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Indigenous perspectives on the biodigital convergence

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Abstract

The biodigital convergence describes the intersection, and in some cases merging, of biological and digital technologies. Biodigital technologies include mRNA vaccines used to treat COVID-19, digitally controlled surveillance insects, microorganisms genetically engineered to produce medicinal compounds, and more. While significant scholarship has been paid to the ethical dimensions of biodigital technologies from a Western standpoint, little attention has focused on Indigenous views on the biodigital convergence. In this article, we explore the biodigital convergence from a Haudenosaunee perspective and suggest that insights from Indigenous philosophical traditions—specifically regarding relationality and territory—may be necessary for humanity to adapt to the profound and existential changes implicit in the biodigital convergence.

Keywords

biodigital convergence, Indigenous philosophy, relationality, synthetic biology, territory

The biodigital convergence and synthetic biology

This article presents our thoughts on the biodigital convergence, and synthetic biology more broadly, derived from presentations that we gave at the Policy Horizons Canada Biodigital Convergence webinar series in November 2020. Aligned with Peters et al.'s (2021) suggestion that the biodigital convergence warrants further philosophical consideration, this article offers our perspectives on the biodigital convergence based on Indigenous philosophy that includes—and extends beyond—ethics to include ontological considerations. Our article begins with a discussion of the biodigital convergence and synthetic biology, we then introduce some useful orienting concepts from Haudenosaunee traditional teachings, and we finish with some thoughts on the importance of Indigenous philosophy for adapting to the biodigital convergence.

New developments in digital technologies and our understanding of biological systems have led to interesting developments at the blurred border between the digital information and biology domains. Peters et al. (2021) identify the dialectic connection that positions "biology as digital information, and digital information as biology" (p. 370). This reciprocal relationship is taken up by Policy Horizons Canada, a federal government organization that employs foresight to inform the development of adaptive policies and programs in anticipation of increasing uncertainty. In their scoping paper titled *Exploring Biodigital Convergence*, Policy Horizons Canada (2020) describes biodigital convergence as "the interactive combination, sometimes to the point of merging, of digital and biological technologies and systems" ("What Is Biological Convergence" section, para. 1). The authors of this document identify three manifestations of the biodigital convergence, including

i. The complete integration of biological and digital entities in which new, hybrid forms of life are created through the integration of digital technologies in living systems and the incorporation of biological components in digital technologies. Policy Horizons Canada (2020) draws on recent reports of the use of digitally controlled dragonflies and locusts for surveillance purposes and digital implants in humans, for medical purposes, to illustrate this category of biodigital convergence.
ii. The coevolution of biodigital technologies occur when innovations in either biological systems or digital technologies lead to progress in the other domain that would have otherwise been impossible. Two examples include gene sequencing technologies paired with Artificial Intelligence leading to the engineering of biological organisms that can synthesize organic compounds in unusual ways and the CRISPR or Cas9 approach—a technology

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derived from bacteriophage genes and associated enzymes—facilitating gene editing in higher organisms (Policy Horizons Canada, 2020).

iii. The conceptual convergence of biological and digital systems in which greater understandings of the theoretical underpinnings and mechanisms governing both biological and digital systems could lead to a paradigmatic shift in our understandings of these interacting systems. For example, the increasing recognition that complex digital technologies operate like biological systems has led to their description as technology ecosystems (Policy Horizons Canada, 2020).

The term *synthetic biology* was first used by Hobom (1980) to describe bacteria that had been altered by recombinant DNA technology. *Synthetic biology* was later reintroduced at the annual meeting of the American Chemical Society in 2000, referring to the use of living systems as hosts for the synthesis of organic molecules that do not otherwise occur naturally (Benner & Sismour, 2005). Cameron et al. (2014) offer a broader definition of synthetic biology as "the use of molecular biology tools and techniques to forward-engineer cellular behaviour . . . with a set of common engineering approaches and laboratory practices" (p. 381). Benner and Sismour (2005) further suggest that a goal of synthetic biology is to modify existing life or create new synthetic life that is compatible with Darwinian natural selection.

