THE SPIRITUAL MEANING OF TECHNOLOGICAL EVOLUTION TO LIFE

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ABSTRACT: There are two senses by which technology can be seen as a new layer of living complexity: first, while biological systems can only appropriate 24 of the 91 natural elements into their metabolic processes, technological systems can imbue complex form into all 91 elements; second, this added capacity gives life the potential to expand across its current limit – the atmosphere of the Earth – in the same way as it expanded from the oceans to the land some five hundred million years ago. This essay explores what such an understanding of life and technology might mean to us, humanity, in the context of our current ecological and social catastrophe.

KEYWORDS: Complexification; Technology; Life; Lyotard; Expansion; Evolution; Charles Taylor

1. INTRODUCTION

In the first sections of this paper, I consider life as an evolutionary process with two general properties: complexification and expansion. After showing how these properties have enabled life to grow over the surface area of the earth, I consider what it would mean to view technology as an aspect of these same processes. I argue that there are two senses in which technology can be seen as a new layer of living complexity: first, while biological systems can only appropriate 24 of the 91 natural elements into their metabolic processes, technological systems can imbue complex form into all 91 elements; second, this added capacity gives life the potential to expand across its current limit – the atmosphere of the Earth – in the same way as it expanded from the oceans to the land some five hundred million years ago.

In the fourth and fifth sections, I consider what such an understanding of technology might mean to us, humanity, the creature through which technology emerges into reality. I begin by engaging with the philosophy of Jean-François Lyotard, who takes an extremely negative position towards this process. I

argue that Lyotard views the expansion in such pessimistic terms because he posits this new understanding as a fundamentalism that reduces all human meaning to the spread of complexity. By contrast, I argue that the expansion should be thought of more moderately, as a new good to be added to the nexus of goods we already recognize. As a way to conceive this more moderate position, I introduce Herman Dooyeweerd's Christian Ground Motive – "creation, fall, and redemption through Jesus Christ in communion with the Holy Spirit."[1] I argue that technology should be seen as creation, a new perspective to complement philosophies that interpret technology as either fall or redemption. The good of creation, as the growth of technological life into the void, would then exist in apposition to redemptive goods like justice or universal equality.

In the final three sections, I explore the logic of technology-as-creation in relation to various other philosophies. Thinking of "creation" simply as the coming into reality of newness, I argue that part of the way human beings bear the image of God is as creators, bringing the newness of technological form into reality,

[1] Herman Dooyeweerd (1979). *Roots of Western Culture: Pagan, Secular, and Christian Options*. Trans. John Kraay. Toronto: Wedge Publishing Foundation, p. 15.

breathing new forms of cybernetic life – biological ecosystems enclosed in technological membranes – into the unformed dust of space. I then interpret the current ecological crisis in terms of this vision, and end with a brief reflection on the important difference between the good of creation and the good of redemption.

2. LIFE-AS-EVOLUTION: THE LOGIC OF COMPLEXIFICATION AND EXPANSION

This paper uses the word "life" in a particular sense. "Life" refers to what I call "life-as-evolution," as a macrocosmic process that has been developing on the surface of the Earth for the last four billion years, as it is carried forward by the current generation of living entities, including humans and their technological apparatus. "Life-as-evolution" must be distinguished from microcosmic discussions concerning "the evolution of life," which seek to uncover the details of how the living process has come into its current shape. Nobel prize winning biologist Christian de Duve provides a good example of the latter attitude when he defines "life" as "what is common to all living beings."[2] He goes on to name things like DNA, proteins,

[2] Christian de Duve, *Life Evolving:Molecules, Mind, and Meaning*, Toronto, Oxford University Press, 2002, p. 41.

and cell-membranes as examples of such common characteristics. Evan Thompson is also operating in the latter mode of thinking when he defines life as an autopoetic process giving rise to a boundary "between the inside and the outside of the system in relation to its relevant components,"[3] in which the membrane is created and sustained by processes occurring within. "Life-as-evolution," by contrast, concerns the overarching relationship between ecosystems and inanimate matter, the differences between the way matter is organized on the surface of the Earth compared to the surface of the moon – life as a continuous chemical reaction that has organized and re-organized matter for the last four billion years.

Conceived in this sense, life displays two general properties. First, it displays a property of "complexification" or "negative entropy," a general tendency to develop from simple to more complex organizations. We can think of this property in terms of the evolution from single-celled to multi-celled organisms, and how the variety of cells within these multi-celled organisms continually increases, producing the different organs of our bodies. We can also think of complexification in terms of the evolution from ecosystems of bacteria to tropical rainforests.

[3] Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind,* London, Harvard University Press, 2007, p. 103.

The bacteria still exist, but over billions of years, a rainbow of ever more complicated trophic levels have grown on top of the original layer. In both examples, life has progressed from simple beginnings to ever more complicated arrays of interconnected form.

