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In this forum, we explore more-than-human design practices that consider the interactions and interdependencies between humans and nonhuman others, including animals, plants, water, bacteria, sensors, and data. **— Anton Poikolainen Rosén and Sara Heitlinger, Editors**

Introducing More-Than-Human Design in Practice

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Following an initial emphasis on usability, ergonomics, and the optimization of interfaces in HCI, a human-centered turn shifted the focus toward designing more collaborative, social, and societal processes. This helped expand HCI beyond only designing products and tasks to consider issues of access, justice and participation—a necessary and welcome development in the field. Nonetheless, and despite the increasing environmental crises, the dominant approaches to design practice in both academia and industry continue to focus on, and privilege, human needs at the expense of all else. Nonhuman species, as well as habitats, water, and the air we breathe, are afforded little thought. At the same time, human-centered design and the unconstrained production and consumption of new products is contributing to many of the ecological crises we currently face that threaten all life on Earth, including pollution of air and water, climate change, mass species loss, and the degradation of habitats.

As awareness of environmental concerns have grown, HCI design researchers have started to recognize the broader impacts of technology. Sustainability has become an important focus, particularly as computing's environmental costs, such as energy consumption and e-waste, have come to light. This shift, along with emerging more-than-human influences from other disciplines, has prompted researchers in sustainable interaction design to think beyond humans and to consider how technologies interact with the natural environment, broadening HCI's scope and setting the stage for more-than-human perspectives.

Today, more-than-human perspectives are gaining momentum [1,2,3,4,5]. They are influenced by other disciplines such as the environmental humanities and geography, Western philosophical movements like posthumanism and new materialism, as well as non-Western ones that draw on Indigenous wisdoms and pluriversal perspectives. *Posthumanism* critiques anthropocentric views, arguing that humans are not the central actors in all systems. Instead, we coexist with other species, objects, and technologies in networks of mutual influence. *New materialism* similarly rejects a strict separation between humans and nonhumans, focusing on how materials, technologies, and objects exert agency in their own right, while Indigenous and pluriversal perspectives have always acknowledged the relational interdependence of all living beings. These philosophical and worldview shifts have inspired HCI researchers to rethink the relationship between human and nonhuman others, accommodate more-diverse participants in interaction processes, and acknowledge the relationality among all living creatures.

A sister field of more-than-human design is *animal-computer interaction* (ACI), which considers how animals can engage with technology. Examples include wearable devices for pets and wildlife tracking systems. ACI underscores how design must account for cognitive, sensory, and behavioral patterns that are different compared to those of humans. Building on these ideas from ACI, more-than-human design now encourages designers to create systems with animals, plants, and others as active participants. For instance, sensors in ecosystems might allow animals or plants to "communicate" conditions to humans or machines, creating symbiotic relationships between natural and artificial systems.

More-than-human design also incorporates ecological and systemic thinking inspired by *systems theory*. This approach treats technology as embedded in broader ecosystems where human and myriad nonhuman entities interact. In areas such as smart cities and precision farming, where Internet of Things devices are typically used to optimize human efficiency for human benefit, there are new opportunities (as well as risks) for sensors and their data to decenter human agency, make species' interdependencies visible, and foster justice for multiple species. This shift from user-centered to ecosystem-centered design encourages designers to consider not only human needs but also the broader impacts on other species and the environment.

The more-than-human approach

Insights

→ A more-than-human turn in design is responding to the role of design in our ecological crises, as well as a growing acknowledgement of the relationality between all living creatures.

→ More-than-human design raises ethical and methodological questions that contribute to and expand the field of design.

also raises ethical questions about agency, rights, and inclusion. Who, including nonhumans, has the right to shape technology and environments? How can designers represent the interests of nonhuman entities, who cannot advocate for themselves in traditionally human ways? Engaging with questions like these is spurring the development of new methods in participatory design [5] that attempt to give voice to nonhuman actors, such as using AI models to simulate the needs of animals and designing for ecosystems as stakeholders. This challenges designers to rethink what it means to "participate" in a design process and who or what counts as a participant. Designers are thus increasingly tasked with new challenges, ethical considerations, and tensions as we attempt to balance human and nonhuman needs and interdependencies.

Living root bridge in Meghalaya, India. This design reframes the assumption that an organism needs to be killed before being utilized as a material in design. It remains unclear, however, how the principles of this design be scaled.

WHAT ARE THE AIMS OF THIS FORUM?

More-than-human design faces significant challenges. Designers must grapple with complex questions around how to practice more-than-human design ethically and sustainably. In this forum, we therefore ask the broader HCI design community to consider what more-than-human design is and could be, and how it might begin to address the problems caused by a human-centered perspective—one in which the human is privileged above all other species. We invite explorations of more-than-human design focusing on concrete outcomes and implications for design practice, and we invite you to engage with some of the following questions:

• *How can more-than-human design help address our environmental crises?*

• *What are the opportunities and risks of designing interactive technologies that attend to the needs of multiple species within diverse ecologies?*

• *How might we understand and represent multispecies' needs in design, in ways that are ethical and just?*

• *How can we develop interactive technologies that support humans to be more attentive to their local and global ecologies?*

• *How can we tally the systemic and indirect negative environmental consequences of interactive technologies*

alongside their potential benefits?