Perhaps the most high-profile synthetic biology achievement has been the development and deployment of mRNA vaccines to immunize against COVID-19 (Kitney et al., 2021). The mRNA vaccines essentially introduce a section of mRNA to the host cell coding for the non-pathogenic coronavirus viral envelop protein spike. The human host immune system recognizes the protein spike, generates antibodies against it, and is then prepared to neutralize the COVID-19 virus when, or if, the vaccinated person is exposed to the virus (Pardi et al., 2018; Park et al., 2021).

An Indigenous critique of the biodigital convergence

Ethical implications associated with various biodigital technologies have been identified and considered by many authors (Ahteensuu, 2017; Baylis, 2019; Heavey, 2013; Policy Horizons Canada, 2020). Peters et al. (2021) further suggest that philosophical considerations must extend beyond ethics to include Foucauldian biopolitics, bio-epistemologies, and evo-ontologies.

Biodigital technologies, relationality, and the boundaries of self

In 1998, Clark and Chalmers, a neuroscientist and philosopher team, ask the question "where does the mind stop and the rest of the world begin?" (p. 7). The authors propose that the external environment plays an active role in our cognitive processes, they call this active externalism. Their theory of active externalism maintains that we use external aids—such as calculators, notebooks, mobile phones—to enhance our cognitive capacity and that these coupled cognitive systems, if reliable, are functionally the same as a cognitive system based solely within the confines of the skull.

Clark and Chalmers (1998) further suggest that "the biological brain has in fact evolved and matured in ways which factor in the reliable presence of the external environment" and that "external coupling is part of the truly basic package of cognitive resources that we bring to bear on the world" (p. 11).

The authors compellingly argue that human language mediates cognitive coupling between people and that our minds also extend to the landscape. These revelations may be new to the sanctioned or dominant narratives in Western thought but the notion of our selves as encompassing other human, non-human, and *non-living* persons is not new to Indigenous philosophy.

The Haudenosaunee worldview

Haudenosaunee peoples, formerly called Iroquois, or People of the Longhouse, are the confederacy of six First Nations—Mohawk, Cayuga, Oneida, Onondaga, Seneca, and Tuscarora—united by a common goal to live in harmony. Contemporary Haudenosaunee communities can be found in upstate New York, Quebec, Ontario, Wisconsin, and Oklahoma (Johansen & Mann, 2000).

The Haudenosaunee worldview does not figure objects or individuals as static. For example, a wooden table is in a constant state of flux or transformation. It is composed of all the interactions it had as a tree in the forest; as wood in the workshop; as a table used for eating or other purposes; and as food for insects, fungi, and other decomposers when it eventually breaks down and returns to the ecosystem. This vibrant dynamism extends to humans, medicine plants, rivers, animals, and the rest of Creation.

In this way, Haudenosaunee identity categories are relational and exemplify a process-oriented ontology (Braidotti, 2006), much like the nascent Western fields of new materialism and posthumanism. Feminist post-structuralist philosopher Elizabeth Grosz (2005) draws on Darwin's work to describe life as a "ceaseless becoming" (p. 36). According to new materialist scholar Karen Barad (2003), "the primary ontological units are not 'things' but phenomena—dynamic topological reconfigurings/entanglements/relationalities/(re)articulations. And the primary semantic units are not 'words' but material-discursive practices through which boundaries are constituted. This dynamism *is* agency." (p. 818). Barad's dynamic conception of material-discursive phenomena—such as humans and tables—echoes Anishinaabe scholar Gerald Vizenor's idea of Indigenous Transmotion or Natural Motion. For Vizenor, transmotion extends beyond movement to encompass the motion associated with words and images. In an essay published in 2015, Vizenor writes that:

> The learned botanical name *Cypripedium acaule*, for instance, inadvertently denatures the exquisite poetic blush of a moccasin flower in the moist shadows, and other more common names and comparative similes lessen the motion of images, such as the heavy breath of bears, the marvelous shimmer of early morning dew, twilight favors on a spider web, ravens tease of hunters in camouflage, stray shadows lean over the fence, or the perfect dive of a water ouzel [blackbird] in a mountain stream. (p. 63)

Movement is central to both balance and the continuance of all life. Enclosures like the reserve system, age-specific segregation in public schools, prisons, the tyranny of the timepiece, and all the other ways in which we compartmentalize our selves and other selves in the contemporary world are at odds with the understanding that being is not static and is better described as a more dynamic *becoming*, like Elizabeth Grosz's (2005) concept of the dynamism of life. The Haudenosaunee view is similar to new materialist and posthuman theory in that both describe, as vibrant, what Western scientists would call *non-living* entities, like tables. The Haudenosaunee perspective and Clarke and Chalmer's *extended mind* are also similar to Rose's (2013) assertion that "the envelope of the skin does not, by rights, delineate an enclosed, autonomous zone" (p. 14) in that all of these notions figure the human self as extending beyond the boundaries of our physical bodies.

The view from somewhere

The animacy of all creation—including, but not limited to, wooden tables—is made clear in Haudenosaunee notions of relationality and in the words of many other Indigenous thinkers. For example, Indigenous scholars Bob Antone (2013), and Vine Deloria and Daniel Wildcat (2001) assert that everything in the universe is alive and is related through connection to place. Deloria and Wildcat (2001) summarize this understanding with the formula "power and place produce personality" (p. 23). It is our understanding that the personality referred to here extends to individual humans, communities of humans and other beings, and the land.

The fundamental ontological importance of place is the antithesis of positivist universalism, which has been described by some theorists as *the view from nowhere* (Nagel, 1986). Feminist standpoint theorists challenge the universality of positivism and suggest that positivist science is far from universal and that it, in fact, represents the worldviews of a select group of Western male researchers and that a richer and more just starting place for socio-cultural inquiry is via the epistemically privileged perspectives of the marginalized and oppressed (Harding, 2004; Smith, 1987). Instead, we go beyond standpoint theory to suggest that without a profound consideration of place, scientific and socio-cultural research both reproduce the very same limited perspective and social inequities that feminist standpoint theory seeks to ameliorate.

Celebrated Kiowa poet N. Scott Momaday's (1976) poem *The Delight Song of Tsoai-talee* describes an expanded sense of self and the animacy of matter. The following lines, excerpted from Momaday's poem, illustrate an Indigenous understanding of self and the more-than-human, anchored in place:

> I am the hunger of the young wolf
>
> I am the whole dream of these things
>
> You see, I am alive, I am alive. (p. 27)

Momaday's words evoke the Haudenosaunee principle of ka'nikonhri:io (good mind), derived from the Great Law of Peace. The *good mind* "occurs when the people put their minds and emotions in harmony with the flow of the universe" (Barreiro, 2010, p. 33). The *good mind* confers the ability to make a sound judgment for the welfare of the broader Haudenosaunee society. Joe Sheridan and Dan Longboat (2006) connect Good Mind to land: "(t)o the Haudenosaunee, the Good Mind and land are inseparable for neither is possible without the other" (p. 378). Furthermore, Sheridan and Longboat (2006) rightly assert that "where one *is* has everything to do with *who one is*" (p. 369). What we take from all of this is that the full expression of our humanity is only possible through intimate connection to each other, to territory, and the various natural cycles shaping existence.

The Policy Horizons Canada (2020) *Exploring Biodigital Convergence* paper identifies an important policy question: "could traditional resource-based competitive advantages fade?" ("Policy-related Questions Arising from Biodigital Convergence" section, Economic subsection, para. 1) and suggests that decentralized food production through synthetic biology could lead to "the ability to create food and engineer meat without the need for arable land" ("What Are Possible Characteristics of the Biodigital System?" section, Decentralization subsection, para. 2).