Besides complexification, life also displays a property of "expansion," a tendency to infuse living form into as much matter as possible. We can conceive of this by imagining a new volcanic island emerging from the ocean: starting as a bare expanse of rock, over millions of years, the material elements of this island will slowly be re-organized into the living and dying cycles of a forest.[4] We can also see the expansive character of life in more mundane examples: the way an abandoned parking-lot will slowly revert into a field of grass; the way a small patch of mold on a loaf of bread will inevitably grow to cover the whole. Similar to how gases diffuse from high densities to low densities, life tends to expand into whatever non-living matter it can reach, until all places within its horizon are filled with as much life as possible.

[4] See George Bataille (1991). *The Accursed Share*, trans. Robert Hurley, New York, Zone Books, chapter 1; this book provides an excellent description of the expansive character of life as a kind of pressure that floods over whatever edges contain it.

The combined logic of complexification and expansion have allowed life to spread across the surface of the earth. Beginning as ecosystems of anaerobic bacteria subsisting on hydrothermal energy on the ocean floor, life expands until it reaches a limit, a physical barrier that it cannot cross. In this case, the limit would be the entire universe beyond the source of these hydrothermal vents. In the face of such a barrier, life "complexifies" in a way that allows it to expand across the boundary; in this case, it develops photosynthesis, which gives it the capacity to take advantage of a much more general power source: the energy from the light of the sun. Growing now through the oceans, life eventually encounters a new limit: the edge of the water, beyond which lie the arid continents. In the face of this new limit, life complexifies again, this time developing a skin that can support a water-based organism within a dry ambient environment – forms that can carry the ocean within themselves. This is the logic of life-as-evolution: first, an expansion up to the edge of an initially insurmountable barrier; following this, complexification into a form that relativizes the previously absolute limit, allowing for a new period of expansion.

Considering technology as an aspect of this process does not entail thinking about how technology is affecting the evolution

of life. Instead, it is a question of what it means to see technology as an aspect of life's macrocosmic capacity to organize the simple matter of the universe. To make this point as clear as possible, I will begin this discussion with reference only to the simple categories of matter and form, initially setting aside the fact that humans are the makers of technology, the efficient cause, and also setting aside what purposes humanity might make technology to accomplish, the final cause, or *telos*, of technology. After I have clarified this position in these simplified terms, I will re-introduce humanity into the discussion, taking up questions of efficient and final causes as they pertain to technology conceived of as an aspect of life's evolutionary logic.

3. TECHNOLOGY AS AN ASPECT OF LIFE-AS-EVOLUTION

In an essay responding to Jacob Klapwijk's new book on emergent evolution, [5] chemist John Satherley makes an interesting observation concerning the relationship between life and matter: "living things require or make use of 24 of the 91

[5] Jacob Klapwijk, *Purpose in the Living World?: Creation and Emergent Evolution*, trans. Harry Cook, New York, Cambridge University Press, 2008.

elements naturally found on Earth."[6] Satherley makes this point in order to emphasize that all of the elements currently organized into biological organisms were at one point inanimate dust. From this, Satherley argues that the emergence of complexity should be thought of not only in terms of life's evolution, but also in terms of the evolution of matter, the evolution of the periodic table from the primordial cloud of Hydrogen and Helium that existed near the beginning of the universe. According to Satherley, the emergence of living complexity is only possible on the basis of a prior evolution in the very matter of which life is made, and a theory of emergence must include this prior material evolution in its scope. Our current discussion of technology is based on a similar realization, but developed in the opposite direction: instead of extending our understanding of evolution backwards, into the matter from which life is built, we extend our understanding forward, and describe the way that life eventually gives rise to technology, a new capacity to bequeath complex form to previously unorganized elements. This means seeing the evolution of life as one phase in a larger process of complexification, which begins with the creation of matter,

[6] John Satherley (2011). "Emergence in the Inorganic World" in *Philosophia Reformata*, 76-1, p. 47.

extends into the creation of life, and is now carried forward in a new way with the creation of technology.

Thinking of technological complexity from the perspective of life, we can see the capacity of biological life to infuse form into only 24 of the 91 elements as a kind of limit. Similar to how life was once unable to infuse the matter beyond a certain distance from hydrothermal vents, or how life was later unable to infuse the material of the continents – so too has life been enclosed within a cycle of only 24 elements, unable to infuse 67 of them with its metabolic processes. Technology, in this sense, can already be seen as an expansion of life's capacity to organize matter into complex forms.

At first glance, this point might seem counter-intuitive. Discounting the cutting edge of cybernetic prosthetics, cochlear ear implants, artificial hearts, we cannot really argue that technology has given life the capacity to include elements like Yttrium in its biological processes. Again, if we confine our understanding of "life" to microcosmic questions of life's evolution, then it would make no sense to speak of life expanding its formative power. However, if we think of life-as-evolution, and compare the way matter is organized on the surface of the Earth to the surface of the moon, technological

organization is clearly an example of life's organizational power. Cars, computers, power plants – these are all immensely complicated organizations that are only possible given the existence not just of life, but of a life form that has achieved the level of intelligence necessary to render technology possible. In light of this distinction, the term "biological life" will now refer to the cycles of 24 elements, while "technological life" will refer to forms that are able to use all 91 elements. "Life" will continue to refer to the more general process of complexification that has been operating on the Earth for the last four billion years, while the even more general concept of "complexification" will be extended back to include the evolution of the periodic table from primeval clouds of gas that existed at the universe's dawn, as well as forward, into the new potentials opened up by the existence of technology.

