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Epistemological Limits and Radical Humility in Complexity

ABSTRACT

The complexity of the global scale technological totality poses urgent challenges for epistemology and ethics. Drawing from a three-level schema of technology, this paper argues that the level III is characterized by wicked complexity and unpredictable emergent phenomena of which humans are constituent parts, revealing the severe limitations of Enlightenment values and methods. As a consequence, a shift in thinking is necessary. This paper proposes a stance of radical humility, calling for the transformation of individual and systematic ways of thinking to better reflect the complexity of the world.

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I. INTRODUCTION: WICKED COMPLEXITY AND THE EPISTEMOLOGICAL DILEMMA

As we are now feeling the full effects of the era of global synchronization through technology, it has become necessary to analyze the full scale of its implications. Issues such as the worsening of climate change, rapid AI integration, and the rise of surveillance are just some of the many technologically related struggles of our age. It is my view that our current methods will not yield meaningful improvements to these phenomena, and that there are many intricacies in the systematic relations of our civilization that make painfully clear our human limitations. I will explain how the technological complexity of our civilization has created a significant epistemological dilemma, one that challenges the Enlightenment values so fundamental to our traditional thinking. To demonstrate this, I will use the analysis by Braden R. Allenby and Daniel Sarewitz in *The Techno-Human Condition* as the foundational ideas for unveiling the epistemological limitations present in complexity.[1] Ultimately, I will argue that these limitations demand a fundamental shift in our ways of thinking that acknowledges epistemological limits as fundamental, holds technological progress as ethically suspect, and dramatically moves common thought away from the values and tendencies of the Enlightenment towards the perspective of *radical humility*.

I will begin with a brief account of the underlying ideas. Allenby and Sarewitz detail three levels of technology characterized by their scale of complexity. The terminology of *technology* is intentionally broad to include the ambiguity of enduring social systems and frameworks, such as governments, languages, systemic racism, methodologies, etc. Allenby and Sarewitz, and many philosophers of technology, reserve the colloquial way of talking about technology (as the plethora of individual physical devices) for other terminology, like *artifact*. Allenby and Sarewitz designate artifacts to the first level of technology, which is described as the "shop-floor level," where these artifacts are used by individual people, with a clear cause-and-effect chain traceable along intention and consequence.[2] The second level involves systematic complexity of interconnected and independent artifact-relations into networks, where cause-and-effect relationships begin to become obscured due to the adaptation of the larger system. The third level is the totality of all these technological system-relations together.[3]

1 Braden R. Allenby and Daniel Sarewitz, *The Techno-Human Condition* (MIT Press, 2013).

2 Allenby and Sarewitz, *Techno-Human Condition*, 51.

3 Allenby and Sarewitz, *Techno-Human Condition*, 37–38, 51, 63.

This hierarchy scheme is admitted by the authors to be "somewhat arbitrary" due to the classification of any technology being dependent on the goals attributed to it.[4] The gem of this model of thought is the clarity offered by the opposed individual existence of the Level I to the totality of the Level III, as a part-whole relation.

For example, to make sense of this hierarchy of complexity, let us consider a single airplane of Level I. It is a singular artifact that serves a direct purpose of flight and is piloted by an individual who wills it based on linear cause-and-effect relations. Of course, the airplane is made of many subsequent parts and distinct artifacts, but holistically it serves as an understood will-extender in which the pilot does not necessarily need to be aware of the functions of each component to use the whole. Level II would be the broad collection of complex systems which airplanes are a part of or relevant to, such as airline companies, manufacturing industries, trade networks, etc. Level II is a very broad category that best demonstrates the arbitrariness of the hierarchy but is still useful for seeing the increasing intensity of ambiguity that comes along with more complexity. For instance, despite each one of these complex systems related to airplanes of Level II being created for (and by) humans, individuals involved must strategically plan for unexpected issues anticipated to arise. It becomes hard to tell where one thing ends and another begins, how a small change may impact other elements, and how these relations may change over time. This is the loss of linearity, the fuzziness between distinctions of elements and relations, which continues to grow with complexity. This is most apparent at the Level III global scale. This level would be the aggregate of airplane-system-relations, integrated with all other systems. It is the totality in which no single airplane (or individual person) is relevant to the total of the global system.

