Aug 11th, 12:00 AM

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Citation

Roudavski, S. (2020) Multispecies Cohabitation and Future Design, in Boess, S., Cheung, M. and Cain, R. (eds.), *Synergy - DRS International Conference 2020*, 11-14 August, Held online. <https://doi.org/10.21606/drs.2020.402>

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Multispecies Cohabitation and Future Design

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doi: <https://doi.org/10.21606/drs.2020.402>

Abstract: How should humans live with animals and other forms of life? Could responses to this question improve the health and wellbeing of the biosphere? This paper argues that design researchers ought to engage nonhuman lifeforms as collaborators: informants and co-designers, or clients and users. Inspired by recent design challenges involving birds, bats and trees, this paper positions emancipatory multispecies cohabitation as a goal that can alleviate ongoing biodiversity losses and human-wildlife conflicts, in cities and beyond. It opens an interdisciplinary conversation by translating emerging scholarship in ethics, politics, and aesthetics to a narrative about desirable more-than-human cultures. This discussion has significant implications and can help to inform regulation, instrumentation, and pedagogies of future design.

Keywords: more-than-human design; multispecies cohabitation; urban rewilding; sustainable futures

1. Introduction: Nonhuman Clients

The ongoing COVID 19 epidemic is but one demonstration of what can happen to health and wellbeing if planning and designing do not engage with nonhuman life and whole ecosystems. This paper argues that design researchers should consider multispecies cohabitation and more-than-human cultures in all designs of future settlements. This position is inspired by existing projects for 'nonhuman clients' undertaken by the Deep Design Lab and its collaborators. These include designs of artificial replacements for bird nests (Fig. 1) (Roudavski & Parker, 2020), designs of artificial structures to replace disappearing keystone habitats such as large old trees (Fig. 2), analyses of existing trees in terms of their affordances for nonhuman life (Fig. 3) including their heritage value (Roudavski & Rutten, 2020), development of intelligent lighting systems to combat environmental light pollution (Fig. 4) as well as designs for insects, mosses and urban marine life.

A recurrent theme in these projects is the need to achieve persistent modifications in behaviours, traditions, and cultures of human and nonhuman cohabitants. If the efforts to make human-populated environment more hospitable to nonhuman life will prove to be

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successful, such challenges will multiply and become more important. Intellectually exciting and pragmatically significant, the task of understanding and cultivating broadly beneficial multispecies cultures will be continuously relevant for future societies. Yet, the common understanding of culture excludes nonhumans even though they permeate human bodies (Dunn, 2011) and human homes (Dunn, 2018). Human societies should learn to resist such exclusions because successful multispecies cohabitation will depend on designs that consider nonhuman as well as human cultures.

Figure 1 Design of a prosthetic nest design for the powerful owl (Ninox strenua) in a host tree. Each nest fits precisely to the host's dimensions. Lead designer: Dan Parker.

This paper thus seeks to highlight the need for a structural reform in human/nonhuman relations. It identifies the target of this change as thriving 'more-than-human cultures' and pencils some aspects of the resulting societies by collating scholarship from multiple fields. The argument first contextualises the inquiry. It provides a brief background to the current exclusion of nonhuman perspectives and its accompanying planetary crisis. It then considers the limits of human intentions and proceeds with an outline of sources that can support imaginative visions of interactions between diverse stakeholders, human and nonhuman. Having begun with design examples, the bulk of the paper is necessarily devoted to an interdisciplinary engagement. It provides illustrations of the challenges and possibilities in three domains: ethics, politics, and aesthetics. The conclusion suggests that while more-than-human cultures are both plausible and desirable, their theoretical grounding and practical development require much subsequent work.

2. Background: The Planet in Crisis

The human impact on the planet is undeniably dramatic. Today, most commentators agree that the situation amounts to a global crisis (Díaz et al., 2019; Laybourn-Langton et al., 2019). Some see it as an existential threat to whole ecosystems (Lenton et al., 2019), others – to human civilizations (Spratt & Dunlop, 2019) or even to human existence (McKibben, 2019).

Figure 2 Design for a prosthetic tree that can serve as a habitat for arboreal wildlife. This image shows a version of tensegrity structure that can attach to existing telegraph poles. Lead Designer: Alexander Holland.