Thinking of a greenhouse in Antarctica can help elucidate the relationship between these terms. In this greenhouse, life would clearly be using previously unusable elements to support and power its metabolism, as technological arrangements of matter allowed living things to thrive in an otherwise inhospitable environment. Technological organization could even be said give life a new layer, a new skin, that allowed a biological inside to

exist in a state of non-equilibrium with a hostile outside world.[7] In purely biological ecosystems, plants or "autotrophs" process the raw materials of nature into organic molecules, which are then consumed by "heterotrophic" organisms, which eat other biological organisms to survive. In technological ecosystems, the raw materials used by the plants would themselves be prepared and protected by a layer of technological skin – in the case of our greenhouse, the plants would be enclosed within an insulated wall that separated a cold exterior from a warm interior, and the whole arrangement would be heated by some kind of technologically mediated power source. Submarines, apartment buildings, and even clothing might be thought of in the same terms – different kinds of technological membrane supporting hospitable interiors within otherwise adverse outside conditions. This, we might note, is also the definition that Thompson has given for living systems: a membrane distinguishing an inside from an outside, sustained by operations that occur within.

[7] See Barry Allen, *Artifice and Design*, Ithaca, New York, Cornell University Press, 2008; this book also uses the image of a "sheltering carapace" (p. 18) to describe technology.

This concept of technological skin can be used as the basis for what might initially appear as an absurd claim: much as life has already evolved over the edge of hydrothermal vents into the oceans at large, and over the edge of the oceans onto the Earth at large, we might note that there is now another boundary blocking life's further expansion, the atmosphere, beyond which lies the void of space. We have already described the logic of expansion as entailing a potentially infinite growth – like the seeds of a dandelion or the spores of a mold, life naturally diffuses outward, from high pressure to low pressure, to the absolute limit of its capacity to grow. We should agree, then, that if it were capable, life would already have crossed the barrier of the atmosphere, swept through space, and infused the matter of the void with living form. This has been impossible up to now because biological systems composed of only 24 elements cannot escape the gravity well of the Earth, cross the irradiated and pressure-less void, and reproduce themselves in the unbearably hostile environments that exist everywhere else in the universe.

With the added power of technology, however, such an expansion is no longer necessarily impossible. Technology has already expanded over the limit of 24 elements, putting all 91

elements of the periodic table within the scope of its formative power. By equipping life with a new kind of membrane, a new way to mediate between an interior and an exterior, it seems at least possible that technology would allow life-as-evolution to expand into space environments that were previously both unreachable and utterly inhospitable to its survival. The reality of apparatus like the orbital space station and the Apollo missions testify at least to the possibility of such an expansion. In this sense, then, technology would relate to life-as-evolution as the means whereby life might become capable of expanding over the atmosphere, its current limit, and infusing the matter beyond the Earth with new types of living organization. More concretely, we might imagine a biological ecosystem contained within a technological skin, which mediated between the outside void and an inner biosphere in the same way as the skin of land-dwelling organisms mediates between an arid exterior and an inner ocean. I will henceforth refer to the potential expansion of technological life into space simply as “the expansion.”

I will now consider what such a vision could possibly mean to the humans who make it possible. Clearly, unless we develop some kind of self-replicating machine (a possibility that I will not consider in this paper), technology depends upon human work

for its continued complexification. In Aristotle's terminology, humans are the efficient cause of technology, the artificers who make the technological skin. This means that the expansion of life into space depends not only upon technology, but also upon us. This, in turn, means that our previous discussion of matter and form must give way to more complicated discussions concerning ourselves and our motivations. Starkly put, we must consider what it would mean to view technology no longer primarily in terms of improving human life, but instead as the means whereby life gains the capacity to expand over its current limit.

French philosopher Jean-François Lyotard, most famous for his work on postmodernity, considers such an understanding of technology in works like *The Inhuman* and *postmodern fables*. Lyotard, however, argues that this understanding is demonic, a desecration of all goodness and beauty. I will begin my discussion of what the expansion might mean to humans by examining Lyotard's condemnation of it, as the limit case, its most extreme rejection. I will first explain Lyotard's position, show why he comes to the conclusions he does, and then show why these conclusions do not necessarily reflect the essence of the phenomena in question.

