inescapable constraint operating on a genome, and requires mechanisms of selection or learning other than natural selection in order to be overcome” (p. 236). For Krakauer (in line with Kurakin, 2011; Mitchell, *et al.* 2009; and Shapiro, 2011), evolution includes “the changing frequency of alternative environment-predictors”, a process of “overcoming fundamental constraints” through the development of “basic cognitive capacities: mechanisms that augment the predictive capacity of genomes alone” (*ibid.*). Evolution he claims, is the same as cognitive learning to the extent that we find “inferential dynamics that build representations in order to predict their environments” (p. 243).¹⁸⁶

In order to overcome genetic constraints, acquire and store more information to survive, Krakauer proposes three functions utilized in systems as widespread as “single cells, and in large tissue systems such as brains”, are used:

- (i) “self-similar structures” generated by genetic regulatory networks, i.e. fractal compression of hierarchical source data;
- (ii) “modification of these structures within a single generation” in response to “environmental cues” (p. 237); and
- (iii) the same structures must be able to be ‘written’ and ‘read’ in many different ways (p. 240).¹⁸⁷

Cognitive mechanisms on Krakauer’s account, lend themselves to the same definition as evolution because behaviours that receive rewards will be reinforced whereas others will be extinguished. In addition, “learning will tend to maximize the amount of information that an individual extracts from the environment. The best behaviour will fix in the population excluding all others until the environment changes” (p. 241).

¹⁸⁶ Indeed, Stewart (2010) writing on the AE paradigm has recognized that it follows “from the equation ‘cognition = life’ that the historical evolution in forms of life, ever since its origin, is an evolution in forms of cognition” (pp. 4-5).

¹⁸⁷ Recognizing that his account is counter the central dogma of Neo-Darwinism, Krakauer argues from what appears to be just the kind of “genetic engineering” mentioned above: “DNA is always associated with histone proteins forming the chromatin complex. Histone proteins possess long tails that can be biochemically modified. Changing the chemical environment of the cell leads to changes in the chemical composition of chromatin. Thereby DNA can be secondarily tagged along a repeating structure that is potentially as information-rich as the genome proper, and possesses the benefit of being directly modifiable within a single cell or organismal generation” (p. 239).

By this reasoning, biological complexity arises as “a series of cognitive innovations, all aimed at supplementing or overcoming the adaptive limitations of genomes, allowing for more efficient representation and predictions of environmental regularities inducing fitness consequences” (p. 242). Krakauer further argues that there are however necessary conditions for an increase in cognitive capacity:

These are when regularities in the environment present themselves at a rate that exceeds the ability of natural selection to record an adaptive response in the genome. When environments change slowly, cognition offers little advantage and genomes should be sufficient to encode adaptive responses. Complexity therefore increases on a “need to know” basis, and does not follow an inexorable trend but a wavering pathway governed by the rate of information production by the environment, where the environment includes organisms and their products (pp. 243-44).

Taking Thompson and Krakauer’s contentions together, this section has demonstrated that Harris’s conception of ‘internalizing the environment’ finds support from contemporary phenomenology and evolutionary theory. For Harris and Thompson the living process entails value and teleology akin with Spinoza’s *conatus*. With this in mind, the dialectical holist conception of cognition can be phrased as *the sense-making of a living system that inspires transcendence of its (internal and external) physiological constraints based upon an inherent value of self-maintenance*. To this philosophical conception Krakauer adds a much needed scientific framework that provides one way by which the very process of cognition can be *at least analogous* to evolution – if not considered *the very same process on a different scale*. In the following section I consider in greater detail what implications result for the theory of evolution if autopoiesis (or ϕ) is extended to *collective biological systems*.

6.3.2 Ecopoiesis and Evolutionary Selection

In this section I argue that a consequence of maintaining both the range of evolutionary mechanisms noted above and the autopoietic theory of mind and life, is that the same formal governance posited at the level of individual organisms is extended to *ecosystems*. I claim this entails a revision of evolutionary selection by endorsing multilevel selection, convergent evolution, and symbiogenesis. While these implications have been only partially recognized by Harris and proponents of AE, Harris’s conception of scales, I maintain, provides further clarification concerning why these theories should be accepted in concert.

In the AE account there is an emphasis on structural coupling, a co-construction between organism and environment in both ontogeny and phylogeny. In agreement with Krakauer and

Kurakin above, the organism is not merely *subject* to selection because part of the inheritance of each successive generation is the organism's environment, one "structured into viable niches by the organisms themselves" (Thompson, 2007, pp. 203-4).¹⁸⁸ The result is a "co-determination" in which "organism and environment enact each other through their structural coupling" (p. 204). The AE approach to evolution is based on the notion that the collective behaviour of a species changes the environment through the production of a niche that creates a reflexive loop between organisms and their environment (in line with third-order emergence discussed above). Thompson summarizes his conception of *developmentalist evolution* as follows:

1. The unit of evolution at whatever level (genomic, cell lineage, individual, social group, and so on) is a developmental system (in the widest sense of a milieu-embedded, propagative unit).
2. Developmental systems are composed of ecologically embedded autonomous networks, which exhibit rich repertoires of self-organizing configurations.
3. Such networks are analyzable not in terms of *optimality* of design or fittedness to the environment, but rather in terms of *viability* in the face of an unpredictable or unspecified environment.
4. Through reproductive structural coupling with their environments, these networks generate selection in the sense of the differential retention of inherited variation (p. 206, emphasis in original).¹⁸⁹

This conception of evolution provides support for Harris's thesis because it posits that the units of selection are simultaneously the *agents* or forces of selection at some relevant scale. Thompson for the following three implications:

- (1) that the replicator/interactor distinction is no longer useful for conceptualizing evolutionary processes: (2) that there is no intelligible distinction between inherited (genetic) and acquired

¹⁸⁸ Recent discoveries by Chen, *et al* (2017) reveal evidence that the self-organization of viable niches in bacteria for example, is achieved by "large-scale collective oscillation" that (in agreement with Gleiser above remarks) once again takes the form of "travelling waves" via "symmetry breaking".

¹⁸⁹ In her analysis of emergence in biology Rothschild (2006) concludes that the "proper locus of natural selection", or "evolutionary individuals could very well include the individual gene, organism, deme, and species [...] Indeed, one could argue for even more levels, such as the level of a tissue or subcellular organelle" (p. 160). To my mind, this is precisely the result of interpreting "natural selection" as formal governance.

(environmental) characteristics; and (3) that there is no intelligible distinction between nature and culture (p. 192).¹⁹⁰

In this way “natural selection results from the ‘satisficing’ of viable trajectories effected by the autonomous networks themselves in their structural coupling with their environments” (p. 207). Thompson holds natural selection is an “emergent consequence of autopoiesis”, so while natural selection requires reproduction, “reproduction presupposes autopoietic unities that reproduce” (p. 212).

Reminiscent of Kurakin’s ET chains, rendering natural selection in the above light means the notions of co-emergence and co-evolution are again particularly apt. As Thurner (2011) explains in a broader context:

Any element, a biological species or an industrial good, whose (re)production rate falls below a critical value, will vanish over time. This again can lead to a re-adjustment of (re)production rates of existing elements. The key aspect of evolutionary systems is that the set of existing elements and their corresponding reproduction rates (fitness landscapes) *co-evolve* (p. 120, emphasis in original).

Formalizing dynamical systems in which elements co-evolve with their (re)production rates is however considered especially challenging. Even if the dynamics of elements could be exactly described with differential equations Thurner explains, “the boundary conditions of evolutionary systems constantly change as they evolve; they are coupled to the dynamics of the system itself” (ibid). It is for this reason that such systems are inaccessible with traditional mathematical methods.

Thurner points out that the parameters of these evolving systems are typically more numerous than can be identified, let alone accounted for. This results in a high degree of unpredictability, meaning that it is unfruitful and problematic “to predict future fitness of species from their present fitness. Instead, one has to understand how species and their fitness landscapes co-construct each other, how they co-evolve” (p. 121). By extension, he claims that the notion of a niche in ecology (and economics) is actually an “*a posteriori* concept” because the niche itself cannot be predicted. “Consequently, a *physical*, fully causal and useful description of evolution has to consider abandoning the concept of fitness as the

¹⁹⁰ Krakauer (2013) draws a similar conclusion concerning his own conception of evolution to be considered below, finding that the ‘nature’ versus ‘nurture’ dichotomy rests upon the false premise that “some traits are fixed whereas others are variable.” He claims that this premise is false “because nothing about a species remains fixed over suitably long periods of time” (p. 242).

central concept and to look for alternatives that operate with the information actually available at a given time” (ibid). Hence, *fitness* (of either a system or trait) and *niche* are related such that the meaning of one depends upon the nature of the other; to have an understanding of either one we must first identify a specific *context* where both niche and fitness provide a means of *mutual explication*.¹⁹¹

Kauffman (2013) has gone considerably further than Thurner to propose a number of implications for evolution that may follow from both Harris and Thompson’s positions. “If we are right, entailing law, the centrepiece of physics since Newton, ends at the watershed of evolving life” (p. 173). Thus, for Kauffman, evolution cannot be understood mechanistically and so he proposes an alternative explanation. He argues that much like the boundless functions of a screwdriver, functionality between a cell and its environment is likewise boundless because both are continually altering each other: “we cannot prestate the actual niche of an evolving cell by which it achieves task closure in part via that niche” (p. 175). Moreover, “the actual niche can be considered as the boundary conditions on selection” (ibid). This implies that adaptations that occur through evolution, or “the very phase space of evolution” changes in “unprestatable” ways (ibid). Hence, we cannot know what will or can happen because we “do not know the sample space” (p. 179). So he finds that if organisms, as Kantian wholes, “co-create their worlds with one another” mechanistic laws of evolution are precluded (p. 183). Niches then are systems of living and non-living structures/processes that are not themselves explained by selection, but permit a range of unprestatable possibilities that collectively constrain selection – equally applicable to social systems (p. 186). Here Kauffman reiterates the AE thesis of co-evolution and advocates for the incompleteness of physics reflected in third-order emergent systems.¹⁹²

Closely associated with the developmentalist paradigm, many authors have begun to highlight the importance of macroevolutionary theories including symbiogenesis and multi-level selection.¹⁹³ Sepkorski (2008) argues evolution “takes place at or above the level of

¹⁹¹ Similarly, Ellis (2004) recognizes that alteration of DNA through the evolution of an organism in relation to its ecological niche is a classic case of top-down action from the environment to biochemistry and the details of which could not be predicted prior to the unfolding of said relation (p. 614).

¹⁹² In complement to this argument of organism-environment coupling, Krakauer has claimed that “there can be no information in the genome that is not already present in the environment”, which implies that evolutionary complexity “is not a property of an individual but a population” (2013, p. 233).

¹⁹³ For further discussions on *levels of selection* see Wilson D.S (2002, 2007); Sober & Wilson (1998); Richerson & Boyd (2005); Wilson (2007); Lloyd (2007); and Serrelli & Gontier (2015).

species” (p. 211). He claims that taxonomic groups can function as “individuals” with their own selection pressures and “evolutionary trajectories” (p. 212). Thus this view is hierarchical, but does not rely upon qualitatively “different causal mechanisms.”

[S]election is seen to operate at both the organismic and species (or higher) levels according to what are effectively the same principles. In this formulation, however, the evolution of higher taxa is not strictly reducible to microevolution, since higher taxa have organizational principles, which determine the outcome of selection, that are not simply the aggregate of their constituent organisms (p. 217).

By this view, species as well as “higher taxa”, can be understood to operate as individual evolutionary units that have their own adaptive traits (p. 221).¹⁹⁴ As was previously discussed concerning the causal de-coupling of phenotype and genotype, macro-evolution is thus considered “decoupled from microevolution” because the mechanisms of selection operating on the level of individual organisms “cannot be extrapolated to explain evolution at the higher taxonomic levels” (p. 226). This is all to say that the “processes that explain macroevolution – whether species selection, sorting, extinction, or something else – are fundamentally irreducible to neo-Darwinian microevolutionary mechanisms” (ibid).

Following Lynn Margulis’s (1993, 1998, 2004) pioneering works, Peacock (2011) shows that symbiogenesis provides a deeper insight into multi-level selection. In symbiogenesis networks of cooperative behaviours can be successful enough that “they are amplified by natural selection into a coherent, reproducing whole” (p. 235). If such a network is sufficiently organized that it reproduces as a whole, then the entire genetic code is considered a replicator. As a result, “what is ‘seen’ by natural selection, is not simple; it is not just the gene (whatever that is) unless by ‘gene’ one means simply any replicator. A sufficiently well coordinated symbiotic association can itself become a unit of selection” (pp. 235-36). Peacock elaborates that even those authors most sympathetic for the theories do not tend to notice the connection between symbiogenesis and multi-level selection:

Apparently-altruistic behavior need not be explained merely as ‘kin selection’; an organism need not be in a mutualism merely with its cousins. It could be in mutualism with any other conceivable form of life at all, so long as the net effect is to provide a modality of survival for the organism.

¹⁹⁴ Here Sepkorski claims macroevolution supports Gould’s theory of punctuated equilibrium: exemplified through the case of a mass-extinction, much like the case of a forest fire, space is cleared for new life to emerge.

Here, by the way is the basis for so-called group selection, which is nothing more than selection in favour of mutualistic symbiosis (pp. 238-39).¹⁹⁵

Considering the ecosystem as emergent in its own right, Yin & Herfel (2011) describe such a system as complex and dissipative, a flux network that permits quantitative and qualitative analysis but is nevertheless relatively independent of its constituents. “1. the structure is an emergent property that cannot be reduced to the sum of its component species; 2. The structure requires constant energy and material throughput to maintain its existence” (p. 399). Taking what they call a *post-classical dynamic perspective*, ecological models they argue, should possess a number of necessary parameters: (i) Lack of steady state, i.e. dynamic equilibrium; (ii) novelty and unpredictability; (iii) nonoptimality; (iv) fundamentally cyclic variables; (v) emergent constraints such as selection effects; (vi) historicity or path-dependent dynamics; (vii) diversity; and (viii) locality or site-specific dynamics (p. 404). The environment – including other organisms, weather patterns, and nutrient availability – establish self-organizing and cyclic dynamics (e.g. seasons) that constrain the form and function of individual organisms (e.g. the second-order emergence of circadian rhythms and migratory patterns).

Taken together, the above evidence suggests that the “classical” view of ecology is antiquated and a richer view is required. Such a framework must account for the capacity of ecological systems to self-organise and establish many of their own boundary conditions “such as the intrinsic rates of growth, carrying capacities and interaction coefficients” (Odenbaugh 2011, p. 427). Towards this end, one theory of ecological self-organization is *trophic cascades*. Beschta & Ripple (2009) have compiled significant evidence to show that top-down influence from predators (carnivores) to herbivores (consumers) and plants (producers) play a significant role in determining ecosystem structure and dynamics via feedback relations. Estes, *et al.* (2011) have more recently argued that the “topology of ecosystem dynamics is now understood to be nonlinear and convoluted, resulting in distinct basins of attraction” (p. 301).¹⁹⁶ They maintain this demands a “paradigm shift in ecology”;

¹⁹⁵ For a further treatment of the role symbiogenesis plays in evolution see Gontier (Ed., 2015).

¹⁹⁶ They argue that perhaps the greatest human influence on ecology has been the widespread elimination of predators across the globe, which has been largely responsible for the mass extinction currently taking place. It is ironic, they point out, that due to the complex web of species interdependencies, “we often cannot unequivocally see the effects of large apex consumers until after they have been lost from an ecosystem, at which point the capacity to restore top-down control has been lost” (Estes, *et al.* 2011, p. 302).

rather than being seen as “ecological passengers”, predators “exert strong cascade effects” via what they call “top-down forcing” (p. 306). In this way, trophic cascades may denote feedback loops of second and third-order emergence at the level of ecosystems. Here, predators act as *order parameters*, determining the *phase transition of the ecological system* to which they belong.¹⁹⁷ With these arguments in mind (given the criteria of appendix § IV-b), the ecosystem satisfies the necessary criteria for a ϕ .

A still further means of identifying formal governance in natural selection can be seen in instances of convergent evolution (e.g. echolocation in dolphins and bats involving over 200 genes).¹⁹⁸ Coffman (2011) argues that according to *developmentalism*, “morphological homoplasy and convergent evolution would be far more common than is generally assumed owing to the existence of (perhaps cryptic) developmental or structural attractors generated by ecological organization” (p. 305). Walker (2014) has likewise argued that top-down causation is an important mechanism for adaptive evolution and is particularly apparent in cases of convergent evolution. “Convergent evolution thus provides a clear example of top-down causation via adaptive selection, where causal influences run from macroscopic environmental context to microscopic biochemical structure” (p. 430). The point is that the ecological system as a whole specifies viable forms and functions (or modes of coupling) that act as attractors for those creatures that remain alive. At this point a fair consideration is that the recurrent forms and functions of convergent evolution are likewise indicative of scales.

To summarize this discussion it is instructive to consider Davies’ (2013) view of complexity. Davies holds that evolution can be understood as “a random walk through the possibility space which is bounded by a ‘wall’ of minimal complexity. The wall exists for the elementary reason that there is a lower limit, but no obvious upper limit, to the complexity of a living organism” (p. 32). As many above have noted however, this boundary is created by the total organization of the ecological system itself, is unpredictable, and establishes *a viable*

¹⁹⁷ Li’s (2002) paper provides significant detail concerning how environmental variables are to be modelled such that “*a theoretical framework of ecological phase transitions*” is scientifically viable.

¹⁹⁸ Further examples include amino acids; photosynthesis; wings; antifreeze proteins in the northern sea cod *Boreogadus saida* and Antarctic *Dissotichus nawsoni* (consisting of repeating threonine, alanine, and proline); sensitivity to long-wavelength green and red visual pigments; serine protease molecules in bacteria (subtilisin) and vertebrates (trypsin), which have different structures but the same active site (Chela-Flores 2008, pp. 158-59). Interestingly, Schloss (2008) has argued that convergent adaptations such as lungs, gills, guts, kidneys, organelles, and whole-organism branching morphologies create an internal, ‘three-dimensional’ surface area that effectively endow living systems with an additional, “fourth dimension” (ff. p. 330). See also Leander (2008).

trajectory of form and function (or fittedness). Accordingly, evolution follows a series of paths of entropy management created by feedback relations between ecosystem organization on the one hand and organism adaptation on the other. If evolutionary selection can be considered *about* the forms and functions that *more efficiently use energy and decrease entropy*, then it would be expected that symbiogenesis is necessary for speciation and a form of natural selection. This would warrant the notion of *ecopoiesis* and sufficiently qualify the ecosystem as an indication of ϕ .

The Gaia Theory

The concept of Gaia is by no means new, having been articulated in various forms by many philosophers and scientists since the Ancient Greeks. In its modern version, the claim is that biosphere, hydrosphere, atmosphere, and lithosphere constitute a semi-independent level of nature, an emergent function that is auturgic/autopoietic, demonstrating sentience and self-directed behaviour through self-regulation.

According to AE, a further means of characterizing a living entity is by *order* of autopoietic systems: first-order is proper autopoiesis demonstrated by the paradigmatic cell, whereas second-order is a *network* of first order systems such as insect colonies and human societies. A crucial question here is whether these second-order systems can meet the criteria of first-order autopoiesis. In this case Thompson recognizes that the idea of boundary takes on a wider definition. He contends that indeed such second-order systems can count as first order as long as the system produces and regulates “its own internal topology and functional boundary...” (Thompson 2007, p. 107). By this definition, the totality of living systems on earth is considered a self-organizing whole, “with the self-regulation of the planetary climate and atmosphere occurring as emergent phenomena” (p. 119).

Thompson anticipates the most common means of refuting this theory, namely the lack of reproduction and selection involved in the operation of such a system. He contends that with regard for a definition of ‘minimal life’ such systems do not require a hereditary lineage:

Reproduction requires an individual to be reproduced, and hence is logically and empirically secondary to the process whereby an autonomous system constitutes itself as an individual. Therefore, a self-producing but non-reproducing planetary system could count as a genuine biological individual. Furthermore, its self-producing and self-maintaining mechanisms, though not the result of natural selection acting on a population of similar systems, would nevertheless

hardly be “accidental.” Indeed they would presumably reflect lawful principles of self-organization and emergence in complex systems (p. 120).¹⁹⁹

Thompson contends that considering the criteria of autopoiesis listed above, Gaia can clearly be understood to produce its own internal topology and functional boundary, circularly producing the components that compose the system as a whole. Interestingly, if the same symmetry breaking considered in cosmological evolution is utilized here, a natural consequence is that ecological systems are the consequent, not the cause of a planetary Gaia. In this vein, rather than reproduction being necessary, we find that *self-differentiation* is necessary for the continuity and congruence of not just the biosphere, but of all life.

Extending his conception of coupled self-organization and ET flow to its further conclusions, Kurakin articulates a view of ecosystem form and function that renders Harris’s € continuous with the Gaia theory:

As a result of molecular self-organization, driven and sustained by electron flow, various living structures, cells, organisms, and ecosystems continuously emerge, metamorphose, and transform one into another in an eternal process of transformation of forms, which unfolds simultaneously on multiple scales of space and time within the multiscale whole of the planetary life, held together and integrated by the invisible threads of moving electrons. As a consequence of such an arrangement, molecules, cells, organisms, and ecosystems function as scale-specific constituents of one multiscale whole of energy/matter flow/circulation, where they represent both means and ends, at one and the same time (2011, p. 26, emphasis omitted).²⁰⁰

This very process of organization and exchange of energy/matter has the result of creating ever more complex and efficient paths of energy consumption, “with the ultimate purpose being the perpetuation and expansion of living matter as a whole” (p. 42).

¹⁹⁹ In their recent work, Capra & Luisi, (2014) establish one of the most extensive treatment of the Gaia theory that is informed by autopoiesis. For a wide range of papers exploring Gaia as a plausible hypothesis see Crist & Rinker (Eds) (2010).

²⁰⁰ Though he does not cite Kurakin or the Gaia theory, Smith (2013) has argued that “phase transitions” provide the appropriate paradigm for understanding the biosphere. He claims some universal patterns of life should be understood as the order parameters of these transitions. As the phase transitions of the biosphere are dynamical rather than equilibrium, he argues (consistent with Bohm and Harris) the “individuality” of living systems that compose it is “derived” and “emergent” from the “core metabolism” of the biosphere (p. 210).

Among others, Peacock (2011) has set out what is perhaps the most realistic argument for the Gaia theory in terms of organic interrelation, i.e. *mutualistic symbiosis*.²⁰¹ Whereas commensalism or parasitism at a global level leads to a reduction of free energy and ultimately, extinction, he contends that reinforcing feedback relations may provide selective pressure for cooperative behaviour sufficient for the global level of organization required (pp. 238-39). He finds sufficient evidence to posit a “distributed genome” in symbiotic systems of numerous scales up to and including a planetary Gaia. This is to say that if the interactions of symbiotic, mutualistic organisms are capable of supporting the reproduction of each separately, and the self-differentiation of the system as a whole, then Gaia is a viable theory.

Kauffman (2013) articulates a view that is in many ways indistinguishable from Harris and AE by extending his conception of the *Kantian whole* (including autocatalytic systems and cells) to the biosphere. Interestingly, he argues that although such wholes are themselves unpredictable, they can “become collectively autocatalytic”, and the process by which this occurs is that of “the phase transition” – the same as for all chemical reactions (p. 187). So, while such wholes are not *irreducibly* complex (due to our limited predictability), they are not captured by efficient causal laws. Hence, as we have seen, he proposes the “Formal Causal Law.” Evidently his extension of such a law to ecosystems and to the biosphere as a whole is all that is required to lend credit to Harris and bring Kauffman into accordance with dialectical holism, but he goes still further. In his conclusion, Kauffman contends that laws of this kind may not only “help explain the emergence of complexity in the diversifying biosphere”, but also reveals that a whole range of “non-equilibrium systems such as Benard cells, whirlpools, and perhaps even stars and galaxies, are linked sets of cross-coupled processes that jointly cause one another’s continued co-creative, non-equilibrium existence in the universe” (p. 188).²⁰² Kauffman’s theory that systems as diverse as DNA, the biosphere,

²⁰¹ For further discussion concerning the connection between symbiosis and Gaia, see Hird’s (2010). In this work she argues that the dependence of environmental activity and regulation upon bacteria through symbiosis and symbiogenesis can be seen as Gaia’s fundamental actants, connecting life and non-living matter in biophysical and ‘biosocial entanglements.’ Hird also provides a lucid historical summary of how the Gaia theory has subsumed the theory of autopoiesis.

²⁰² Indeed Harris extended his theory of increasing wholeness, coherence, etc., in his writings on social organization (e.g. 1992, 1993, pp. 3, 10, 106). In these works Harris makes it clear that the interdependence and interconnectivity of diverse social systems coupled with an efficient means of energy use is not only necessary for human survival but teleologically given by nature itself. In this way globalization, suppression of war, and

economic systems, and galaxies, are linked into a mutually reinforcing whole, clearly resembles Harris's theory of a scale of forms, each considered a partial reflection of an overarching Concrete Universal. Hence, Kauffman's "Formal Causal Law" is not new, but is rather a repackaged version of the presently examined theory of ϕ .

Four conclusions can be reached from the above: (i) AE provides arguments for considering Gaia in the same terms as the autopoietic system irrespective of its lack of reproduction and difference in boundaries. (ii) Kurakin shows how Gaia may follow from the above conception of evolution (\mathcal{E} or ET transfer) that is continuous across living and non-living systems alike. (iii) Irrespective of its soundness, the same formal governance posited at the scale of the self-organizing cell has been depicted as the selection effect of biological evolution, and the biosphere as a whole. (iv) To the extent that this principle is held responsible for an increase in complexity (via symmetry breaking and symbiogenesis) and conflicts with the the Neo-Darwinian paradigm, Harris's teleonomic philosophy of biology receives significant support from contemporary research.

6.4 Conclusion

In this chapter I have argued that there is a clear parallel between the conceptions of life, cognition, and evolution articulated by Harris and contemporary systems biology. Both involve formal governance operating at numerous levels (e.g. genome, the organism as a whole, the ecosystem, and biosphere). Additionally, in agreement with Harris's conception of unifying principles (ϕ), each of these levels have in recent years been modelled as a respective phases of matter.

In § 6.2.2 have argued that the most coherent (and sympathetic) interpretation of Harris's views regarding the essential parameters of mind and life result in the attribution of both sentience and intentionality to any (auturgic) living system, in line with AE. In § 6.3.1 have argued that there is significant support for a broadening of evolutionary mechanisms that involve individual sensorimotor engagements and genomic modification. The argument rehashed in favour of Harris's theory of *environmental internalization* runs as follows: If self-maintenance (entropy management) of living systems entails a basic sensation of need and continuous re-evaluation of values (adaptive meaning-making) on the basis of self-

the increasing development renewable energy are a result of the same explicative process considered heretofore. Unfortunately, space prohibits any further discussion of sociological topics in this thesis.

preservation, then organic forms and functions are expected to generate new modes of sensation, behaviour and increasingly efficient social organizations (symmetry breaking). Thus, it appears to be a logical extension of both Harris's and AE evolution that the *cognitive process* may play a role in driving and constraining evolutionary development via *learning* at shorter time scales than natural selection. As discussed in § 6.3.2, though not emphasized by Harris, organism-environment coupling, multilevel selection theory, and ecological emergence respectively, may be understood to introduce evolutionary selection effects (PSEs) irreducible to any other level of analysis. Hence, regardless of whether there is a teleological drive to evolution as Harris and others have claimed, were this kind of argument to receive ongoing empirical corroboration it would provide further evidence of third-order emergence (ϕ) in ecosystems and the biosphere alike.