Much of this human impact is relatively recent (Dukes, 2011; McNeill & Engelke, 2014; Steffen et al., 2011). Yet, the damaging actions are persistent and ancient (Barnosky et al., 2014; Ellis et al., 2013; Foley et al., 2013). In the areas of human settlement, the diversity and abundance of nonhuman life have dramatically diminished shortly after the dispersion of *Homo sapiens*, sometimes many millennia ago (Diamond, 1989; see MacPhee, 2019 for a recent review in application to megafauna). For example, Australia lost 86% of its large mammal genera in 4000 years, an extinction that began about 45,000 years ago with the dispersal of humans (van der Kaars et al., 2017). The Americas lost up to 80% some 11,000 ago (Surovell et al., 2016) and in New Zealand moa birds have thrived for millions of years but disappeared abruptly with the arrival of *Homo sapiens* in the late 13th century (Allentoft et al., 2014). In most places, even the oldest human traditions have no tangible memories of the environments before these destructions, only echoes in old creation myths. Today, degradation and extinctions are on the increase. The estimates suggest that men, women and children have destroyed a tenth of the Earth's wilderness in the last 25 years (Watson et al., 2016). Most living organisms exist because of human activities.

A series of comparisons between human and nonhuman species provide important illustrations of the situation. For example, all humans weigh some 300 million tons. Their

agricultural animals, including cows, pigs, sheep, and chicken, total some 700 million. This managed life together adds up to about 1 billion tons. In comparison, the combined mass of all surviving large wild animals is less than 100 million tons, ten times smaller. The contrasting numbers of species are also telling. For example, according to recent estimates, the Earth supports some 1.5 billion cattle but only 80,000 giraffes, 400 million domesticated dogs but less than 200,000 wolves and 250,000 chimpanzees but 7 billion humans (Harari, 2014, Chapter 18). Human control clearly extends beyond agriculture, with most of species surviving in intentionally managed habitats. The wilderness is already overwhelmed.

Figure 3 Feature recognition and statistical analysis algorithms applied to a point cloud of a tree. This approach can inform designers about the features that are important for birds and bats, such as the length and orientation of roosting sites. Lead designer: Alexander Holland.

Against this background of the biosphere in crisis, human intentions stand out as a major cause. Of course, there are physical, energetic, and chemical constraints to planetary life. However, some key drivers of the degradation are civilizational or cultural (Clammer, 2016). Some called the negative impact of human-centred cultures the crisis of reason (Plumwood, 2001), others—the crisis in habits of thought (Morton, 2013).

Given the growing human populations and their increasingly pervasive influence, one inescapable problem is the cohabitation of human and nonhuman lifeforms. This challenge occurs in less affected environments as well as in substantially modified settings such as cities. While better protection of existing ecosystems is of utmost importance, there is a growing recognition that artificially changed environments, including inner cities and other urbanised areas, also require support as sites of valuable lives. Recent research shows that cities already house many species (Douglas & Goode, 2011; Gaston, 2010; Parris, 2016; Sandberg et al., 2015). Urban environments can serve as biodiversity repositories (Ossola & Niemelä, 2018) and host many nonhuman organisms. It is possible—and reasonable—to significantly amplify this capacity. Such an expansion of cohabitation will not be without

problems (Adams, 1999/2016; Soulsbury & White, 2016), including the increased potential for conflict, violence and other risks including bacterial or viral exchanges that can harm both humans and nonhumans. However, potential advantages for human and, especially, nonhuman life can outweigh or cancel the risks and call for the development of knowledge and practices that can make such cohabitation possible.

Figure 4 Design for a component of an intelligent lighting system that knows about historical and current behaviours of the local wildlife. Light pole activation is a minimal impact compromise between human and nonhuman stakeholder needs. Lead designer: Tony Yu.

3. The Will to Cohabit

Any attempt to design towards a goal of multispecies cohabitation will face considerable challenges that extend beyond the confines of current professions and disciplines. The scale and impact of these challenges are unfamiliar to science, to written records, to oral histories and to humans as species. Importantly, this venture is novel to human imagination. All past human practices have neglected and abused other forms of life, even if some are considerably worse records than others. What can inform a plan for a mutually rewarding cohabitation?