Level III is the "complex, constantly changing and adapting" collection of systems (both human and natural) which interact in unpredictable ways, producing "emergent behaviors."[5] It is characterized by *wicked complexity*, which is described by Allenby and Sarewitz as "when a system's makeup and dynamics are dominated by differing human values and by deep uncertainty," and that "any solution to a wicked problem should be expected to create unanticipated but equally difficult new problems."[6] This is the concept of *emergence*, in which the complexity of a system yields more than just the sum of its parts; the production of novel phenomena or characteristics.[7]

4 Allenby and Sarewitz, *Techno-Human Condition*, 40.
5 Allenby and Sarewitz, *Techno-Human Condition*, 63.
6 Allenby and Sarewitz, *Techno-Human Condition*, 109.
7 George H., Lewes, *Problems of Life and Mind. First Series: The Foundations of a Creed*. Vol. 2 (James R. Osgood & Co., 1875), 369.

This Level III complexity is wicked in the sense that it is unconquerable by the "favorite child of the Enlightenment, applied reason."[8] Any attempt to observe the totality, think up, or apply a solution to one of its many emergent elements, has already failed, as each of these desires has already been facilitated by the complexity of the totality, in which the total form and direction adapts. It is the Ellulian *Technique* with its characteristics of *monism* and the *necessary linking together* of methods under a system-wide sense of rationality.[9] It is the Deleuzean concept of the *control society*, in which there is a modulated uniformity across all interconnected environments simultaneously. It is a "universal system of deformation," changing from "one moment to the other" and facilitated by the Level I practical thinking of the technical *one best way*.[10] It is a complete synchronization of systematic relations.

Allenby and Sarewitz detail the nuanced existence of this characteristic in depth. It becomes particularly clear with any analysis of the phenomena mentioned previously: climate change, the internet and social media, and the exponential development and integration of AI technology.[11] Complex phenomena like these are both emergent and cultivate unpredictable emergent issues from the complexity of the Level III. There are no direct solutions available at this scale because of the overwhelming relations among many elements.[12] This is the wickedness of wicked complexity.

This is a situation that must necessarily be addressed in an atypical manner, as current ways of thinking get caught in the individual (Level I) ways of thinking, which serve only to perpetuate the deepening of the totality. How do we go about confronting problems of this scale when our attempts at understanding only aid the necessarily unpredictable complexity of that very problem? If solutions cannot be traced to be simply true-or-false, and we are left with no capacity for trial-and-error, what meaningful answers can our methodologies provide?

II. LIMITATIONS WITHIN THE WEB OF COMPLEXITY

Gilles Deleuze writes about a very similar concept, *control societies*, but with an emphasis on the manipulation of individual behaviors and

8 Allenby and Sarewitz, *Techno-Human Condition*, 111.
9 Jacques Ellul, *The Technological Society*. (Vintage Books, 1964), 79–98.
10 Gilles Deleuze, "Postscript on the Societies of Control," *October* 59, Winter (1999): 3–7.
11 Susan Schneider, "From LLMs to the Global Brain: The Emergence of Planetary-Scale Artificial Intelligence," *Disputatio* 16, no. 73 (2024): 87–122.
12 Allenby and Sarewitz, *Techno-Human Condition*, 115, 118.

desires. It is a total system of change that flows within each person, altering desire through the manipulation of all environments simultaneously, and with any opposition being absorbed into it.[13] This analysis by Deleuze serves to underscore the mechanisms of the Level III totality's influence on the individual who is necessarily within it, showing how it is both a manipulative force and a container of humans upon which it is contingent.

