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Sentience and Place: Towards More-than-Human Cultures

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Abstract

Expectations for the future can differ greatly. Some await a technical utopia that will support harmonious and easy lives. Others predict a global ecosystem collapse that will threaten the future of humans as species. Both camps make appeals to sentience in support of their stories. Addressing this discordance, this paper combines narratives in ecology and technology to ask what roles sentience might play in future places. In response, it hypothesizes that an understanding of sentience as an inclusive, relational and distributed phenomenon can promote more-than-human cultures and contribute to the wellbeing of heterogeneous stakeholders on the Earth and beyond. To test this hypothesis, the paper outlines biological understandings of sentience (as applied especially to humans, animals and other lifeforms), contrasts them with the interpretations of sentience in artificial entities (including robots and smart buildings), gives an example of attempts at sentience in architectural design and discusses how sentience relates to place. The paper's conclusion rejects the dualism of technophilic and biophilic positions. As an alternative, the paper outlines sentience as a foundation for richly local more-than-human cultures that have intrinsic value and can help in the search for preferable futures.

Keywords

Sentience; place; architecture; design; technocentrism; ecocentrism; politics; ethics.

Introduction: Between Futures

Most human societies undergo or aim to join the rapidly accelerating technological development. Investment-supported pledges include General Artificial Intelligence, smart cities, smart medicine and smart agriculture. Promised benefits of this widespread smartness include greater efficiencies, unprecedented innovations and, at the core, the ensuing growth of consumption. Concerns associated with this model of development include losses of privacy, increasing societal segregation, joblessness caused by automation, colonialism by new means and replacement of democracy by the corporate power. Despite such apprehensions, technocentric development remains in the influential mainstream.

At the same time, the planet endures an acute environmental crisis. This predicament is a result of humans' massive, destructive and wasteful resource extraction. The negative consequences of societies based on extractive and industrial economies include irrecoverable biodiversity losses, climate change with resulting sea-level rises, predicted mass migrations and food system failures. Calls for more sustainable societies advocate greater care for the planet's ecosystems.

This incompatibility between technocentrism, infocentrism and technophilia on one hand and biocentrism, ecocentrism and biophilia on the other will be a significant challenge for future actions. Inclusive approaches to participation in decision making have been successful in application to oppressed groups in human societies, including slaves, women, children or people with disabilities. We suggest that this process of political emancipation can expand from disenfranchised human groups towards non-humans and provide an avenue for improvements.

Sentience is one way to conceptualize and describe interactions with biotic and abiotic others. Interest towards sentience across disciplines reflects this generality. The concept of sentience finds application in biology, psychology, philosophy, animal rights, robotics, art, architecture and design. In practical fields, technologists aim to build what they call artificial intelligence, smartness or sentience into all environments, from objects to buildings and from cities to landscapes. The purposes of these implementations are typically anthropocentric or at least instrumental and utilitarian.

There are concerns about what this might mean for human society [1, 2]. Such capabilities can lead to commodification of emotions and intelligence. Examples include the use of sentient robots for sex or the casting of humans in need of emotional support as commercial opportunities for care robotics. These tendencies can lead to the devaluing of suffering and its expansion. The concept of sentience has been important in efforts to protect biological agents such as animals. It can also afford protection to possible future artificial entities.

However, protections based on the common interpretations of sentience are likely to result in some form of segregation. Speciesism is a characteristic example that results in debates about the place of moral boundaries that invariably exclude some beings. Examples of existing harmful speciesist practices include the privileging of humans, or only primates and cetaceans, or only vertebrate animals, or

only animals but not plants and so on. The exclusion of abiotic entities from the sphere of moral concern amplifies the harmful outcomes of this speciesist preferencing and forecloses opportunities for improvements in more-than-human justice. We believe in the importance of this inclusive justice as a program for action or, in the very least, as a hypothetical frame for further research.

Instruments of governance should support such inclusive justice and work on approaches such as earth jurisprudence represents relevant initiatives [3]. However, legal regulation cannot be effective without inclusive ethical cultures. Such cultures need to incorporate human as well as non-human stakeholders and require much further practical and theoretical work. The study of human and nonhuman sentience and its performance in concrete places will constitute an important part of this future progress.

This brings our narrative to an existing gap in knowledge. At this moment, there is no rigorous discourse that unifies bodies of learning on sentience in biology, computer science, politics and design. The discourse on artificial intelligence and robotics in relationship to ecology is even more limited.