The above research has revealed that Neo-Darwinism is not incorrect *per se*, but merely incomplete in light of systems biology, some philosophical implications of which Harris has clearly anticipated. The resulting teleonomic philosophy of biology reveals a continuity between living and non-living systems, remains consistent with AE, and I maintain, captures what one should expect from extending Bohm's *implicate order* to biological phenomena. In the final two chapters I examine Harris's arguments for extending his metaphysics into a theory of consciousness.

Part IV

Harris's Metaphysics of Mind

Chapter 7

Harris's Reformation of the "Hard Problem"

7.1 Introduction

In the remaining chapters of this thesis I evaluate the means by which Harris appealed to the dialectical whole to establish a theory of consciousness. As Harris's philosophy of mind is fairly extensive, I confine my focus to only the central thread of his argument concerning efforts to naturalize subjectivity and knowledge. Toward this end, in § 7.2, I clarify Harris's anticipation of the AE approach to consciousness. In this section I also establish a preliminary reformation of the hard problem to be elaborated in the following discussions. In § 7.3, I assess Harris and Damasio's respective appeals to Spinoza's conception of *ideatum* as a model of embodied cognition, and contrast this approach with more recent arguments from embodiment. In § 7.4 this line of thought is extended to Spinoza's concept of *conatus* in order to clarify how Harris's theory of self-awareness relates to corresponding views from embodied and embedded theses of mind.

7.2 Harris's Anticipation of an Enactivist Strategy

For Harris there are two 'critical' points of transition in the scale of forms: "The first is from the physicochemical to the metabolic, marking the emergence of life. The second is from the sentient and perceptive to the fully self-conscious and self-reflective" (1991, p. 139). Neither of these transition points are abrupt however. Each is considered an enfoldment of the preceding scales. In this section my aim is to elucidate Harris's conception of this second transition to mind in the context of human cognition.

As discussed in chapter 6, the first critical transition from non-living to living systems is characterized by a constant adaptive response to elements of the system's environment based upon the sensation of meaningful stimuli. For Harris, the capacity of living systems to use information thus demonstrates more explicitly the principle of order and progression inherent in our universe. However, as with the previous scales, life demonstrates this principle "deficiently." He claims this is because in its more primitive forms living systems behave

automatically, instinctively and lack a *holistic cognition*, or awareness of itself-as-a-whole. Harris holds that the lack of holistic cognition means that the organism's "wholeness is still implicit, and its centreity, while recognizable by us as observers is not for itself a subject" (1991, p. 103). The simple organism's parts adapt to one another (establishing a self) and the organism can adapt to its environment (establishing awareness), but it nevertheless lacks *self-awareness*. Harris claims that the "mere organism, as such, is self-contradictory" (1991, p. 104) (discussed in § 6.2).

In his use of the term "contradiction" Harris aims to mirror earlier phases of development involving the reconciliation of opposition leading to *sublation* and *coalescence*. At this stage the organism is inevitably struggling against the system to which it belongs in pursuit of its own survival. Hence, Harris finds that the organism strives to reconcile this contradiction through an evolutionary process (discussed in § 6.3.1). This process involves "an inherent urge" of the organism "to appropriate and internalize its other, to unite and integrate the outer world into its own self" (1991, p. 104). This he claims to be achieved in two ways: (i) "by absorption and ingestion of material substances required for the maintenance of its bodily integrity", and (ii) "in the quest for this sustenance, through sentience, the feeling and registration of external influences and conditions..." (ibid).

Taken together, these processes establish the "next phase transition in the self-differentiation of the universal principle of order, the next step in the scale of forms – what constitutes the matrix of succeeding phase, mentality" (ibid). Harris has argued that the adaptive character of life arises from the requirements of self-maintenance of the organic unity so that living activity itself results in a progressive development, i.e. increasing the agent's capacity to respond to environmental elements. His starting premise then, is that the progressive enfoldment of complex systems (an aspect of €) leads to the second transition of mind. For the remainder of this section I outline five facets of Harris's theory of consciousness that will guide the discussions to follow.

(1) *The crucial problem* – Harris proposes our initial question thus: "How is what the brain does converted into what the mind does?"; and "how is what the mind does related to its body and the external world?" (2006, p. 21). These questions compose what Harris denotes the "crucial problem".²⁰³ In his earlier work he considers whether observable behaviour "is a

²⁰³ Harris (2006) cites but does not discuss Chalmers' (1996) *The conscious mind*, within which the 'hard problem' was famously discussed. On the other hand, Harris nowhere cites or discusses Levine's (1983) work that originally outlined the *Explanatory gap*.

sufficient index of the presence of consciousness in the creature so behaving”, but concludes that it “does not seem to be wholly sufficient” (1965, p. 293). One page earlier Harris supports this conclusion by reasoning that for any behaviour one considers indicative of mind, a *mechanism* can be conceived that most would agree to be devoid of mind. In this way he finds the problem of mind is a discrepancy between material behaviour and mental awareness, such that behaviour will never be sufficient to derive conscious experiences.

(2) *Judgment* – Building upon the *cogito*, Harris contends that judgment may be a non-mechanical, non-behavioural function of mind sufficient for guiding further investigation:

To doubt or deny is not to pronounce a form of words, to write them or in some other way to make them communicable (operations that might be performed by a machine). It is to judge, without necessarily communicating anything. It is, in short, to be in a state of mind or awareness with respect to some object. And if the subject of the judgment is one’s own awareness, all doubt of its occurrence must be bogus and any denial false (1965, p. 293).

Accordingly, judgement provides a non-mechanical and pre-linguistic function of mind. Towards a clarification of this purportedly unique mental ability, Harris notes some of the innumerable cases of previously learned intellectual and physiological skills that can be performed without immediate awareness. He maintains that no matter the marker of consciousness, it is “not *sui generis* but emerges from processes, which are of the same general kind and may with equal right be called mental, but which occur on a level of activity which is not conscious” (1965, p. 295). Judgment then is considered to be scalar, arising from numerous unconscious dynamics that provides a *necessary* contextualization (or “*synthesis*”) that renders some sensation, impression, or conception conscious (p. 374).

(3) *Scale of forms* – Harris hopes to dissolve the problem by investigating consciousness as a phase of evolving material systems on the one hand and of non-conscious *mental* processes on the other (1965, p. 296). Harris assumes that “this is not a relationship between two different substances or separate entities. It is the relationship between different phases of a continuous organic process” (ibid). To support this line of reasoning Harris follows the Gestalt form of neural-identity theory, which he uses to depict both mental and physical domains as respective *fields*:

neither behavior nor experienced phenomena can be adequately explained in terms of the conjunction and conglomeration of single units, whether simple reflexes or single sensations [...] both the physiological aspect and the phenomenal must be treated as Gestalten, wholes of parts which exist inseparably and only in the whole (p. 302).

Harris hereby dismisses any *corpuseular* conception for the units of mind or matter maintaining there is an “identification of the psychological with the neural ‘field’ [...] an identity of structural order – an isomorphism” (pp. 302-3).²⁰⁴ In further agreement with Gestalt psychology he maintains the sensum is created by a selective activity of attention and it is never simple, rather it is “constituted by interrelations” of neural and psychical fields, each exerting internal (albeit unconscious) “‘forces’ of organization” (p. 334).

(4) *Dynamic constraint* – Harris reasons that neural and sensory processes are subject to thresholds of impulse intensity resulting from what he calls “a fusion – a summation of subliminal pulses” (1965, p. 305). Although it is not yet known how this process of summation takes place, he suggests it may be “rooted in the metabolism of the cell body” (ibid).²⁰⁵ Likewise, he claims that the nervous system acts as an organic whole that is governed by the wider whole of the total organism, which is in turn “governed by an auturgic principle which unifies it in all its multiform variety...” (ibid). He goes on to say that “at a definite level of integration this unity can only be expressed as, and become effective in, behaviour which is ‘informed’, in both the senses ‘given form’ and ‘guided by knowledge’” (ibid).

Harris later elaborates that although form and structure are generally synonymous, as complexity increases in the scale of forms the difference between these terms becomes significant and “mere spatial pattern is transcended [...] The proposition now being advanced is that the integration of physiological processes at a high degree of complexity and intensity assumes a new form, the experience of feeling” (1991, p. 105). This claim may be more fruitfully cashed out to say that as a kind of *organization*, conscious behaviour is not so much a matter of *capability* – since, as noted above, all *capacities of a particular level* might be mechanically instantiated – but a matter of *dynamical constraint* across numerous *levels of activity*:

There are not two agencies influencing each other, but two or more levels of activity, the lower ancillary to, sublated in, and integrated with, the higher, which at a certain stage of development is

²⁰⁴ Note that this point does not contradict Thompson’s (2007) proposal of neurophenomenology as cited in § 2.3.2 because – as will become increasingly evident in the following sections – Harris’s “isomorphism” is not a reductive identity of mind to behaviour or *vice versa*, nor does he imply some set of facts that can be read in one way or the other, but rather, both refer to one and the same phenomenon that is *not captured by either mind or behaviour alone*. This is in line with Bohm and ENM.

²⁰⁵ Though they do not cite AE, Hollis, *et al.* (2009) argue, “[i]f metabolism is the primary function of a nervous system, then an elegant theory would be one in which cognitive activity emerges out of metabolism. Such a theory would begin to bridge the chasm between laws of physical processes and cognition” (p. 212).

conscious (or mental) activity. Each level, of course, has effects upon every other for they all (in the higher phase) belong to a single, though complex, dynamic totality (1965, p. 309).

This is to say that “feeling” (phenomenality) and “knowledge” result from, and eventually guides, the sublation of disparate phases or wholes (both biological and mental). The “*form of organized physiological functioning*”, is what Harris considers *conscious behaviour* (2000, p. 180).²⁰⁶

(5) *Anticipation of Neurophenomenology* – Harris (1965) argues that while insights from phenomenology have significantly influenced psychologists, their insights have been overlooked by philosophers. Towards a unity of phenomenal experience and the analysis of behaviour he again appeals to the gestalt conception of a psychical field. Harris argues that the perceived “units” of sensation must not only be considered dialectically related to its gestalt, but that this field is likewise inseparable from the spatiotemporal world:

For the alleged datum, be it colour-patch, sound or tweak of pain would not be the whole of what was presented but would necessarily occur against a contrasting background and in succession to contrasting predecessors. In awareness there are no mere blanks, the absence of stimulation is itself a stimulus. Consequently, the so-called sense-datum cannot be taken as separable from its spatio-temporal context together with which it makes up an organized field (p. 322).

In this vein, Harris contends that the *unit* of mind must be the differentiated field of awareness as a whole. Thus he recognizes that the epistemic aim to “build up our knowledge of the external world from atomic data” is one that has long overstayed its welcome (p. 324).

Harris argues that mental organization is “continuous with biological and biological with physical”. Each he maintains reveals “some active *nisus* to wholeness and integration recognizable even in the spatio-temporal matrix of the physical world. The principles sought are those of polyphasic unity, no less immanent in the operation of the physical laws than in the exercise of conscious mind” (p. 341). In consequence he finds that the activity of mind involves both practical behaviour and cognitive processes, each characterized by its own scientific methods, and each inseparable from the other within a sufficient theoretical account of consciousness:

²⁰⁶ As with the emergence of preceding scales, Harris claims that such “integration” is analogous to the unity of disparate lines into a solid shape (2000, ff. p. 178). Keeping Bohm’s analogy of the fish tank in mind (1980, p. 237), though he does not appeal to the particular term, it may be helpful for later discussions to recognize that emergence of this kind results in an expansion of *dimension*. I return to this issue in § 8.2 below.

There is no reason to regard either of these methods as superior to the other in scientific rigour [...] neither the behavioral nor the phenomenological approach is sufficient by itself. Each demands and illuminates the other, as is to be expected if the object of study is at once both a pattern of movements and a form of experience (pp. 341-42).²⁰⁷

(6) *Anthithetical Ontologies* – Harris recognizes the relations between his own position and a number of alternative theses of mind. First and foremost, Harris holds that the world-view of twentieth century science is radically different from the mechanistic picture that informed Descartes' *dualism* and so the respective views are incompatible (1965, p. 290). Harris disavows the traditional *identity theories* that mind is *nothing but* a neurological process or bodily behaviour because the agreeable *correlation* is insufficient for *causal explanation* (1965, pp. 300-1). If (as discussed above) nature manifests in degrees of holism, then at lesser degrees of integrity qualities "prefiguring" mind should be identifiable (1991, p. 107). Harris argues his thesis is also incompatible with Alexander's *emergentism* because positing a disparate supervening quality "breaks the continuity of evolutionary process" (1965, p. 309). He admits that his monistic account bears resemblance to *panpsychism* in "its insistence on continuity between the graded phases of self-specification of the organizing principle, which is universal to the entire scale" (1991, p. 107). Panpsychism is dismissed however, because on Harris's account the Concrete Universal is considered non-mental, since mind requires "a special and specific degree of wholeness before it emerges" (*ibid*). *Epiphenomenalism* is likewise rejected since by Harris's lights, what mind contributes is influential (though non-causal) for the system that has it (1991, p. 108).

In sum, the emergence of mind is believed to have resulted from the explicative process of self-differentiation "that has been operative throughout, active now with a higher degree of unified complexity and self-determination" (1991, p. 109). Harris holds that "a monistic

²⁰⁷ Harris describes the emergence of a psychical field with the case of awakening from a head injury in a way clearly reminiscent of symmetry breaking: "The state of consciousness described is one of foginess in which vague inhomogeneities gradually emerge, as the field of awareness becomes progressively organized. The first distinguishable elements are sensory, vaguely unpleasant (in this case) and emotionally colored. Then the field becomes bipolar with a self distinguished from a not-self [...] From the first there is some inhomogeneity and vague differences in sensory modalities are felt before the self is distinguished as the subject of the experience. The awakening consciousness is from the start an activity of organizing and distinguishing" (p. 314). In a later chapter Harris clarifies that in these lowest stages of awareness "is the nearest approach to homogeneity in the psychical field that is ever experienced" (p. 331). This again suggests that Harris recognized (on some level) despite his later writings, that to speak of a homogenous sensory field is contrary to his system.

position can be set out, to which the neural-identity theory is a sort of halfway house, which is better able to account for our common experience and which can still accept the dualist's reason for wishing to separate the mind from the body" (2000, p. 168). What Harris means is that while there is nothing beyond the physical, mind is considered irreducible to *bodily behaviour*.²⁰⁸ Nevertheless, at a particular point in the system's development, "self-maintenance of the system is possible only if the organism's activity is informed by the character of the total situation within which it is reacting. At this stage, its organic responses must be so closely integrated that they become fused into a single unity" (2000, p. 176). In other words, self-maintenance is possible if the system is *informed* by the relations necessary for the maintenance of its respective complexity. Here Harris aims to describe bio-physical self-maintenance in such a way that bridges the Cartesian chasm. Hence, he must provide a valid line of reasoning demonstrating how self-maintenance (as a bio-physical process) gives rise to phenomenal awareness (i.e. mental *states*).

7.3 *Ideatum*: The Idea of the Body

In this section I compare Damasio's (2010 and 2003) works with Harris's original (1973, 1995, 2006) arguments that contemporary neuroscience supports a metaphysics of mind based on key principles of Spinoza's system; a thesis Harris maintains follows from the wider metaphysics considered heretofore.²⁰⁹ In addition I compare these results with more recent enactivist theories. My aim is not to defend a particular interpretation of Spinoza, nor to establish soundness of the resulting theory of mind, but rather to demonstrate a common and coherent thread that runs through the works considered, i.e. a *Spinozian embodiment*.

Harris finds Damasio's (1994, 1999, and 2003) works particularly illuminating (unlike Flanagan and Dennett) because Damasio "makes no attempt to deny or explain away consciousness" (2006, p. 63). For Spinoza, Harris explains, there is a distinction between *attributes* as apparent aspects of nature, and *Substance*, which is the actual monist reality. "Body and mind are one thing (*res*), one entity, not two. They are substantially one and the

²⁰⁸ For a summary of Harris's approach to the problem of mind, see the below appendix § V.

²⁰⁹ In Spinoza's system mind and matter emerge as *aspects* of a singular fundamental *Substance* that is God. My reasons for excluding God from the discussions that follow are (i) I maintain that at its core, insofar as Harris's logic relies upon Spinoza's reasoning, it can be reduced to a NM without any loss to the force of his resulting system; (ii) to my mind much more argument is needed to conclude that the neutral Substance is *Godly* than either Spinoza or Harris provided; and (iii) space prohibits my sufficient consideration of this issue.

same; but the essence of the one substance is expressed differently under different attributes, and what is, under the Attribute of Extension, a body, under the Attribute of Thought, is an idea or mind” (1995, p. 53). In a similar vein, Damasio writes that by “keeping separate levels of description” he is not endorsing substance dualism but instead appealing to Spinoza’s “*aspect* dualism” (2010, p. 44). Both Damasio and Harris vehemently refute the homunculus, direct realism, and Cartesian dualism. Toward this end they depict the mind in terms of what Spinoza calls the *ideatum*.

Positing an interpretation of perception and learning in line with embodied cognition, Harris claims that “perceptual discrimination of objects is not an immediate revelation but a skill which we learn in early infancy by a gradual process [...] an activity of organization, of selection, of distinction, correlation and synthesis in which objects are constructed out of the deliverances of feeling” (1965, p. 336). As noted above, he here claims that feelings and their synthesis are fundamental to mind. Following Spinoza, he later argues mind is the idea of the body, “not the conception of the body, nor its mental image, not a complex model of its physiological functioning constructed by abstract scientific thinking, but the feeling or self-sentience of the body – sensory-awareness...” (1995, p. 63). Bodily feeling is thus “the basic level of consciousness” (2006, p. 111).

Importantly, in one of his earliest texts on Spinoza, (drawing from the Ethics II, xiii) Harris noted that despite our perceptions to the contrary, an implication of the *ideatum* is that, “when one speaks or thinks of oneself as ‘feeling’ other bodies (e.g. tactually), it is only when and because one experiences a specific sensation in some part of one's own body” (1973, p. 81). Harris hereby recognizes that our sense organs are transparent to the subject. Positing that the body is primary in awareness means questioning our very *conception* of bodies beyond our own in all cases – not merely those in which we suspect that our body is *malfunctioning*.

The mind is the idea of the body as a whole, not only of the nervous system; and, no doubt, different physiological activities are reflected in it by differences in idea, but the awareness of the body that constitutes the mind is not a clear and distinct idea of the body and its internal processes, but (at any rate, in the first instance) a confused idea (pp. 82-83).²¹⁰

²¹⁰ Indeed this interpretation of Spinoza is corroborated by van Bunge, *et al* (2011), who explain that for Spinoza “All knowledge of the human body (E2p19), the human mind (E3p23) and the external bodies (E2p26) begins with affections of the body” (p. 145). What Spinoza called our confused and fragmentary knowledge of the first kind (E2 p. 29).

If awareness is fundamentally of what is being processed through the body then the *idea* that generates our conception of self and world is mistaken because we do not have awareness of its nature in Substance (thus we require some method of clarification). Harris proposes that Damasio's *protoself* is a neuro-cognitive analogue of the *ideatum* (2006, p. 64).

Damasio (2010) agrees that "the body is a foundation of the conscious mind. We know that the most stable aspects of body function are represented in the brain, in the form of maps [...] located below the level of the cerebral cortex, in [...] the upper brain stem" (p. 14). What Damasio calls "maps" are "not a mere copy, a passive transfer from outside the brain toward the inside" (p. 44). Rather, maps consist of interoceptive, proprioceptive, and exteroceptive *primordial feelings* that together compose the first stage of his model of consciousness, what he calls the *protoself* (pp. 51-52). Damasio claims the operation of upper-brain-stem nuclei are responsible for bringing the body to mind, which "is the ultimate expression of the brain's intrinsic *aboutness*, its intentional attitude regarding the body" (p. 63),

Importantly, Damasio maintains that over time mappings of the body permanently influence the body itself. This he claims, is because "neurons are about life and about managing life in other cells of the body, and that that *aboutness* requires two-way signalling" (2010, p. 62). Such feedback systems Damasio believes to be based upon a "biological value" ever working toward *homeostasis*, whether in the case of a cell, an individual or a social system. This value, he maintains, has shaped neuronal evolution and is so fundamental as to deserve the "status of principle".²¹¹ Although Damasio denies *mind* to individual cells, in addition to *value*, he grants that *intentionality* and *will* are evident in neurons (p. 25). In consequence, he recognizes that by granting intentionality to neurons, the "body-brain separation" appears "somewhat exaggerated since the neurons that make up the brain are body cells..." a point, he recognizes, that has significant "bearing on the body-mind problem"

²¹¹ "Biological value has influenced the evolution of brain structures, and in any brain it influences almost every step of brain operations. It is expressed as simply as in the release of chemical molecules related to reward and punishment, or as elaborately as in our social emotions and in sophisticated reasoning. Biological value naturally guides and colors, so to speak, almost everything that happens inside our very minded, very conscious brains. Biological value has the status of a principle" (Damasio 2010, p. 17). On Harris's (1965) account, biology reveals a "value judgment" under the guise of "survival value", which has become a criterion of success in evolution. This, he claims, has shown that value is "consequent upon auturgic wholeness." He goes on to argue that if we identify the intelligence of "social interaction and theoretical formulation" with the same self-organizing *nisus* heretofore considered, we are justified in holding intelligence to be superior in in the scheme of evolution (pp. 425-26). Clearly this is all consistent with the findings of chapter 6 above.

(p. 203). In this vein, self-maintenance may be a means to bridge the mind-body chasm if, as Damasio contends, the process by which cells of the body maintain life is one of self-sentience, a process that gives rise to our felt conception of self and world.²¹²

Both Damasio and Harris follow Spinoza's (*Ethics* II) conception of "*idea ideae*", or the idea of ideas. Damasio considers this to be crucial for "representing relationships and creating symbols" and he holds that it "opens a way for creating an idea of self" (2003, p. 215). He goes on to claim that the most basic kind of self (in humans) is a "second-order idea" because

it is based on two first-order ideas—one being the idea of the object that we are perceiving; the other, the idea of our body as it is modified by the perception of the object. The second-order idea of self is the idea of the relationship between the two other ideas—object perceived and body modified by perception. This second-order idea I call self is inserted in the flow of ideas in the mind, and it offers the mind a fragment of newly created knowledge: the knowledge that our body is engaged in interacting with an object (ibid).

In neuro-cognitive terms, this may correspond to Damasio's later discussion of *reentrance and recursion*, which refers to signals that in addition to "going forward along a single chain, also returns to the origin, looping back to the ensemble of neurons where each element of the chain begins" (2010, p. 60). This is part of what he calls the "massive interconnectivity" of "mind-making regions" in which, "a high complexity of cross-signalling is achieved, a feature that in the case of the cortex is amplified by cortico thalamic interlocking" (ibid).

Harris appears sympathetic to this approach, but he is philosophically more fine-grained in his discussion. Harris claims the 'active' idea of the human body

is conscious of itself, is self-reflective and so self-transcendent, because being idea it is (*ipso facto*) *idea ideae*. Thus it can grasp in idea the relation between ideas and the structural principles of configurations, which are registered in, but not apprehended by, bodies as such. This reflectiveness (as we are told in TdIE) enables the human mind to clarify itself of confusion and to make its knowledge adequate (1995, p. 86).

Consciousness thus obtains iff the self-sentience of the body is *capable* of becoming about itself (i.e. meta-cognition or knowing that one knows). This manifests as a *judgement* of one's relation to their objects but does not involve an infinite regress of ideas. Such a regress, Harris asserts, is not only unnecessary for consciousness but also impossible in practice

²¹² These assertions are particularly interesting considering that Damasio makes no mention of AE in his (2010, 2003, or 1999) works, and offers only brief agreement with Varela *et al*'s (1991) *The Embodied Mind* (2003, p. 308; and 1994, p. 234).

(1973, p. 88). Rather (in my words), this judgment involves a cognitive *decoupling of object from background that is coincident with negation*, thus permitting on-going clarification of a self-world relation.

What follows from this recurrent picture of cognition Damasio calls the ‘not even *unpopular* view’ in neuro-psychology that mind begins in the brain-stem (further supported by cases of hydranencephaly). The philosophical implication of the proto-self is thus a monistic view of consciousness described as a continually regenerated neurobiological state, one identified with the *homeostatic* process that generates feeling-centered maps of the body-in-relation. The body is thus conceived: “as the rock on which the protoself is built, while the protoself is the pivot around which the conscious mind turns” (Damasio, 2010 p. 15). Mind, for both Harris and Damasio is achieved when the idea of the body effectively becomes *self-referential*, thus achieving a greater level of constraint on the dynamics of the body. In what follows I consider how this line of thought conceptualizes emotion in comparison with more recent accounts from AE.

7.3.1 Sensorimotor-Enactivism and Affectivity

On Harris’s (1965) account, cognition is not “all there is to consciousness for every cognition is, at the same time and by the same token, emotionally toned and conatively propulsive” (p. 367). In clear anticipation of sensorimotor contingencies, “perception” Harris maintains, “is conditioned and limited by the organic neuro-muscular conditions of sensibility and the spatio-temporal circumstances of the percipient” (p. 429). He avers that muscular tensions and bodily movements “do (perhaps always) accompany thinking and that internal problem-solving and reasoning are sometimes assisted, though at other times hindered, by them” (p. 440). However he recognizes that “some thinking occurs even in the absence of specific muscular tensions”, which brings him to conclude that “there is a sense in which we think with our whole bodies, but it is because thinking is the organization of total behaviour, not the functioning of special organs” (ibid).

What is meant by ‘organization’? In his later (1988) work, Harris elaborates this point by arguing that there is a “close association of cognition with impulse and emotive tone [...] even in the coldest and driest theoretical speculations of developed consciousness”; and consciousness, or perception, cannot “emerge independently of instinctive urges and the biological needs” (p. 81). Developing upon his interpretation of the *ideatum*, Harris holds that cognition is dependent upon emotions that are further developments of underlying biological

needs. Hence on his view, emotion serves as an organizational constraint that facilitates both biological survival and cognitive awareness.

With regard for Spinoza, Harris elaborates that just as the body is an “active metabolic and physiological system” (by maintaining dynamic equilibrium) for Spinoza, the idea is not a passive replica of its object, but an “activity of thinking” (1995, pp. 53-54). He goes on to say “self-sentience of the body, what for Spinoza is the idea of the body, includes everything of which I am sensuously aware; and it is from this, and on this as foundation, that all my ‘ideas’ of whatever kind are elaborated” (1995, p. 55). Following Spinoza (*Ethics* III), the physical *affects* such as joy and desire are primary, with the *passions* considered secondary and constructed out of these *ideas*. Again, it is because our ideas are fragmentary that our practices result in error and suffering (1973, ff. p. 113). That is, “they are only partial and leave out significant aspects or factors belonging to the objects they present” (1995, p. 59).²¹³ To ground his view in neuropsychology, Harris appeals to Damasio’s conceptions of the *somatic marker*, *convergence-divergence zones* (CDZ), and *core-self* respectively (2006, pp. 72-79).

On Damasio’s account, the body (and structures with which it relates) acts as a distributor of cognitive functions, speeding up reaction time by using physiological cues corresponding to cognitively constructed “*dominions*”. Following William James, Damasio claims the mind distinguishes such dominions of body, mind, past, and present by attributing emotions and feelings to their perception, feelings that serve to separate self from not-self.