The aim to design for cohabitation presumes the introduction of further control towards intentional goals. However, such goal-directed planning can be difficult and sometimes

impossible or undesirable. The dominant political paradigm prioritises self-organising market mechanisms and the resulting ‘cheap natures’ (Moore, 2016). Arguments that defend the autonomy of ‘nature’ (Merchant, 2016) or the need for spontaneity in place-making (McClay, 2014) doubt the usefulness of planning. The unpredictability of forecasting the behaviour of complex nonlinear systems leads to low confidence in planned outcomes. Tensions arising from the unfair distribution of hardship (Low & Gleeson, 1998; Sandler & Pezzullo, 2007; Shrader-Frechette, 2002) and distinct ways to pursue environmentalism (Guha & Martinez-Alier, 1997) complicate conversations about possible actions. It is difficult to notice the ‘slow violence’ of unfolding environmental change (Nixon, 2011). It is impossible to imagine socio-environmental conditions without being influenced by ‘environmental imaginations’ of others (Purdy, 2015). Humans struggle to relate to global patterns with no direct links to local practices (Heise, 2008).

The common outcome of these constraints on human intentions is the impression that no radical alternatives to the present are available or practical. Are there other options than growth, capitalism or consumerism? What are the contrasting choices to the ingrained cultural commitments to meat, eggs, milk, wool, silk, or sickly dog breeds? Such questions are relevant because they highlight the extent of societal changes necessary for any significant increase in cohabitation. As Plumwood (2009/2010, p. 32) argued, the most challenging task facing the world today is the engagement with “a thorough and open rethink which has the courage to question our most basic cultural narratives.” Existing disciplines like political science explores a range of options including versions of ecosocialism (Pepper, 2010), green versions of nation states (Eckersley, 2004) and forms of a cosmopolitan global state (Held, 1995). Such efforts are necessary but will not be enough for practical change-making without an integration with the theory and practice of future-planning fields such as engineering and design.

4. Sources of Imagination

This paper suggests that design can contribute through the provision of inspiring and plausible visions of the future multispecies cohabitation. These visions need to broaden and concretize the space for alternatives. Such space needs to include extended time scales and diverse cultural practices. It ought to include a broad range of stakeholders, human and nonhuman. It also should learn from contrasting examples of cohabitation, however unpleasant or counterintuitive. These can be available through historical research, cultural or social studies of the present or as counterfactuals.

To illustrate, some more dramatic likelihoods of the near future can resemble past situations. For example, the current biodiversity collapse (Díaz et al., 2019; Kolbert, 2014) follows five other planetary extinctions. The plans for space colonization (Musk, 2017, 2018) evoke the biological unification of the Earth after the Age of Discovery (Crosby et al., 2004). The predicted separation of humans into new species (Fry, 2012; Hawking, 2018) parallels the historical coexistence of multiple species of *Homo* (Berger et al., 2017).

In the order of such hard-to-imagine events, rewilding is one characteristic example. Rewilding is a deliberately future-oriented activity (Gammon, 2017), with nonhuman autonomy at the core (Prior & Ward, 2016). Such autonomy presupposes open outcomes that can appear detrimental to humans and nonhumans alike. In contrast to this emphasis on autonomy are the efforts to preserve cultural landscapes (Jones, 2003) that have formed over centuries, for example by the European Landscape Convention or the 'Caring for Country' (Lennon, 2018) approach practiced by Traditional Owners in Australia. There is a fear that such rich landscapes (Schama, 1995/1996) can disappear or become meaningless and alien. Others argue that there is no worth in preserving cultural landscapes that represent environmental harm (Monbiot, 2014).

The co-presence of such incompatible positions indicates the difficulty in imagining or planning towards any concrete future states. Instead, it might be more productive, fair, or plausible to think in terms of exchanges and procedures instead of destinations. When relationships are actuated into events without certainty, the agenda of multispecies cohabitation shifts from the making and implementation of plans towards the effort to specify the rules of engagement. These can take form of research methods, techniques of governance, approaches in education, technical tools, or design agendas. The resulting interaction between multiple ideas, ways of living and stakeholders provides procedural rather than prescriptive templates. In this context, design can play a useful role by staging 'design experiments' to test theoretical approaches as well as by building instruments to enable better integration of nonhuman participants.