The totality is symbolic of the *oneness* of systems, in contrast to the dissipating individuality of Level I. It is a complete modulation of every individual every element of technological and ecologically integrated systems. It has exponential complexity, where new technological systems are "necessarily linking together" in the mechanisms of interconnected adaptation.[14] Boundaries between perceived distinctions and traceability of cause-and-effect relationships become necessarily fuzzier. The unpredictable emergent phenomena of this scale have urgent issues with real impacts, but we are limited by our relational *position*.

All is contained in the breadth of the umbrella of systematic adaptation and cannot be distinct from it. People are constituents of the totality in the same way that a cell is a constituent of a human body. The cell is not independently relevant to the entire body, but through the coming-together of many cells (of many interconnected system-relations), the totality of the body emerges. The modern, globally synchronized technological world is the birthplace and energy of an organism that we cannot understand because we are individual cells rendered within it.

It is with this relational position in the *web of complexity* that the choice of the individual cannot be meaningfully considered on the scale of the self-deforming totality. An individual choice cannot scale up to any "good" or "bad" result on Level III. The *within-individual* loses relevance as complexity scales, along with the certainty of simplicity.

The common schema for approaching this dilemma is the Enlightenment tendency for more methodological examination, more technological devices, and more techniques of information organization, all under the systematic guise of "progress." In this sense, the Enlightenment values of rationality, individuality, certainty, and progress are fuel for the fire of growing systematic complexity. These certainly serve well on the practically focused Level I, but it has led to (and further drives us into) increased depth of complexity in which we are *encased* and dependent upon our infrastructure. Through

13 Deleuze, "Postscript on the Societies of Control," 3–7.
14 Ellul, *Technological Society*, 111.

our attempts to tame the complexity of the environment around us, we have unwittingly cultivated wickedness in the systems that have emerged from our interactions as individuals and as institutions. As Martin Heidegger put it, in our pursuit of Truth, the danger remains that the "true will withdraw."[15]

On the scale of Level III, wicked complexity dooms these Enlightenment values to failure. Our very attempts to perceive the totality (much less predictably impact it) cause the total system to adapt its complete form. The result is that the foundations of human understanding, applied directly, are practically useless on this scale. The totality is fundamentally inaccessible to methodology, because our methodologies and institutions are analogous to organs of it.

The recursive relationship of constituent to whole that characterizes wicked complexity may occur outside of human-originated complexity. However, the technological complexity of our current systems is unique in that it cannot be thought of as existing separately for examination. As explained before, the totality emerges from our epistemological, social, political, cultural, economic, and methodological systems interacting on an intensely broad scale with individuals as its constituents. It is an aggregate that emerges from us all as a collective but produces emergent phenomena at the will of no individual. Even so, it is recursively influenced by individuals. It both shapes the context that shapes us and relies on us as constituents to drive the change of total form.

The unnoticed deepening of complexity has likely been facilitated by the survival and habitualization of Enlightenment thought, which, through rationality, holds that all can eventually be understood. As Neil Postman points out, it is this way of thinking that proposes "progress" as the moral good, justified in perceived efficiency.[16] It involves a push toward *objectivity*, rooted in the efficiency of quantification, where any sense of *subjectivity* is pushed away; considered less efficient, less valuable, and less true. This is evidenced in the dominant pursuits of knowledge appealing to static objectivity. However, wicked complexity makes it impossible for any methodology to treat itself as separate from the world it seeks to study. It curates the illusion that knowledge is a universal objectivity in which subjectivity is obscured, and therefore must be discarded, in its efficient pursuit. However, the reality is that no variable can be separated from the entirety.

15 Martin Heidegger *The Question Concerning Technology*, trans. William Lovitt (HarperCollins Publishers), 10.
16 Neil Postman, *Technopoly: The Surrender of Culture to Technology* (Vintage Books), 42, 59–60, 159, 179.