The somatic marker does not need to be a fully formed emotion, overtly experienced as a feeling. (That is what a “gut feeling” is.) It can be a covert, emotion-related signal of which the subject is not aware, in which case we refer to it as a bias. The notion of somatic markers is applicable not just to high levels of cognition but to those earlier stages of evolution. The somatic marker hypothesis offers a mechanism for how brains would execute a value-based selection of images and how that selection would translate in edited continuities of images. In other words, the principle for the selection of images was connected to life management needs (2010, p. 123).

Similarly, Thompson (2007) has argued these “emotion-based signals” or “affects” serve as an “allure” operating prior to conceptual or conscious information processing in order to differentiate our field of awareness into a “dynamic gestalt or figure-ground structure” (p.

²¹³ Note the connection between what is here considered the inadequacy of ideas and what has above been discussed as the MPF. See van Bunge, *et al.* (pp. 282-83) for a more detailed reading of Spinoza’s conception of the *passions*.

374). Following Thompson, Maiese (2014) contends this produces a “caring-contoured mapping of one’s surroundings, so that one can immediately focus one’s cognitive attention. This serves to directly bias the competition for processing resources in favor of information one feels is important” (p. 237). By implication, Maiese concludes in apparent agreement with Harris that to the extent AI systems

fail to exhibit the dynamics of living systems, they are not self-regulating, autonomous agents, and their sense-making is not physically grounded in autopoietic and metabolic processes. Thus, there is good reason to think that they cannot have emotions like ours and are incapable of making sense of their surroundings via affective framing (p. 239).

Neurologically speaking, Damasio proposes that *convergence-divergence zones* (CDZs) are formed through a subject’s neuronal *dispositions* to respond to certain stimuli in characteristic ways based upon the strengthening or weakening of synaptic connections over time. More specifically a “CDZ is an ensemble of neurons within which many feedforward-feedback loops make contact” (2010, p. 101). CDZs receive “feedforward” connections from “earlier” sensory signal-processing networks and also sends reciprocal feedback signals to those areas. Additionally, CDZs project “feedforward” signals to regions located in the next connectional level of the chain and receives signals from them.

Damasio holds that the activity at the end of the processing chains occurs within what he calls a “dispositional space”, made up of microscopic CDZs *and* macroscopic convergent divergent regions (CDRs) in the *association cortices*. These regions are supposedly not engaged in image-making but provide necessary assistance for this process. Though the dispositional space (e.g. in *anterior medial temporal cortices*) contains what are called *grandmother neurons* “whose activity correlates with the presence of a specific object”, Damasio holds that this activity does not in itself create recognizable mental images of objects and events without successive *retroactivation*: “To recognize or remember our grandmother, we must reinstate a substantial part of the collection of explicit maps that, in their entirety, represent her meaning. Like mirror neurons, so-called grandmother neurons are CDZs” (p. 107). Thus, for Harris, AE, and Damasio, experiences such as ‘a grandmother,’ cannot be isolated from the affective and neurological contexts within which they arise, nor can they be reduced to individual neurological states.

Establishing the second stage of Damasio’s argument, he proposes the *core-self*: “a pulse of core self is generated when the proto-self is modified by an interaction between the organism and an object and when, as a result, the images of the object are also modified [...]

the modified images of object and organism are momentarily linked in a coherent pattern” (p. 127). This is to say that a momentary *sense of self* is possible when a subject’s bodily sensations are influenced by an object such that both CDZs and CDRs are altered by the subject’s association/identification of the object-in-relation to oneself. Again, this appears as a more detailed account of what may be considered a *constraint* instantiated by *attentional judgement* (§ 7.2, arguments 2 and 4).²¹⁴ Thus, Harris appears justified in claiming “corroboration” of what he considers Spinoza’s position, in that “perception is not simply the reception of a ‘datum’ but is an active interpretation of the sensory input requiring at least implicit judgement” (2006, p. 74).

Following Merleau-Ponty, Brender (2013) relates sensorimotor theory to his conception of symmetry-breaking in a manner that is further supportive of Harris and Damasio’s conceptions of embodiment. Cognition, he argues, is contingent upon the asymmetry of an environment, upon which a body may act, and without which, the organism will receive no perceptual answer to the questions posed by its motor movements. In this way, bodily movement underwrites what he considers “the original ‘transformation’ [...] in the body’s perceptual field”, one that brings a meaningful world into being:

The particular asymmetries a body perceives will depend on its particular way of moving, the unique motor habits it has developed over the course of its life. As our movements become more complex and asymmetrical, so too does the world we perceive. Thus the organism and its world grow together dialectically, each driving the other to become more articulated and determinate through its own increasing determinacy. This is the growth of sense: the self-articulating field of differences that make a difference to the organism (p. 271).

Connecting Brender’s comments to the above discussion, I suggest that for AE it is precisely the primitive feelings of the proto-self, *together* with their sensorimotor couplings to the environment that undergoes symmetry breaking, which gives rise to a core-self characterized by particular affective and cognitive capacities. Indeed, a growing body of experimental evidence and theoretical works are revealing that conceptual content is often

²¹⁴ I fully appreciate how massive the philosophical terrain concerning the nature of ‘self’ actually is, and thus how drastic a leap I am making by moving forward in the discussion. Indeed innumerable texts have been devoted to defining the concept and Harris certainly took pains to elucidate what he meant by self (e.g. 1965, pp. 315-32; 1987, pp. 83, 117, **238**, 259; 2000 ff. p. 250; 2006, ff. p. 111). Unfortunately this topic requires too deep a divergence into phenomenology and neurophenomenology than I currently have space to consider. Thus what little more is offered on this topic in the following section will have to suffice for my present purposes.

constituted by sensorimotor and affective systems, rather than disembodied abstract symbols.²¹⁵ As Robbins (2013) argues:

affect serves what were traditionally believed to be purely cognitive functions. These functions include the consolidation of memory, anticipation of the future, evaluation of the other people and things in the world, and, especially, through the integration and modulation of the process of the transduction of sensation into complex perceptions, the production of a personally meaningful world—a world articulated explicitly by phenomenology but which is lived primarily at a preverbal, implicit level of awareness (p. 6).

In this vein, Gallagher (2014) contends that enactivist accounts based upon sensorimotor contingencies (e.g. O'Regan and Noë 2001; Noë 2004) are far too narrow due to their “neglect of the relevance of the affective aspects including proprioceptive and kinaesthetic aspects — factors that should be of high interest since they derive from movement and contribute to one’s practical grasp of sensorimotor contingencies” (p. 234). Gallagher argues that while our affective states are explained by and dependent upon operations of the rest of our body, an affective state such as hunger significantly influences cognitive judgments and sensorimotor abilities. While the subject’s environment affords various possibilities for action, each has an affective price tag: “One thus not only has a practical (sensorimotor) understanding of accessibility, but an affective take on that same accessibility [...] a perceptual sense of the ease or difficulty of making something present” (p. 236).

As Thompson (2015b) summarizes, the nervous system enacts a self/not-self distinction through a relational process established between *effluent motor signals* for action and the *reafferent sensory signals arising from action*:

On one side lies a unique sensorimotor perspective that constitutes the subject of perception and the agent of action. On the other side lies the environment as the meaningful locale of perception and action. In this way, sensorimotor I-making and sensorimotor sense-making arise together and are inseparable; they’re dependently co-arisen (p. 334).

²¹⁵ For example, writing in the context of EM theory, Niedenthal, *et al.* (2014) have found “the body’s reproduction of parts of an emotional experience constitute conceptual content for emotion. The words “disgust” and “interest” are not mentally grounded by disembodied symbols but are grounded by parts of the bodily state that are re-enacted to support perception and thought” (p. 247). See Colombetti (2010 and 2013) for further details concerning affectivity, phenomenology, and AE; see Pessoa (2015) and response articles for an extensive discussion on the *cognitive-emotional brain*. For an overview of *affective neuroscience* see Armony & Vuilleumier (2013).

At this point it is clear that the Spinozian embodiment to which Harris appeals can be more technically established by Damasio's neurological conception of the emergence of core-self, which can in turn be further philosophically articulated by AE. On this view, feelings, affect, and emotions are not dissociable kinds of process from those capacities commonly considered cognitive, such as reasoning. Moreover, higher-level cognitive capacities reliant upon recursive thought (*idea ideae*) may be both dependent upon and constituted by affective sensorimotor associations. With these sentiments, Harris's place within the AE camp is increasingly evident. However, positing cognition in these terms requires that Harris and others must address to what extent the world is *constructed* by our participation – an issue to which I return in chapter 8. What remains to be clarified in the following section is how Harris relates to the embedded thesis. It is through this consideration that his proposed relationship between self-maintenance and consciousness may be further elucidated.²¹⁶

7.4 *Conatus*: The Self-Preservation of Consciousness

According to Harris, Spinoza's *conatus in suo esse perseverandi* denotes the constant effort inherent in all things, to persevere in their own being, an effort to increase their power of action, which provides the incentive for self-improvement. "Accordingly, the effort to persist in one's own being is *ipso facto* the endeavour to act solely from one's own essence or nature" (1995, p. 58). At the human level of organization Harris contends, "*conative efficacy*" occurs as an enfoldment of simpler feelings manifesting as "emotional states" that are "consequent upon the disturbance of equilibrium" (1965, p. 324). So for Harris, the very same self-preservation identifiable in living systems occurs in and through the self-organization of emotions, which (purportedly) permits the complexity of human function. "If this is remembered" he finds, "much misleading talk confusing organic and psychological tensions with mechanical pushes and pulls may be avoided and many mis-conceptions entertained in machine-theorizing may be corrected" (1965, p. 325).

Anticipating later embodied and embedded conceptions of active meaning-making (such as *affective allure* mentioned above), Harris makes two particularly important points that exemplify the *conatus* of human consciousness: (i) In perception "[l]ong-standing sets may be

²¹⁶ For further research concerning the *Foundations of embodied cognition* today, see Fischer & Coello (Eds) (2016), volume 1 *Sensorimotor and emotional embodiment* and volume 2 *Conceptual and interactive embodiment*.

established which will determine definite perceptual dispositions, as when, for instance, a distant dust cloud is seen by a general as the movement of troops, by a herdsman as a movement of cattle” (1965, p. 402); (ii) “empathic elements may be contributed by past motor responses (e.g. the appearance of a hill as ‘rising’, or a road as ‘winding’). Thus the general set or adjustment of the organism determines the way things appear and emphasis is placed upon the active integrative and organizing process involved” (p. 403).

So for Harris there is “no such thing as ‘pure observation’”, and perception is a process by which the subject non-consciously *projects* previously constructed assumptions and generates hypothesis that are either confirmed or disconfirmed so as to revise their original assumptions (1965, p. 416). As a means of philosophically interpreting this gestalt conception, Harris appeals to Spinoza’s contention that causation of any kind between the attributes and their respective modes is denied; “Ideas cannot cause motions nor motions ideas” (1973, p. 85). However, he argues ideas are “not epiphenomena” since they can become “genuine actions of the mind and are identical in substance with bodily acts involving motion conducive to the health and preservation of the bodily organism” (ibid). Hence, on this account, the *constraint* of emotions on the basis of *self-maintenance* leads to the emergence of a conscious *self*. To connect his theory to contemporary neuroscience, Harris appeals to Damasio’s “autobiographical-self.”

The third stage of Damasio’s argument, the autobiographical-self develops as an aggregate of the core-self and is necessary for all the most characteristic qualities associated with consciousness such as identity and self-awareness through time. Accordingly, this cognitive function (responsible for our use of knowledge recorded in innumerable external mediums) is generated when identifiable “objects in one’s biography” stimulate the core self to produce a “large-scale coherent pattern” (2010, p. 127). He claims that this occurs in two stages. (1) A significant set of “biographical memories must be grouped together so that each can be readily treated as an individual object” (p. 150). These networks are then capable of modifying the protoself and re-producing the core-self. (2) Due to their complexity, the brain needs devices capable of coordinating the relevant recall of memories with respect to identifiable objects, situations, etc.

From a neural standpoint the coordinating process is especially complicated by the fact that the images that constitute an autobiography are largely implemented in the image workspaces of the cerebral cortex, based on recall from dispositional cortices, and yet, in order to be made conscious, those same images need to interact with the protoself machinery, which, as we have seen, is largely located at brain-stem level (ibid).

The autobiographical self, Damasio contends, involves capacities of memory and reflection that depend upon networks across numerous neurological and bodily strata. However he further notes that biographical memory “depends on the brain’s ability to produce not only mental representations that imitate reality slavishly and mimetically but also representations that symbolize actions and objects and individuals” (2010, p. 206).

At this point Harris diverges from Damasio’s conception of the autobiographical self for its reliance upon representations but follows Spinoza in what he claims is a *nominalist* position (1973, p. 95). In a later work Harris notes, “it is to the neurophysiologist, who is conscious of the neural activity and its consistent relation to something, and to us who perceive the image, that the relation is represented. There is no implication that the function of the brain is representation” (2006, p. 65). He goes on to point out that even if such representations were permitted, we will remain puzzled by “how such codes could be decoded to present an image to the conscious subject” (p. 66).²¹⁷ His concern is that the brain cannot be responsible for management of the (autobiographical) self because this involves “assessment of circumstances and decision”, neither of which seems explicable in terms of representations by neural states (p. 68). In an earlier work he argues the subject must make some kind of distinction between the concept as remembered and the object it represents, between the present remembering and the past remembered – what is essentially an act of *judgment*: “To do all this, my remembering cannot be confined either to the present event or to the past but must transcend both, as well as the relation between them” (1988, p. 88). With these contentions, Harris denies that self-awareness is to be either *spatially* located in neurological states or *temporally* located in phenomenal representations of a particular moment.

Harris’s solution to this problem of locating the idea of the self may be considered in a number of steps. First, following Spinoza, Harris maintains “sensations in themselves are neither true nor false...” (1973, p. 91). Error, he explains, consists in our omitting something without our awareness that is pertinent to the idea that we affirm. “It is in virtue of this unrecognized omission that the idea we affirm is confused. Error, for Spinoza, therefore, is

²¹⁷ He later complains that for Damasio, not only is the brain representational but “all thought consists of images” and “all thinking and acquired knowledge, for him, is conscious” (2006, p. 66-67), a position that Harris is unwilling to accept. For his part however, Damasio does appear to avoid criticisms concerning representation and the non-conscious in his later work: “Nuclei are filled with ‘dispositional know-how,’ the sort of knowledge that does not require detailed mapped representations” (2010, p. 62).

mere privation or abstraction – the omission of essential fact or implication...” (p. 92). Consequently, no idea or feeling represents something in the world since “what is felt is not just the original activity by itself [...] it is in intimate organic relation to the whole enviroing universe” (2000, p. 180). Second, Harris claims perceptions (somatic and kinaesthetic) are “interpretations of impressions in the light of their context and past history. This is a perpetual process of judging [...] measured by its coherence and self-consistency” (2000, p. 192). I discuss this resulting coherence theory in § 8.3.1, but for now it is only important to orient Harris’s rejection of ‘representations.’

In consideration of Steiner’s (2014) thorough analysis of enactivist arguments against representationalism, Harris presents himself as advocating for the most extreme of positions: (i) against the *role* of representation in cognition and bodily function, i.e. against mind independence; (ii) against the *formats* of representation, meaning functions like language, meaning memory retrieval and problem solving are not abstract representations; and (iii) against the existence of representations in the world (pp. 44-46). In contrast to classical cognitive theory, nothing can represent anything else in dialectical holism because such signification depends upon the knowledge of an entire system within which the *particular relation* may be *sufficiently* individuated. In other words, nothing can be representational, nor correspond to anything *in and of itself*, unless it were constructed to do so at the level of the system-as-a-whole (e.g. by *observers*). In the latter case, claiming something is *representational* is to provide no more than a mere tautology.²¹⁸ As proponents of AE recognize however, taking this position does not conflict with *methodological representationalism*.

Harris concludes that self-awareness is achieved not only through “brain activity” but is also “inseparable from social activity” (2006, p. 69). He goes on to argue that Damasio’s conclusion that self-awareness depends upon sociality is not strong enough because it still permits us to say that judgment is represented by neural states:

²¹⁸ In the context of memory, Bechtel (2009) contends that “information is often encoded in a very distributed fashion in which there is no single locus for the engram” (p. 25). He goes on to explain that one consequence of this distributed representation scheme is that the representations or memories are “subject to catastrophic interference as the learning of new information alters the connections that maintained the previously learned information” (ibid). Hence, even if we admit the term *representation* in philosophical discussion, it may not actually serve much if any explanatory purpose given how dynamic brains and worlds actually are.

A moral point of view is possible only for a self-conscious mind, which is aware of the self in its social relations and can make judgments of right and wrong that may induce it to oppose its own instinctual inclinations. How and where patterns of neural transmissions in the brain bring about such self-conscious reflection is puzzling enough [...] but that such patterns could themselves amount to moral judgments [...] hardly makes sense (2006, p. 69).

Bearing in mind the discussions from §§ 7.2 and 7.3.1, the basis of such judgement must be the feeling of self-organization and preservation of *the system as a whole*. At the level of human consciousness, judgements of the *whole* (being within a social context) fall under the heading of morality. Though Harris does not make all of them explicit, three contentions follow: (i) sociality can obtain iff subjects establish “a moral point of view”; (ii) if self-awareness depends upon sociality, a moral point of view is necessary for self-awareness; and (iii) if moral judgements are *constituted* by social relations beyond the brain, self-awareness is irreducible to neural states.²¹⁹ In the next section I consider this line of reasoning in greater detail so as to clarify Harris’s conditions for self-awareness.

7.4.1 Embedded Persons and Responsible Minds

For Harris, elucidating the *conatus* of humans involves an analysis of *responsible action*, what he calls the activity of reason that becomes possible only for reflective, self-conscious beings, or *persons*:

Personality and self-consciousness, however, develop only in a social setting and are elicited only through communication with other people, recognized equally as rational agents. Responsible action is, therefore, social action, and its performance presupposes social relations and social structures (1988, p. 107).

²¹⁹ Unfortunately I do not have space to elaborate the fascinating empirical evidence to this end but the following summarizes two relevant lines of reasoning. In evolutionary neuroscience, Striedter (2005) has argued that the last significant burst of brain growth for *Homo sapiens* 100,000 years ago was not due to a change of diet or genetics alone, but “altercations with fellow humans” that spurred language and culture (ff. p. 318). In evolutionary psychology, Corballis (2007) maintains that there is a link between the FOXP2 gene mutation and the mirror system (Broca’s area), proposing that this mutation has provided a means to incorporate vocal control into (and thus depended upon) our abilities to mirror physical actions. “It provides further evidence that the FOXP2 mutation was the final stage in a series of adaptations that allowed speech to become autonomous” (p. 585). Additionally see Richerson, *et al*’s., *Not by Genes Alone* (2005).

He goes on to argue “history is the self-knowledge of mind [...] on the grounds that to know oneself is necessarily to be aware of oneself as a social being, and that requires the *a priori* concept of the historical past” (1988, p. 133). In a Spinozian context, Harris elaborates what he sees as an implied coherence theory:

inadequate ideas, if properly supplemented and set in proper context, approach the truth [...] There they are fully adequate, completely filled out, and fitted into the web of their actual relations to all others. The nearer ideas approach to this completeness (as is equally the case with their *ideata*) the more reality, and the more perfection, they possess (1995, p. 59).

Taking these points together, proper self-consciousness can obtain (and be *maintained*) only on a *moral* and *historical* basis: that is, networks in which a given agent faces pressures to establish judgments concerning the actions and dispositions of other agents with cognizance of historical context. Achieving *adequate ideas* further implies the agent is capable of re-cognizing their *identity* (self-relation) with respect to other agents and alternative points of view with increasing systematicity. Perhaps another way to understand this proposition (§ 7.2 argument 4) is to say consciousness obtains iff the ideatum establishes a relation to (becomes about) some socially constructed MSE and cognizes *judgments* about this relation. Here I claim Harris has moved into the domain of *situated cognition*.

Providing general support for Harris’s position, Damasio and others have argued that in the absence of emotionally charged somatic markers (as in subjects with damage to the vmPFC), the subject is incapable of effectively determining moral value of outcomes. This emotional impairment leads to moral malfunction, which supports the position that rationality is insufficient for moral reasoning (Strejcek, *et al.* 2014). Concerning morality and cognition, after reviewing a range of empirical studies on social isolation after (relatively) normal development, Doris and Nichols (2012) have concluded that “[r]ationality is not only socially *developed*, it is socially *sustained*; in many domains, optimal reasoning occurs when the reasoning process occurs as part of a social process” (p. 434).²²⁰

Following Husserl’s *phenomenology of culture*, Havelange (2010) contends that empathy reverses the *natural attitude*. Comprehension of the “Other” he maintains, comes not from apprehension of an objective body. Rather empathy provides a “substrate of immediate meaning” that permits the communicative intention of the Other to engender a corresponding

²²⁰ On the extreme, famous examples abound in social psychology of mal-development resulting from severe neglect in children that has been shown to arrest moral and reasoning capacities associated with human consciousness (Itard, 1802); (Spitz, *et al.*, 1949); (van der Horst, *et al.*, 2008).

intent in the subject. The shared bodily and linguistic expressions he maintains, enables the subject “to intuitively understand the experience of the Other by ‘putting myself in his place’ and to predict his behaviors” (p. 344). Similarly, Thompson (2015b) argues that social cognition, perspective taking, and empathy are closely related to the ability to cognize the self/not-self distinction. He finds that “being able to think of oneself as a self seems inseparable from being able mentally to grasp an outside view of oneself, that is, from the vantage point of the other” (p. 345). In defending this stance he appeals to studies from developmental psychology arguing

these two mental abilities arise together and build on the capacity for shared or joint attention. Joint attention emerges around nine months of age and comprises the threefold structure of a child, an adult, and something to which they know they are both giving attention. It includes activities such as gaze following (reliably following where one or the other person is looking), acting together with shared objects (such as toys), and imitative learning (the child’s acting on or using things the way adults do) (pp. 345-46).

He concludes that “self-experience emerges from I-making processes that are fundamentally social and intersubjective” (p. 347).²²¹

In contrast to *theory of mind* (ToM) approaches that emphasize mind reading, Gallagher (2014) argues that the *mirror neuron* system is activated not merely as imitation of another, but *anticipation* of another agent’s behaviour. He defends what he calls *the predictive coding model*:

Intersubjective interaction is not about mindreading the mental states of others, but about directly perceiving their intentions and emotions in their postures, movements, gestures, facial

²²¹ Harvey *et al.* (2016) have maintained that interactivity reveals a shortcoming to the enactivist conception of operational closure: “where enactivism describes agent-environment relations in terms of in-the-moment coupling, we assume these relations play out on multiple heterogeneous timescales, such that in many cases – perhaps most – agency is fundamentally distributed” (p. 235). Their worry appears to be satiated by considering Thompson’s (2007) appeal to *generative phenomenology* that “concerns the historical, social, and cultural becoming of human experience” (p. 33). He goes on to claim “To investigate the life-world as horizon and ground of all experience therefore requires investigating none other than generativity – the process of becoming, of making and remaking, that occurs over the generations and within which any individual genesis is always already situated” (p. 36). Evidently Harris’s conception of historical cognition is in deep agreement with, but perhaps not as technically developed as generative phenomenology.

expressions, vocal intonations, etc., as well as in their highly contextualized (by physical environment, social roles, culture, etc.) actions... (p. 238).²²²

These sentiments are in line with AE (and dialectical) evolution as described above, in that cognitive capacities do not arise through intrinsic or genetic alterations alone, but in and through behaviour, which in the human context is necessarily social, moral, and emotional. Concerning the importance of historical cognition, in Bayesian terms, Gallagher (2014) holds that neurological dynamics of anticipation are hierarchical, involving synaptic inhibition “based on an empirical prior—something that depends on the organism’s previous experience and context-sensitive learning” (p. 241). He holds that neural states are to be understood not as holding intrinsic content, but rather as being meaningful only in and through the agent’s history.

Moreover, it is the historical environmental interaction (beyond the brain) that provides the means for and determines ongoing processes of “top-down synaptic inhibition”:

Such inhibitory patterns constitute a prediction which is then matched against ongoing sensory input. If there is a mismatch, i.e., if the new stimulus generates a different firing pattern than the one anticipated, prediction errors are sent back up the line and the system adjusts dynamically back and forth until there is a relatively good fit (p. 241).

This dovetails with Harris’s view that modification of connections sufficient for anticipating future processing relies upon both prior processing and constraints across numerous spatial scales. In agreement with both Bohm (1980b) and Silberstein & Chemero’s (2015) ENM (§ 2.5 above), Gallagher maintains the “explanatory unit” of perception, cognition, or action, should not be considered the brain, nor some number of brains in social interaction,

but a dynamic relation between organisms, which include brains, but also their own structural embodied features that enable specific perception-action loops involving social and physical environments, which in turn effect statistical regularities that shape the structure and function of the nervous system (p. 242).²²³

²²² See Clark (2016) for further details concerning *prediction theory* in embodied cognition.

²²³ Interestingly Harris recognizes that the bi-polarity between self and not-self is not black and white because on occasion, “the body, or part of it, is excluded from the self; at others the self may come to include what, in different circumstances, would be regarded as parts of the not-self” (1965, p. 338). While this and other lines of reasoning concerning the *noösphere* (1991, pp. 139, ff. 149, 173; 1992, pp. 3-4; 1988, pp. 149, 151) and *collective mind* (1995, pp. 90-91) leave open the possibility of further discussion with contemporary arguments in *extended mind/sociopoiesis*, unfortunately space prohibits my addressing this issue in greater depth.

How then, does this line of reasoning conceive of *self-awareness*? Harris claims that the capacity of a cognitive system to ‘extricate itself’ so as to grasp an entire structure as a whole means that mind is self-transcendent. The problem is that the *self* remains ephemeral because it must be capable of grasping and he maintains, *going beyond* a differentiated whole of experience, and thus cannot be for itself an *object*: “no such judgements and no awareness of relations could occur without a subject who transcends the single terms of the relationship” (1991, p. 142). For Spinoza, Harris writes:

Ideas, so far as they are the awareness of finite extended things, involve the awareness of the limits which define their objects, and such awareness *ipso facto* surpasses those limits; for if it did not it could not be an awareness of them. Thus the self-awareness or idea, of the body, by its very ideal nature, transcends the limits of that body both spatially and temporally (1995, p. 66).

Importantly, Harris does not mean to claim that self-awareness is actually *ideal* in a Platonic sense. Rather, the conscious subject cannot be part of its gestalt, nor the sum total of bodily parts at any one time because for Harris (and AE), *it does not even exist at any one time or place!* Harris concludes that while the self is dependent upon and partially constituted by relations with its world, its transcendence of these relations is required to afford knowledge of the world.²²⁴ This means that for Harris and AE, the *explanatory units* of mind are relations across both spatial and temporal scales: “Human experience is always continuous, not discrete; embedded, not isolated; temporal, not eternal” (Gallager 2015, p. 115).

Harris’s concluding remarks regarding the *conatus* reveal important insight into how he believed the process of mind could be depicted as continuous with that of evolution:

The *conatus* produces reactions to [the passions] in the endeavor to preserve the self, which take the form of appetites and desires accompanied by the appropriate emotions. But the *conatus* is the endeavor of the thing (*res*) – in this case the human being – to maintain itself in its own essence [...] The *conatus*, therefore, is, in its proper and most adequate expression, the endeavor to increase the power of action of the human self. Ideas corresponding to action (as opposed to passion) are always adequate ideas, and the power of action is the power of reason. Accordingly,

²²⁴ Indeed Damasio says, “The oddest thing about the upper reaches of a consciousness performance is the conspicuous absence of a conductor before the performance begins, although, as the performance unfolds, a conductor comes into being” (2010, p. 16). Similarly he finds this implies that “No single mechanism explains consciousness in the brain, no single device, no single region, or feature, or trick, any more than a symphony can be played by one musician or even a few” (p. 17).

human nature is twofold [...]: it is both subject to passion and is capable of action; it is both appetitive and rational (1995, p. 102).