4. THE EXPANSION AS LYOTARD'S HELL

For Lyotard, the expansion not only has no legitimate human meaning, it is actually evil for a human to ascribe meaning to it: "it is only for the last of men, the nihilist, that [⋯] the rise of the megalopolis to the stars can procure an (evil) delight."[8] By "rise of the megalopolis," Lyotard is referring to what I have described as the expansion of life, but from the inverse direction: not as life growing into a new environment, but rather as the expansion of technology, a hideous Leviathan that has nearly consumed the biosphere, is reducing human life to mechanical drudgery, and now looms at the edge of an infinite expansion into the void. The reasons for Lyotard's extreme critique, however, go deeper than mere choice of words; whether understood as life or as technology, Lyotard argues that viewing the expansion as having any relevance to humanity entails imposing an utterly inhuman standard onto human life. Judging human life by such a standard dehumanizes us, and delighting in this dehumanization is evil.

This argument is based upon a radicalization of the classic critiques of technology. Lyotard sees technology as reducing all value to mere efficiency, as tending to absolute control, with

[8] Jean-François Lyotard, *The Inhuman*, trans. Geoffrey Bennington and Rachel Bowlby, Stanford, Stanford University Press, 1988, p. 198.

both of these lamentable tendencies as now grounded in an apparently ineluctable cosmic process. In short, if complexification is a true description of the cosmic story, and if technology is the necessary next step in this development, and if technology leads to the dehumanizing of humanity, then it would seem that humanity is fated to be dehumanized. For Lyotard, however, to be human means to struggle against fate, to strive to create a just world in spite of the awful necessities that impinge upon us. In the past, necessity might have been characterized by the struggle to survive in a hostile natural world, by war between nations, by the inevitability of death; now, necessity is also characterized by the expansion of complexity. In either case, the humane response to necessity is to struggle for justice in spite of it. For Lyotard, therefore, to see technology in terms of the expansion is to forsake the fundamental moral duty of every human being, as though the only significant thing that human beings had to contribute to reality were a raw physical expansion of brute life into an endless night.

Lyotard argues that such a conception is like a myth. He calls it a “postmodern fable,” and condemns it as “the almost

infantile expression of the crisis of thought today."[9] Lyotard does not see the mythic story of the expansion as something to be believed; instead, it is something to be reflected upon, a prism through which to think about the human condition in the world today. Engaging in such reflection, Lyotard indicates a series of decisive differences between the myth of the expansion and more traditional narratives. First, although the expansion offers a kind of historical narrative, "it is concerned only with energy and matter as a state of energy."[10] Human beings are conceived of as nothing more than complex organizations, and their sole purpose in the cosmic story is to create more complex organizations. Second, the story only allows for a diachronic temporality. Time moves forward in a line from less complex to more complex, from a simple past to a simple future; being human, by contrast, involves a halting attempt to remember a forgotten past, and bear this memory forward into an unknown future. The myth of the expansion treats the vagaries of this human temporality as a liability, to be erased in the name of a more efficient system. The third and fourth differences can be

[9] Jean-François Lyotard, p*ostmodern fables*, translated by George Van Den Abbeele, Minneapolis, University of Minnesota Press, 1997, pp. 100-101.

[10] Lyotard, *postmodern fables*, p. 98.

seen as consequences of this forgetting: Lyotard observes that "this history is in no way directed toward the horizon of an emancipation,"[11] and that "the future this fable recounts [⋯] is not an object of hope."[12] The expansion does not call upon us to lead better lives; it does not call upon us to treat our fellows with compassion, or to act with justice in our civic responsibilities in order to leave a better world to our children. It is indifferent to all these things. Finally, the future it projects as its goal is qualitatively no different from the present, and will probably be much worse for whatever human-like things end up accompanying the megalopolis on its cosmic odyssey into nothingness.

5. PROBLEMS WITH LYOTARD'S FABLE

Given the way Lyotard has characterized the expansion, his critique is perfectly apt. Lyotard posits the expansion as a kind of fundamentalism, reducing all human meaning to the story of complexity expanding into space. It is not necessary, however, to take such an extreme position with regard to the human meaning of the expansion. In other words, rather than trying to

[11] Lyotard, *postmodern fables*, p. 98.

[12] Lyotard, *postmodern fables*, p. 99.

replace all previous visions of the good with a single overriding imperative to expand, it is possible to add a concern for the expansion to an already accepted system of values. The expansion does not need to be imagined as some new ideological totality. It can be imagined as a small addition to the system of goods that we already acknowledge.

In *Sources of the Self*, Charles Taylor makes a distinction between a "hypergood" and a "good." By "good," Taylor means a general value or orientation in life: "rational mastery, or a rich conception of family life, or expressive fulfillment, or fame."[13] These would all be different goods that a person might adhere to, often to various extents at the same time. Generally speaking, people orient their lives in relation to a variety of different goods. However, it is also possible for people to orient themselves in relation to what Taylor calls a "hypergood," a good that is seen by its adherents as being "incomparably more important than others," and also provides "the standpoint from which these [other goods] must be weighed, judged, decided about."[14] As an example of a hypergood in modern culture, Taylor cites "a notion of universal justice and/or benevolence, in

[13] Charles Taylor, *Sources of the Self: The Making of the Modern Identity*, Cambridge, Massachusetts, Harvard University Press, 1989, p. 62.