The incompatibilities between technocentrism and ecocentrism constrain designing and management. Unfortunately, human impact on planetary ecosystems is increasingly unavoidable. In the future, novel ecosystems such as cities, agricultural landscapes or managed forests will be increasingly prevalent across the globe.

Major incompatibilities between existing approaches impede the study of ethical and political implications in action-oriented and pervasively influential disciplines such as environmental management or urban design. The placemaking activities within these fields exist at an intersection of technological, ecological and political domains and would benefit from their integration.

We see an opportunity to contribute by integrating the existing bodies of expertise on sentience. Such an integration will support a better understanding of more-than-human communities and will enable a more broadly participatory reinvention of future places.

Seeking to use this opportunity, this paper asks what roles sentience might play in future places. In response, it hypothesizes that an understanding of sentience as inclusive, relational and distributed phenomenon can promote more-than-human cultures and contribute to the wellbeing of heterogeneous stakeholders on the Earth and beyond.

To test this hypothesis, the paper outlines biological and physical understandings of sentience, contrasts them with the interpretations of sentience in artificial entities, gives an example of sentience in architectural design and discusses how sentience relates to place.

Findings: Inclusive Sentience

Extents of Natural Sentience

This section introduces the understanding of sentience in biological and physical sciences. It seeks to demonstrate

that sentience is a constructed concept. In nature, processes that resemble sentience are common, varied and possibly omnipresent. In human use, this concept is often political. Importantly for this paper, its commonness can serve as a basis for the idea of more-than-human cultures.

The idea of sentience is under active discussion. A common definition describes sentience as the capacity to feel, in contrast to reason or logic [4]. Similarly, Singer's well-known pragmatic definition states that sentience is the capacity to suffer and experience enjoyment [5].

Such definitions help to outline the concept but require explanations of additional terms such as reason, feeling and enjoyment. An alternative approach is to look at the pragmatic purposes the concept of sentience supports in research and practice.

The dominant deployments of the concept of sentience are anthropocentric. For example, it is commonly used to contextualize the human evolution for the study of human faculties. Many biological interpretations suggest that sentience has emerged in humans and other animals because it has adaptive value [6]. On such views, sentience facilitates the maintenance of organismic homeostasis through feelings and emotions. Emotions evolved to guide cognitive and behavioral responses to improve fitness and survival [7]. Biological entities experience emotions and feelings positively or negatively and with different degrees of intensity or persistence. In humans, emotions such as happiness, empathy, fear and disgust help to guide fitness, promoting behaviors such as resource acquisition, partner retention, predator evasion and disease avoidance. More complex emotions such as jealousy might be useful for competitive social situations, while love is useful for forming bonds to improve social acceptance, co-operation or reproduction [8]. The focus on humans in arguments of this type leads to the conclusion that feelings and emotions require complex neural interfaces.

In parallel with the work on humans and 'higher' animals, other research demonstrates the existence of 'emotion states' in many lifeforms [9]. Evolutionary situations that resulted in human sentience have hosted many other organisms, with similar effects. According to this work, many or all lifeforms can have sentience or at least subjectivity and personal sense-making capacities [10]. For example, researchers acknowledge sentience in a growing number of animal species [11]. To illustrate: zebrafish can have emotional fever – a transient rise in body temperature in response to stressors [12] and bumblebees can be optimistic [13]. Beyond animals, plants might also be sentient. In response to stressors, they can release pesticides, harden protective boundaries and change how they eat and breathe [14]. Even single-cell organisms can reverse the direction of motion when they bump into obstacles or swim towards food and away from poison [15]. A further step is to interpret all life and its evolution in cognitive terms, as an evolution of consciousness [16].

Even broader definitions of sentience, linked to this last position, extend past life towards all self-organizing systems that can maintain self-identity. Such definitions un-

derstand sentience as a process of sensing non-self, processing the incoming information and responding to it [17]. We shall return to this inclusive understanding of sentience in the discussion of ecocentric and extraplanetary ethics.

Meanwhile, a much more frequently deployed definition relates sentience to the capacity to suffer. This relationship sets an important precedent that links sentience to ethics. Animals' capacity for suffering is the core argument in sentientist approaches to nonhuman rights [18, 19]. Among many other outcomes, this interpretation of sentience informs important efforts to improve animal welfare [20] and develop alternative governance systems [21]. By contrast, the insistence on the absence of sentience in some lifeforms and in all abiotic systems can justify careless use of nonhumans by human societies. Examples include the use of animals for food, entertainment and labor as well as practices that lead to environmental degradation.