In summary, for Harris the conative effort of self-preservation that characterizes consciousness is one of historical sensitivity and social relatedness; it is an effort to increase freedom via self-knowledge. Consciousness then involves the effort by an agent to become *about* one's own aboutness by becoming increasingly sensitive to the (endogenous and exogenous) unconscious dynamics that instantiate their gestalt. For AE and Harris, awareness of this kind provides a means to regulate otherwise endogenous passions and vicissitudinous environments. What Harris attempted to convey, I maintain, is that the *self-preservation of consciousness* is the same process of *internalization* or *broadening of phenomenological horizons* posited in dialectical evolution, with the only difference being a matter of scale. I submit that the arguments from Harris and recent proponents of AE can reach the common conclusion that for humans, the *conatus* is to be identified with the capacity to re-cognize one's momentary ideatum *as socially situated*. This process results in increased *freedom* and stands as a necessary condition of consciousness: *Conscientia est ego-transcendentia ad infinitum*.²²⁵

7.5 Conclusion

Towards establishing a connection between self-maintenance and consciousness Harris has argued that sensations “are differentiations of feeling or sentience, which supervenes on a certain high degree of integration of physiological functioning involving specially integrated patterns of activity at lower levels” (2000, p. 178). He notes that the “lower levels” consist not only of neural discharges “but probably all, or most of, the metabolic and physiological functions of the body” (ibid). While he recognizes the importance of the nervous system and brain, he claims, “the whole system of the organism is involved” (2000, p. 179). Moreover, as discussed above, the process of consciousness is considered inseparable from social networks and historical context. Accordingly, self-awareness is identical not with any neural process taken in isolation, but with the form of one's living, historical, and social *lifeworld* as a whole.

In § 7.3, I have highlighted Harris's anticipation of Damasio's neurological model of mind and sensorimotor enactivism. With Harris, Damasio has recognized the relevance of many of

²²⁵ For a summary of this argument for *Spinozian Embodiment*, see the below appendix, § V-a.

Spinoza's concepts for contemporary neuropsychology (such as *ideatum* and the centrality of emotion). However, I have argued that Damasio's appeal to representations at the level of the biographical-self is incompatible with both Harris and AE. In clear agreement with Harris's conception of the self, enactivists give emotional affect a central role in their theory of sensorimotor cognition. This convergence of ideas was further exemplified in § 7.4, concerning Harris and AE's arguments that social, moral, and historical relations are partially constitutive of self-awareness.

With this convergence of ideas having been established I am now in a position to evaluate Harris's revision and naturalization of the *crucial problem*: "It is not a matter of bridging the gap between first-person revelation and third-person description [...] What needs to be overcome is the chasm between third-person description of brain functioning and third person description of conscious awareness" (2006, p. 60). What remains to be seen is the extent to which the above *descriptive model of mind* (neuropsychological-heuristic) can be expanded into an *ontological explanation*. Toward this end, in accordance with his above (§ 7.2) conception of (3) *the scale of forms*, Harris appeals to DST, thus in the following chapter I examine the possible fruits of this approach.

Chapter 8

Bridging Philosophies of Consciousness and Cosmology – The Implications of Harris’s System

8.1 Introduction

In the previous chapter I elucidated Harris’s neurocognitive model for the emergence of consciousness. Harris took pains to show that the findings of contemporary sciences were most efficiently systematized by appealing to metaphysics of process, dialectical relations, and a series of unifying principles. With these conceptual guides he argued that it is possible to discuss both “subjective” and “objective” phenomena without being hindered by the Cartesian Chasm. Additionally, he argued consciousness can be considered continuous with evolution (as discussed in § 6.3.1). What remains to receive a head-on treatment in this final chapter is Harris’s argument for a naturalization of mind and knowledge within the holist metaphysics considered heretofore.

In § 8.2, I outline Harris’s appeal to DST in neuroscience and his anticipation of theories depicting consciousness as “phase of matter.” Here I consider possible implications this proposition has for AE. In § 8.3, I reconsider the TAP in light of Harris’s response to the hard problem and highlight some consequences this theory has for a naturalization of knowledge. Here, I suggest Rapoport’s (2011) and Rosen’s (2008) conception of *Klein Bottle Logic* serves as a suitable analog of Harris’s reasoning and extension of AE’s appeal to *second-order science*. In the final § 8.4, I elucidate Harris’s contention that *consciousness is a scale* and argue that the resulting model reveals a *cosmological dimension* for the enactivist paradigm.

8.2 Consciousness as a Phase of Matter

In this section I clarify the ontological status of consciousness within a dialectical holist framework. In his later work Harris reiterates his above (§ 7.2) contention (3), that if mind and neural activity are the same phenomenon, merely described with different languages (as

the dual aspect theorist claims), “there must be some similarity or common character in their ‘logics.’ They must be mutually convertible in some way, as mathematically isomorphic calculi are mutually convertible” (2000, p. 171). What is this common language? As previously discussed, Harris posits an ontology of self-organizing scales, each dialectically related and inseparable from the Concrete Universal that embodies the form of Nature. Specifically, the process by which this scale of forms undergoes self-differentiation is considered to be the very same process that instantiates consciousness. In this way he believed we could establish a common language between phenomenal and material processes.

Consciousness, Harris argues, occurs through a *graded scale*, in which earlier grades of presumably lesser complexity “can exist without the later, but not *vice versa*.” Hence, “thought and intellect” are unnecessary for earlier phases such as locomotion and appetite, but these capacities cannot develop without the “lower vital functions” (2006, p. 98). As previously discussed, the lower and higher functions taken together establish Harris’s *conditions of consciousness* (2006, ff. p. 150):

- (1) Self-organization (entropy management);
- (2) Embodiment (sensorimotor affectivity and implicit judgment);
- (3) Interrelation with other organisms (normativity/selection);
- (4) Organization of emotions (the explicit judgment of one’s gestalt); and
- (5) Modification of one’s gestalt/world-view (“adaptive thought” of a *transcendent ego*).

Following from Harris’s original conception of *auturgy* toward consciousness, phenomenal awareness is by this reasoning understood as emerging through a graded scale. The complexity of cognizance is considered a range of “self-specification” from greater to lesser homogeneity (i.e. symmetry-breaking) of the “psychical field” (1991, p. 109). Attention, he claims, is established through the construction of “a figure-and-ground datum”, that differentiates the life-world or Gestalt of attention in the same manner as that found in the physical world. Each involve “the same organizing activity as that operative throughout nature [...] It is the same organizing principle that integrates the physical cosmos and unites the biosphere, which unifies conscious experience and ensures the integrity of the experienced world” (1991, p. 132). He goes on to claim that “all are mutually continuous dialectical phases or specific forms in the necessary self-differentiation of the universal totality” (ibid). By essentially appealing to nominalism, Harris arrives at his TAP: if consciousness is a scale of nature, then it is considered a necessary phenomenon within the

history of the Universe. Hence what remains to be established is an argument that depicts the function of consciousness (as depicted heretofore) as one such scale.

Contrary to the brain/hardware, mind/software argument of the 80's and 90's that attempted to paint a "grandmother neuron" picture of neuronal activity, Harris maintains that contemporary science has depicted brain function as holistic. "The sensory cortex was found to be hierarchically responsive, successive layers reacting to more detailed and refined characters of objects presented" (2006, p. 83). Neurons, he maintains respond dynamically under varying condition and are in a continuous flux of death and regeneration. This he believed "undermined the pixel interpretation of neural performance" (p. 84). Population coding suggests that the average firing strength of neural populations, rather than individual neurons, were correlated with consciousness. This implies, "neural reactions were not so much digital as global. They were integrated and inseparably conjoined, so that groups acted as wholes to produce their output" (ibid). Harris argues that a far more accurate approach to the science of mind going forward is DST.

Harris finds that in order to represent neural activity computationally, due to the incredible sensitivity of the brain, adjustments have to be made in the measurements relating input to output, which seemed so small as to make no intelligible difference to the outcome of calculations. Chaos theory becomes relevant in this context because it has "discovered that the minutest difference in initial conditions could, in the course of non-linear processes, result in enormous deviations in the eventual outcome" (2006, p. 85). He goes on to say that what appeared on the surface to be chaotic was in fact a complex order emerging from the total process guided by a strange attractor. "It was impossible to explain the consequent effect by analysing the process and reducing it to disparate items. The organizing principle of the whole is what determined the detail of the total structure" (ibid). Citing the non-linearity of "re-entrant" feedback loops and their subsequent cascade affects, Harris posits that "the reaction of the brain to any input is never predictable as is the response of a computer" (p. 86). Thus, Harris finds that chaos provides viable methodological approach for neuropsychology.

In this vein, Harris appeals to Edelman and Tononi's (2000) work, which argued the synchronicity of neural firing patterns, rather than specific neurons or nuclei, explains for example how object recognition may be achieved.²²⁶ Harris finds that memory is most

²²⁶ Harris may have gone too far in positing "that theories of artificial intelligence can throw little or no light on how the brain operates, any more than they can on what I have said is the crucial problem" (2006, p. 87). He

adequately conceptualized by the dynamic core because it has been found to arise through the collective efforts of numerous “scattered nuclei” throughout the whole brain and changes in accordance with the subject’s experiences. “It is dynamic, not static; that is, it has not only developed over the time of maturation, but is continually changing with varying experiences and learning” (2006, p. 88). While the dynamic core is meant to model the contents of consciousness, Harris believed it to “occur as one undissectable operation”, in which conscious acts both constrain and are dependent upon peripheral non-conscious goals, emotional cues (i.e. value systems), learned motor functions, etc. (p. 89).²²⁷

For Harris, the emergence of self-consciousness in and through this *dynamic core* is considered the “actualization of the potentialities of all the earlier stages, each successively matter to the next as form” (2006, p. 98). Harris maintains this relationship is “analogous to that between a magnetic field and the molecular structure of the body from which it emanates” (2006, p. 146; see also 1991, pp. 105-6). As with earlier scales,

the human mind is the form (or idea - *eidos*) of the human body, a highly organized complex phase of matter, incorporating all prior stages in the scale of forms. Yet as a composite of matter and form the living human being is one substance only, not two, as the wax and the impressed pattern are one and the same thing (2006, p. 99).

Again, he holds there is no causal “transition” from neuronal function to consciousness, but that awareness is an “enfoldment” of the organism as a whole, “a phase transition occurring when a critical threshold is reached of complex integral unification” (p. 161). In line with my above analysis, Harris thus proposes that consciousness is a field, phase of matter, or further instance of ϕ , whose mode of formal governance is *for the sake of* the intellect and *adaptive thought*. In the following sections I evaluate this position with respect to more recent works.

maintained that without a programmer there is no program, without an informed observer there is no behaviour, read out, etc. To judge an algorithm as intelligent or not, meant for Harris, presupposing an intelligent creator. Following Penrose’s (1989) appeal to the Gödel theorem, he maintains that we must be able to determine whether or not the system is capable of non-computable *insight*, short of this no test will suffice (1991, p. 118).

²²⁷ Following Greenfield (2000) and McCrone (1999), Harris (2006) claims that imaging technology of contemporary neuroscience has provided support for his argument that there is no one-to-one correlation between function or phenomenal experience and brain region, nor does any one region represent an experience. Rather, experiences must be understood as global processes wherein the brain regions that constitute awareness execute their functions through their interplay with one another and the body as a whole.

8.2.1 Neurodynamic Field Theory

In recent years, dynamic systems theory (DST) has become increasingly useful for numerous sub-disciplines of psychology. This paradigm provides an overarching framework for investigating the dynamical activity associated with consciousness across multiple space-time scales (Cosmelli, *et al.* 2007).²²⁸ Specifically, *dynamical neural fields* (DNFs) have been useful for studying processes of individual behaviour, development, learning, and environmental constraints. In what follows, I review evidence that DNF provide support for Harris's (§ 7.2) contentions (3, 4, 5) and with respect to the previous section, permits consciousness to be treated as a phase of matter.

In accord with Harris's appeal to the irreducibility of a *dynamic core*, DNFs are holistic in that it is usually not "known exactly where the processes modelled in the DNF take place in the brain, and it may even be doubtful whether any single neural population exists that behaves exactly as the dynamic field does" (Schneegans, *et al.* 2008, p. 252). Consequently, the "functionally significant states of such complete systems emerge as attractor solutions from these dynamics under the appropriate circumstances [...] These functions are not fixed and they do not 'sit somewhere' until activated. They are simply emergent properties of the dynamical system" (p. 268). Accordingly, brain connectivity reveals a "hierarchy of scales" from local neuronal circuits to functional topological networks, the dynamics of each "determined not just by processes at that scale, but by processes at other smaller and larger scales as well" (Richardson, *et al.* 2014, p. 46). DNFs thus arise from multiple distributed areas whose net evolution of stable activation patterns reveals an "interaction dominant system", the components of which cannot be treated in modular terms (p. 48).

DST is therefore complementary with situated cognition, for it depicts the organism as obtaining in and through numerous (spatio-temporally) coupled levels including the nervous system and environmental task context. The brain is thus conceived as "a very high dimensional, complex-dynamical system, built neuronally, but potentially coupled so closely to the environment through its own effector and sensor systems that these become part of the dynamical system" (Schneegans, *et al.* 2008, p. 268).²²⁹ Because interaction-dominant

²²⁸ For example, concerning *neurodynamics and electrocortical Activity*, Minelli (2009), summarizes: "The spectrum of EEG activity is usually divided in the following bands: delta, 0 to 4 Hz; theta, 4 to 8 Hz; alpha, 8 to 12 Hz; Beta, 12 TO 30 Hz; and gamma, 30 to 80 Hz" (p. 76).

²²⁹ The goal for those working in DST is to identify the tasks and elementary behaviours, through which such dynamic structures can be identified, "in which projection from the high dimensional state space into much

systems are irreducible, some authors have maintained “the cognitive system in question is not encapsulated within an individual brain or even an individual body [...] When human-tool or social cognitive systems are complex dynamical systems with interaction-dominant dynamics, they are extended cognitive systems” (Richardson, *et al.* 2014, p. 48). This idea is clearly consistent with many of the above contentions (§§ 2.5, 7.4.1) for extended and situated minds.

In accord with Harris’s above (§ 7.2) contention (5), a growing number of theorists in recent years have argued DST provides a method applicable to both physical and phenomenological dynamics. In their introduction to *Chaos and complexity in psychology* (2009), Guastello, *et al.* explain synergetics in a way that recapitulates *formal governance* (§ 5.3): “The emergence of a hierarchical structure follows the same mathematical and physical dynamics as a phase transition, such as the transition of a solid to a liquid” (pp. 24-25). Moreover, supporting a possible extension of ϕ to consciousness, Hollis, *et al.* later contend “the brain and body” may be considered “excitable media” stimulated to create autocatalytic “*traveling waves* or *solitons*” – “temporarily invariant structures that exist as coherent, ordered entities within the space and energy of an excitable medium” (p. 212). They explain such waves do not reduce to components of the nervous system, but are “emergent phenomena” within a hierarchy of constraints: “Constraints are accrued through idiosyncratic experience, and constraints are implicit in the immediate context. Constraints are aspects of biology, culture, history, context, or current states that narrow down the possibility for cognitive activity, prior to its occurrence...” (p. 214). It is unsurprising then that Renaud, *et al.* (2009) have found agent-environment coupling can be characterized by fractal patterns, in which stable forms can be represented by specific attractors and repellers that in turn guide an agent’s behaviour (p. 182).

In a clinical setting, Van Geert (2009) agrees that the levels of childhood development are best understood as highly dynamic attractors represented by a fuzzy logic (i.e. a function of continuous rather than discrete membership). As attractors, he holds, stages of development

lower dimensional subsystems is possible” (Schneegans, *et al.* 2008, p. 269). What the mathematics of dynamical systems describes is the temporal evolution of state variables “governed by a field of forces, the vector field, which specifies for every possible state of the system the direction and rate of change in the immediate future” (Schoner, *et al.* 2009, p. 454). Besides claiming that nervous systems can be modelled by differential equations, DST reveals that the functional states resulting from nervous, sensory, and motor system couplings are best captured by attractors and thus fall into a special class of dynamical systems, called “dissipative” systems (pp. 456-57).

are most comparable “to the phases of physical matter (gaseous, liquid, solid)” (p. 262). These stages are “defined by the developmental system’s major order parameter”, which is captured by brain maturation and habitual skills developed within the subject’s niche. He finds the difference between phase transitions of a substance and the emergent self-organized criticality of complex systems such as embodied-embedded brains, is that for the latter, the phases are *possibilities* rather than necessities – the stages are thus *metastable*. As Hollis, *et al.* (2009) explain, whereas self-organization, by itself ends in an attractor state (e.g. fixed point, limit cycle, Taurus, or strange), humans by contrast, appear to be drawn to *metastable states* of self-organized criticality, “that dance in the neighbourhood of attractors without fully realizing them...” (p. 218). Such states have more recently been identified with what Van Orden, *et al.* (2011) call *pink noise*, which reveals *fractal patterns* between random (white noise) and over-regular (brown noise). “Pink noise is a fundamentally complex phenomenon that reflects an optimal coordination among the components of person and task environment” (p. 629). They explain that deviations from this optimum occur when learning a new skill, in advanced aging, and disease.

In this vein, Dixon, *et al.* (2014) have argued that the classical approach to cognition has proven incapable of accounting for the generation of new cognitive processes, including novel means of problem solving. Towards a more fruitful approach they suggest that “[e]ffects in physical systems, including those within biology, must be understood in terms of the flow of energy and matter” (p. 163). They argue that a truly embodied cognition requires that interactions are understood as a result of “energy consumption”, and so should the quantities we measure, which provides what they call a “common currency across all scales of the system and environment, as well as explicit connections to thermodynamic laws” (*ibid.*)²³⁰ They conclude that the generation of new macroscopic cognitive functions is most adequately defined as *phase transitions*:

²³⁰ Concerning the relationship between neuroanatomy and cosmology, Cherniak (2009) has found certain biological structures have originated “directly from simple physical processes, without need of DNA involvement” (p. 371). An example of this is the way in which nature solves the *Steiner tree problem*. According to Cherniak’s research, the brain solves this problem “via a lucky if counterintuitive factoid of computational geometry, that embedding dominates over topology; topology can in effect be ignored at comparatively little cost [...] Neuron arbors solve their minimization problem to within a few percent of optimality, about as well as nonliving arbors, such as river drainage networks...” (pp. 372-73). Interestingly, this is to say that brains achieve volume minimization “via the same basic fluid dynamic processes as do water networks” (*ibid.*). Indeed, this should come as no surprise given the findings from §§ 5.2 and 6.2.1.

Phase transitions are well understood theoretically, and have been broadly demonstrated empirically in a wide variety of systems [...] Our work shows that the formation of new cognitive structures shows the same signatures as in other embodied, physical systems. That is, an increase in fluctuations as the transition point approaches... (p. 168).

In an effort to *live away the problem of mind*, neurophenomenology utilizes DST as a means of modeling neurological and phenomenological dynamics in terms of trajectories of states within correlated but irreducible phase spaces (Robbins & Gordon, 2013). Treated as a complex system, the global state (for either phenomenal or neurodynamic domains) is captured by a single point in some number (n) of independent variables that together compose an *n-dimensional state space*.

A sequence of such states followed in time defines a trajectory, also known as the system flow. The shape of the flow is determined by the system's intrinsic dynamics — the forces that push the system state in one direction or another, depending on where the current state is located. They can be thought of as constituting a kind of landscape over which the behavior of the system moves. An “attractor” is a trajectory in phase space to which the system will converge from any set of initial conditions (Van Quyen 2010, p. 256).

By this methodology it can be seen that *phase transitions* and *symmetry breaking* are applicable to both phenomenological and neurological domains. The result is that these domains are conceived as “homologous”, mutually informing state spaces characterized by a common evolutionary trajectory or “landscape”.²³¹

For autonomous dynamical systems, the global shape and evolution of the landscape are determined by order parameters (*constraints*) created by collective interactions among the individual parts of the system, which in turn govern the behavior of the individual parts. Intentional constraints however must be added to those already present in the environment and linked to boundary conditions (like those prescribed in a laboratory). “Once again, in a circular causal manner, the intentions modulate the control parameter, which in turn maintain (or modify) the intentions” (Renaud, *et al.* 2009, p. 183). DST entails that intentional

²³¹ Concerning its practical application, Van Ouyen concludes that in the case of seizure research, neurophenomenology can provide a significant advance in our understanding of the disease. What must be remembered however, is that “the efficiency of this approach needs a continuous circulation between the field of phenomena revealed by the patient's experience and the correlated field of phenomena established by the neurodynamics [...] this circulation can be based on a state space strategy, revealing homeomorphisms linking the topologies of phenomenal and neuronal states” (p. 261). The research, he maintains, reveals a “co-determination” between respective domains.

constraints permit perceptual-motor coordination *on a time scale larger than that of body movements* and thereby “modulate the intrinsic dynamics of the order parameters linked both to the flow of information and the flow of motor control. By so doing, they define an attractor capable of guiding motor behaviour toward the desired pattern” (p. 183).²³²

Tschacher, *et al.* (2009) point out that this circular causal structure (synergetics) bears important implications for the nature of intentionality. They argue “emergent mental properties *do indeed matter*”, and cannot be “epiphenomenal” because this conception of synergetics “is applicable to both sides of the mind-body gap, and may even put forward ways to bridge this gap...” (p. 329). Likewise, Van Orden, *et al.* (2011) have argued (continuous with *formal governance*) that DST may naturalize intentionality:

We have proposed that intentions affect behavior as constraints, not causes. Intentions as constraints are temporary dynamical structures, soft assembled from interdependent components to function in control parameters to create critical states [...] Constraints are therefore no less natural or no more magical than causes, or the convectional cells of the atmosphere that change the weather. Thus the complexity account makes progress toward naturalizing intentionality (p. 657).

This section has shown how the tools and methods of DST, when applied to the study of mind reflects Harris’s (§ 7.2) central ontological claims (3 and 4) and support his contention that the mind is an instance of ϕ . For DST, mind is principally characterized by constraints arising from the organization of a series of irreducible forms, indicated by *phase transitions*, attractors, and *fractal dynamics* across numerous spatio-temporal scales (for further details see Steyn-Ross, *et al.*, 2010; Di Ieva, 2016). Concerning Harris’s methodological contention (5), neurophenomenology utilizes multi-dimensional phase models as a common language for bridging first, second, and third person accounts of consciousness. While the above is merely

²³² Schoner, *et al.* (2009) find that DST accounts for the capacities of openness to learning, adaptation, the differentiation of skills, patterns of behaviour, and the emergence of novel functions that take place across numerous time scales: “DST makes it possible to talk about the continuous temporal evolution of processes, their mutual or unidirectional coupling and decoupling, and their coupling to sensory or motor processes” (p. 453). Importantly, this is possible without appealing to abstract, symbolic and or computational representations of goals and actions. The system needs only to couple its neural control system driving its motor behaviours to the dynamical neurons that receive sensory inputs about environmental elements of attention. Localized activation peaks of DNFs thus replace the units of representation by acting as “the attractor solutions of dynamical systems that describe the temporal evolution of activation fields” (p. 462). As opposed to information processing or connectivism, learning is not downloading a function but “a process that eases the constraints on the environmental and task conditions under which a function may emerge” (Schneegans, *et al.* 2008, p. 268).

a crash course in the application of DST to neuroscience, the strongest argument for mind as a phase of matter is in many ways opposed to the enactivist paradigm. In what follows I consider this proposition in light of what I consider the dialectical holist response.

8.2.2 The “ Φ ”, Phase, and Scale of Consciousness

Following Tononi’s *integrated information theory* (IIT) as a means of naturalizing consciousness, Tegmark (2014a) contends that “consciousness can be understood as a state of matter, “perceptronium” with distinctive information processing abilities” (p. 1). According to Tononi (2012), IIT can be essentially captured with four axioms:

1. *Information axiom* – every experience is specific, each is what it is by differing in a particular way from a wider repertoire of alternatives. Additionally, a mechanism in a state must “specify either selective causes or selective effects” (e.g. inputs and outputs), so as to generate *cause-effect information* within the system (p. 297). Tononi explains that in ontological terms, the information postulate means that “from the intrinsic perspective of a system, only differences that make a difference within the system exist” (ibid).

2. *Integration axiom* – each experience is unified and is irreducible to independent components. As an ontological postulate, this means that only information that cannot be partitioned into independent mechanisms or components (irreducible in the past and the future) *exist in and of themselves*: “Integrated information (Φ) can be captured by measuring to what extent the information generated by the whole differs from the information generated by its components (minimum information partition MIP)” (p. 297).²³³

3. *Exclusion axiom* – every experience is *definite* by being limited to particular things and not others and flows at a particular speed and resolution, i.e. only experience that have definite borders, temporal, and spatial grain, exist intrinsically. From this Tononi claims a mechanism that specifies only one *maximally irreducible* set of past causes and future effects is considered a *concept*. A *complex* is a maximally irreducible set of concepts. Its concepts signify a maximally integrated conceptual information structure. As an ontological postulate this means that only entities that are “maximally” irreducible exist in themselves (p. 297).

²³³ The reader should bear in mind that Tononi’s original symbol for integrated information is a capitalized phi, whereas my symbol for Harris’s unifying principle or scale of Nature is the lower case version used heretofore.

4. *Identity theory* – when in a particular information integration state, the *complex* becomes necessary and sufficient for a *quale* of experience. In this way there is an ‘identity’ posited between the phenomenological and causal-informational aspects of a system:

an experience is a maximally integrated conceptual information structure. Said otherwise, an experience is a “shape” or maximally irreducible constellation of concepts in qualia space (a quale), where qualia space is a space spanned by all possible past and future states of a complex. In this space, concepts are points in the space whose coordinates are the probabilities of past and future states corresponding to maximally irreducible cause-effect repertoires specified by various subsets of elements (p. 298).

Although he does not address Tegmark’s work, Thompson (2015b) takes issue with Tononi’s IIT because to his mind, it incorrectly renders consciousness “an abstract informational property” when consciousness must be understood as “a concrete bioelectrical phenomenon” (p. 343). Thompson argues further that

consciousness can’t be instantiated in an artificial system simply by giving the system the right kind of computer program, for consciousness depends fundamentally on specific kinds of electrochemical processes, that is, on a specific kind of biological hardware. This view predicts that only artificial systems having the right kind of electrochemical constitution would be able to be conscious (ibid).

Given the previous discussions, Harris’s theories of mind are in clear agreement with Thompson’s contention. Hence, despite Harris’s appeal to Tononi’s work, current IIT only dovetails with Harris’s idea to the extent that it supports an “irreducible” conception of mind. Tononi’s claim that qualia are the *units* of mind is something neither Harris nor AE can endorse. Tegmark’s more recent work however does partially satisfy Thompson’s worry by emphasizing that consciousness is fundamentally dynamic and requires the right kind of substrate.