[14] Taylor, *Sources of the Self*, p. 63.

which all human beings are to be treated equally with respect, regardless of race, class, sex, culture, religion."[15] To those who adhere to this hypergood, all other goods would only be good insofar as they furthered the absolute end of justice and universal equality.

In Lyotard's fable, the expansion is taken as a hypergood, as the absolute end towards which all other goods must be directed, the absolute foundation from which all other goods must be derived. To such a vision, justice and equality would be subordinate to the development of technology, which would itself be subordinate to the expansion of complexity. Such a vision would indeed be worthy of total condemnation. However, it is not necessary to understand the expansion in such an extreme way. Instead of as a hypergood, the expansion can be taken as a simple good, to be acknowledged along with other goods instead of as a replacement for them.

That being said, Lyotard's critique bites into this more moderate position as well. As he correctly points out, the expansion of complexity into space has absolutely nothing to do with promoting justice or equality. This means that if Taylor is correct in saying that modern culture takes justice and equality

[15] Taylor, *Sources of the Self*, p. 64.

as hypergoods from which all other goods must be derived, then there is simply no place within modern culture to accept the expansion as a good even in the mundane sense. To a modern moral consciousness, in other words, if the expansion does not lead to justice or equality, then it is morally irrelevant. This has already become a problem for those who have argued for "the colonization of space" – without engaging in sophistry, it is very difficult to argue that the expansion, in this case of humanity, will bring any palpable benefit to anybody.[16]

This, then, is the problem: in order to argue that the expansion does indeed have a legitimate human meaning, we must acknowledge it as a good; however, we do not want to posit it as a hypergood, reducing things like justice and equality to their instrumental utility in promoting the growth of technological life. Conversely, we also do not want to reduce important values like justice to the level of mere "good," which people could choose or not choose depending on their

[16] See Carl Sagan, *Pale Blue Dot: A Vision of the Human Future in Space*, New York, Random House, 1994; Sagan honestly portrays how "colonizing space" offers no real practical benefits to humanity. He ends up arguing (pp. 279-282) that the space program can only be justified on the basis of the "intangible benefits" that accrue to people who live for a higher purpose; essentially, the space program can only be justified as a dream.

temperament. It is here that Dooyeweerd's articulation of the Christian Ground Motive becomes an important hermeneutic lens: by splitting our vision of goodness up into different, mutually irreducible spheres – in this case, creation and redemption – we gain a way to acknowledge the goodness of things like justice and equality, while at the same time acknowledging the goodness of the expansion.

According to Dooyeweerd, the Christian Ground Motive goes as follows: "Creation, fall, and redemption through Jesus Christ in communion with the Holy Spirit." In the context of our current discussion, justice and equality would be concerned with redemption, while the expansion would be concerned with creation. Both redemption and creation are goods, but they operate in fundamentally different spheres, akin to the difference between the good of being born (creation) and the good of becoming a spiritually healthy adult (redemption). By filtering our thinking through this prism, both redemptive goods and creative goods can be acknowledged without the corrosive necessity of reducing the one to the other. In the more precise context of the philosophy of technology, we also notice that only two of these three positions are currently represented in the

discourse: we have technology-as-fall and technology-as-redemption, but we do not have technology-as-creation.

For the purposes of this paper, I will treat technology-as-creation as entailing the expansion: the growth of life across the barrier of the atmosphere, as the current expression of life's inherent tendencies to complexification and expansion. In the final three sections of this paper, I will offer some tentative suggestions as to how this idea might look to some traditional philosophic and religious systems. My aim is to set these radical ideas into more intimate relation with other discourses, to make them more comprehensible as well as open them to critique. This is necessary to avoid naming the expansion a new hypergood, and thereby creating a new fundamentalism that interprets all aspects of reality in terms of one narrow frame. These final sections are experimental, attempts not so much to define the meaning of the expansion in terms of one absolute system but rather to set these ideas into various traditions, so as to avoid unwholesome extremes, to facilitate dialogue, as well as to help carry the wisdom of the past into the context of our current world.

6. TECHNOLOGY-AS-CREATION: RETELLING THE MYTH OF THE EXPANSION

In his aptly titled essay, "Technology: Liberation or Enslavement?", David Cooper describes different philosophies of technology as generally falling into two camps: one camp sees technology as representing either human freedom from nature, or the highest expression of humanity's nobility, or the ability to recreate ourselves according to our desires, or the capacity to increase democratic participation – this would be "technology-as-redemption"; the other camp sees technology as representing either the loss of human sovereignty, or the emergence of tyrannical governments, or the reduction of our interaction with the world to instrumental manipulation – this would be "technology-as-fall."[17] To this duality of visions, I will now add technology-as-creation, as the interpretive key needed to acknowledge goods like justice and equality while at the same time acknowledging the good of the expansion.