This section has demonstrated that the current discourse on sentience is increasingly inclusive. Reflecting increasing societal acceptance, legal mechanisms in many countries increasingly attribute sentience to animals. Acceptance of sentience in other forms of life is also growing. The application of sentience to abiotic structures is much less usual. Many are likely to resist this application on practical grounds. For example, animal rights advocacy often benefits from empathetic responses that rely on the similarities between human and animal sentience, in contrast to the presumed insensitivity of other lifeforms and the nonliving world.

Despite such understandable tactical objections, this paper seeks to emphasize the ubiquity of sentience. It proposes that a more inclusive conceptualization might prove to be less prejudiced and more useful in the likely future places. To explore this proposition, the paper next turns to the discussion of sentience in artificial systems.

Prospects of Artificial Sentience

Analysis of existing and emerging artificial systems is important because it provides concrete examples of potential forms of nonbiological sentience. It is also significant given the predicted proliferation of artificial intelligence.

The discussion in this paper is inclusive of all forms of artificial intelligence, including those with physical manifestations such as mobile robots and smart buildings.

Engineers see artificial intelligence and sentience as realistic possibilities or even as an inevitability. While even some of the technology advocates admit that many of these expectations are fashionable exaggerations by the vendors [22], others predict human-like artificial intelligence within the next decade [23].

Artificial intelligence designs can serve practical purposes or support the study of living systems [24]. In both cases, humans create them for their purposes. Consequently, emerging ethical problems in artificial systems parallel the moral concerns regarding biological beings. In some cases, designers deliberately aim for sentience-like capabilities. For example, emotions such as jealousy, loneliness, and love can help govern and inform artificial systems'

social behaviors or improve their decision making. Negative emotions such as fear or pain can help artificial systems protect themselves.

Artificially intelligent systems are different from other machines because they are autonomous. In moral philosophy, autonomy is an outcome of responsible reasoning and decision-making [25]. Increasingly, technical systems can make decisions without direct human intervention, sometimes in ways that are beyond human understanding. Often this opacity is an essential feature of their design, as in the case of deep neural networks. A range of ethical concerns arises from this capability for autonomy. For example, an artificial system might prefer its integrity to the safety of human operators [26]. To illustrate, the design of autonomous cars has to distribute responsibility in situations where the harm is not avoidable [27]. The same is true for the war robots undertaking an attack or choosing which wounded to assist.

These and other concerns for human safety dominate the discourse on the ethics of artificial intelligence. Many see an ability to ascribe the responsibility for actions as an important concern. Such considerations led to the initiation of formal processes that can give legal rights to 'electronic persons', for example within the European Union [28, 29].

In addition to the concerns related to human safety, there is growing discourse on the wellbeing of the intelligent artificial systems and its ethical dimensions. Some worry that the acquisition of sentience by such system can lead to a large-scale increase in suffering [30, 31]. For example, plans to create robotic servants that can experience human-like feelings to make their human masters more comfortable is one path to suffering. Such deliberately subjugated systems might experience persistent humiliation and resulting forms of non-physical pain [32].

Concerns about the wellbeing of artificial intelligence systems resulted in calls to expand the confines of the moral circle. Such an expansion requires further theoretical and practical work. Existing studies and practical efforts within animal studies and the animal rights movement can provide useful precedents [33].

This brief overview of the developments in artificial intelligence and robotics illustrates the tendency of technical systems to move towards autonomy, intelligence and sentience. This happens in parallel with the increasingly inclusive understandings of sentience in biological and natural entities discussed in the previous section.

Many of the approaches discussed above focus on individual entities and on characteristic representatives of types. Typically, such approaches seek to extend the rights of individual humans to other agents. However, this individualistic approach can be problematic. Humans do not have one model of preferred behavior. Instead, they exhibit multiple contradictory biases. Injustices motivated by sex, age and race are common examples. Omission or suppression of human minorities is also common. Human treatment of nonhuman stakeholders is overwhelmingly exploitative and often cruel.