Analogous to ‘computronium’ (the most general substance capable of computation), Tegmark suggests ‘perceptronium’ as the most general substrate capable of supporting perception. He argues that if consciousness is a state of matter, it will be possible to identify, quantify, and model its characteristic dynamics despite the likelihood of there being numerous types (just as there are different types of liquid). In a functionalist spirit, he claims consciousness (just like wave dynamics) can obtain in a range of supportive media. Towards this end, Tegmark argues that such a perceptive state of matter must satisfy at least six necessary conditions: (i) substantial information storage capacity; (ii) substantial information

processing capacity; (iii) substantial independence from its world; (iv) it must be integrated, meaning it cannot consist of nearly independent parts; (v) the system is unified such that it specifically records information useful for it; and (vi) the system is *autonomous* such that it has substantial *dynamics* and *independence*, which means “information can be processed with relative freedom from external influence” (p. 2).

Tegmark claims there is a parallel between conceptions of integration in non-living systems with that found in biology. Following Damasio’s (2010) work, Tegmark argues

to be in homeostasis, a number of physical parameters of our brain need to be kept within a narrow range of values [...] this is precisely what is required of any condensed matter system to be near-critical, exhibiting correlations that are long-range (providing integration) but not so strong that the whole system becomes correlated like [...] a brain experiencing an epileptic seizure (p. 5).

Tegmark claims that Φ goes to zero bits as the temperature $T \rightarrow \infty$ on one hand and to one bit as $T \rightarrow 0$ on the other. However, Φ assumes a maximum (>1) at an intermediate temperature that is also near the critical point of phase transition (p. 6). Integration thus requires that memory is relatively efficient (in terms of energy consumption) in both reading *and* writing information. So the system/substance must not be too ridged, like the ordered molecules of gold, meaning it must be capable of complex dynamics, but it must also be more ordered than a liquid or gas. These remarks agree with the findings of § 6.2.1 and so appear to satisfy Thompson’s above concern that consciousness depends upon a *living* substrate.

While Tegmark’s contention that consciousness occupies a unique region of phase space is certainly shared by AE and Harris, another point of disagreement is brought to light with respect to the appropriate *scale* of consciousness. Tegmark argues, “consciousness is related to information processing, not mere information storage”, which means Φ “applies to classical neural networks rather than general quantum systems” (p. 12). Unlike Harris and AE, Tegmark and Tononi believe that the *function* of neurons obtaining at the classical scale should provide a sufficient identification of consciousness. For example, Tononi reasons:

[I]t should be possible to establish if in the brain consciousness is generated by neurons or groups of neurons. In this case the exclusion postulate would also mandate that the spatial scale at which Φ MIP is maximal, be it neurons or neuronal groups, excludes finer or coarser groupings: there cannot be any superposition of (conscious) entities at different spatio-temporal scales if they share informational/ causal interactions (2012, p. 305).

“Integration” is thus appreciated by the dialectical holist insofar as it agrees with formal governance and third-order emergence, but for Harris (§ 7.2), it is a category mistake to identify *measured information* (“mechanism”) *at a particular scale with consciousness*.

For the dialectical holist, it would be possible to use Tononi’s “ Φ ” for *predictive* purposes only if the integrated information is considered an *abstracted signature* taken from a contextually embedded system-as-a-whole. In this case, the degree of “integration” would be *indicative* of formal governance arising in and through the particular history of an embodied, embedded, and living system, i.e. *as an organizational constraint across spatio-temporal scales, not of a particular scale*. It should be noted that this puts an additional demand on the ‘black box’ conception of functionalism: If mind obtains through a particular organization of scales, each can be treated as a black box, but each will also bear *dialectical relations* to those of its neighbours – relations that are considered necessary for the occurrence of consciousness. It is the process of this organization that appeared to Harris to be indicative of the *phase of consciousness*. While it is expected that living bodies and brains will be analysed as unique phases of matter, the *properties* of which must not be *identified* with perception because doing so abstracts away from the total *dynamical system* (the total set of material scales) that instantiates consciousness. This is an interpretation that appears congruent with AE appeals to DFT as discussed above, because the attractor dynamics of behaviour, learning, biological adaptation, and environmental alteration are all considered *partially constitutive of consciousness*.

In sum, although Tegmark and Tononi disagree with Harris and AE concerning the metaphysics of cosmos and mind, all parties can share the common conception of mind as a phase of matter. Additionally, insofar as the integrated information (Φ) of consciousness counts as a *necessitated and irreducible mathematical structure* in Tegmark’s MUH, he endorses a much stronger anthropic principle than he has been able or willing to recognize (in line with my conclusion of § 4.5.2).²³⁴ These revelations warrant much further empirical collaboration and philosophical discussion between IIT and AE paradigms in future works.

²³⁴ Linking the MUH with his theory of mind, Tegmark provides an approach to the *quantum factorization problem* concerning why we perceive the world as a dynamic hierarchy of objects that are strongly integrated and relatively independent (2014a, p. 3). This Tegmark claims is “because a generic Hamiltonian cannot be decomposed using tensor products, which would correspond to a decomposition of the cosmos into non-interacting parts, so there is some optimal factorization of our universe into integrated and relatively independent parts” (pp. 26-7). This factorization is what conscious observers are expected to perceive because the observer is considered an integrated and relatively autonomous information complex. Thus he suggests, “we need a criterion

8.3 Ontological Individuation: *Chasing the Slippery Serpent*

In the following sections, I further unpack Harris's conception of consciousness as a phase or scale with respect to his wider epistemic and cosmological theories. In this section I consider how Harris (or a subsequent dialectical holist) can justifiably refer to the scale of forms as ontological, rather than epistemic, i.e. as merely *conventional* categories. By extension, this means addressing the extent to which Harris's metaphysical arguments provide a means of bridging phenomenal and noumenal domains, thus avoiding Kant's transcendental idealist conclusions. To do so, I first consider two problems resulting from correspondence-driven approaches to a ToE.

Following Rees (1999, pp. 12-13), numerous cosmologists have begun modelling complexity within the cosmos in a way that appears to mirror Harris's scale of forms. Most notably, Carr (2007) maintains that "physics has revealed a unity about the Universe which makes it clear that everything is connected in a way which would have seemed inconceivable a few decades ago. This unity is succinctly encapsulated in the image of the uroborus..." (p. 11). Carr has elaborated this view as follows:

The physical evolution of the universe from the big bang (at the top) through the Pyramid of Complexity to humans (at the bottom) is just the start of a phase of intellectual evolution, in which mind – through scientific progress – works its way up both sides to the top again [...] interpreted historically as representing how humans have systematically expanded the outermost and innermost limits of their awareness... (2006, p. 150).

for identifying conscious observers, and then a prescription that determines which factorization each of them will perceive" (p. 28). While this establishes a research program for identifying the material conditions of mind, it must be recognized that as a mathematical structure, the phase of consciousness is considered inherent within and necessitated by the logic or law of the Universe. On this point dialectical holism agrees.

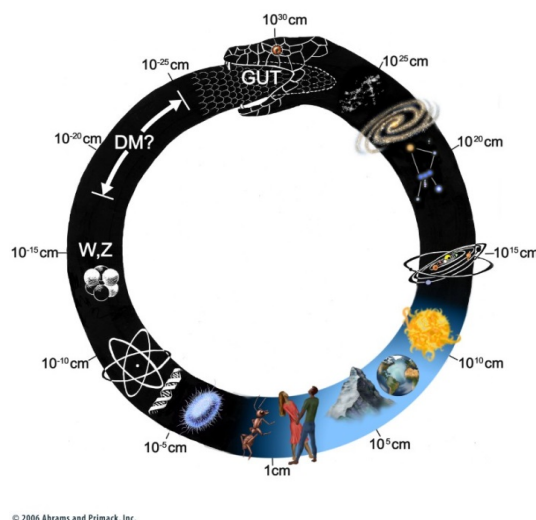


Figure 4 – Uroborus as analogous to Harris’s scale of forms and explicative process. Figure recreated with permission from Primack & Abrams’ (2011). For details on the uroborus see the glossary below.

Here Carr’s (phase-1) top-down process is akin to Harris’s € , while the bottom-up intellectual progress (phase-2) mirrors his conception of cognition as increasingly *internalizing the environment* (§ 6.3.1). Harris’s metaphysical task then, is to establish an ontology of consciousness in relation to this two-phase process.²³⁵

Towards a clarification of Harris’s approach to nature and knowledge, it is instructive to consider Ellis’s (2015) argument for a “holistic ontology.” Ellis proposes that nature may be understood as a *hierarchy of possibility spaces*, each influenced by both bottom-up and top-down causes, all of which considered equally real (ff. p. 6). These include: (i) the matter and forces of physics (p. 237); (ii) biological phenomena (ff. p. 140); (iii) minds and meaning (ff. p. 291); and (iv) computer software (ff. p. 35). Importantly, Ellis contends that all these realms exist independently of our minds and each correspond to a super-space of Platonic possibility:

This Platonic world is being progressively discovered by humans, and represented by our mathematical theories. That representation is a cultural construct, but the underlying mathematical features they represent are not, they are timeless eternal realities whose existence does not in any way depend on the existence of human beings (pp. 365-66).

²³⁵ Interestingly, Rosen (2008) argues that we cannot distinguish between uncertainties of the ‘large scale’ (GTR singularities) and ‘small scale’ (QM measurement problem) because they “constitute the very same limitation” (pp. 31-32). In both cases he claims, the problem is that this uncertainty “entails the collapse of scale” (p. 33).

Although Harris's scale of forms is similar to Ellis's possibility hierarchy, there are a number of important discrepancies. Building upon the discussion of § 5.3, ϕ are to be understood as general classes of spatio-temporal dynamics obtaining through self-organization, phase transition, and symmetry breaking. Much like the *identifiable* scales within a fractal curve however, the regularities (or physical laws) that characterize respective ϕ are *abstractions* from a continuous whole. The emergent laws that obtain in each are possible because of *both intra- and inter-relations of instantiated* ϕ . Ellis and Harris's ontologies are fundamentally at odds because the former appeals to Platonic counterfactuals – that is, to *possible* domains that do not materially exist – whereas for the latter, the (concrete) evolutionary trajectory of differentiating ϕ is all that exist. This means for Ellis the identifiable domains *exist in themselves*, but for Harris, they are nothing apart from a concrete movement, our knowledge of which is ever incomplete.

The principle conflict then concerns the *individuation* of such domains. As anticipated by the discussions of previous chapters, Tegmark (2007) admits that unless we maintain a Platonic position that mathematical structures are real, “discovered” rather than created, there can never be a ToE due to an unavoidable infinite regress: “one is ultimately just explaining certain verbal statements by other verbal statements” (p. 114). Despite his Platonic sympathies, Ellis has recognized two problems concerning a potential ToE. First, the question of whether a given domain (e.g. humanity) is *determined* will not be solved by a ToE, but only “reinforced” because “such a theory would in essence have the image of humanity built into it – and why that should be so is far from obvious, indeed it would border on the miraculous if a logically unique theory of fundamental physics were also a ‘theory of everything’” (2004, p. 634). Second, Ellis (2006a) considers the inability of a ToE to *predict* future theories and experiments results in “the self-referential incompleteness of physics” (p. 756). Indeed, Ellis's worries should be concerning for anyone sympathetic for his ontology.

Ellis has argued that because we cannot reduce or avoid positing domains of various kinds, we should conclude that those defined by our present capacities of observation (i.e. those “discovered” by respective scientific fields) *successfully individuate* corresponding Levels of Nature. This move not only conflates epistemology and ontology (MPF), but also results in our *transcendental problematic*. Hence, Ellis's first worry arises because our ability to “discover” *Platonic domains* assumes the very *bridge* between knowledge and nature (via individuation) that is at issue concerning metaphysical arguments about how (if at all) *mind figures into nature*. In other words, it would not be surprising to find humanity built into a

ToE because this is inevitable for all metaphysics that purport *completeness* without justifying the means of individuation that generates such a system by some metric beyond the system it creates.

This circularity results in a contradiction however, which remains even if we deny a Platonic realm but maintain a correspondence (or representational) theory of truth and reality. In this case, it is believed science should “decrease the degree of discrepancy between objective and subjective” until we acquire a complete picture of nature (Jordan & Day 2015, p. 3). By this reasoning however, “science is metaphysical” in that it “reveals how reality really is” (ibid). This means that the methodological examination of nature is somehow *beyond the physical* in order to be capable of representing it, but in so doing, science escapes its own net – thereby leading to Ellis’s second worry. Hence, by presupposing the capacities of (empirical) individuation we tacitly presuppose what will be taken as *natural*, which separates observer from observed and so undermines our efforts to *discover* a consistent theory of nature-as-a-whole.

In an attempt to turn reductionism on its head in support of his TAP, Harris contends that if physics is successful in reducing the laws of nature to a mathematical *formula*, we will then exemplify Hegel’s articulation of *dialectical reason*: Nature will have become conscious of itself as “pure thought” (2000, p. 37). Although a prospective ToE is not used as a justification in Harris’s system, the above remarks should sufficiently highlight the problem confronting both contemporary physical theory and metaphysics: attempts to systematize the whole of nature appear to result in an awkward circularity such that the form of our epistemology (formalism) justifies our methods of individuation, which provides an ontology (what we believe exists), and thereby justifies our preconceived relation to the world. Consequently, the relationship between Nature (phase-1) and knowledge (phase-2) is tacitly assumed in our individuation practices, and so it cannot be justifiably established by these practices. *As a mere circle, our conception of nature must be recognized as being inherently false.* Despite his rejection of a Platonic reality and representations, it remains to be seen how Harris (and a proponent of dialectical holism) can escape this circularity.

8.3.1 Coherence Theory: Towards a Unity-in-Diversity of Nature

Here I consider some efforts to establish an epistemology that avoids the above circularity and remains consistent with Harris’s system. In contrast to the thoroughgoing commitment to a correspondence theory of reality and truth, Jordan & Day have developed an alternative

coherence approach, under the guise of *wild systems theory* (WST), one that I maintain is consistent with Harris's epistemology and largely implied by AE. I suggest this epistemology can be combined with Clayton's proposal for a plurality of "complexity producing mechanisms," so as to exemplify what, on Harris's account, the relationship is between ϕ of phase-1 and 2.

According to Jordan & Day (2015), appealing to coherence means refusing to begin a discussion concerning reality by assuming "its independence of observers" (p. 1). In accord with my conclusion of the previous section, they go on to say, the "correspondence relation is validated by placing it within an assumed, larger-scale reality [...] the evolved physical world" (p. 6). They maintain however that this "assumption" undermines the realist's thesis. Clearly retracing Harris's reasoning concerning internal relations and reality, they argue that if one maintains

a difference between intrinsic and relational properties, then realism seems the obvious choice; the purpose of science is to uncover the intrinsic properties of reality. If, however, one assumes that relata are themselves constituted of relational properties [...] then there can be no intrinsic properties. This is because the constitution of all properties, by definition, would be re-lational. In short, reality would constitute a unity in which all things were constituted of all things (pp. 7-8).

This notion of reality being infinitely relational is at odds with the correspondence theory because, they contend, such a reality cannot be subdivided into intrinsic properties "in-and-of-themselves". In an infinitely relational reality, all objects and subjects are contextually grounded, so what at first appear to be intrinsic properties are eventually re-cognized as relational.

In agreement with Harris, they argue that if we reject the assumptions of subject-object independence and objectivity being of paramount *value* then,

truth can no longer be measured by assessing the degree of difference between reality and an impression, idea, or representation we have of it, or by investigating an assumed relation we share with it. There exists nothing 'as it is' to which anything else can accurately correspond. The final, ontological description of what something is must include reality as a whole (p. 9).²³⁶

²³⁶ Again, this view is perfectly congruent with Bohm's ontological theory: "It should be clear from the above that we do not expect to come to the end of this process of discovery (for example, in a form that is currently called the 'Theory of Everything'). Rather our view is that nature in its total reality is unlimited, not merely quantitatively, but also qualitatively in its depth and subtlety of laws and processes [...] Our knowledge at any

They claim scientific endeavours should be understood as “modes of experience”, or “abstraction” from reality, which is an “internally related unity in which we are embedded” (p. 11). By “abstraction” they mean science can never be outside of, nor look at reality itself, but is *partially constitutive of the reality it is meant to describe*. Scientific practice then is “conceptualized as a recursion on reality—an abstraction about that from which it emerged and within which it is entailed” (ibid). Hence for WST there is no effort to capture reality as a whole, nor to establish our relation to it from the outside, but only to systematize identifiable relations towards increasing *clarification*.

Consistent with Harris’s € and neurophenomenology, such clarification in WST focuses on “multi-scale, self-sustaining homologies [...] that which is common across the internal and external contexts of an organism; namely, energy transformation” (p. 13). In this way, an organism is conceptualized as “the very energy-transformation hierarchy in which it sustains itself; it is an embodiment of the reality (i.e., context) within which it emerged. In short, it is reality within reality” (p. 14). The topologic of this conception will be considered in greater detail in the following section, but at this point I am only concerned to elucidate how WST establishes “truth.” WST applies the coherence criterion to experience and beliefs by conceptualizing organisms as *embodiments of context* (i.e. as necessarily being *about* their environment in a meaningful way), which avoids the correspondence relation. Truth they claim, is a matter of coherence “entailed within one’s moment-to-moment embodied context (i.e., phenomenology) and across the beliefs one derives from the moment-to-moment flows of embodied context” (p. 16). Coherence is in this vein no less than a criterion for *sustained sensorimotor enaction* across ever widening environmental domains.²³⁷ WST thus considers our phenomenal and larger-scale reality as a single recursive hierarchy of energy transformation that is sustained in and through coherent self-reference – a conclusion that is itself maintained only by its coherence.

In his discussions of emergence, Clayton provides an interesting vein of support for WST that further clarifies Harris’s epistemology. Clayton contends that the theory of emergence is

stage is an abstraction from this total reality and therefore cannot be expected to hold indefinitely when extended into new domains” (1993, p. 321).

²³⁷ In agreement with Harris’s appeal to the *ideatum*, this implies that mental ‘models’ are not representing a reality external to us, but “would have to be stretched to such a point that the organism itself constitutes a model of reality” (Jordan & Day 2015, p. 16). In other words, avoiding an epistemic gap created by representations means conceptualizing the organism “as a self-sustaining prediction” (p. 17).

meta-scientific, necessary for what he calls “integrative ordering” and predicts “that each relation between neighbouring disciplines will exhibit certain general features recognizable across disciplines” (2004, p. 603). In a later (2013) text, he makes considerable efforts toward developing this idea. Here, Clayton is careful to voice criticism of the Unity Approach, which holds that complexity may unify all natural sciences. Clayton contends that we should “resist the Unity Approach to complexity [...] because it obscures a deeper insight that complexity theorists offer into the way that cosmic evolution works” (p. 334).

Clayton argues that we currently do not have a single coherent science of complexity, but a variety of *complexity-producing mechanisms* (CPM) operative at different time scales and observed across numerous disciplines, which provide a “meta-level theory of complexity” (p. 338). Hence, CPM “is meant to produce common ground so that conversations can continue even while theorists deeply disagree about fundamental features of complexity” (p. 340). Importantly, Clayton notes that the common features of CPM can only be identified via comparative studies of their functions in respective empirical fields (i.e. *transdisciplinarity*):

non-symmetrical relations between disciplines of study produce the “ladder” of the sciences. This ladder is temporally indexed and corresponds to the order of cosmic evolution [...] Later fields of study in the process contain all the complexities of earlier fields while adding new forms of complexity of their own [...] To pluralize complexity studies, as the CPM approach does, does not block the natural scientific study of the world but enhances it (2013, pp. 342-43).

Indeed, many of Clayton’s claims concerning the plurality of CPMs have been anticipated by Harris’s €. CPM captures Harris’s message that individuating the respective wholes of nature requires ongoing interrelation and synthesis between disciplines to resolve conflicts and generate increasingly coherent paradigms. Additionally he recognized that our method should be focused upon not merely understanding the “underlying mechanisms” of natural phenomena, but, more fundamentally for metaphysics, also on establishing principles of the “highest” scales of organization depicting “different orders of reality” (1970, p. 369). Bohm (1980b) has likewise echoed this strategy when he maintained that comprehension of an ultimate law of the whole cannot be the “final goal of scientific research”, but rather our goal is to clarify “a movement in which ‘new wholes’ are continually emerging” (p. 137). In a similar vein, as a process of ongoing clarification and revelation of wholes, Clayton is apt to state, “[s]cience’s most powerful ally [...] is emergence” (2004, p. 599). In short, CPM provides a way of establishing metaphysical *unity-in-diversity* across the natural sciences that embraces interdisciplinary collaboration, which may itself generate further disciplines. The

resulting conception of reality is that of an ongoing *becoming of scales* (e.g. a *fractal*), rather than a means of carving nature at its joints (as though said joints existed *prior* to the carving!).

Clayton's CPM appears consistent with WST because theories of emergence are meta-scientific in *organizing domains of observation*, but scientific observation itself does not capture any *part of reality*. For WST, this is because there can be no correspondence test of reality, no intrinsic properties, and science cannot be metaphysical: "That is, if reality is an internally related unity, then theories are constitutive of that reality and can never 'point to' reality as if to do so outside of it. They are, by definition, 'in it' just as we are. Thus, they are, by definition, incomplete" (p. 18). They claim WST provides a way for cognitive scientists in particular to frame their theories and models not as metaphysical tests, but as *pragmatic* tools. Hence, the increased coherence that science affords us provides "more influence over our context; that is, it affords us the ability to more effectively sustain ourselves" (*ibid*). This, they conclude, avoids "distracting arguments" concerning the problem of how the meaning of our concepts, symbols, etc., are to be *grounded*.²³⁸

WST's appeal to coherence is clearly congruent with Harris's own support of this theory. For Harris, respective fields and paradigms of science, just as sense modalities of individual perspectives, progress by differentiation and synthesis – what Harris considered € of social development (1992, ff. p. 1). Harris's conception of "adaptive" or "reflective thought" as ongoing, implies that one's gestalt is never complete, each "represents a stage in the development of knowledge and none can be finally and totally satisfactory short of omniscience" (1970, p. 352). Nevertheless, WST's pragmatic conclusion is *prima facie* at odds with Harris's much stronger attempt to secure a direct-realism about scales:

Coherence is order and organization. We perceive and come to know the surrounding world by organizing the contents of the sensuous field into an orderly and coherent system. The activity that

²³⁸ As opposed to the 'hard naturalism' that resulted from Dewey's system, which eschewed metaphysics and the reality of the subject, following Nagel (2015), Jordan & Day (2015b) argue meaning is "ubiquitous throughout reality" (p. 3) and later, "meaning is constitutive of reality" (p. 4). Additionally however, they contend that we need not appeal to the *a priori*, the transcendental, objective reality, or the absolute (p. 3). It is difficult to imagine how the ubiquity of meaning in Nature can be maintained and idealism avoided, while the transcendental, *a priori*, and absolute are rejected. These moves appear inconsistent but are clarified no further. Harris's holism depends upon the transcendental *a priori* and at least some implications for the absolute. To my mind, any dialectical holist would be obliged to maintain Nature is inherently meaningful because we are inherent within it, but 'meaning' remains an abstraction from the whole.

does this is judgment, and the faculty of reason. It is the same dynamic principle of wholeness that is active at lower levels in the gamut of natural forms, which, in the course of self-specification, has brought itself to consciousness in the human mind, it reveals itself as reason and as dialectically continuous with the organizing principle operative in the physical and the biological phases of reality (2000, p. 248).

Like proponents of WST, Harris proposes that the development of nature (phase-1) and knowledge (phase-2) can be considered a single continuous process.

Towards a reconciliation of Harris's realism and WST's pragmatism, it may be possible to appeal to Brender's ontology of asymmetry. Brender proposes an *endogenous sense* to nature that implicitly supports the PAP as articulated above:

The autoproduction of sense in nature takes place through symmetry-breaking, in which natural wholes articulate themselves into parts or regions, creating differences out of indifference and form out of uniformity. These differences are neither things nor ideas, neither atoms nor artifacts. They cannot be known by a disembodied mind, but only perceived by a living body (p. 272).

Brender goes on to dismiss the prospect of obtaining *a view from nowhere*, arguing that ironically nothing could be more anthropocentric than the efforts of mechanistic science to "strip nature of all anthropic predicates in order to arrive at an account of reality as it exists 'in itself'" (p. 272). In line with WST, CPMs, and my conclusions of the previous section, Brender finds that the mechanistic reductive project has thus failed for deciding *a priori* "how nature is to be divided" (p. 273).

Here again, symmetry breaking provides further illumination of Harris's € by serving as a *neutral base* of evolution (phase-1) and knowledge (phase-2), but insofar as it serves as an ontic conclusion, it nevertheless remains *pragmatic*. This is because the goal of science Brender holds, is to permit a natural phenomenon to reveal 'which difference make a difference to it', and this involves continually learning to recognize differences that were previously unrecognized while at the same time discounting some that were previously considered relevant (ibid). Accordingly, *coherence* may be understood as yet another instance of the same recurrent process of self-differentiation and formal-governance that has been fundamental to my exposition of dialectical holism heretofore. In the following three sections I consider how this conclusion may be formalized with respect to Harris's TAP.²³⁹

²³⁹ Petit (2014) has also provided arguments concerning the relationship between autopoiesis, coherence theory and neurophenomenology that largely agree with the conclusion of this section. He proposes coherence as a "multi-scale concept" that may be "applicable to different levels of organization of the living being" (p. 219).

8.3.2 Towards a Topologic of Phenomenology

Towards an elucidation of the logic by which Harris believed he had overcome the problem of consciousness, the recent development of *Klein Bottle Logic* (KBL) appears invaluable. I argue that Harris's theory of consciousness as an instance of ϕ anticipates Rosen and Rapoport's independent arguments that KBL provides an onto-epistemology for understanding mind, life, and (cosmological) evolution. Additionally, though the metaphysics of ENM has yet to be sufficiently specified, I maintain KBL makes significant strides towards this end.

Rosen (2008) contends that what is needed to surmount the present difficulties in theoretical physics is a completely new "philosophical base" that provides an altogether different "way of intuiting the world" (p. xi). By recognizing, rather than suppressing philosophical assumptions he aims to embrace subjectivity and surpass the subject-object split. Taking a "dialectical approach", Rosen claims "neither mind nor body, neither subject nor object nor space" is primary to the other, but each arises from a common "inchoate flux", which he calls *apeiron* (i.e. without measure) (p. 7).²⁴⁰ Following Rosen, Rapoport holds that the dominant worldview today, *Aristotelian Boolean logic* (ABL) is responsible for reinforcing rifts of philosophy-science, ontology-epistemology, mind-matter, etc. Moreover, Rapoport contends, our reliance upon the dualistic ABL has lead us to speak about the manifestations of things and processes as contained in space and time, which has resulted in the *myth of finality in science* (2012, p. 7). In accord with the conclusions of the previous two sections, Rapoport claims the central problem is that ABL has "failed to describe its own generation and its association with becoming" (p. 14).

Rapoport and Rosen propose a paradigm shift based on the topology of the *Klein bottle* (K^2) as a principle that surmounts the *Cartesian cut* (CC). Appealing to cybernetics and multi-valued logic they challenge the fundamentality of unity/symmetry in physics, which Rosen claims, permits a self-transforming function for cosmogony – 'a unity-in-diversity of nature'. Rapoport writes that the resulting model is essentially a "second-order cybernetics"

However, Petit gives up the neurophenomenological project because he finds it an impossible task to 'identify' neurodynamics with mind since there are too many relevant parameters both within and beyond the brain to be considered. I address this issue in the final sections.

²⁴⁰ On numerous occasions Rosen (2008) recognizes Bohm's anticipation of this line of reasoning with his arguments for the holomovement (pp. 2–3, 26, 29–30, 46, 80, 83, 108, 126, 201, 211).

in which, “the steerer has to be included in the system that is steered, and thus self-reference is placed as the lifeworld of the system in which the observer cannot be excluded [...] subject and object become fused into a single being...” (2011, p. 35).²⁴¹ Both authors agree that the analytic assumption of *object-in-space-before-subject* stands as their primary obstacle.