5. The Challenge of Culture

Existing trends in conservation, such as the 'new conservation science' (Kareiva & Marvier, 2012) seek to emphasize the goals of protecting the environment for human benefit. Alternative views emphasize the need to preserve nature for its intrinsic values (Curry, 2011). The proposition of this paper is that the expansion of environmental imagination should not be undertaken by humans alone. The historical trend toward a more inclusive justice that emancipated slaves or women and seeks to include disempowered minorities should address the oppression of nonhuman life. Such approaches seek to maximize the freedoms of all entities, as, for example, through a reconsideration of nation states in critical political ecology (Eckersley, 1992, 2004) or in the proposal to extend citizenship to animals (Donaldson & Kymlicka, 2011).

The gaps in the current knowledge and the opportunities for contribution from within design lead to the key question posed by this paper: what conceptual and practical steps will be necessary for ecocentric, more-than-human design? This brief paper cannot answer the question in full.

Instead, it focuses on one specific aspect and hypothesises that any successful multispecies cohabitation will depend on design that considers nonhuman as well as human cultures.

To test its hypothesis, the paper first defines designing as an activity that happens in shared cultures. With this understanding, it considers the role of culture in three areas: ethics, politics, and aesthetics.

6. Forms of Interspecies Culture

By multispecies or more-than-human design, this article does not mean designs of farms, agriculture, zoos or aquaria (such as those described in Kisling, 2001). These and similar designs bring nonhuman beings into proximity with humans for human enjoyment (as pets or garden plants) or for other human-use purposes, such as nutrition (milk and flesh), sources of materials (wool and horn) or psychological therapy, for example. Designs of this type aim to support human needs, often (or always) at some expense to nonhumans. These anthropocentric projects ignore nonhuman needs or intend to control and oppress. The celebrated penguin pool at the London zoo and the resulting hurt to the animals is a typical example (Gutierrez, 2019).

By contrast, this paper understands more-than-human design as a practice that seeks to benefit nonhuman as well as human stakeholders. As in other forms of design, more-than-human design can achieve better outcomes by designing ‘with’ nonhuman users and not only ‘for’ them. This need to ‘design with’ highlights the existence and importance of overlapping human/nonhuman worlds: spaces, structures, behaviours, memories, stories. The list of shared interspecies phenomena will vary depending on who is involved. The subjective interpretations of shared physical realities will also vary between species and individuals. Examples in this paper refer to the cultural overlap, evoking animals, but also (possibly) plants and various others.

6.1 *More-than-Human Ethics*

The first of these shared cultural areas is ethics. Morality in animals is an important emergent concern (Rollin, 2017). However, I must leave this aspect outside this brief paper. Instead, this section considers human-formulated ethics in application to nonhumans as the first step towards more inclusive cultures.

Reintroduction of nonhuman life into areas also inhabited by humans will necessitate a consideration of principles that regulate interactions between species and individuals, raising difficult questions about the applications of human power. For example, in 2019, Natural England, the official government’s adviser, revoked general licenses for killing 16 species of birds including crows, woodpigeons and jays after a legal challenge by a not-for-profit organisation Wild Justice. This led to acrimonious protests and even death threats from farmers and shooters because of the resulting damage to lambs, young crops, and ground-nesting birds. This example is characteristic of the tensions between the interests of nonhuman life mediated via human cultures that class them as ‘pests’, ‘endangered species’ or ‘livestock’.

Similar tensions arise in other situations. In the Australian states of Victoria and New South Wales, the struggle to protect feral horses from those who want to remove (and possibly kill) them to preserve the native bush in the Alpine National Park exemplifies a tension between interests of a species and an ecosystem as well as a mismatch between the value of an introduced and native species.

Beyond these examples, human capabilities for rewilding begin extending into reviving. Is it acceptable or desirable to recreate mammoths or even Neanderthal children? Some human groups take such a possibility seriously, radically expanding cohabitation to encompass an even broader range of ethical concerns.

Existing research in ethics covers a broad range of approaches, from the often ineffective mainstream of animal welfare, to the proposals to abolish all animal use (Francione & Garner, 2010) and more speculative considerations of ethics in relation to other lifeforms, such as plants (Kallhoff et al., 2018). Approaches akin to Leopold's "land ethic" (1949) seek to include an even wider set of concerns and stakeholders including, for example, soils, waters, plants and animals. The challenge of cohabitation specifically highlights the need for the understandings of justice that could account for entire ecosystems, including their physical dynamics as well as the resulting intelligences, behaviours, and cultures. Such socio-environmental ethics should describe ways of being besides (or instead of) defining the codes of conduct (Dobson, 1990/2007). It invites a reconsideration of sociality in relation to non-human communities and all biosphere/noosphere (for the context on the noosphere, see Samson & Pitt, 1999).