As we have seen, complexification refers not only to the evolution of life, but also to the prior evolution of matter. The physical cosmos itself has grown in complexity through the formation and explosion of stars, which created the atoms of

[17] David E. Cooper, "Technology: Liberation or Enslavement?" in Roger Fellows (ed.), *Philosophy and Technology*, New York, Cambridge University Press, 1995, pp. 7-18.

the periodic table, and the phenomenon of life only becomes possible on the basis of this prior cosmic development. Technology-as-creation points to the future evolution of complexity, the explosive growth of life out of its present container, to occupy more of the material substrate of reality. In terms of the story of Genesis, much as the Bible speaks of God forming us from the dust of the ground and breathing into our nostrils the breath of life, so too would we now breathe living form into the dust of space. Human beings would bear the image of God not only as recipients of creation, but as agents of creation, as co-creators mandated to extend the radius of the universe imbued with the breath of life. In a more scientific idiom, technology would be akin to the lichen that transforms bare rock into fertile soil, and we, the creature that lives within the technological membranes that it constructs, would come into harmony with the living process by carrying the cycle of technological evolution outward into radically new environments.

In Stoicism, humans are considered good insofar as they come into harmony with the universe. Stoic thought gives us the word “cosmopolis,” which was to replace the Greek polis as the site of human identification and meaning. To a Stoic, one lived well by becoming a good citizen not of the empire of the

Earth, but of the city of the cosmos. In the context of a view of technology-as-creation, this type of position once again makes sense. For the Stoics, however, the universe was a completed whole, and harmony came from knowing this whole. For this view, by contrast, the universe is still in the process of becoming. This means that citizens of the cosmopolis must come into accord not with a state of being, but with the direction of the universe's becoming. In an interesting essay on spirituality in the context of an unfinished universe, John Haught argues that if the universe is emerging, then "the natural world is on a pilgrimage of its own,"[18] and we should attune our own individual pilgrimages to the pilgrimage of the universe as a whole: "Our religious striving towards the infinite is to be satisfied only by our attuning ourselves to the larger and longer cosmic odyssey into the future."[19] Haught argues that attuning ourselves to the universal pilgrimage means learning to become the humble caretakers of the biosphere. While acknowledging the importance of this understanding, the metaphor of a universal pilgrimage works exactly the same for the idea that

[18] John F. Haught, "Theology and Ecology in an Unfinished Universe" in David M. Lodge and Christopher Hamlin (eds.), *Religion and the New Ecology,* Indiana, University of Notre Dame Press, 2006, p. 241.

[19] John F. Haught, "Theology and Ecology in an Unfinished Universe," p. 243.

humanity continues the process of creation by expanding life into the dust of space.

7. CREATION AND FALL: THE ECOLOGICAL CRISIS

One of the strongest visions of technology-as-fall comes from reflections on the ecological catastrophe being wrought by modern technological civilization. Such reflections also lead to one of the strongest critiques of this vision: how is it possible to speak of technology as working for the benefit of life when it is clearly so destructive? First and most importantly, arguing that technology is primarily an aspect of creation does not mean that it does not also manifest the fall. However, technology does not embody the fall in its essence, but only insofar as its creation is motivated by human greed. That point being made, it is still necessary to elucidate the relationship between technology and biology, not as they might exist in some as yet unrealized future, but as they relate in the context of the current suffering of the Earth.

Technological civilization is often described as a kind of sickness to the biosphere. James Lovelock, famous for the Gaia hypothesis that sees the entire Earth as a single living system, argues that human beings have been “Earth's infection” since

"we first used fire and tools purposefully." [20] This human infection only became a full-blown disease with the industrial revolution. Dave Foreman, founder of the environmentalist group "Earth First!", uses a similar metaphor: "we human beings have become a disease – the Humanpox."[21] Ecological philosopher Van Weigel makes the same point using the metaphor of cancer: "Earth, an exceptional and remarkable planet, an island of life within a barren universe, has cancer."[22] Weigel elaborates by drawing an analogy between technological humanity and a metastasizing tumor: both grow indiscriminately over the otherwise healthy tissue around them, leading to the death of the system they actually depend upon for their existence.

These metaphors have captured an important point. If human beings did not exist, the biosphere would clearly be much healthier than it currently is. However, there are many different ways to think about the sickness of the biosphere, in terms of when it began, what is causing it, and what should be done to stop it. In *The Future of Life*, Harvard biologist Edward

20 James Lovelock, *The Vanishing Face of Gaia,* New York, Basic Books, 2009, p. 233.

21 Dave Foreman, *Confessions of an Eco-Warrior*, New York, Harmony Books, 1991, p. 57.

22 Van Weigel, *Earth Cancer*, Westport, Connecticut, Praeger, 1995, p. xi.

Wilson points out that modern technology is not the culprit in the ecological disaster. Humanity has actually been devastating biodiversity since the neo-lithic. The disappearance of mega-fauna on the continent of Australia, for example, can be dated to within ten thousand years of the first aboriginals arriving there from Indonesia. More recently, within a century of the first humans arriving on New Zealand in the late thirteenth century, an entire genus of large flightless bird, the moa, had been eradicated.[23] This, in turn, is just one example of the wave of mass extinction that coincided with the migration of people across Polynesia. Such facts prompt Wilson to call humanity the "serial killer of the biosphere,"[24] a creature that has brought mass extinction wherever it has gone. Modern humanity, equipped with modern technology, is therefore not the origin of the tragedy. We are simply carrying it forward at a much faster rate.