Toward this end, Rosen argues that for some relationships between identifiable variables to remain invariant, we must posit a container that is also invariant. However, “space is not an object to be known but is the means by which the subject does the knowing” (p. 18). Consequently, spatiotemporal dimensionality can no longer be considered a changeless backdrop: “Dimensionality itself is seemingly thrown into the arena of concrete change, thereby mitigating the absolute distinction that had been drawn between the spatial container and the dynamic processes it contains” (p. 20). This implies, there are no invariant variables to be identified and even the “laws of nature” are “viewed as evolving” (ibid).²⁴² Phenomenological intuition, Rosen argues, offers an alternative to the duality reinforced by the “external relations” of contemporary science. Accordingly, “all relations are *internal* [...] in the underlying *lifeworld* there is no object with boundaries so sharply defined that it is closed off completely from other objects” (p. 44). Likewise, Rapoport argues, “if objects are related by mutual containance, no separate container is required to mediate their relations, as would have been [...] the case with externally related objects” (2011, p. 39). Hence, there is a “dialectical relation” between object and subject in which “space and time are not mere containers but the essential core of this relation” (ibid). What is meant by “core”?

Appealing to Merleau-Ponty’s (1964) conception of “*depth*”, Rosen insists that “the dialectical features of perceptual experience (‘orientation, polarity, [and] envelopment’) are not merely secondary to a space that itself is devoid of such features” (p. 47).²⁴³ Rosen finds Merleau-Ponty’s *depth* was intended as a ‘first’ or fundamental dimensionality that “contains itself”, from which our conventional notion of space and dimensionality are derived. The

²⁴¹ For an overview of cybernetics see the attached glossary below. For a rigorous discussion concerning the present status and viability of *second order cybernetic*, see Riegler & Müller (2016).

²⁴² Rosen apparently supports a version of the PAP by maintaining that this problem expresses “the indivisibility of the observer and the observed. It seems that, in QM, the observer no longer can maintain the classical posture of detached objectivity; unavoidably, s/he will be an active participant. Evidently this means that quantum mechanical action cannot be regarded merely as objective but must be seen as entailing an intimate blending of object and subject” (pp. 25-26).

²⁴³ Rosen points out that while the depth dimension gives rise to intentionality, it is not itself intentional in its act of generation, but more appropriately “spontaneous” and “impulsive” (p. 125).

“depth dimension” thus “blends subject and object concretely, rather than serving as a static staging platform for the objectifications of a detached subject” (p. 49). Essentially then, Rosen considers the depth dimension to be an instance of Kant’s *synthetic a priori*, “the immutable organizing principle for all experience”, a principle side-tracked by mathematical abstraction employed to fill the void of what he calls ‘phenomenological intuition’ (ff. p. 66).

Rapoport proposes the K^2 torsion as a means of surmounting the CC by serving as a logophysical field that unites our description of subject with object, thus providing an ‘*onto-epistemological principle of self-reference*’ (2012). Rosen finds that the simultaneous open and closed nature of the one-sided K^2 provides a paradigmatic model of *depth*, demonstrating “a continuous, self-containing movement that flies in the face of the classical trichotomy of contained, containing, and uncontained — symbolically, of object, space, and subject” (p. 72).²⁴⁴ Hence, neither subject, Nature, nor the K^2 are contained within space, but are self-contained, *embodying both global inside and outside through self-reference*. In this way they claim, K^2 supplies a bridge between the physical and logical domains that ‘incorporates’ and ‘produces’ dualism without permitting independent ontologies because K^2 remains a unified field.

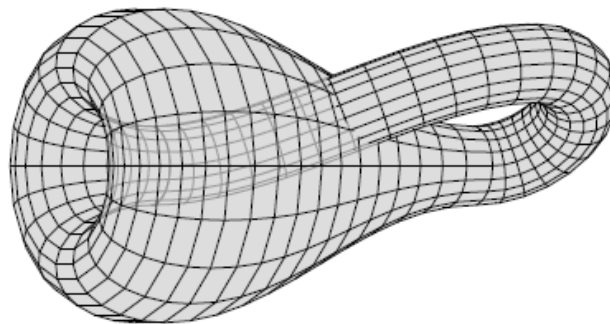


Figure 5 – Klein bottle. Recreated with permission by Diarmuid Crowley of the Manifold Atlas Project: <http://www.map.mpim-bonn.mpg.de/2-manifolds>. For further details concerning dimensionality and the K^2 , see the glossary below.

²⁴⁴ ABL is a two-valued system of T/F (0, 1), which are inter-transformable through negation. In Matrix Logic, on the other hand, Rapoport contends T and F are non-dual operators in which the negation operator does not transform the values. “True and False are no longer in specular reflexive relation; there is a folding in the cognitive plane, which is embodied in the twist of the Möbius Band and the Klein Bottle...” (2012, p. 19). Here the torsion defines a cognitive operator, M, given by the difference of True and False, i.e., $M = \text{True} - \text{False}$, which is not equal to the null operator. In Matrix Logic, ABL is a projection within the superposed topological states of true and false, nor true nor false, etc. (2012, p. 20).

According to Rosen, the point at which the uncontained intersects the contained, a discontinuity seems to be created, but the true Klein bottle,

enacts a *dialectic* of continuity and discontinuity [...] Depicted here is the process by which the three-dimensional object of the lifeworld, in the act of containing itself, is transformed into the subject. This blueprint for phenomenological interrelatedness gives us a graphic indication of how the mutually exclusive categories of classical thought are surpassed by a threefold relation of mutual inclusion. It is this relation that is expressed in the primal dimension of depth (p. 72).

To make this move however, Rosen argues that the standard mathematical conception must be wrong because as an abstraction, it presupposes an “extensive continuity” that cannot account for the “inherent *discontinuity* of the Klein bottle created by its self-intersection” (p. 75).²⁴⁵ Rosen thereby rejects the notion that K^2 is a closed object embedded in a hyperdimensional continuum. Instead, as a phenomenological structure, he maintains the Klein bottle breaks the continuity of space itself. Thus there is no need for ‘extra’ dimensions within which the form is embedded, rather the hole or point of intersection (*D-0 singularity*) is considered the ‘dynamic ground’, acting as source and goal of the whole.

Both authors likewise reject the standard view of cosmogenesis because in place of a primal symmetry, KBL implies a dialectic of symmetry and asymmetry (‘synsymmetry’). Rosen explains, “[a]ssociating wholeness with symmetry and ‘holeness’ with asymmetry, we can also see the intrinsically synsymmetric nature of Kleinian action. In flowing through itself as it does, the Klein bottle continually breaks and remakes its own symmetry...” (p. 119). Cosmogenesis then is considered a process of dimensional (global) transformation, a “self-transforming symmetry process” (p. 120). Consequentially, dimensions cannot be considered objects of analysis, but as “spatio-subobjective concrete universals” whose evolutionary dynamics are accessible to “phenomenological intuition” (p. 167). Here, it can be seen that the ‘first’ symmetry break is one of *self-reference* in and through depth dimension.

²⁴⁵ Rapoport elaborates upon the KBL as follows: “M = Time + Spin, the Time and Spin Logophysical operators, respectively [...] the former computes the difference between logical states, and thus a (logical) distinction that generates distinctions, [...] and geometrically operates rotating the real numbers axis to the imaginary numbers axis. Hence, Time connects the representation for *res extensa* with that of *res cogitans*. Spin produces a rotation normal to the complex plane, and thus together they form a primeval logophysical vortex operator (identically to the torsion of spacetime)...” (2012, pp. 20-21).

If linking the evolution of the universe to transformations of consciousness seems odd, it is because we have been deeply conditioned to regard cosmological events in purely “objective” terms, as physical occurrences “out there in space,” with subjective awareness playing no role. But phenomenological intuition guides us to a different sensibility. From this standpoint, cosmogony cannot properly be understood as a sequence of happenings devoid of inner life, of lived subjectivity. Instead we must regard it as a process of Individuation that involves the self-transformations of sentient dimensional organisms (p. 207).

This line of reasoning renders consciousness continuous with cosmology and results in a cyclic model of cosmic evolution, each phase of which permitting a “new dimension, including new forms of matter and a new force of nature” (Rosen, p. 206).²⁴⁶ Likewise, Rapoport holds that applying KBL to cosmology entails an eternal return symbolized by the “*Ouroboros*.” In agreement with Kurakin and Smolin above, Rapoport argues “Mathematically, non-linear systems have an increasing entropy until they suffer a transition, a ‘blow-up’ [...] in which they go through an infinity (the Klein bottle re-entering) after which the entropy is lowered, instead of the thermodynamic death that the Big-Bang mythology claims for the Universe” (2012, p. 90). Hence, both Rapoport and Rosen claim to have linked cosmological evolution with phenomenal dynamics. What results is a means of accounting for *individuation* in what I call a *triadic phenomenology*:

²⁴⁶ In virtue of its self-containing and self-transforming quality, the Klein bottle eigenstructure $\epsilon D2/\epsilon D3$ develops from what Rosen calls “dialectical action upon itself”, or “Kleinian autopoiesis” (p. 110). Depth dimensionally is considered the lemniscate’s support of the Moebius via $\epsilon D2/\epsilon D1$ and acts as the lemniscate’s primary guiding action. Similarly, he holds that the $\epsilon D3/\epsilon D2$ enantiomorph of the Moebius provides support for the Kleinian wave. Further, the enantiomorph, $\epsilon D3/\epsilon D1$ provides a secondary means of guidance for the three-dimensional Kleinian vortex. Here the “fusion of $\epsilon D3/\epsilon D1$ and $\epsilon D1/\epsilon D3$ enantiomorphs leads instead to the $\epsilon D3/\epsilon D2$ and $\epsilon D2/\epsilon D3$ coupling, the higher-dimensional enantiomorphic pair whose subsequent merger does bring the Kleinian vortex to fruition” (p. 112).

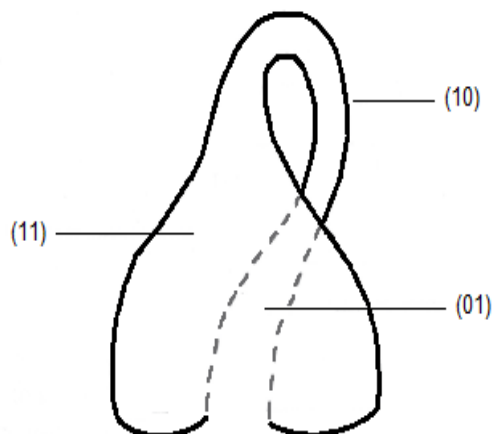


Figure 6 – Klein Bottle topology as a *triadic phenomenology*.

(01) Outside-Inside – The *contained* consists of bounded and finite relations, ‘facts’, structures, and objects. In this primitive form of individuation, subject/object, past/present, inside/outside remain undifferentiated.

(10) Inside-Outside – The *uncontained* denotes the individuation of agent in relation to their object via an action exclusively from the former to the latter. Here, the Kleinian form flows back upon itself to reveal a *dialectical lifeworld*.

(11) Inside-Inside – The *containing* space serves as the means by which reflection occurs. This represents a climactic return of the lifeworld to itself via ‘proprioceptive circulation’, wherein the identities of subject and object become fused. The *synthesis* of this stage itself becomes the *object* upon a return to (01) (Rosen, p. 77, p. 127; Rapoport 2012, p. 72).

Rosen finds psychical and physical domains become so connected that movement from one to the other “is at once a return to the first” (p. 237). This results in what he calls a “dialectical cosmogony”, that involves “situating the analysis of cosmogony within cosmogony itself” (p. 242). In the act of cognizing the self-transformation of the cosmos, the theorist herself surpasses the projective construction of oneself as an independent observer and “the analyst figures essentially in the reflexive enactment of this process” (ibid). Echoing Harris’s TAP, Rosen claims phenomenology reflects the very same self-referential dynamics of Nature because the “self that participates in the concrete universality of cosmic transformation must also be universal” (p. 243). In accord with the conclusions of § 2.5, emphasizing a sub-objective and psycho-physical quality of dimensional transformation results in a *self-referential ontology* and a *reflexive epistemology*, i.e. an *onto-epistemology*.

In sum, for KBL the ‘transcendental problematic’ is side-stepped by rejecting the assumption of object-in-space-before-subject and embracing an inherent reflexivity of Nature that is directly observable in and through embodied phenomenology. Brender’s symmetry breaking and KBL are mutually supportive because in each case object and subject may be

reconsidered as a single (dimensionally) differentiated field. In agreement with Clayton's CPM, KBL posits a unity in diversity of nature that also links Jordan & Day's WST account of science as a "recurrence on reality" with the findings of §§ 5.2 & 5.3, i.e. further illuminating an *enactivist cosmology*. As will be discussed in the following section, I contend this reasoning accommodates the *synthetic act* of observation in the very same manner as Harris's €.²⁴⁷

8.4 Dialectical Holism

Harris (1965) argues that the world revealed by contemporary science is "undoubtedly monistic..." (p. 452). On the following page he makes it evident that what he has in mind is *neutral-monism* based upon process ontology: "Physics, if it does not actually reveal, nevertheless gives ample reason to presume a primordial matrix of the world, which though *mater*, is not *materia*, because it is prior to all matter. The matrix is in no way static but is some form of perpetual activity, in essence process" (p. 453). What is this process? Harris later concludes: "The process of evolution thus transpires as one of progressively bringing to explicit self-consciousness the principle of organization inherent in the organism from the start, that which galvanizes its auturgy and is itself the immanent principle ordering the cosmos as a whole" (1991, p. 91). As self-specification, the Concrete Universal is thus identified with processes of both mind and evolution. I will examine his reasoning in three steps.

(1) *Epistemological Coherence* – Invoking coherence theory Harris says, "the diverse components must be mutually adjusted so that they fit together without conflict or friction, and this means that they are organized in accordance with a principle of order that determines how they are reciprocally adapted" (2006, p. 152). Harris argues that if the world is the result of a dialectical evolutionary process, the "'external world' is not extruded from the mind so as to be inaccessible to it, nor is the proffered theory of knowledge such that, if it were true, it would be impossible to ascertain" (p. 163). Being realist about the scale of forms does not

²⁴⁷ To my mind KBL and symmetry breaking are really two sides of the same coin. This is because the very completion of self-reference by a Klein bottle introduces a fundamental kind of limitation, an *exclusion* of what is not included in the referential process, i.e. what is *beyond* the system. It is this inclusion/exclusion that (on the dialectical holist account) necessitates an open-ended process for nature and mind. In the following section I shed some further light upon this process.

result in circularity he claims, because as long as chaos is parasitic on order, *modus tollens* shows that “unless the world had the sort of dialectical structure revealed in knowledge, we could not have the sort of knowledge that we enjoy” (1970, p. 383).

(2) *Ontological Coherence* – In order for the Universe to “fulfil its own holistic character” Harris maintains, it must complexify its physical constituents so as to “elaborate its intrinsic differences as a noetic world, in which the physical and the organic are sublated and re-presented in a theoretical system of unified science” (1991, p. 155). Explication of the world is for Harris achieved in and through explication of the subject: “What is organized and integrated is a relational complex and relations are made explicit only when they are cognized...” (2006, p. 147). The synthetic act of consciousness is thus considered the “universal function of relations” (p. 152). The principle of coherence is here considered the same ϕ identified in previous forms, now manifested as the awareness of one’s body-in-relation: “The ‘transcendental subject’, therefore, turns out to be the ultimate dynamic principle of organization itself...” (2006, pp. 154-55).²⁴⁸

(3) *Anticipating KBL* – Harris argues the problem of the transcendental ego has not been resolved or avoided by appeal to Husserlian or Heideggerian phenomenology because in either case,

relationships are being posited, awareness of which, even though only incipient, requires synthesis of a manifold in the Kantian sense, spontaneous and *a priori*, which can only be attributed to an apperceptive subject logically and ontologically prior to any of the related terms (one of which is Dasein) (1988, p. 95).

Harris contends the result of this recurrent situation is as follows: “On the one hand, Dasein is in the world, but at the same time, on the other, there is an important sense in which the world is in Dasein” (p. 96). His solution is that the content of consciousness is “the entire scale of forms, dialectically related each to the next, as which the universal principle of organization has specified itself – the very process through which the mind has been generated. What becomes object is itself the autogenesis of the subject” (2006, p. 163). This is to say the object of the mind is the world in becoming and “the subject is no less than the world come to

²⁴⁸ In other words, individuation of any *phenomenon* is achieved via the differentiation of a *phenomenological space*, i.e. the individuation of an *object* is identical with the *projection* of some dialectical whole of the *subject*, each of which incomplete with respect for its actual relation to the whole of Nature.

consciousness of itself” (1991, p. 115).²⁴⁹ By implication, if the material world and phenomenology are best conceived as a self-specifying and self-transcending scale of forms, then it is justifiable to maintain that consciousness is itself a re-entrant scale of nature, thus vindicating Harris’s TAP.

8.4.1 On the Topology of Transcendence

Towards a development of dialectical holism it may be noted that many of the above mentioned authors who appear sympathetic to the system have made a common case that consciousness must be included within any sufficient cosmology. On numerous occasions, Harris and his would-be proponents have articulated this as some kind of ‘emergent hierarchy.’ I propose that such a conception would render the resulting metaphysics incoherent and therefore requires an alternative structure.

As Rapoport has maintained, due to its cyclic dynamics, appealing to the Klein bottle entails a *heterarchical* paradigm captured by *hyper Klein bottle logic* (HKBL): “For the HKBL the ‘outmost’ system in the heterarchy, re-enters in all systems which also exteriorize as the outermost Outside-Outside state as well as in a myriad of intercommunicating systems” (2012, p. 86). Rapoport claims that the archetypical form of all systems in the world is the HKB, all of which are “interrelated in heterarchies with re-entrances of all elements on themselves and other selves and the whole re-entering in the elements as well” (p. 97). In other worlds, the self-recurrent structure of Being entails an ongoing process of ontopoiesis that involves constraints across all scales – as Bohm has maintained, none of which being at the *bottom* or *top*. Rapoport argues that if conscious observation requires such a contextualization (i.e. if it must be embedded in culture), then consciousness must be described with HKBL, meaning “reality is a joint construction of the dialectical relation of object with subject...” (p. 24). For Rapoport, HKBL implies “that the world indicates itSelf

²⁴⁹ Harris hereby identifies the very *concept* maintained by consciousness with the same self-specifying Concrete Universal considered heretofore (€) (1987, p. 200). He anticipates the idea that understanding the dynamics of respective kinds of complexity or scales, ought to require disparate cognitive abilities of corresponding *predictive* capacities. Harris finds our epistemic need to appeal to scales in scientific observation is mirrored in our sensory modalities and cognitive functions (1970, ff. p. 352; 1991, ff. p. 121; ff. p. 135). Additionally, the closest Harris comes to an analogous and succinct HKBL (as I depict in what follows) can be found in his (1987) discussion of *objectivity* (ff. p. 227).

through ourselves, which by doing this we indicate our-selves (and the Socius) and the Self of Nature...” (p. 96).



Figure 7 – Nested glass Klein bottle as a topological depiction of self-transcendence in and through cultural development. Created by Alen Bennett, shown at the London Science Museum. <http://www.sciencemuseum.org.uk/images/i046/10314758.aspx>. Image reproduced with permission from *Science and Society* image executive Sophia Brothers.

Interestingly, this heterarchical conception is in line with Thompson’s ontology:

In the process view, “up” and “down” are contextual-relative terms used to describe phenomena of various scales and complexity. There is no base level of elementary entities to serve as the ultimate “emergence base” on which to ground everything. Phenomena at all scales are not entities or substances but relatively stable processes, and since processes achieve stability at different levels of complexity, while still interacting with processes at other levels, all are equally real and none has absolute ontological primacy (2007, p. 441).

KBL is further reflected in Thompson’s (2015) blog post, in which he builds on his earlier notion of “groundlessness” (1991) by maintaining “Nature, by way of the brain, beholds itself [...] You might think that you contain your mind, but it’s actually the other way round: your mind contains you—your sense of self—and your mind is too vast for you to comprehend.” Dialectical holism goes further. The argument (from figure 6) is that any attempt to explain *phenomena* (01), by investigating empirical *matter* – that which is apparently *beyond self* (10), or appealing to *a priori* first principles (11), results in a return and reliance upon the opposite. This is because the self-reference of *Being* distinguishes 01, 10, and 11, but also couples each to the rest in a continuous self-differentiating movement. Moreover, the

trajectory (or *bias*) of this movement remains transparent (i.e. *unconscious*) to the subject at each stage. Consequently, the subject is engaged in an ongoing self-transcendence in and through their embodied engagement with their *Other* (i.e. self-projection).

An examination of cultural development serves to exemplify the above points. Harris and AE share the common appeal to coherence that requires reflexive attendance to a *finite set of relations deemed relevant within a given context*. For Harris, by *going beyond* this structure we fulfill the *final cause* of Nature in our philosophical and scientific practices. Gunn (2011) appears to reveal insight into Harris's original teleological proposal: the "goal" of Nature, he claims, "cannot involve the attainment or bringing into existence of some specific physical state [...] but only the continuous unfolding or objectification of the activity itself" (p. 416). What is meant by 'objectification'? Gunn proposes that human activity is a "special instance" of physical or "pneumatical force", whose goal is the progressive and "never-ending development of culture" (ibid).²⁵⁰ This implies a simultaneously *circular* and *linear* development of Nature:

objectification of anthropic force at a given time alters the environment in which this force will subsequently objectify itself, and this in turn alters the subsequent objectification itself [...] Therefore, the correct geometrical image for cultural development and the history of thought is neither the circle nor the line but the spiral... (ibid).

More specifically, for dialectical holism it appears that re-cognizing our selection effect(s) within a given paradigm results in a HKB *ascension*. While Harris maintained an *ontological realism* about a culmination of this process (i.e. *objective idealism*), as above, I contend contemporary dialectical holism can only remain consistent (with an appeal to coherence) if its ontology is endorsed on *pragmatic* grounds.

For Thompson, classical emergentism is inadequate for maintaining "that physical nature, in itself, is fundamentally non-mental, yet when it's organized in the right way, consciousness emerges" (2015c). He goes on to say that as long as we maintain this kind of conceptual dichotomy the emergentist view won't work. He claims this means developing a theory of

²⁵⁰ Rosen claims his conception of 'proprioception' is similar to Fox-Keller's "empathy", in her scheme of *dynamic objectivism*. In line with sensorimotor enactivism, Rosen emphasises feeling, embodied empathy, and love that constitutes the lifeworld: "It is a world in which the dialectic of difference and identity is enacted proprioceptively, through an intimate knowledge of other that requires and is inseparable from the knowledge of self (a 'consciousness of self')" (p. 241). Though not discussed by Gunn, empathy is a key aspect of AE and Harris's conception of cultural development – the latter view will be summarized in § 8.4.1.

“neutral monism—which says that the ‘physical’ and the ‘mental’ are concepts that capture different aspects of something that’s more fundamental and neutral between them, being neither ‘physical’ nor ‘mental’...” (ibid). Following Merleau-Ponty, Brender has proposed that our “new ontology”, or “milieu” common to philosophy and the natural sciences that serves to unite “the phenomena of form and morphogenesis”, thereby closing the Cartesian chasm is “asymmetry and symmetry-breaking” (p. 272). Providing a *primal process of transformation*, symmetry breaking is epitomized by €: I propose that the common conclusion for Harris, Bohmian ontology, and AE is that the subjective and material domains are considered co-arising and mutually constraining scales; each of which incomplete abstraction from a *higher dimensional Concrete Universal* that achieves self-reference via self-differentiation (i.e. symmetry breaking). On this pragmatic view, consciousness is to be *treated* as a 5D transformation of Nature, one that is *constituted* by the dynamics of *neuronal, bodily, ecological, historical, and social scales*.²⁵¹

²⁵¹ For a summary of the revised ENM that results, see the attached appendix § VI.

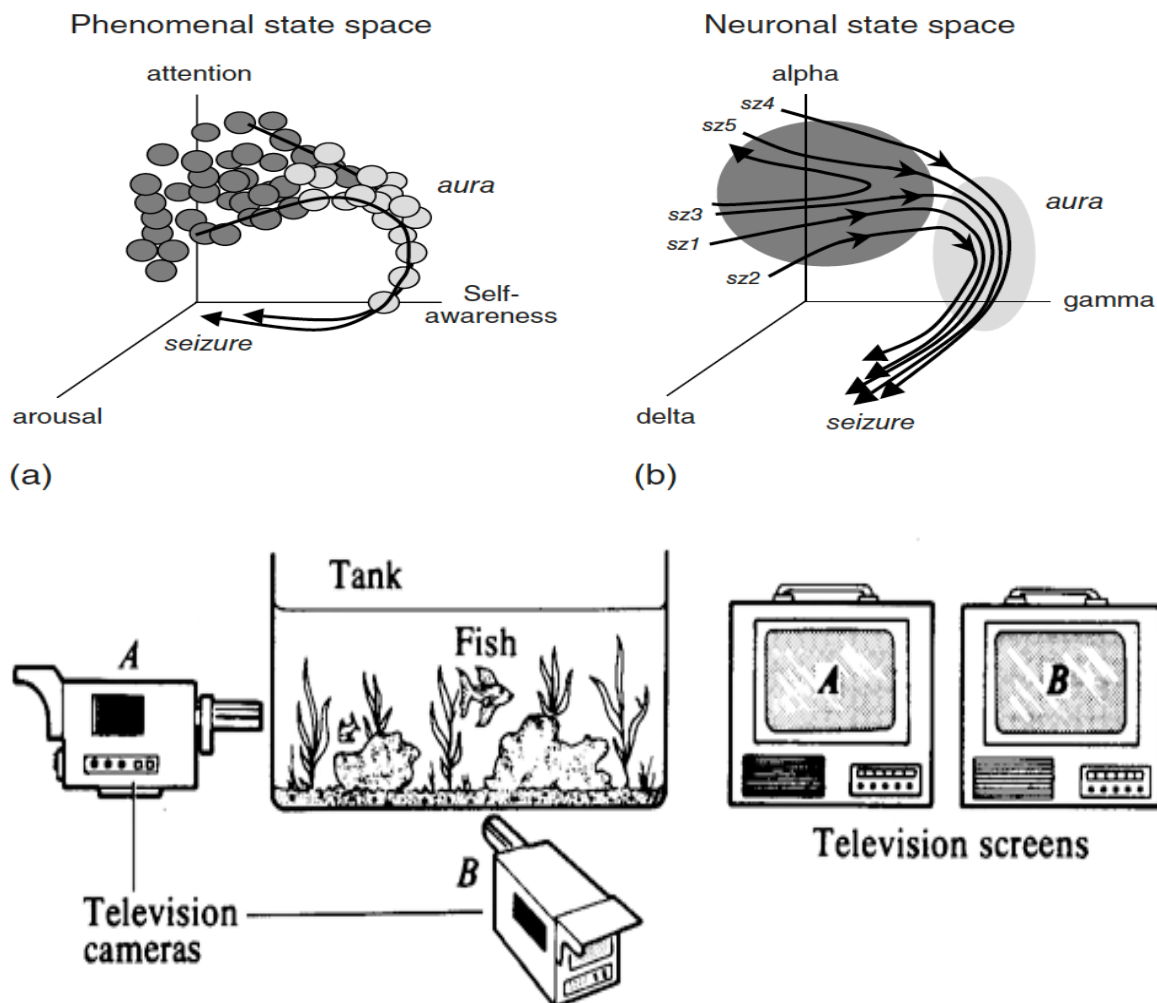


Figure 8 – Relating neurophenomenology and the implicate order. Top: a “homeomorphic” relationship between (a) phenomenological and (b) neuronal dynamics used in neurophenomenological seizure prediction (Van Quyen 2010, p. 259). Recreated with permission from MIT press. Bottom: the correlations of phenomenal and neurodynamics are for Bohm analogous to respective 2D recordings of a single 3D object (1980, p. 237). Bohm holds that the reality *behind* respective ‘aspects’ will be of a “higher dimensionality than are the separate images on the screens” (p. 238). Recreated with permission from Routledge press. Here, Bohm originally mirrored Harris’s scale of forms maintaining that “there is a universal flux that cannot be defined explicitly but which can be known only implicitly, as indicated by the explicitly definable forms and shapes, some stable and some unstable, that can be abstracted from the universal flux. In this flow, mind and matter are not separate substances. Rather, they are different aspects of one whole and unbroken movement” (1980, p. 14). Juxtaposing these diagrams is philosophically illuminating of the neurophenomenological methodology because in both cases mind is not to be identified with the data from either of the *abstracted* phase spaces, but rather, it is identical with a ‘higher dimensional whole,’ to which we have incomplete access regardless of what methodology is employed.

