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Exploring Speculative Methods: Building Artifacts to Investigate Interspecies Intersubjective Subjectivity

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Abstract: *This article explores approaches to propagating interspecies understanding and examines the most appropriate ways to investigate the topic as a form of research. It addresses making, or Research through Design (RtD), as a more appropriate research method to generate new knowledge around interspecies embodied experience and to help audiences consider what it might be like to be a nonhuman animal than more traditional forms of scholarship. It presents a range of approaches to exploring interspecies understanding and then situates this knowledge in context with reference to a series of prototypes and design artifacts which constitute the body of work Equine Eyes. The Equine Eyes project consists of a mixed-reality headset, which uses immersive technology to help the user adopt the “point of view” of a horse. The work and the knowledge it produces is experiential in that it requires the audience to wear the headset which simulates horse-like vision to consider how tacit knowledge can be explored through making. The project adopts a RtD method to explore how speculative design artifacts, and play, can be utilised to help foster interspecies thinking and understanding and generate new speculative methods for interspecies design practice. It emphasizes the importance of developing usable speculative design artifacts that can be experienced by users to enact the speculation as an embodied experience.*

Introduction

This article explores different methods for helping people, or human animals, understand different creatures, or nonhuman animals. The research uses these terms to help make connections between human and nonhuman animals and situate humans as just one form of animal in the world. We should understand this as a politically charged, rhetorical framing of humans and their relationship to other forms of life. This research, both in its written form and in the accompanying design artifacts outlined in the concluding sections of this article, explores how we might better relate to other nonhuman animals by opening a space for speculation and exploration of the different experiences of different types of bodies. It argues that Research through Design (RtD) and Research through Creative Practice (RtCP), or “making as research”, are the most appropriate methods for fostering interspecies understanding, as the knowledge is embodied in an artifact that can be experienced by users. Understanding other species has practical implications in disciplines such as Animal Computer Interaction (ACI) as well as cultural implications in the way that we treat other nonhuman animals, including the potential to increase our focus on animal welfare. The article will outline approaches to making, in different design contexts, as a form of research where the new and valid knowledge is situated in things rather than communicated through language. It will then explore diverse approaches to understanding nonhuman animals in different design contexts to discuss the limitations of positivist approaches and lay the groundwork for more experimental methods. The article will claim speculative design is the most appropriate way to explore interspecies understanding, but propose that it must progress as a method to focus on creating

experiential artifacts that users can use to configure and reconfigure the knowledge through experimentation and play.

The article will then present a body of research called *Equine Eyes* which consists of a series of prototypes that use speculative design as a method to explore interspecies understanding. It builds an understanding of design rhetoric to demonstrate the importance of situating knowledge in things rather than words and outlines the discipline-specific discourses around different forms of research. This is then used to explore different design contexts where designers make things for different nonhuman animals. The project focuses on animal–computer interaction to build a research context, and frame a set of design problems associated with the anthropomorphising of nonhuman animals. This article proposes speculative design as a method to explore the design problem but also calls for more experiential, playful and explorative speculative design. It presents a range of existing creative practice and design methods which explore similar issues, highlighting the important contributions that these projects make but also addressing their limitations. The article concludes by presenting a body of work which explores how design could help build artifacts to propagate an “interspecies intersubjective subjectivity”.

Designing for, with and as Research

We can understand research as the contribution to, and generation of, valid and new knowledge. In this article we must position RtD and RtCP, or the “making as research”, in a broader research context to address why making, and situating the knowledge in an object or experience, might be a more appropriate way of exploring an idea or consolidating a contribution to knowledge. If we can consider research as the generation of new and valid knowledge, then we must consider the most appropriate methods to acquire and produce new knowledge within the research context. RtD or RtCP usually starts with an open-ended question rather than a hypothesis which will be validated or rejected through data collection. This question is explored through an iterative process (often described as “problem framing”) of thinking, designing and making (Schön). This is a reflective process which leads to a series of small findings as the project progresses, which are usually reflected on by the designer and researcher through a portfolio and then situated in a research outcome as part of the continuing investigation. The research outcome is then the summary of a reflective process which communicates the outcome to the audience or user through artifacts, systems or objects. The outcomes are more qualitative forms of new knowledge crystallised through a research process, into things. One of the primary criticisms of RtD is that the subjectiveness of the designer can often play a significant role, leading to the iterative and reflective process and research outcomes being affected by the culture of, and the knowledge held by, the designer(s) through the authoring process. Whilst embodying values in design can be viewed as problematic it can also be considered as a positive and appropriate method for generating new knowledge when we consider the design as rhetoric. The design rhetoric is inscribed into the design with a myriad of choices that may include: the functionality of the design, its aesthetics, the practicalities of production, and the motivation for making, the identities and capabilities of the people for whom the artifact is intended (Gaver and Bowers). When we frame or consider design as a form of rhetoric, we can start to unpack what the design is proposing about the world.