• *What role might increasingly autonomous and seemingly intelligent technologies play in transitions to justice for multispecies?*

• *How can we ensure that the worldviews and values we bring to design don't further contribute to environmental and socially unjust design practices?*

To emphasize the focus on practice, we introduce three themes: methods for more-than-human design, implementation of more-than-human design, and scaling more-than-human design.

Methods for more-than-human design. We need to adapt current design methods so that they incorporate more-than-human perspectives throughout the whole design process, including data gathering, empathy building, ideation, sketching, prototyping, and testing [6]. This involves both adapting existing methods and imagining radically novel methods. Submissions on this topic are encouraged to describe methods that can help us move beyond human-centered design toward a relational more-than-human design. Relevant questions on this theme include but are not limited to the following:

• *How are more-than-human design methods different from human-centered ones?*

• *What are the limitations of current design methods as applied to more-than-human design practice, and how must they be expanded?*

• *How do we study and design with beings that do not communicate through human language?*

• *How can we represent nonhuman stakeholders in design processes?*

• *What are the challenges, risks, and opportunities of more-than-human design methods?*

• *What can more-than-human design methods teach us about design more generally?*

Example contributions on this topic may include creative methods that allow us to get to know nonhuman stakeholders (e.g., multispecies personas), methods for understanding relationality within a multispecies ecology (e.g., multispecies live-action role-play), and methods for sensitizing and attuning to more-than-human environments and senses (e.g., multispecies ethnography).

Implementation of more-than-human design. The theories motivating more-than-human design are well developed, drawing on established scholarship from diverse disciplines. More-than-human design in practice is still underdeveloped. We are therefore very keen to use this forum to showcase

cutting-edge research in this emerging area of applied knowledge, including how to move beyond theory and speculation in design toward practical implementation. In this section, we are particularly interested in hearing about implementations of functioning prototypes, field studies, services, products, and similar real-world implementations. Relevant questions on this theme include but are not limited to the following:

• *How is more-than-human design implemented in practice?*

• *What are the challenges and opportunities of implementing more-than-human design in practice?*

• *How can we study and evaluate more-than-human design "in the wild"?*

• *Which species are included in the design and evaluation process, and how are these decisions made?*

• *How are conflicting more-than-human interests and needs negotiated in practice?*

Example contributions on this topic may include studies where nonhuman use is affected by interactive technology (e.g., AI systems for communicating with and between nonhuman species, data visualizations for interpretation by nonhumans); implementation of more-than-human design processes in established design agencies and institutions (e.g., commercial design briefs with more-than-human perspectives); evaluation that assesses the outcomes of more-than-human design from a more-than-human perspective (e.g., evaluation over time of a sensor system that was implemented to benefit biodiversity); and analysis of contemporary technology use from more-than-human perspectives (e.g., outlining the indirect environmental consequences of an automated delivery robot).

Scaling more-than-human design.
While there is a growing number of excellent more-than-human speculative and conceptual design work [7], there is much less work focused on how to scale these small experiments. But to truly mitigate environmental destruction, more-than-human designs and strategies need to scale. Submissions on this topic are encouraged to describe how we can move beyond a limited instance of more-than-human design to achieve real and scalable impact. Relevant questions on this theme include but are not limited to the following:

• *How can we begin to scale more-than-human design when this approach clearly goes against the profit-driven and human-centered focus of mainstream design practice?*

• *What potential do small experiments and implementations have for creating larger shifts in cultural narratives and perspective?*

• *What are the obstacles to scaling impact across different sectors and disciplines?*

• *What are the opportunities for harnessing technology to help scale the impact of more-than-human design?*

Example contributions on this topic may include more-than-human design in policymaking (e.g., environmental protection regulation, multispecies participation in decision making); more-than-human design in the business sector (e.g., changing business standards); and infrastructure projects (e.g., technology projects to support regenerative economics, habitat restoration, and nature-based solutions for urban infrastructure).

JOIN THE CONVERSATION
The forum More-Than-Human Design in Practice aims to challenge conventional human-centered approaches by exploring how design can account for the needs and interactions of multispecies. We invite the HCI design community to engage deeply with the questions raised in this forum and contribute methods, case studies, and strategies that push beyond speculation toward implementations in the real world. We encourage you to join the conversation and be part of a transformative movement in design, helping scale the impact of more-than-human design from concept to practice.

We coexist with other species, objects, and technologies in networks of mutual influence.

For more details, see www.interactions.acm.org/submissions and send your submissions to MoreThanHuman@interactions.acm.org.

ENDNOTES
1. Heitlinger, S., Foth, M., and Clarke, R. eds. *Designing More-than-Human Smart Cities: Beyond Sustainability, Towards Cohabitation.* Oxford University Press, 2024.
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