Anthropologists such as Ingold (2000) and Descola (2013) show that some human societies have a history of seeing nonhuman lifeforms as integral to their cultures. Such societies think that the human self is part of the nature-culture continuum (Harvey, 2013). These attitudes typically occur in nonindustrial or indigenous communities, often leading to more caring (but as often still exploitative) attitudes to nonhuman neighbours. Unfortunately, such communities are increasingly rare. They provide valuable precedents for more inclusive ethics, but their views and practices often refer to intensely local and already non-existent or rapidly disappearing environments.

Future environmental challenges will require the inclusion of relationships and phenomena that are outside of such local traditions. Examples might include distant sources of pollution and the resulting climatic effects or remote consequences of production/consumption chains that extract resources from and deposit waste to remote regions, such as the unempowered and poorly protected Global South (Gould et al., 2008) or even the Moon and the asteroids. Already occurring and predicted migrations of human and nonhuman lifeforms in response to environmental change will also result in challenging novel conditions (Higgs, 2017).

To conclude on the contribution of more-than-human ethics in terms of the aims of this paper, I consider existing ethical approaches to provide a promising foundation for the consideration of future cohabitation. However, its ethical framing requires further development. This is clear from the established topics in one of the more developed areas

of moral concern: animal ethics. One recent edition of a comprehensive reader (Armstrong & Botzler, 2003/2017) lists sentient capacities; animal use for food, experimentation and biotechnology; issues with wildlife, zoos and companion animals as key topics. It does not explicitly address the issues of multispecies cohabitation or the capabilities of design. Another (Linzey, Andrew & Linzey, Clair, 2018), structures the issues differently and looks at control, captivity, killing and suffering. All are relevant in design, with control being particularly important. Further work is necessary in this domain, and the next section highlights some relevant existing research.

6.2 More-than-Human Politics

Human cultures have provided many framings for the notion of control, including politics, governance, and law. The precedents within this complex field range from tyrannies to anarchies. Animals, plants, and other subjects of multispecies cohabitation already pertain to this sphere of power struggles but merit and will have to obtain greater influence. The task of imagining a substantially different future poses political as well as ecological questions (Robbins, 2004/2012). Multiple recent examples can illustrate the challenges that multispecies cohabitation will only intensify. Should koalas have property rights over their forests (Bradshaw, 2018; Hadley, 2017)? Can rivers act as persons and have parliamentary representation (O'Donnell, 2019; Youatt, 2017)? Should cats and dogs be citizens and the wild ecosystems have legal entitlements of sovereign nations (Donaldson & Kymlicka, 2011)? Do sheep and cows or frogs and bees deserve labour rights (Cochrane, 2016; Porcher, 2017)?

Let me use this last idea as an illustration of one possible path. It proposes to consider all work as collective and distributed labour of humans and nonhumans (Battistoni, 2017). Suggestions include generic ideas on the solidarity between species as well as concrete rights for holidays, sick leave, workplace safety, retirement pensions and so on (Coulter, 2016). Such rights represent an intermediate solution. Their provision is a stronger choice than animal welfare laws, which many researchers and activists perceive as insufficient (Francione, 2009). At the same time, the introduction of labour rights is less radical than a parity between animal and human rights that the lay public typically sees as unrealistic or unacceptable. To date, practical implementations involve domesticated animals such as police or guide dogs. Similar rules can apply to wild animals. For example, workplace safety would prevent the use of pesticides that harms insects or birds whose labour benefits all ecosystem stakeholders, including humans, in cities or in the country.

To emphasize, the point of this section is that the project of multispecies cohabitation will have to consider who might enjoy or suffer from its effects, and how. Current capitalist, neoliberal political structures seek to put nonhuman life to work as capital, commodities, services or labour (Barua, 2019). It is necessary to guard the proposals for cohabitation from the adoption of templates that encourage further exploitation.