In light of this, it is incorrect to see modern technology as the cause of the crisis. It is rather the cause of an exponential exacerbation of a crisis that has existed since human beings first came into existence. Wilson argues that now that we are

[23] Edward O. Wilson, *The Future of Life,* New York, Alfred A. Knopf, 2002, pp. 91-96.

[24] Wilson, *The Future of Life,* p. 94.

conscious of what we are doing and what we have done, we can change our ways and establish a rational harmony to replace the disaster that ensues when we follow our instincts. For reasons of both morality and practicality, this is absolutely right – we must come into harmony with the biosphere. However, the way we conceive of this harmony will depend a great deal on our understanding of "life." If we see "life" as equivalent to "biology," then technology will appear as detrimental to the good of life, and harmony will mean reigning technology back into accordance with the cycles of biological life. However, if we see "life" as a process of complexification and expansion poised at the edge of a new environment, with technology as the means whereby this expansion becomes possible, then harmony with the life will entail entirely different kinds of action.

German rocket scientist Krafft Ehricke makes an interesting argument with regard to this question. In his almost forgotten ecological philosophy, composed from the early 1970s until his death in the early 1980s, Ehricke argues that industrialization is analogous to the development of photosynthesis some three billion year ago. As we know, when photosynthesis first evolved on the Earth, the waste product – oxygen – was lethal to the anaerobic bacteria that were then predominant. Even worse, at

this time there was also no animal life to inhale the oxygen and exhale the carbon dioxide, which meant that the first photosynthetic organisms were taking a finite supply of carbon and slowly converting it into a toxic poison.[25] Ehricke calls this the "First Great Crisis" in the evolution of life. He sees the current ecological crisis as the Second Great Crisis, in which the new industrial metabolism exudes a pollution lethal to the biospheric metabolism from which it emerges. The solution to this crisis, however, is not to stop the industrial metabolism, to try to bring it into internal harmony within the biosphere that it is devastating. That, according to Ehricke, would be like arguing that the oxygen-producing bacteria should have stopped photosynthesis, and the beautiful expansion of living form should have languished at the edges of its hydrothermal heat source. Ehricke argues that the solution to this second crisis is analogous to the solution to the first: much as the oxygen metabolism allowed life to expand beyond the hydrothermal vent, so too does the technological metabolism allow life to expand beyond the boundaries of the atmosphere. In this way,

[25] Krafft Ehricke, "The Extraterrestrial Imperative: Why Mankind Must Colonize Space," in Marsha Freeman (ed.), *Kraffte Ehricke's Extraterrestrial Imperative*, Toronto, Apogee books, 2008, pp. 250-256.

technological life will come to exist in a new environment where its waste products would no longer devastate the biosphere, since there is no biosphere in space and that the external environment is already suffused with deadly radiation.

In such an expanded framework, the Solar System having become the locus of a new technological ecosystem, Ehricke speaks of the Earth as being transformed into the garden of the Solar System, the only place in the universe where life exists "naturally." Instead of seeing technology as some kind of disease to the biosphere, Ehricke suggests that we speak of humanity as being the Earth's pregnancy, with the biosphere as a womb within which a new kind of technological life is gestating. Certainly, pregnancy also entails danger – but if we were to describe pregnancy as a kind of sickness, it would be a sickness unto life, not unto death. Humanity would play the role of midwife to this pregnancy, and the industrial revolution would become the beginning of the labour pains, whereby a technological organism began to emerge from out of the womb of the Earth.

8. CREATION AND REDEMPTION: THE DIFFERENCE BETWEEN BIRTH AND BECOMING GOOD

Given the binary logic of fall or redemption that has hitherto dominated the philosophy of technology, it might seem that this view is just another form of the old view of technology-as-redemption. This conflation is perhaps exacerbated by the fact that modernity generally acknowledges only redemptive goods – justice, equality – as goods at all. In other words, since we are accustomed to treating goodness and redemption as equivalent terms, it seems that claiming technology is good entails claiming that it is redemptive. In order to speak about the good of technology-as-creation, therefore, we need to sharply distinguish between two different kinds of good: the good of existence as opposed to the good of existing well, the good of being born as opposed to the good of being "born again." In fact, this distinction can be described in both philosophical and theological terms, the former with reference to Aristotle's concept of actuality, the latter in terms of story of Genesis. In both cases, simple existence is itself a kind of good, while becoming good as a thing that exists would be another kind of good. In the context of this argument, while technology can clearly influence things that already exist to become better or worse, in which case it would be contributing to redemption

or to the fall, technology is essentially a manifestation of creation, and an extension of the good of existence into extra-terrestrial matter as yet unblessed by living soul.