Yet the problems we are facing emerge from the growing complexity of human civilization. How do we address them? Proposed solutions to these problems tend to only involve more delusional technological fixes that add to the complexity. It is this very habitual reliance on the technical problem-solving mentality that justifies the continuation of technological integration, of its progress. This is a wall that our Enlightenment-era thinking cannot penetrate, which only serves to make it more dreadfully looming. This is the epistemological dilemma.

It is in this way that any call for technological progress or for technological solutions should be considered ethically suspect, not for any traceable cause-and-effect relations or intentions, but simply for its blind contribution to the smothering wicked complexity of the totality.

Hans Jonas details that traditional ethics only reckons with "non-cumulative behavior" of the "basic situation between persons." In contrast, the constant adaptation of the technological totality "constantly overtakes the conditions of its contributing acts," lacking any linearity in the synchronized manipulation of the Level I context, rendering traditional ethics meaningless.[17] If it is aiding the growing complexity of the totality, it is risking the emergence of uncontrollable, and potentially invisible, characteristics of influence on the individual Level I, and on the ecological systems it integrates with.

This is not to advocate for a complete rejection of technology, but for a more critical lens on what technology is allowed to be integrated, at what intensity, and in what ways. Even so, there does not appear to be any other path other than the technological one. Perhaps it is time to abandon the notion of *paths forward* altogether.

III. RADICAL HUMILITY: NECESSARY THINKING AND NECESSARY PLURALISM

We must begin discussing the next step. It is a challenging step to take. How does a cell, or even a group of cells, protest against the total body without destruction of itself or of the totality? It has been shown that it cannot be known. However, what is known is that we require an altered stance of engagement with the complexity of the world; a novel transformation of our thinking on the Level I scale. It is necessary to shift the tendencies of our individual relations and the framing of the world away from Enlightenment habits of thought. A radical change is

17 Hans Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age* trans. David Herr (The University of Chicago Press), 7–8.

required in common thinking to consequently alter the whole of the totality in which we together facilitate.

Allenby and Sarewitz work on this difficulty, suggesting some basic principles for navigating the multi-level web of complexity with as much grace as possible. They push for the abandonment of solutions and predictions that are presented under the guise of certainty. They say to focus on constant pluralistic dialogue for frequent decision-making, where choices are of less intensity and of higher frequency.[18] Their underscoring of pluralism being smarter than individuals with expertise has its wisdom in scientific studies of swarm intelligence.[19] It may be principles like these that, despite agitating the nerves of individuality, help us to adjust to the complex web of our relations. Even so, how can this change in thought be meaningfully implemented into the world?

I suspect that any change must have its roots in education (in the broadest sense). However, there is danger in attempting to detail a specific direction for supposed improvement, which implicates some kind of predictive element. Methods of prediction are technological, so attempts at solution only risk aiding the wicked complexity of Level III. This is the danger of the *problem-solving mentality* so prevalent in our thinking, likely woven further by Enlightenment values.[20] My concern is that this habit, grouped with the fixation on efficiency and objectivity, filters the potentiality of novel thought outside of technological methods.

Therefore, I am not claiming that there is any bullet list of ideas to be absorbed into our thinking to *solve this problem*. We cannot escape the historical roots of our technological thinking, certainly not through any degree of technological systematization or appeal to rationality. Rather, I will suggest a principle of thinking that continually recognizes the necessary limitations of ideas, methods, ethics, epistemology, etc., in resignation to the reality of the wickedness of the web of system-relations. It is this principle of thinking that encourages a shift in thought away from the current model, of there being a problem to solve, to instead there being *conditions to navigate*. This is the principle of *radical humility*.

This principle is the fundamental rejection of any universal certainty; of it being any more than a technological justification in the totality. It is a continual recognition of ideas, methods, and selves in

18 Allenby and Sarewitz *Techno-Human Condition*, 162–67.

19 Bremer Jörg and Sebastian Lehnhofff "Ant Colony Optimization for Feasible Scheduling of Step-controlled Smart Grid Generation," *Swarm Intelligence* 15, no. 4 (2021): 403–25.