Recent insights in diverse scholarly fields point to the importance of recognizing expanded boundaries of the human self and the animacy of the more-than-human. For example, in new materialist thought, some branches of geography, and both critical plant and animal studies. But, these philosophical innovations are still obscure, largely confined to the academy, and have not been enacted by Western society at large.

A question that we ask ourselves is, is it possible that biodigital technologies could make the entangled connection between human and *other* more explicit or will these technologies distract us from recognizing our interrelatedness with all of creation?

If mainstream Western society is only beginning to understand the importance of land to the human condition, how will a further disconnection from this wellspring of life affect our ability to respond to climate change, rampant species loss, our changing sociality, our expressive arts, our collective decision making?

We turn to the Original Instructions to orient our responsibilities to all our relations, including place. Other Indigenous peoples have their version of the Original Instructions (Nelson, 2008), but we will focus on the Haudenosaunee Original Instructions in this article.

According to Akwesasne Notes (2005), the Original Instructions,

> direct that we who walk about on the Earth are to express a great respect, an affection, and a gratitude toward all the spirits which create and support Life. We give a greeting and thanksgiving to the many supporters of our own lives-the corn, beans, squash, the winds, the sun. When people cease to respect and express gratitude for these many things, then all life will be destroyed, and human life on this planet will come to an end. (p. 86)

Furthermore, it is our understanding that humans have an obligation to fulfill certain responsibilities to Creation which also includes, at a minimum, not interfering with other beings' ability to fulfill their own responsibilities to Creation. Central to these obligations is the Haudenosaunee notion of kasasten'sera which is the vital life-force of the human and more-than-human individual, human collectivities, and ecological communities and is a form of power derived from the unity of all matter that supports the continued existence of all creation. How would various biodigital technologies look if we assessed them according to the Original Instructions? Does the coevolution of biodigital coupled systems allow each party—the biological and the digital—to fulfill their obligations to creation? These crucial questions, and more, cannot be answered by us alone, rather they require collective cultural knowledge and elders' wisdom. An important next step could involve engaging Indigenous elders and knowledge keepers to seek their thoughts on the best way to chart an ethical course forward as we navigate the biodigital convergence.

Conclusion

It strikes us that many of our thoughts on the subject of biodigital convergence are both axiological and ontological in nature. How do we value our selves and other selves? Who are we, and does our personhood extend to include all our relations and the technologies that we use on a daily basis? Biodigital innovation is already happening, and there is certainly the potential for positive benefits to humanity, all our relations, and more broadly to Mother Earth.

It seems that industry is the driver for biodigital innovation, and we question the extent to which private interests function to advance the needs and aspirations of the collective, including all of creation. Could collective benefits to humanity and all our relations be the default position instead?

The Policy Horizons Canada (2020) *Exploring Biodigital Convergence* paper states that "perspectives on biodigital technologies may vary across groups, and multiple ethical traditions including Indigenous perspectives and knowledge could help shape thoughtful responses" ("Governance" section, para. 5). We agree with this assertion, and from an ethical standpoint, it is important to think beyond the current scope of our assumptions which are rooted in the Western liberal humanist tradition. Also, rather than leading with business interests, or the technology itself, a robust consideration of the ethical underpinnings and consequences of the biodigital convergence will help us to avoid or mitigate potential crises—or at least undesirable outcomes—associated with these technologies. If advances in biology and the biodigital convergence herald the commencement of the "century of biology" (Rose, 2013, p. 8), then what are the implications associated with an unexamined acceptance of Western liberal humanist assumptions as we engage these technologies that have the potential to irrevocably alter life on this planet, as we know it? The conceptual tools inherent in Indigenous thought and in the emerging fields of new materialism and posthumanism offer radically different ways of conceiving of ourselves in relation to others and to place. Philosophical insights, particularly from Indigenous traditions, may be necessary for humanity to successfully adapt to the profound and existential changes implicit in the biodigital convergence.

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