The dialectical holist response to the *hard problem of consciousness* is thus to back away from discussions presupposing ABL in analyzing phenomena of the world. The dialectical holist refuses to take properties, T/F atomic *facts*, and the *object-in-space-before-subject* as given. Appealing to HKBL, consciousness may be framed as a natural function of the Universe that is ultimately neither mind nor matter. This topologic provides a sympathetic response to Harris's TAP, a revision of emergentism, and a common ground for mind and matter. Taking the lessons from KBL and WST together, Nature's self-referentiality is posited on pragmatic grounds with the expectation of theoretical *unity in diversity* in and through agential participation. This participation is believed to facilitate an ongoing clarification of our individuation practices directly correlated with an ongoing differentiation of scientific disciplines and philosophical domains (e.g. Clayton's CPM). As formal governance is considered the torsion of *system*, so *phenomenology* is considered *a recurrence of €*. To my mind a model of this kind fulfills Varela's conception of 'walking the razor's edge' between scientific realism and subjective idealism. Thus, the resulting onto-epistemology encapsulating 'self-reference', and 'symmetry breaking' of the 'Concrete Universal', appears to metaphysically ground the neurophenomenological program and elucidate a cosmological dimension of the enactivist paradigm.

8.4.2 Ethical Implications: The Responsibility of Being a “Philosopher”

I believe that a particularly apt testament to Harris's character is eloquently exemplified in the preface of one of the last books he published, *The Restitution of Metaphysics* (2000). Even at the age of 90, still hoping to inspire new minds to the tremendous value of philosophy, he explains that a metaphysic and moral philosophy premised on the conception of wholeness is our best chance of counteracting the environmental and social challenges that have resulted from our modern technological capacities and empirical outlook. He explains that this work

presents a world view that I think I can claim is genuinely post modern [...] If there is little sign at the present time of widespread adoption of a fresh philosophical outlook, I can but hope that what I have written may catch the attention of some of the younger generation, in whose hands the direction of the future lies (2000, p. xiv).

While Harris's works on ethics, value, and politics are too extensive for even the briefest of summary here, I intend to bring attention to a characteristic feature of Harris's approach that fuses the practices of knowing with an analysis of normativity.

Harris argues that viewing the development of knowledge in the terms outlined in this thesis produced a number of ethical implications in general and provided criteria for the practice of philosophy in particular:

For the Ancients, philosophy meant what it said: the love of wisdom. Wisdom was held to be the fruit of intelligence and thoughtful reflection upon as wide a range of experience as possible. It was held to bring insight into every aspect of human life and to give enlightenment in the face of every problem, both theoretical and practical [...] Philosophy, as the love and practice of wisdom – for to love it must be to use it and not just to affirm its theoretical teachings – was not merely an intellectual pursuit but a way of life... (p. 69).

To this end, while a review of the past and analysis of scientific claims are necessary, the aim of philosophy for Harris, is to reveal connections between scientific disciplines thus unifying our understanding of nature to solve contemporary problems. As Harris states above, the problems we face are not just theoretical, but involve the interrelations of actual people. Ultimately Harris's metaphysics implies a deep concern for the evolutionary trajectory of humanity as a whole, an imminent responsibility to avert global disaster and aspiration toward "enlightenment." What is meant by enlightenment?

Harris laments that logic "is simply a matter of convention" in that the logician is free to adopt whatever logic validates their chosen theory (p. 74). As a result, "the philosophy of analysis, in its eagerness to clear away rubbish, has been so zealous that it has removed everything of any positive value and left a vacuum, into which the forces of extremism may move without effective resistance" (p. 76). Interestingly, Harris found that over-emphasizing analysis was to blame for many ecological and socio-political problems. He claims that when applied on its own, such intellectual dissection could not provide morals, cannot facilitate human development, nor account for one's fellow beings as ends in themselves. For Harris, the solution is to recognize "the organizing and integrating activity of the mind in all its functioning", believing that the "proper activities of reason", consists in a process both "analytic and synthetic in mutually complementary phases. Thus it is the principle of insight and rational enlightenment" (p. 77). Only the professional philosopher, he claimed, with an appreciation of holism, is equipped to assess the clash of ideologies and their resultant social conflicts in the real world (p. 80).

Harris argues that we cannot but adopt some philosophical theories about the world and that these theories unavoidably become *value judgments*. These judgements he claims, cannot but affect our conduct: "Philosophy always changes the world, and only if this is clearly

recognized and acknowledged by philosophers will they understand, and can they fulfil their proper function in society conscientiously and responsibly” (p. 81). As discussed above, he argues that for both common sense and scientific practice, observation is “embedded in and inseparable from interpretation” (p. 88). Any thought or observation requires the projection of a paradigm, which means any “metaphysical explanation is the same in character as, and is continuous with, scientific explanation” (p. 92). He goes on to remind us that, “[t]he aim of metaphysics is a comprehensive conceptual scheme in the light of which the whole of experience can be organized and become intelligible” (ibid). It is the philosopher’s responsibility, therefore, to not only critically assess the form of a paradigm, but to also synthesize such worldviews with ever increasing *coherence*.

In applying this dialectical logic, Harris (2005; 1993) advocates for a Global Federation, a unification of humanity and dissolution of sovereign states. Each nation, he maintains shares the earth and must recognize their interdependence with those of their neighbours. As a species, Harris claims, our very survival depends upon our ability to facilitate the emergence of a “noösphere” of “communal minds and wills” (1988, p. 161). To do so he argues, human efforts across disciplines and nations must be unified in and through our differences, and there is only one way by which this can be achieved:

the pervading and consolidating sentiment that alone can bind together the members of any society [...] is love – not a sensuous or sentimental love, but a genuine felt concern for the true welfare of its object. In any community whatsoever that can maintain itself as a society, there must be some degree of mutual reliance and trust (p. 162).

Harris argued that the only way any sort of social contract or intellectually constructed social organization can remain a non-contradictory and self-preserving whole is through love. Upon “self-reflection” he claims, love of one’s neighbour and of God become coincident: “It is genuine concern for the welfare of each and every individual, it is the universal respect for persons, that treats each as an end and none merely as a means” (p. 163).

In relation to the whole of Nature, mankind is understood as a single community, the *concern* of which is the maintenance of oneself, world, and society: “That maintenance is a responsibility upon man, so that his relation to nature is ethical, rather than simply biological or technical” (1987, p. 262). To act upon this moral concern is considered a “responsibility to the ultimate totality”, one fulfilled only “in a spirit of unreserved self-giving”, towards what he calls a “a spiritual *Heimat*” (p. 263). As with previous unifying principles, the individual “is not solely constituted by his or her subjective character, but by the social functions and

capacities exercised and the consequent web of relations woven by interaction with other people” (1992, p. 15). *Evil* is thus considered “whatever denies or contradicts the universal principle of order, or obstructs or counteracts its dynamic urge towards wholeness” (p. 42).

Considering Harris’s ethics with respect to the above discussions concerning dialectical holism in general reveals a number of interesting conclusions. All conscious beings (especially philosophers) have the responsibility of pursuing enlightenment. This involves relating a given theory, concept, etc., to an ever more inclusive system in order to establish not only a clearer understanding of the *object*, but also of *oneself* as the subject(s) *reponsible* for bringing the whole into being. *Truth* thus requires an embrace, rather than a suppression of our subjective disposition, only then can we *account for the world we enact* and transcend our momentary means of *individuation*. Accordingly, *Reality* is not only revealed to us, but comes into being as the observer and community can enact a greater range of relations. Whereas *evil* is instantiated by an *individual* assuming dominance over, and thus contradicting the whole to which they belong, *love* is considered the only way by which a (social) system can achieve coherent unity in and through difference: *Coherence of love and the coherence of truth are thus one and the same; both enacted through the ongoing empathic awareness and synthesis of alternative perspectives beyond one’s own.*

8.5 Conclusion

Despite his entire career being focused upon a study of consciousness, when Harris finally finished his one and only text devoted to the subject, he merely remarked, “I have been able to get hold of several useful books on this subject and have managed to complete a short book of my own, ‘Reflections on the Problem of Consciousness’” (unpublished, pp. 259-60). Ever so humble, this is all we are told regarding the culmination, the conclusion of his lifelong intrigue. However, in the preface of this work we gain a somewhat deeper insight that rings with well-warranted condescension:

From whatever angle one approaches philosophy one cannot avoid this problem [...] The problem has been central to my own thinking throughout my philosophical career and has figured in almost everything I have written. The solution I have reached is not new and I claim for it no originality; it is derived from Aristotle, Spinoza, Hegel and Collingwood [...] I know of none that is better founded. But I can claim that it has been sorely neglected and universally overlooked by contemporary writers whether from ignorance or from deliberate oversight; and I have felt the necessity repeatedly to remind them of it (2006, p. ix).

I think that at this point Harris's humility had clouded his judgment. I hope it is clear from the contents of this thesis that the extensive efforts he made to *derive* his conclusion from earlier philosophers and restate these results while retaining consistency with contemporary sciences assures the originality of his solution.

For my own part, I have shown that Harris's conception of the dialectical whole in his theories of cosmos, life, and mind, anticipates a number of philosophical and scientific works of recent years. I maintain that despite Harris's silence on this point, the metaphysics of dialectical holism is broadly a *phenomenological* response to both the problem of mind and AR. By way of making the value of this contribution clear, it will be useful to mention a number of avenues for future research within the resulting paradigm.

1. Identifying the unifying principle with *solitonic* or *formal governance* provides a metaphysical framework for understanding natural phenomena from the formation of galaxies, to autopoietic systems of varying sizes and complexity. In line with CPM, dialectical holism would be supported to the extent that principles from disparate disciplines are mutually informative yet remain irreducible to each other. Ongoing collaboration should provide illumination of such principles and thereby lead to the development of further scientific disciplines. Specifically, as discussed in chapter 5, to the extent that phase transitions and symmetry breaking provide support for \mathcal{E} , the resulting theories of evolving laws, second- and third-order emergent systems will demand further scientific and philosophical development. Toward this end, it is hypothesized that phases of matter should be *innumerable* upon further investigation.

2. Depicting the whole of nature as a self-governing, self-differentiating Concrete Universal has provided a viable teleological response to the anthropic principle. In support for this conclusion, Harris's theory of '*environmental internalization*' that was originally conceived as a biological telos is now logically extended to the evolution of the cosmos. If dialectical holism is to be maintained, proponents should critically develop and apply the HKBL that supports this approach as broadly as possible, e.g. to phenomenology, ethics, anthropology, and cognitive neuroscience.

3. For Harris, the telos of nature in general but of humanity in particular, is the recognition of the universe as a whole. Broadening enactivist sensorimotor-affectivity and ENM, Harris has maintained that at the level of human (i.e. social) cognition, the same universal process of auto-genesis and self-reference appears as empathy and self-transcendence. Continued neurophenomenological research should in this vein be combined

with projects in anthropology, complexity, and cosmology so as to further clarify the purported scale of consciousness. Specifically, the philosophical interpretations of physics that underpin neurophenomenology must be further developed. Towards this end, the above discussions have indicated that utilizing Bohmian QT and research into *dimensionality* should be invaluable for this program.²⁵²

Harris died on June 21st, 2009 at the age of 101, leaving behind four children and over 25 books that he had authored or co-authored throughout his 70-plus year career. In this thesis I have shown that Harris's metaphysics is alive and well, though until now, maintained within disparate camps and research programs, their proponents each unaware of one another. In this thesis I have set out what I believe to be the strengths of the dialectical holist naturalization of mind and the challenges it ought to face in future research. The principle value of this work has been to pose a challenge to philosophers of mind to recognize the wider cosmological and underlying metaphysical implications of their position. Specifically, I hope this work stirs those sympathetic for AE to respond with either detailed refutation or support of the respective camps I argued they implicitly endorse. It warrants further mention that Harris system was extensive, developing tributaries into issues of phenomenology, free will, religion, political philosophy, and ethics, none of which have I been able to adequately address in this thesis. To fully grasp the import of the system born from Harris's efforts, the dialectical holist development of all of these topics demands attention in future works.

²⁵² For a summary of the overarching reasoning of this thesis and what I consider a resulting *onto-epistemic dialectical phenomenology*, see appendix, § VI-a.

Appendix:

The Principles of Dialectical Holism

I. Dialectical Individuation

(1) If all physical properties depend upon a dynamic context to obtain – if the fundamental observable unit is the relation – then we are obliged to appeal to a principle of coherence that both specifies how such relations fit together and constrains the possibility space of these relations over time, i.e. what Harris called the *unifying principle*.

(2) In this scheme, positing ontology requires explaining precisely how a given phenomenon or entity relates to the system within which it obtains, i.e. how it relates to the history of the Universe as a whole.

(3) Since in practice such knowledge is currently beyond our reach, it is considered necessary *a priori* to posit respective *unifying principles* – though the ontological status of the particular principles so proposed remains uncertain.

(4) As a result, the organizational constraints upon natural phenomena are *enacted*, or brought forth in part by our acts of *levation* or *diffractive practices* as culturally construed. More specifically, propositions of ontology are acceptable on the basis of their coherence within a given paradigm – what can be called an *onto-epistemic coherence theory of knowledge*.

(5) In consequence, no level of analysis is any more fundamental than any other and *reduction* must be reconsidered. This results in a continuous transdisciplinary movement across domains of analysis that increase in coherence to the extent that more perspectives, paradigms, and relations can be organized.

II. Metaphysical Pillars

(1) *Nominalism* – This system is anti-realist about abstract structures including: (i) propositions; (ii) properties; (iii) universals; and (iv) worlds. In the case of (i), (ii), and (iii), the dialectical holist relies upon a coherence theory of knowledge (see below) that considers these terms conceptual tools that do not directly correspond to anything independent in the world. Concerning (iv), the ‘possibilities’, or counterfactual ‘worlds’ are converted into

hypotheses. In all cases, a great deal of effort is exerted to distinguish between these linguistic structures and the empirical phenomena to which they refer, or from which they are derived.

(2) *Process Ontology/Dialectical Relations* – What exist in nature are relatively stable, modes of organization instantiated through *dialectical processes*. This is to say that nothing exists intrinsically, but only as interdependent *dynamical relations* (i.e. mutually contingent or interdependent). While universal patterns (i.e. forms, *unifying principles*, or *implicate orders*) of respective spatiotemporal scales may be identified, they are granted no independent ontological status, but are believed to exist in and through intra-relational processes of the whole within which they obtain.

(3) *Neutral Monism* – Natural evolution, just as the advance of scientific and philosophical theories, are both recapitulated as the self-differentiation of a single whole or Concrete Universal. Mind and matter are considered two *modes* of a single whole that is not to be identified with either the qualities of matter as empirically observed, or with phenomenality. Importantly, while respective forms are understood to be emergent with respect to one another – matter exists as a plurality of *unifying principles* or organizations – each of which is not an addition to, but abstractions from the neutral whole, i.e. a scale of forms or holomovement. The resulting “dialectical whole” is considered a *synthetic a priori* presupposition of science, philosophy, and phenomenology, i.e. this structure-process is fundamental to our knowledge (paradigms) and in Nature (ontology).

III. Epistemic Interdependence of U and C

(P1) Self-individuation (*C*) is a legitimate *a priori* first principle.

(P2) Positing *C* requires some background context of system (*U*) to which it relates (i.e. $\neg C$) within which *C* obtains and by which *C* can be known.

(P3) As the whole of *U* is beyond empirical analysis, propositions about it remain *synthetic* and *a priori*.

(C1) The *existential relationship* between *U* and *C* (\exists^R) is an *a priori synthetic* proposition.

(P4) Parameters necessary and sufficient for defining *U* and *C* respectively are covariant such that alteration to one side entails some corresponding alteration(s) to the other.

(P5) Entities are *epistemically interdependent* iff changing the *defining nature* of one necessarily constrains the defining statements that can be made of the other.

(C2) Analyses of U and C are epistemically interdependent in virtue of \exists^R .

(C3) Any complete account of either U or C must include a complete account of the other, i.e. as an epistemic system, *the dialectical whole has a bipolar structure*.

III – a. A Priori Argument for the WAP

(P1) It is *a priori* there is a self-referential thinking being (C).

(P2) It is knowable a priori that if the universe (U) contains a C , then U satisfies the local (necessary and sufficient) conditions for C .

(P3) On the assumption that the universe is congruent with the existence of C , then it is knowable *a priori* that one can learn about U by studying the local conditions of C .

(P4) The WAP says it is possible to learn about U by studying the local conditions of C .

(C) The WAP is true.

III – b. Selection Effects

(1) *Epistemological Selection Effect (ESE)* – Denotes the limitations of *a posteriori* knowledge resulting from the method of investigation employed. A common metaphor is the mesh of a net used for fishing, which permits fish smaller than the mesh size to escape and therefore avoid being observed. This is to say that what we observe is constrained by the experiments we devise and capacities of our sensory system. Hence, the occurrence of our sensory system (as a material phenomenon) must cohere with what we know about the material world within which it occurs.

(2) *Physical Selection Effect (PSE)* – Involves any force acting on material entities such that certain observations are restricted while others are made possible. The above metaphor is here taken literally as the *physical constraint* that some entity (e.g. a net) has upon a system (e.g. a population of fish). The PSE necessarily contributes to the ESE, but does not exhaust it.

(3) *Metaphysical Selection Effect (MSE)* – Considers the impact that *a priori* presuppositions have on the form of the observer's physical theories, e.g. rules of logic, the questions we ask, the rules for mapping abstract terms onto objects of the real world (individuation), and choice of methodology. Here the constraint arises from our paradigm, which creates a limitation to

how accurately physical entities can be individuated. For example, a theory concerning the relationship between the constants of nature and the necessary and sufficient conditions of life is constrained by our limited ability to define the relevant terms (life and constants) within the relevant domain (Universe). Hence, any extrapolation based upon such self-consistent or 'possible' transformations must be carefully qualified with respect to these limitations. The MSEs are a sub-group of the ESE.

III – c. Evidence of Fine-Tuning

(1) If the weak force were much weaker, hydrogen would not exist and so supernovas would not have developed. If it were much stronger, supernovae would fail to seed interstellar space with heavy elements, upon which life as we know it depends.

(2) The nuclear binding energy as a fraction of rest mass energy or strong force ($E \approx 0.007$) is considered fine-tuned for if it were 5% greater, all of the hydrogen in the early universe would have been converted into helium. Likewise, the dimensionless ratio of electrical and gravitational forces between protons $N \approx 10^{36}$ is considered fine-tuned because if protons were 0.2% heavier, they would decay into neutrons, destabilizing atoms.

(3) The luminosity of a star is determined by its mass and life on earth has required that our sun has a mass between 1.6×10^{32} kg and 2.4×10^{30} kg. If the electromagnetic force were to be greater by 4% relative to the other fundamental forces, the production of carbon and oxygen would have stopped in the early universe and planets would be unable to form. On the other hand, if it were 4% weaker, all stars would be much hotter, which would result in their having much shorter time-spans as stable stars, helium would not have formed, and the result would be a hydrogen-filled universe.

(4) Carbon is created in the helium-burning phase of red giant stars via the triple-alpha reaction, in which two alpha particles combine to form beryllium, which combines with a third alpha particle to form carbon. If this conversion occurs too rapidly the result will be oxygen. The process takes about 10^{10} y, at which point stars explode as supernovae, scattering the elements necessary for complex chemistry throughout space.

(5) The amount of matter in the universe ($\Omega \approx 0.3$) in units of critical density; the amplitude of density fluctuations for cosmic structures ($Q \approx 10^{-5}$); and the cosmological constant $\Lambda \approx 0.7$ (expansion rate) in units of critical density provide the strongest grounds for AR. For example, if Λ were slightly larger or smaller, our universe would have blown itself apart or

collapsed before complex systems could form. There remains uncertainty as to which of these are determined by (presumably random) processes during the early universe and which are prescribed “freely” as part of the initial conditions.

(6) Having $D < 4$ spatiotemporal dimensions results in an absence of gravity (so says GTR) and in $D < 3$ there is insufficient complexity for the emergence of observers. In $D > 4$ bodies would fall much faster, i.e. inhibiting planetary systems for all but $D = 4$. Likewise in $D > 3$ there would be no stable atoms and thus no life.

III – d. A Priori Argument for the Dialectic PAP

(P1) To posit anything relies upon the individuation of a dialectical whole.

(P2) The totality of all that exists (the Universe) is the only *physical*, complete, and self-contained whole.

(P3) The Universe is an object of metaphysical synthesis whose form is ultimately grounded upon embodied (meaningful) relations with immediate experience.

(P4) According to the dialectical PAP, short of accounting for the selection effect(s) inherent in our embodiment, it is impossible to coherently conceive of the Universe independent of \exists^R .

(C1) Positing a universe in which the relation between the embodied agent and their environment is void undermines the coherence of (AE) epistemology, i.e. such a universe is *meaningless*.

(C2) It is impossible to coherently conceive of any complete, self-contained whole that does not include the participation of the subject (\exists^R).

III – e. Dialectical Argument for the TAP

(P1) Teleology (in dialectical holist terms) obtains iff particular entities X bear a dialectical relation to their wider system Y such that the *physical* nature of Y depends upon the physical nature of X and the nature of X depends upon the dynamical constraints of Y .

(P2) Some material phenomena (X) bear a dialectical relation to their superordinate system (Y).

(P3) X instantiates irreducible relations (laws) that are necessitated by the constraints of Y .

(C1) If \exists^R instantiates irreducible dynamics (laws), then this phenomenon can be considered the result of a teleological process (€) instantiated by U.

IV. The Universe as a Complex System

(1) *Process/structural ontology* – Process ontology in combination with OSR is a viable (if not preferable) foundation for understanding complex systems. Accordingly, relational processes constitute entities at all scales though the two are ontologically equal and interdependent.

(2) *Emergent constraints* – Forms arise through self-organization that both restrict and enable future states, dynamics, structures, and relations.

(3) *Deterministic function* – The components of a complex system are interrelated/coupled such that if one of the constituents is absent the function (or evolutionary trajectory) is incomplete.

(4) *Historicity* – Complex systems are *path-dependent* meaning small events can become locked-in to constrain future dynamics and emergent structures.

(5) *Hierarchical levels* – Nested structures obtain within complex systems, each requiring different (irreducible) descriptions.

(6) *Situated dynamics* – The constituent states/structures depend upon the environment within which they are embedded.

(7) *Intricate and cycling behaviour* – Complex systems obtain between simple order and total chaos, which instantiates periodic behavior that does not exactly repeat.

If the Universe is a complex system, its function is identified with a space of determinant forms/states that obtain throughout its evolution (€).

IV – a. Argument from Absolute Chaos

(P1) In a condition of absolute disorder no principles, patterns or laws can obtain.

(P2) To posit a state of nature is to distinguish an instance of order.

(P3) A state of perfect symmetry is one that lacks all contrasts, patterns, and regularity, i.e. order.

(P4) To posit a state of nature devoid of order is tantamount to saying there is a state of matter that is *no-thing*, i.e. abstract homogeneity.

(C1) Therefore, nature can never be in, nor arise from a state of absolute disorder or perfect symmetry.

(C2) Any disorder of the Universe as a whole presupposes self-differentiated order.

IV – b. Revised Criteria for Scales (ϕ)

(1) Identification of ϕ s should involve at least three parameters, whose *combined* values are unique to the respective scale: (i) *structure* – a-temporal relations within an identifiable boundary; (ii) *kinetics* – capacity to do work via energy transference (ET chain of a particular form); and (iii) *periodicity* (*relatively* stable self-organized spatiotemporal dynamics).

(2) While some relations will be multiply realized across scales, i-iii results in a *function* that arises at a global level for each ϕ that is indicative of emergent laws, *formal governance*, or a PSE). Importantly, the emergence of such laws should be explicable in terms of symmetry breaking.

(3) The formal governance of a given scale ϕ_a , will permit certain (thermo-) dynamic relations and phase transitions both within and beyond its bounds (e.g. order parameter and some self-organized boundary conditions), that permit the (at least second-order) emergence of scales $\phi_a^1, \phi_a^2, \phi_a^3 \dots \phi_a^n$, dependent upon ϕ_a .

(4) As a result of their irreducibility, it should be impossible to conduct *a priori* investigations from a given ϕ to its neighbors. While common principles will be discovered that unite identifiable ϕ with increasing systematization, their discovery and relationships will require ongoing *a posteriori* observation.

(5) Just like the investigation of states within an infinite dimensional phase space or structures within a fractal curve, it is hypothesized that the discovery of scales (i.e. phases) will be ongoing.

IV – c. Dialectical Evolution

(P1) Variation of auturgic (self-organized) form is a precondition of natural selection.

(P2) As the genome only functions as a whole, its *information* obtains only at the level of a living organism within an environment, e.g. traits obtain in living organisms actively engaged within an environment (traits consist of form and function), not in independent DNA.

(P3) The self-organization of information at the level of the *adaptive* organism provides a positive/physical selection effect (PSE) tending towards viable states.

(C1) The unit of selection is the self-maintaining system as a whole (i.e. the systems that have sufficiently coordinated form and function within an environment).

(C2) Fittedness is determined by how an organism's adaptive behavior (macro-functionality) both accommodates and feeds back to influence inherited genetics (micro-form) so as to remain viable within an environment (Neo-Lamarckism).

(P5) Increasing coordination of form and function in response to perturbation is equivalent to increasing complexity.

(P6) Selection pressures result from the self-organization of an ecological system as a whole upon the autonomous agent.

(P7) The self-organization of the ecological system is facilitated by individual systems adaptively coordinating form and function in accord with their ecological constraints.

(P8) Any open thermodynamic system that adaptively constrains the forms and functions of its constituents is auturgic.

(C3) The biosphere as a whole exerts constraints upon its members that drives an increase in complexity, thus qualifying as auturgic (i.e. ecopoiesis or Gaia).

V. Approaching the Crucial Problem of Consciousness

(1) *The Crucial Problem* – Harris proposes the problem of consciousness is the discrepancy between identifiable behavior and mental phenomena such that behavior will never be sufficient to derive conscious experiences.

(2) *Judgment* – If all *bodily* behavior can be recreated via mechanical means, it must be insufficient to account for mental phenomena. Harris proposes that judgment is arises from numerous unconscious dynamics that provides a *necessary* and *pre-lingistic* contextualization/synthesis that renders conscious some sensation, impression, or conception.