20 Allenby and Sarewitz *Techno-Human Condition*, 31–32.

the relational context of the multi-layered web of complexity, noticing how we as constituents of systems facilitate the emergence of the whole and that all our human elements influence the totality and our consequent perception of it. This is an opposition to the framing of nature as something to be manipulated, as if it were distinct. In a similar way, it is also the opposition to the traditional approach of any method of inquiry being separate from its perceived object of interest.

It is no longer sustainable to traditionally approach any subject of concern as separate; as an objectified distinction accessible by rationality. A perfect, logically sound system of ideas cannot completely account for the unpredictable changes its existence will cause in the context it is rendered within. Any system of ideas that asserts notions of universality, unconditionality, Truth, etc., fails to acknowledge its relevant relational existence in the broader context of the web of complexity. It fails on the principle of radical humility.

This perspective discourages any attempt to detail a specific direction of development because that implies prediction. This is a tricky position, because I am both rejecting *solutions* while also arguing for a principle that is effectively presented as a specific path forward. However, it is not this, nor any one roadmap. It is not radical humility that is the new direction for change. It is not in and of itself a path toward a specific development, but rather a necessary habit of thinking on the individual and institutional levels. It is a change from pursuing false certainty about an environment falsely considered separate into a focus on our own existence, our limitations, and relations within context.

Current thinking and individual relations are the rules (or internal logic of a system) that perpetuate the present existence of the totality. It is analogous to the biological and chemical rules of cells in the human body, interacting to create the whole. If we, the individual constituents, shift our common habits, then the contingent emergent systems must also change in some way. Radical humility is the habitualization of doubt to encourage novelty in thinking and wrestle against the systematic forces of total integration.

The current avenues of pursuing knowledge fail when they present any notions of a single *right way*. A siloed-off discipline, no matter the logical strength of its methodologies, cannot grasp the complexity of the entire context. It does not progress toward any Truth, like it is often suggested, but only deepens its justification into institutional systems and common thinking. Often, disciplines are self-contained in their perceived truths and pursuits of knowledge, yielding conflicts when compared to differing approaches. These silos of academia are

increasingly isolated from each other in these passing processes of systematic justifications. What seems to be the methodological pursuit of independent actualizations is just the pursuit of external justification through efficiency. The urgent changes needed to navigate the present cannot be found in the disciplines that have made their continued existence possible as organs of the totality.

If every perspective and approach included the necessary humility due to its recognition of the epistemological limitations of complexity, opportunities would arise for synthesis through difference, rather than disregard. In the rejection of certainty, objectivity, and pure separation through radical humility, we find the possibility of synthesis through accepting perspectives as subjective. Instead of a hierarchy of validity based on systematic power, we acknowledge each system of thought to be equally valid by nature of its logically coherent existence. The pursuit of knowledge then becomes a task, not of finding the *one right way*, but of coherently synthesizing as many perspectives as possible while acknowledging necessary limitations and novelty. The potential is to create a pluralistic map of thought that better resembles the complexity of our interconnected, constantly adapting reality.

IV. CONCLUSION

The complexity-based hierarchy provided by Allenby and Sarewitz provides clarity to the challenges of our technological world. Examined further, it is discovered that we exist as constituents of systems, where the totality of systems reflexively absorbs attempts at understanding into its growing complexity, destabilizing epistemology and ethics. Therefore, we require a philosophical stance of radical humility based on pluralism and the acknowledgment of limitations to better navigate wicked complexity. This stance contrasts with traditional Enlightenment values, but it is not as simple as just picking up a to-do list and incorporating it into our thinking. It is a necessary shift, but one that we cannot aim for without risking furthering the complexity of the totality that needs to be altered. Therefore, work needs to be done to find potential routes of change, likely through a revolutionary analysis into educational processes through the lens of complexity, with methods that account for the principle of radical humility and contextual system-relations.

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