In the second book of *On the Soul*, Aristotle defines matter as potentiality, form as actuality, and actuality as having two senses: the sense of possessing the capacity for something, and the sense of actually using that capacity. Aristotle illustrates this distinction with reference to knowledge: there is a difference between "the possession of knowledge and the exercise of it."[26] This distinction points to the distinction between the good of existence and the good of existing well: having the power to possess knowledge would be the good of existence (creation), while actually possessing knowledge would be the good of existing well (redemption). In terms of the expansion, we would say that the matter of space has the potential to be reformed into living beings. This reformed matter would thereby gain the potential to know; however, how these new beings used this power would be an entirely different matter. Technology, operating under the logic of creation, would grant only the power; it would not ensure that this power be used properly.

[26] Aristotle, *On the Soul*, trans. W. S. Hett, Cambridge, Massachusetts, Harvard University Press, 1935, p. 67, 412a12.

In terms of the story of Genesis, we must note that God first exhorts humanity to be fruitful and multiply prior to the fall from grace. In fact, God gives this same command to the fish and the birds, blessing all living things to and telling them to fill the waters and the earth. In his book *Maybe One*, Bill McKibben argues that we should see these commands as having been fulfilled. In other words, since we have already succeeded in filling the Earth with humans, we should now turn our attention to making this humanized world more just.[27] If we see technology-as-creation, however, the meaning of this almost completely inverts. Being fruitful and multiplying no longer means only making children, in line with our most primal urges. Instead, we would be called upon to exercise our reason to construct technological systems that would enable living form to grow into the inhospitable environments beyond the atmosphere. The fact that God gives these blessings and these commands prior to the fall suggests that following these commands does not lead to redemption. Instead, following them leads to an extension of existence, in line with the same logic whereby the rest of creation was carried out, as the

[27] Bill McKibben, *Maybe One: A Personal and Environmental Argument for Single-Child Families*, New York, Simon and Schuster, 1998, pp. 198-99.

expansion of the volume of reality imbued with the simple goodness of life.

Generally speaking, European philosophy has tended to understand “existence” as already given, whether by nature or by God, such that the only real human concern was with “existing well.” Complexification suggests that existence is not simply given, but is rather still in the process of coming about. Viewing technology-as-creation further suggests that human beings play an important role in this process, as the medium through which a new stage of the unfolding of reality becomes possible. Lyotard, equating technology with sin, sees the advance of complexification as closing down the possibility of redemption. By advancing a vision of technology-as-creation, we can now see complexification as operating in a different sphere from redemption. We can acknowledge that it is good for life to expand, as an extension of creation, and at the same time acknowledge that it is important to be just, to be benevolent, and to recognize the universal equality of all people. These represent different types of good, mutually irreducible.

However, it will not do to be overly innocent in our understanding. This spreading of existence beyond the bounds of the Earth occurs in a fallen world, suffused with injustice and

suffering. This means that the same motion that extends the good of existence also breathes the fall into dead matter that has never suffered, has never felt guilt, has never fallen ill, has never died in grief. The expansion, therefore, is also an act of faith, that despite all that is awful in the world, life itself is still good, such that the universe would be better with more of it. By breathing living form into the dust of space, humans beings show themselves to be in general agreement with God, who looks back over the world he has created and says that it is good. From a spiritual stance infused by this belief, we must believe that despite all the suffering that the expansion of life will bring into reality, the good of existence outweighs this suffering, and the possibility of redemption will remain for whoever, or whatever, comes into existence at the other side of this process.

9. CONCLUSION

In this paper, I began by presenting a macrocosmic view of life-as-evolution and describing how life's properties of complexification and expansion had enabled it to spread across the surface of the Earth. I then argued that we could see the development of technology in terms of two different

manifestations of this logic: first, as an expansion over the limit of 24 elements, giving life the capacity to infuse complex form into all 91 elements naturally occurring on the Earth; second, as a potential expansion over the limit of the atmosphere, as a new technological skin capable of supporting biological ecosystems in the void of space. I then considered what such a philosophy could possibly mean to humanity, which makes technology and therefore makes this expansion possible. I first presented Lyotard's pessimistic appraisal and argued that it was directed at an unnecessarily extreme version of the expansion. I argued that the expansion should not be seen as a new hypergood, from which all other goods needed to be derived, but should instead be seen as a new good, to be added to a nexus of goods that we generally already recognize. I then suggested that the Christian Ground Motive provided a good lens through which to think of this: technology should be seen as extending the good of creation, while goods like justice and equality should be seen as working towards the good of redemption. I then retold the story of the expansion, related it to the current ecological catastrophe, and distinguished the good of creation and the good of redemption in terms of the distinction between existing and existing well.

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