A viable approach might extend green or inclusive (human and nonhuman) deliberative democracy (Smith, 2003). This can take the form of enfranchisement or political

representation of ‘mute’ groups such as animals but also young, mentally ill or otherwise marginalised humans (see an overview in Garner, 2016). Another path is through citizenship/denizenship for animals (Donaldson & Kymlicka, 2011). Adoption of such approaches will call for design protocols that can:

1. Provide novel means to include nonhuman stakeholders because humans such as experts, indigenous knowledge holders, human/nonhuman family members or various human others can only represent nonhumans (Essen & Allen, 2017) with significant limitations;
2. Extend beyond representation to the construction of mini-publics (Fung, 2010) through the ongoing nonhuman participation in decision making and management; and
3. Widen into the participatory work of imagining possible futures, practically and morally (Mulgan, 2018).

Currently, most researchers understand social constructivism as an interpretative work by human stakeholders understanding their worlds in subjective ways. Design is relevant here because it is a collection of attitudes and practices that encourage and instrumentalise the construction of states that do not yet exist. Effective (or even plausible) approaches to doing this work with nonhumans will require further research.

Resulting multispecies-design processes will not only bring together various points of view and contribute towards productive communication between stakeholders but also provide patterns for the observation, appreciation and cross-adoption of creative skills and expertise. The challenge here is to acknowledge and cultivate skills emanating from nonhuman as well as human practices and cultures.

6.3 More-than-Human Aesthetics

Questions emerging from concrete design challenges require interactions in hybrid, human/nonhuman cultures. For example, should humans teach birds to migrate (Fritz et al., 2017)? Should children learn to accept as normal the dismembered parrots under owls’ nests? Should urban designers teach birds or bats to see buildings as nesting sites? How might human education frame nature’s spontaneity when it leads to death, decay, disease, or pollution? The amount of suffering among wildlife leads some to argue that the prevention of existence might be a better option for many animals (Tomasik, 2015). Most of this suffering has nothing to do with humans and recolors the much-praised nature’s autonomy (e.g., see Heyd, 2007) as a questionable ally. The future of multispecies cohabitation will not escape engaging with such concerns.

The notion of a more-than-human culture, to which such questions pertain, cannot be given justice within a short paper. Instead, this section focuses on one aspect of culture: aesthetics. Aesthetics can serve as a useful example. Understood inclusively, aesthetics is a way to form subjective evaluations of the surrounding world (e.g., see Volland & Grammer, 2003; Welsch, 2004; Høgh-Olesen, 2018). Such evaluations can guide animal behaviour in the environment

and society, for humans and nonhumans. It is one way to define subjectivity, which is a characteristic of all life (e.g., see Maturana, 1972/1980; Miller et al., 2019) and maybe even of all self-organising systems.

Aesthetics is undeniably significant in environmental management because it underpins thinking and practice of all humans, including scientists, professionals (Kovacs et al., 2006) as well as indigenous communities (Roque de Pinho, 2016) or the unconcerned. In the future, human preferences will increasingly influence which species will survive or vanish (Stokes, 2007).

Similarly, aesthetic values will play a significant role in multispecies design, framing data collection and interpretation as well as governance (Richardson et al., 2018) and planning. Rewilding can bring difficult aesthetic experiences. Some discuss such experiences as unscenic and ugly (Prior & Brady, 2017). When nonhuman life repopulates degraded or abandoned land, people often see the resulting spaces as feral and associate them with illicit or devious activities (Farley & Roberts, 2012; Gandy, 2012; Lorimer, 2015; Sinclair, 2011). In general, valuing nature's autonomy is still contrary to the dominant human-aesthetic discourse and practices (Godlovitch, 1998). Other interpretations are possible and do exist in many human-cultural practices. International artistic movements such as 'land/environmental' (Brady, 2007; Lintott, 2007) or 'systems' art (Halsall, 2008) provide some examples. Such movements can contain interesting models but emerge from and impact relatively confined 'artworlds' (Danto, 1964). Indigenous cultures with their spiritual perceptions and dreaming stories provide another. When human practices develop alongside ecosystems over extended periods, sustainable practices are likely to emerge. However, as discussed above, all human cultures produced substantial environmental changes with negative impacts on other lifeforms. Therefore, their aesthetic interpretations of the resulting environments and the remaining nonhuman inhabitants require interrogation.