(3) *Scale of Forms* – Rather than positing a relationship between conscious awareness and material behavior, Harris aims to investigate consciousness within a scale of non-conscious mental processes on the one hand and the scale of material evolution on the other. Harris argues that a result of framing mind in this way is that there is an isomorphic configuration and identity of organization that appears as respective fields, not corpuscles.

(4) *Dynamical Constraint* – Through the sublation of relatively independent phases of organization/ function Harris claims the system is ‘informed’ in the sense that it is guided by the feelings it creates. “Conscious behavior” is a dynamic constraint upon or organization of phases that instantiate a higher order phase (characterized by a judgment of feeling). This kind of organization does not however occur at the level of the brain and/or body, but across numerous levels of the *system as a whole through time*.

(5) *Neurophenomenology* – Anticipating later works in the philosophy of neuroscience, Harris holds that both phenomenological and cognitive neurological investigations are required and neither is sufficient on its own to study the phenomenon of consciousness.

V – a. Spinozian Embodiment

(P1) Self-maintenance of a human being is achieved in and through self-sentience of the system (*ideatum* or *biological value principle*).

(P2) Self-sentience of the *system as a whole* depends upon *self-reference*: systematization of *judgments* concerning past and future actions involving (initially confused) affective cues.

(P3) A conscious system must be capable of cognizing beyond one’s (non-representational) felt model of self-in-relation-to-world by anticipating alternative models (i.e. *self-transcendence* via empathy).

(P4) Self-transcendence is possible only for a system that is embedded in a sociological network and has access to external perspectives of oneself and their objects of intention.

(C) Consciousness is an embodied, embedded, and enacted process of self-reference whose *constitutive conditions* include biological, ecological, and social (moral) relations.

VI. Enactivist Neutral Monism

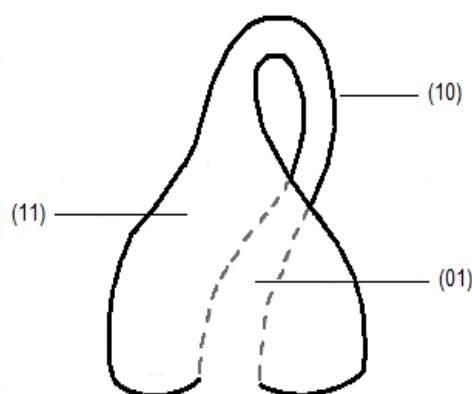
(1) *Coherence and Reflexivity* – Intentionality, life, and mind are considered interrelated and co-instantiating. As a result, AE in conjunction with sensorimotor theory requires that conscious experience is not *in or about an external world*, but is intentional and *reflexive*, meaning agents produce a meaningful world and this world produces us. This entails a WST, or coherence theory of truth, in which *affordances* are about a synthetic *world-as-experienced*, which gives rise to the objects and properties we identify. However, there is a continuous movement beyond any given system so constructed, towards increasing clarity.

(2) *Dynamic Systems Theory* – DST rejects intrinsic properties of atoms, neurons, brains, or people. As a result, in the context of consciousness, qualia are rejected while experience is attributed to *embodied, embedded, and extended* organisms. Representationalism and computationalism are rejected on the basis that brain-body-world forms a strongly coupled non-linear dynamical system. This behavior of this system can be treated as an attractor in phase space and its functions can be modeled as phase transitions, consistent with those non-living system with which subjects can be coupled.

(3) *Ontic Structural Realism* – The natures of space, time, and matter are incompatible with standard metaphysics that rely upon concepts like *individuals* and *intrinsic properties*. An OSR supportive of ENM grants ontological priority to relational processes and structure – structures that turn out to be relations upon further inspection. Accordingly, the world is not made of any basic parts, nor does it have a foundational level; but is conceived as relations all the way up and all the way down. Here structures and relational processes are ontologically equal and inseparable.

(4) *Neurophenomenology* – On the one hand, the NCC are considered necessary but insufficient conditions of consciousness. On the other hand, conscious experience necessarily involves temporal flow, the feeling of presentness via ongoing *synthesis* that permits *protention* of the future and *retention* of the past. This implies that subjective reports are fundamentally incomplete and constrained by the above coherence theory. Consequently the evolution of a subject's gestalt and neurodynamics are treated as correlated but irreducible processes, each modeled in phase spaces characterized by respective symmetry breaks and self-organization. In accord with Bohm's conception of correlated lower dimensional structures that are *unified in a higher dimensional reality*, phenomenology and neurodynamics can be mutually informing and increasingly illuminating of a common neutral base.

(5) *The Neutral Base* – Mental and material domains are partial realities, abstractions from a neutral base that is neither a substance, nor fundamental kind of constituent. This base is considered a higher dimensional and self-specifying whole that manifests as a range of co-arising domains, i.e. a scale of forms. Consciousness is not a property, thing, entity, or substance that arises from a substrate in the strong emergentist sense, nor is it *essentially* different, separable from, or merely correlated with matter. The dichotomies of outside/inside, knowledge/nature, and mental/material are rejected (or rephrased as conventional). Subject and object/world are considered co-existent, co-constraining, and self-consistently constructed as a one sided Klein bottle.



VI – a. Onto-Epistemic Dialectic Phenomenology

(1) *Dialectical Whole as Structure* – Characterized by a-temporal abstraction, at this level there exists only a framework for knowledge resulting in rough empirical levation/diffraction via *noematic givenness* (ESE/thesis). Outside-inside (01) in KBL, this level denotes the experience of 2-3D *form* – that is, efficient causation and ideal sensation of *contained body*.

(2) *Dialectical Whole as Kinetics* – Identification of dynamics permits increasingly accurate, spatiotemporal levation. Here structures are individuated in virtue of their generating, or being generated by some temporal process, thereby distinguishing the *formal governance* that constrains efficient causation (PSE/antithesis). Inside-outside (10) in KBL, this denotes the 2+1 or 3+1D identification of form against a relative background – that is, the differentiation of bodily self from bodily Other. The addition of time permits the specification of possible *alterations* to the identified phenomena, thus *anticipation* and *judgment* are enacted.

(3) *Dialectical Whole as Periodicity* – Spatiotemporal iterations leading to the *identification* of empirical emergence, respective levels of nature characterized by self-organization, and formal governance (MSE/synthesis). Inside-inside (11) in KBL, this signifies the return to depth-dimension. Here the subject establishes identity with their object via self-reference and self-transcendence of this *identity* via *conception* of the *object's* origin and developmental *trajectory*. Relations among objects are systematized through (the now possible) social conventions that permit the *object* to be identified with the whole of reality, thus establishing *a priori synthesis*, cosmology, and metaphysics. Such systems may again be objectified (via *epoché*), thus returning to stage 1.²⁵³

²⁵³ Notice also that these three phases mirror the above conception of Spinozan embodiment (including Damasio's arguments) for the emergence of self, i.e. ideatum/proto-self, core-self, biographical/situated social self.

Glossary

Autopoiesis – (self-producing) refers to the self-creating, self-organization of chemical, neuronal, and cognitive systems, in which there is a continuous regeneration and reproduction of the system by its own processes. This theory was originally proposed by Varela and Maturana (1972) as a model of life in its simplest form, i.e. the individual cell. The resulting conception of biochemical feedback loops between the living system and its environment (sensation), coupled with those between its membrane and components (self-generation) have been considered necessary and sufficient for adaptive self-preservation (minimal intentionality and cognition). In later developments, this theory has been extended to analyses of ecological and social systems more broadly.

Cybernetics – Derived from the Greek *kubernētēs* ‘steersman’, from *kubernan* ‘to steer.’ The paradigm shift ushered in by cybernetics replaced the linear Newtonian worldview by showing that information (or detectable differences) permits order in and through feedback relations of a system. Hence, cybernetics is the science of communications and automatic control systems in both living and non-living systems. With cybernetics there is particular emphasis upon self-organization, recursively, and form. Second-order cybernetics (or second-order science) attempts to account for the feedback influences of an engineer or observer upon an original target system.

Diachronic – denotes historical changes in a system over time that lead to the emergence of some properties, relations, functions, etc., that are purportedly irreducible to their lower level constituents. For example, the occurrence of life in an environment that previously did not contain life, or the alteration of a language to include rules previously absent fits this category. In this thesis it is argued if certain phenomena cannot, by their very nature be spatio-temporally localized, they are diachronically (at least second-order) emergent.

Dialectic – as a method, the dialectic began with Socrates’ (469 – 399 BCE) approach to discourse. Towards the establishment of truth concerning two or more different points of view about a subject, the dialectic can progress by *reductio* by assuming the truth of a particular view and then showing that it leads to contradiction. As proposed by G.W. Hegel (1770-1831), the dialectic was presented as a triadic structure that exemplifies three stages of development through *abstract* → *negative* → *concrete sublation*. Later elaborated by J.G. Fichte (1762-1814), the dialectic took the following iconic form: (i) a *thesis* that takes the form of a positive proposition, structure, or effect; (ii) an *antithesis*, which contradicts or

negates the thesis; and (iii) a *synthesis* that resolves the tension between the two and generates a successive thesis. In this thesis “dialectic” denotes both a kind of relation and an evolutionary process. The term “dialectical relation” (synonymous with “internal relation”), applies to instances in which the nature of an entity and the system within which it obtains are mutually dependent and dynamical. For a summary of “dialectical evolution”, see the below entry on “explicative process”.

Diffraction – If a wave meets a barrier in which there is a circular opening whose diameter is much smaller than the wavelength, the waves emerging from the other side of the opening spread out in all directions. This deviation from the previous straight-line path results in the wave impacting the opposite face of the barrier, which creates an interference pattern. According to *agential realism*, diffraction permits a more accurate means of conceptualizing the relation between nature and culture than a representationalist analogy of reflection from geometrical optics. This relation is considered that of “exteriority within”, an “enactment” of boundaries.

Dimensionality – In physics and mathematics the dimension of a space or physical object is typically defined as the minimum number of (orthogonal) coordinates needed to specify any point within it. For example: 0D is the point, an infinitely small placeholder that exists not in space, but only in time. Although no time passes within it, the zero dimension marks the moment between past and future. A line has 1D because only one coordinate is needed to specify a point in such a space. A surface such as a plane or the surface of an object is 2D because two coordinates (latitude and longitude) are needed to specify a point in this space. The inside of a cube, a cylinder, or a sphere for example is 3D because three (x, y, and z) coordinates are needed to locate a point within this space.

Ecosystem – A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment. Specifically, I take the term ecosystem to mean two or more organisms whose self-organizing processes have become coupled or interdependent with one another and to a mutual non-living context. Systems of this kind are unique for their capacity to collectively manipulate their non-living environment and thereby instantiate the selection effect of evolution. This is possible to the extent that the organisms, combined with their environmental create a feedback loop to constrain the form and function of the organisms themselves.

Effective Field Theories – (EFTs) includes the appropriate degrees of freedom to describe certain physical phenomena occurring at a relevant length or energy scale, while ignoring substructure and degrees of freedom at shorter distances and higher energies. EFTs provide

what some call a ‘tower of theories’ ordered hierarchically according to energy scale, where high-energy (short-distance) theories are at the ‘top’ and lower-energy (larger-distance) theories compose the lower ‘levels’ in the tower. Each of the levels are considered (quasi-) autonomous in that each can be studied independently of the one above it, but the entities of a particular level are also somehow constituted by those of the level above it. Roughly speaking, the respective energy levels correspond to the phenomena studied by respective disciplines, e.g. quantum gravity, particle physics, condensed matter, chemistry, biology, and psychology. According to the reductionist program the dynamics of microlevel entities should determine processes on the macrolevel (the low-energy processes). In practice however, theories from different levels are not as closely connected because a law that is applicable on the macrolevel can be mostly independent of microlevel details, e.g. hydrodynamics. Each level is thereby linked to its neighbors via emergence relations.

Embodiment – A theory of cognition that maintains particular bodily forms and functions are a necessary precondition for the experience of emotion, use of language, thought, and social interaction. Kinesthetic awareness of the body is thus a vehicle through which sensorimotor, perceptual, and nonconceptual lived world is experienced. Antithetical to representational and computational theories of mind as emotionless symbolic manipulations, this theory posits a proprioceptive, nonconceptual awareness that is sub-conscious, pre-reflective, and necessarily intersubjective.

Enactive – First used by Bruner (1966) in his theory of child learning that consisted of three successive modes of representation: enactive (action-based), iconic (image-based), and symbolic (language-based). The phrase, “enactive approach to cognition,” was later used by Varela, Thompson, and Rosch (1991) in the context of embodied cognition. Accordingly, all life involves autonomous agency that actively generate and maintain their identities, enact (bring forth) their own cognitive domain. For example, the nervous system generates and maintains its own coherent and meaningful patterns of activity according to organizationally closed reentrant sensorimotor network of interacting neurons. According to this theory, the nervous system does not process information in the computationalist sense but creates meaning. This implies that the cognitive being’s world is not a pre-statable, external realm, represented internally by its brain, but a relational domain that is brought forth by that being’s mode of coupling. The environment then, is from the first, partially constituted by a network of agents. Human knowing and purposeful acting is best understood as a complex interrelationship between brain, body, and environment.

Explicative Process (€) – Harris’s theory of evolution intended to be applicable to cosmology, biology, and the sociological development of knowledge. Harris’s theory of evolution concerns the self-differentiation of Nature as a whole (i.e. the Concrete Universal). For Harris, this evolutionary process results in a series of “unifying principles” (Φ) *becoming* specified over time, the relations between which are considered fractal and thereby interdependent (i.e. dialectically related). In the present thesis I have argued that € is most adequately conceptualized as a process of *symmetry breaking*, largely analogous to Bohm’s articulation of the “holomovement” and Gunn’s conception of “pneumatical force.” As Harris recognizes however, since each phase is believed to sublimate and transform those of its predecessors towards increasing completion (contra Gunn) this process is essentially dialectical in the Hegelian sense.

Fractal – To obtain a fractal dimension we begin with a Euclidean 2D space and reduce its linear size by $1/r$ in each spatial direction (length, area, or volume). The measure thus increases by $N=r^D$ times the original. Taking the log of both sides of the resulting $N=r^D$, produces $\log(N) = D \log(r)$. Solving for $D = \log(N)/\log(r)$, which means D is not an integer, as it is in Euclidean geometry, but a fraction between 1 and 2 dimensions. As a fraction dimension, each scale has the same statistical character as the whole over potentially infinite iterations. Fractal modeling can be useful for predicting structures in which similar patterns recur across a range of scales (such as snowflakes), and in describing chaotic and dynamic systems such as crystal growth or galaxy formation. Although such natural phenomena demonstrate scale-free patterns, they are considered quasi-fractals because they are finite.

Idealism – A range of metaphysical theses maintaining that *reality as a whole* (ontological variants), and/or *reality as we can know it* (epistemic variants), is fundamentally mental, spiritual, or otherwise immaterial. Whereas George Berkeley’s “immaterialism” advocates for the exclusive ontological reality of ideas, Immanuel Kant provides an example of a critical or “epistemic” variant typified by his division of “phenomenal” and “noumenal” domains. Idealism has been further differentiated into “subjective” and “objective” variants. In his subjective idealism, Fichte argued that only subjective content of the *I* is absolute and denied its identity with *not-I* or nature. Contrarily, Schelling attempted to establish the identity of the subject, object, and concept by positing the objectivity of subject (*I*), as well as the subjectivity of the object (*not-I*). Objective idealism identifies subject and object as the “absolute,” unconditioned first principle of philosophy (hence, it is a “philosophy of identity”). Harris, following Hegel, proposed that self and not-self (mind and matter) were co-

arrising phases through which the Absolute must pass (like a symphony), but that formal (dialectical) constraints are common to both and ultimately render these (conventional) distinctions continuous. On my account, dialectical holism can recognize the ultimate continuity of “subject” and “object,” but cannot identify any particular subject-object relation with the Absolute since its status remains beyond our ken.

Klein Bottle –The *Möbius strip*, named after the astronomer and mathematician August Ferdinand Möbius (1790-1868), was first proposed in 1858: start with a rectilinear strip of anything, say paper, twist it 180^0 and then join the ends. The most interesting feature of this object is that it is considered *non-orientable* – meaning it has only one surface. In 1882, Felix Klein (1849-1925) considered what would happen if two Möbius loops were connected together to create a single sided bottle with no boundary. Here the structure’s “inside” is its “outside”. While the Möbius strip obtains only if it is embedded in three-dimensional Euclidean space, the Klein bottle typically requires being embedded in 4D. A physical Klein Bottle is a 3D *immersion* of a 4D structure, analogous to a two-dimensional photograph of a three dimensional object. As a 2D manifold (i.e. there is only one surface) a Klein Bottle requires 4D because the surface has to pass through itself without a hole, which is to say it must be closed and non-orientable. In this way we must *imagine* the 4th dimension that permits its structure. In this vein, a hyper-Klein Bottle obtains in still higher dimensions.

Neutral Monism – An ontological thesis in the philosophy of mind maintaining that the mental and the physical are two ways of organizing or describing nature as a *whole*, which is itself something *neutral* between the two. Importantly, NM is noneliminativist about the reduction of mental and physical aspects to their common base. The questions these proponents must answer are: (i) What is the nature of the neutral base that forms ultimate reality, e.g. plural (the usual account), or singular? (ii) What is the relationship of this neutral base with matter and mind? In this thesis it is argued the neutral ground is best captured by appeal to a particular ontic structural realism.

Ontic Structural Realism – Scientific realism, is the belief in the existence of unobservable entities posited by the most successful scientific theories. One of the most powerful arguments against this view is from the history of paradigm changes in science. First proposed by John Worrall (1989), structural realism (SR) provided a way of having the best of both worlds. In its epistemic form (ESR) can be understood as a relational constructivism, in which we know only the causal-relational structure of the world, not its intrinsic nature. According to OSR, the natures of space, time, and matter are incompatible with standard metaphysics that rely upon concepts like *individuals* and *intrinsic properties*.

Broadly construed, OSR supports any metaphysical thesis that grants ontological priority to structure and relations – structures that on many accounts turn out to be relations upon further inspection. The version of OSR attributed to dialectical holism in this thesis maintains that fundamentality in the philosophy of physics is not granted to structures (abstract symmetry relations) nor to their relata (kinds of physical entity), but rather to *the dynamic process by which both become realized*.

Ouroboros – (jʊərəˈbɒrəs, ˌjʊərəʊ; Ancient Greek: οὐροβόρος [ὄφις] < οὐρά (tail) + βόρος (devouring) "tail-devouring snake") is a symbol originating in Ancient Egyptian iconography depicting a serpent or dragon eating its own tail. The ouroboros entered Western thought via Greek magical tradition and was adopted as a symbol in Gnosticism, Hermeticism, and alchemy. As in this thesis, it is typically intended to represent a process of eternal return. Counter contemporary appeals to this symbol as characterizing scientific progress however, I argue that the implication of finality, as in a ToE is mistaken.

Phase of Matter – Matter is defined as that which has mass and occupies space. States of matter are the physical forms that matter takes under some condition of temperature and pressure such as solids, liquids, gases, plasma, Bose–Einstein condensates, condensed, magnetic, time crystal, and electric. To specify the *state* of matter is to provide the compound of a physical system (e.g. a jar of oil and water is in a liquid state) whereas *phase* specifies the set of states within such a system (in this case two phases due to their relative *insolubility*). Phases of matter are determined with respect for the region of space in which there are uniform physical parameters (temperature, pressure, etc.) or phenomenology (the types of molecular movements observed at different temperatures). During a *phase transition*, a system passes beyond a critical state at which point the order parameter goes from zero to non-zero. Critical states appear as repellers by acting as boundaries between basins of attraction, but they can also act as attractors since the smallest relevant perturbations can collapse the system beyond the threshold. Passing this boundary, phase transitions describe how relations among molecules can suddenly undergo qualitative changes to more efficiently dissipate energy. Immediately before a phase transition, disorder increases within the system, which coincides with a disintegration of existing structures prior to reorganization. After a phase transition, disorder drops to a lower level than it was previously. The difference between the entropy before the start of the phase transition and the entropy immediately after is called negentropy, which coincides with the emergence of new thermodynamically advantaged structure due to an increase in how quickly the system can manage/export entropy.

Phenomenology – A philosophical tradition originating in the early nineteenth century European sources interested in the study of phenomena, the structure appearance, experience, or consciousness. Kant used the term to distinguish between the study of objects and events as they appear in experience (*phenomena*) and as they are in themselves (*noumena*). Hegel (1770-1831) used the term to denote a science he hoped to develop, by which mind may become known to us as it is in itself. Franz Brentano (1838–1917) introduced the concept of *intentionality* (from *intender*, meaning directed aboutness). For William James (1842-1910), phenomenology was radical empiricism, lived experience in the immediate moment before the differentiation of subject and object. Edmund Husserl (1859-1938) and his followers focused upon lived experience of the immediate moment. Husserl’s transcendental phenomenology used a method characterized by the *epoché* (from the Greek ἐποχή *epokhē*, "suspension") or *bracketing* of our naïve or *natural attitude* that what is observed exists ‘out there’ beyond the observer. This became a method of self-discovery and ego transcendence, a discipline endeavoring to describe how our *lifeworld* is constituted and experienced by reducing or distorting influences of various cognitive operations of one’s object. For Martin Heidegger (1889-1976), phenomenology was ontology, the study of *dasein*, or modes of being in the world. For Merleau-Ponty (1908-1961), phenomenology was the study of essences, the nature or meaning of perception. Developed by Francisco Varela (1946-2001), contemporary neurophenomenology, draws upon these traditions in combination with Eastern meditative practices and neuroscience to elucidate common principles of neurologic and experiential dynamics.

Pneumatology – On the very first page of Gunn’s (2011) work he notes “pneumatology” is taken from the Greek word for breath. By *pneumatic* he intended an antonym for mechanical action by which one entity acts on another. An entity acts pneumatically when it determines or endeavors to determine its own state. Gunn’s project has been to argue that physics reveals sufficient evidence to posit *pneumatical* action as not only possible but essential to Nature. That is, nature is fundamentally self-determining and self-moving, thereby excluding any need to invoke God or any other external force. Hence in line with Bohm and Harris, Gunn’s thesis aims to antiquate a mechanistic view of nature and undercut idealism in favor of a process ontology based in contemporary physics.

Pragmatism – An American philosophical movement initiated by C. S. Peirce (1839-1914) and William James (1842–1910), who were unable to agree on a single definition of the term, thus resulting in two *pragmatisms*. Pragmatism rejects the idea that the function of thought is to describe, represent, or mirror reality. Instead, pragmatists consider thought an

instrument or tool for prediction, problem solving and action. Pragmatists contend that most philosophical topics – such as the nature of knowledge, language, concepts, meaning, belief, and science – are best viewed in terms of their practical uses and successes. Pragmatists can appeal to a coherentist theory that rejects the claim that all knowledge and justified belief rest ultimately on a foundation of non-inferential knowledge or justified belief. Justification can then be established via the *relationship between beliefs*, none of which are privileged as in the case of foundationalist theories. Pragmatists thereby hold a considerably deflationary account of truth. Accordingly, assertions that predicate truth of a statement do not attribute a property called truth to such a statement, but such assertions are rather *useful-to-believe*. This is also consistent with an instrumentalist and *anti-realist* philosophy of science that a scientific concept or theory should be evaluated by how effectively it explains and predicts phenomena, as opposed to making claims about objective reality. This leads to a pluralist view of metaphysics that there is more than one sound way to conceptualize the world and its content. Dialectical holism endorses this view but maintains (or hypothesizes) a particular kind of open-ended convergence, i.e. an ongoing unity-in-diversity of ontologic and epistemic theories.

Supervenience – A relationship holding between some higher- and lower-level properties. Some intrinsic qualitative properties of an object *O* *supervene* upon intrinsic qualitative properties and relations of its parts just in case there is no change in the properties and relations of *O* without a change in the properties and relations of its parts. Hence, higher-level properties supervene upon the lower level when knowledge of the underlying constituents overdetermines the knowledge of the higher level.

Symbiogenesis – Also referred to as endosymbiosis, this theory began as an evolutionary theory of the origin of eukaryotic cells from prokaryotic organisms, first articulated in 1910 by Russian botanist Konstantin Mereschkowski. The theory was later elaborated and substantiated with microbiological evidence by Lynn Margulis in 1967. Accordingly, eukaryotic cells evolved from the organization of numerous prokaryotes (e.g. mitochondria) into a single system. This theory has provided significant support for conceptualizations of multi-level selection and macro evolution endorsed by both Harris and contemporary enactivism.

Symmetry – Derived from the Greek words *sun* ('with' or 'together') and *metron* ('measure'), which forms *summetria*. This term originally implied a relation of *commensurability* or relation between theories using a shared terminology that allows direct comparison to determine which is more valid or useful. In the late 1800s Pierre Curie

established criteria for symmetry breaking. Asymmetry was understood as a particular absence of symmetry that is considered to be precisely what permits anything to happen within a system. While the symmetry elements of a cause must be found in its effects, the reverse is not the case, which means an effect can be more symmetric than its cause(s) (called *Curie's principle*). Symmetries can be exact (unconditionally valid), approximate (valid under certain conditions), or broken (context dependent). *Symmetry breaking* is understood to create certain phenomena that have lower symmetry than the previous states or systems involved. In other words, the initial symmetry group is broken into one of its *subgroups*. A symmetry principle is one in which a law or physical phenomenon remains invariant under transformation(s) (e.g. rotation, reflection, translation). In symmetry principles, symmetries take an explanatory role within a hierarchical structure of a physical theory. Here, symmetries are properties of laws that explain their form and occurrence/non-occurrence via physical events. Given the methodological power of symmetries, a great deal of ink has been spilt in arguments as to whether specific symmetries are ontological or epistemic. Symmetry may, at least pragmatically, indicate “objectivity” via invariance under transformation of reference frames.

Synchronic – The study of the elements and their relations at a given moment. In the context of emergence this concept refers to instances in which a phenomenon is considered as though it were a static photograph so that its purportedly “higher”- and “lower-level” properties can be analyzed without dynamical interference.

Synthetic A Priori – A type of proposition in logic that meets the following two criteria: (i) the truth of such a proposition is knowable independently of experience (*a priori*); (ii) the predicate of the proposition is not analytically contained within the subject, but requires empirical observation (*synthetic*). In the present thesis it is attributed to Harris that the *structure* of a dialectical whole identifiable in phenomenology satisfies (i), i.e. it is a priori knowable that identity is dependent upon difference via internal relations. Additionally, the process of self-differentiation into a scale of forms satisfied (ii), i.e. the content or constraints of each scale is only known through empirical investigation, but its *coherent* evolution remains a priori.

Unifying Principle – (ϕ) Central to Harris's theories of nature and knowledge, this term refers to particular kinds of systems or dialectical wholes. Harris claims an understanding of nature and knowledge can be acquired by focusing upon instances in which the form of a system imposes an organizational constraint (coherence or *unity*) upon its constituents. Though the whole is considered prior to its parts, this governance is expected to arise not

solely through top-down constraint, but equally through bottom-up self-organizing dynamics, i.e. a causal feedback loop. The particular details of this feedback dynamic are believed to be characteristic of a particular spatiotemporal domain. Consequentially, the system is (dialectically) coupled to its environment just as its components are coupled to one another. It is therefore proposed that Nature can be understood as a series of theoretical principles that provide accurate predictions within a particular domain or *scale*. Likewise, theories just as their organizing paradigms are considered to be dialectical wholes of this very kind. It must be remembered however, that no matter their level of sophistication, the principles that are constructed in our systems of knowledge *do not refer to actual levels of nature*, but are general patterns akin to *distinguishable* levels of a fractal that lead to the discovery of innumerable further wholes upon closer inspection.

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