Therefore, it is important to support the discussion on synthetic persons with the analysis of their habitats. These habitats have the character of highly distributed and complexly interconnected systems of relationships between multiple agents and processes. These relationships take forms of habits, traditions, cultures, politics and other objective/subjective phenomena. Participating agents experience these effects as persistent contexts, environments, milieus or places; the terminology and interpretations vary broadly across the fields of study. The next section points out some of the relevant characteristics of such contexts by considering them as future places.

Placed or Indigenous Sentience

As stated above, this section highlights that all forms of sentience occur in concrete places with unique continuous cultures.

Today, human activities affect and attempt to control all planetary environments. These attempts at control are likely to intensify. As a result, artificial systems from mining, infrastructure and agriculture to cities and buildings become increasingly spread, interconnected and automated. Consequently, all current and future sentient beings will inhabit partially artificial, monitored and controlled environments.

Standardized frameworks of numerical data, mathematical routines, computational automation and global communication underpin these hybrid habitats. On one hand, intelligence and sentience are among the declared objectives for such artificial systems. On the other hand, natural sentient agents already populate most or all environments that such artificial systems will enter and attempt to control.

Therefore, design and management of future spatial environments will have to consider many types of sentient agents. At the same time, governance and management of natural and artificial sentient agents will have to engage with extended ecological contexts and forms of sentience that are indigenous to these places.

Here, we can understand indigeneity as a form of more-than-human culture that came to a form of balance within a place through a prolonged engagement of multiple agents. This understanding highlights an analogy where introduction of novel, powerful and non-indigenous agents in the form of artificial intelligent systems is similar to the immigration of non-indigenous humans, animals, plants and microbes during the biological unification of the Earth and the colonial period. The tragic lessons of that history provide a warning of possible losses. It is important to remember that artificially sentient systems enter richly populated and complexly intertwined worlds, not *terrae nullius* that are in need of improvement or cultivation. Current losses of cultural and biological diversity show that such improvements can easily lead to careless or unforeseen eradication of richness and value.

The challenge of making technical systems indigenous should not be dismissed as implausible, especially in the context of greater attention towards indigenous knowledge in science and management [34]. However, becoming

indigenous for intelligent technical systems will be at least as difficult as for the human colonial cultures [35].

Situated Sentience in Design Practice

An in-depth analysis of situated sentience in current and emergent design practices is beyond the scope of this paper. Instead, this section aims to indicate that such sentience is plausible and calls for further study.

Current design frequently equates sentience with intelligence or smartness. Practitioners or commentators use these terms to suggest capabilities for automated responsiveness. The typical emphasis is on efficiency [36].

For example, at building scales, recurring examples include reactive building skins [37]. Often described with a biological term ‘adaptive’, such structures can change in response to input. They typically aim to save energy and improve thermal comfort through adjustable shading or display information. Here, the focus is on a more efficient fulfilment of anthropocentric goals. The involvement of artificial intelligence or sentience is possible but not necessary.

At urban scales, characteristic examples emerge from the work on smart cities. Like sentience, this related concept lacks a precise definition [38]. Derived from the desire to achieve a politically acceptable ‘sustainable growth’ the notion of smart city combines ideas on knowledge economy, ubiquitous digital technologies and the optimization of urban services. Many researchers worry that its capitalist motivations can undermine inclusive and just environments [39].

At landscape and ecosystem scales the growing emphasis is on sensing and monitoring. Here, the notions of smartness or intelligence often refer to practices that seek to address specific issues: fire-smart landscapes or water-smart agriculture. Even though ecological engineers have been discussing ‘technoecosystems’ since the 1980s [40], the practical use of autonomous systems in the management of biophysical dynamics is only emerging.

Given current unavailability of fully realized autonomous artificial intelligences or sentient entities at architectural or urban scales, experimental artistic installations provide suggestive alternatives. In addition to artistic work, they include some architectural projects, for example our own work [41] or the experiments by Beesley [42].

Below, we highlight some existing capabilities of such artificial systems asking whether they have sentience in comparison to humans, nonhuman organisms or other systems capable of maintaining self-identity.

Such systems can:

- Have bodies with interior and exterior, consume energy, obtain sensory input, process information and make decisions. These capabilities alone can qualify them as a form of sentient systems, at least according to some of the definitions discussed above.
- Have and express emotional states in response to stimuli. In technical systems, such states do not link to evolutionary histories and fitness-enhancing behaviors.

However, artificial emotions cannot be automatically disqualified on this basis. In living systems emotional responses among all other mechanisms can be atavistic, random and maladaptive.