Forms of Japanese aesthetics supply another example of cultural appreciations that appear to value natural processes because they prize qualities such as transience and imperfection (Saito, 1997, 1998, 2007). However, such aesthetics have been cultivated and practiced in dense cities by small numbers of privileged people who knew little about wildlife or ecosystem interactions. Consequently, Japanese traditions tend to appreciate highly stylised nature. They focus on individual species and lack ecological and ethical awareness (Kellert, 1991), leading to very low popular support for the environmental movement (Heuer & Shan, 2018; Mitsuda, 1997).

Such precedents and practices can be useful but given the novelty of the challenges it is also reasonable to expect that in many cases experimentation with new aesthetics, a reconceptualization of aesthetic categories and education of relevant human stakeholders will be necessary. In the least, it will be important to show how human aesthetics can extend to accommodate the agency of all relevant agents (including wild organisms).

Any serious effort aimed at including nonhuman stakeholders will pose further, more radical questions. As mentioned above, culture and aesthetics frame understanding, learning,

behaviour, and traditions of nonhuman as well as human organisms. Given that evolution conditioned human aesthetic preferences, it is reasonable to expect that other species also have aesthetic experiences or tastes. Birds, monkeys and raccoons can favour order, symmetry and regularity while many species differentiate between visual appearances or construct aesthetic displays (Ackerman, 2016; Davies, 2012; Høgh-Olesen, 2018; Prum, 2013, 2017; Ryan, 2018; Welsch, 2004; Westphal-Fitch & Fitch, 2018). Consequently, while the expanded human aesthetics would be an important advance on the current conditions, further and more challenging work on true interspecies aesthetics and, more broadly, on interspecies cultures will still be necessary to support design for sustained multispecies cohabitation.

7. Conclusion: Multispecies Cohabitation in the Future

While brief, the sections above indicate that future design of multispecies cohabitation will have to engage with more-than-human cultures. Existing work in biology, ecology, environmental history, animal studies, ethnography, geography, and other disciplines demonstrates that multispecies interactions are common, making focused design work in this direction appear plausible. To contribute, design disciplines will have to update their practices including education, certification, and tooling.

For example, notions of ecocentric (Kopnina, 2019) and ecojustice (Martusewicz et al., 2011/2015) education or radical ecopedagogy (Kahn, 2008) are relevant for the cultivation of the conducive approaches. In parallel, descriptions of desirable destinations can provide useful problem framing. These might include ideas for the abundant Earth (Crist, 2019), shared Earth (Wilson, 2016), the reconciliation ecology, the Ecozoic Era (Swimme & Berry, 1994), bioproportionality (Mathews, 2019) or ecological ethics (Curry, 2011). Initiatives like the Statement of Commitment to Ecocentrism or Architects Declare (highlighting the biodiversity emergency) provide further examples.

This paper positioned emancipatory multispecies cohabitation as one of the approaches that can alleviate the planetary crisis. The continuing loss of nonhuman habitats is not inevitable. Human settlements can house many more lifeforms than they do currently. With this in mind, the paper sought to point out some challenges of such cohabitation. It hypothesised that any successful multispecies cohabitation would depend on design that considers nonhuman as well as human cultures. To test this hypothesis, the paper sampled the implications of multispecies cohabitation in ethics, politics, and aesthetics. This discussion provides provocations for further theory construction and practical experimentation.

In summary, the paper argued that long-term planning is difficult on multiple counts, including insufficient knowledge, fundamental unpredictability of complex systems and disagreements about desirable futures. In response, my argument proposed a shift of attention from the attainment of preferred future states towards the organisation of relationships between human and nonhuman cohabitants. Many of the prevailing environmental forecasts are gloomy and demotivating. Rewarding, plausible and just

prognoses are harder to come by. While the prolonged and global outlook for multispecies cohabitation is uncertain, an ecocentric and multicultural approach discussed here is valuable because it provides exciting intellectual, emotional, and functional challenges that can motivate further research and practice. To fulfil its promise for a substantive refashioning of urban life, future design will have to abandon the anthropocentric bias of human governance and seek to extend the existing emancipatory trends to include nonhuman stakeholders.

Acknowledgements: The ‘Untaming the Urban’ conferences hosted by the Fenner School of Environment and Society, Australian National University, in 2016 and 2018 have been instrumental in the development of the ideas presented in this paper and I thank the organisers and participants of these events. Colleagues at the University of Melbourne’s Faculty of Architecture, Building and Planning (some of whom are named in image credits) have also contributed to this theme. This research was supported by the Australian Research Council DP170104010 grant.

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