- Come into relations with other agents. Technical systems can strongly affect social relationships between lifeforms. They achieve this by provoking emotions and modifying behaviors. As a result, cognitive phenomena such a memory or imagination become increasingly distributed [43], with sentience shared between agents.

The missing capabilities include:

- General intelligence comparable to humans. However, these types of structures are as likely to acquire general intelligence as other artificially intelligent systems. Irrespective of this eventuality, the possession of general intelligence is not a prerequisite for the inclusion into the moral circle. Most of nonhuman lifeforms also have specialized rather than general forms of intelligence but still deserve ethical consideration.
- Intrinsic purposes not specified by designers. In this way such systems are different from desiring, goal-directed animals. However, abiotic structures such as rocks or hybrid formations such as ecosystems also do not have interests or intrinsic purposes but still have value and receive or deserve to receive protection.

The intersections between diverse modes of existence become particularly evident at landscape, urban and architectural scales where interactions between agents organize into places. At these scales, humans find themselves not only among but also within variously sentient beings. Shared cultures within such environments create novel ethical challenges that require further study.

Discussion: From Metaphors to Participation

Existing artistic and architectural installations provide limited but suggestive examples. To date, the references to sentience or intelligence in such cases are largely metaphorical, aimed to provoke reflection, imagination and future study. Implementations of such installation are not readily suitable as blueprints for designs that can aim for widespread adoption. However, characteristics of such installations can help to concretize the trends suggested by bodies of discourse discussed earlier.

The emerging discourse on robot ethics follows the individualistic logic that inherits moral rules practiced in human societies. According to this logic, if artificially intelligent systems exhibit sentience and sapience, they can inherit moral status from humans. This is an inclusive move because it does not disqualify agents based on the mechanics of their intelligence or the ways they come into being [44]. This perspective highlights that synthetic systems can

encounter servitude, physical or emotional abuse, neglect, or the suppression of rights.

However, we argue that this focus on the capabilities of human-like individuals considered separately from their relationships with other human and nonhuman agents is problematic. The discussion above demonstrates that it is possible to define sentience as a characteristic capability of all interacting complex systems. In living systems, sentience can act as an enabler of cultures. These cultures transfer extra-genetic information. Many lifeforms can have such cultures, including unicellular organisms [45].

This expanded understanding of sentience can undermine its utility as a marker for suffering that is necessary for the sentientist ethics of animal protection. However, this weakening is not inevitable. Instead, we hope that the understanding of sentience as a ubiquitous capability can lead to more participatory approaches to the construction and management of future environments.

Conclusion: Some Proposals

This paper has considered the roles of sentience in future places. Our short paper cannot provide conclusive answers. However, its argument indicates that an inclusive understanding of sentience might be useful. This definition connects the anthropocentric understandings that ascribe sentience to some cognitive systems with ecocentric approaches that see sentience as abundant and pervasive.

An inclusive understanding of sentience has implications for ethics and practical design. Human-centered, utilitarian approaches to ethics render the usefulness of nonhuman life in terms of services and fail to protect lifeforms that are not knowingly useful for humans. At the same time, important ecocentric approaches remain under-represented in the mainstream of contemporary societies [46]. Ecocentrism remains on the margins of the design disciplines in general and the discourses about the construction of intelligent technical systems in particular. Attempts to promote ecocentric approaches on psychological (love for nature) or philosophical (intrinsic value) grounds struggle to find widespread purchase. Perhaps the idea of ubiquitous sentience can provide a more encompassing target for respect.

Ubiquity can make a concept useless as a tool of discrimination. An alternative interpretation might emphasize that sentience is a process of expressing relationships rather than as a property of an entity. A dog in the sun feels hot and walks to the shade. Its ability to feel discomfort and seek relief requires the sun and the rock, evolutionary and ethologically. This focus on relationships does not privilege humans, biological nonhumans or synthetic systems but sees them as stakeholders within the common moral circle (related work includes the Earth justice and wild law, land ethics, geoethic and astroethics or the Ecozoic Era as an alternative to the Anthropocene).

To conclude, this paper's position rejects the ideological contrast between technophilia and biophilia. It then questions the bias towards human-like of sentient entities and extends ethical consideration to nonhuman lifeforms, abi-

otic structures, all Earth and places beyond Earth. Such an inclusive understanding of sentience can aid the development of more-than-human cultures, even if only as a provocation for further study.

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