Design rhetoric, or design as a communicative discipline, is a method of proposing arguments about the world through authored objects, products or artifacts. These objects are

designed to help persuade an audience or market of a particular need, or desire, either aesthetic or functional. These products form encoded statements which, as Buchanan suggests, are infused with the “influence of a designer’s personal attitudes, values, or design philosophy; or the way the social world of design organization, management, and corporate policy shapes a design” (4). Buchanan’s work understands design as an ideological or subjective process of authoring objects which are imbued with, and shaped by, the designer’s social, cultural, and political environments and beliefs.

It is important to understand that it is not just the object or artifact which can be inscribed or encoded with meaning, values or the ability to act as a critical tool; the systems and processes underlying the technological or aesthetic structure of the design also offer a space to foster critique or open discursive spaces. Bogost situates digital games as a medium which can render design rhetoric through the use of systems and procedures (*Persuasive*; “Rhetoric”; *How*). This procedural rhetoric uses the interconnectedness of game objects, player characters and game systems to propose arguments about the way the world could or should be. The game as a system can be used to author arguments about the world through processes (Bogost, *Persuasive*). Procedural rhetoric extends the work of scholars like Buchanan to help to understand how systems contain design rhetoric. The design outcomes might be different in form, but rhetoric is produced through the authoring process through the interconnected and intertwined design qualities of the artifact’s technological reasoning, its character and through emotional engagement with the audience. These three factors work to construct a design rhetoric for all design practice. The outcome of the RtD process says things about the world, and the designer (consciously and unconsciously) authors arguments through the iterative cycle of thinking, making and reflecting. Buchanan argues that “persuasion comes through arguments presented in things rather than words; they present ideas in a manipulation of the materials and processes of nature, not language” (7). The design artifact is usually accompanied by an exegesis of the practice, a reflective portfolio, an artist/designer statement or more traditional scholastic output, which is more easily digested by a research and academic community. RtD can be used to frame a wide variety of complex issues as an investigative and iterative research methodology which explores design problems through cyclical and iterative loops of thinking, making, critiquing and reflecting.

Designing and making in a range of research contexts is a political and ideological process of authoring arguments through design rhetoric into things rather than constructing arguments through words in more traditional scholarly research. This is then a largely nonlinguistic approach to the generation of new knowledge, where the “things” embody the knowledge that has derived from the research process. As the meaning is authored in things rather than language, the knowledge is afforded a multiplicity or flexibility in the meaning or interpretation. In practical terms, this means that the design artifact or outcome is usually accompanied with a reflective portfolio and a linguistic exploration (such as this) which helps to explain the research, communicate the findings in a clearer way and help in the decoding of the output or artifact. This is not to say that the new knowledge then resides in the linguistic exploration, as it would in a more traditional scholarly output, but that RtD and RtCP usually have accompanying paratextual work which gives context to the methods, process, and knowledge. As Bill Gaver and John Bowers suggest, the theory, or written exploration and explication of the knowledge produced in RtD, “promises generality and guidance but seems inadequate to capture the situated, multidimensional, and configurational nature of design, and moreover threatens to occlude the potency of unique, embodied artifacts in a cloud of words and diagrams” (42).

Designing for and with Other Species

This project uses RtD to explore anthropocentrism and our relationship with nonhuman animals. The project started as an exploration of the research methods in Animal Computer Interaction (ACI) and the approaches of the discipline to understanding nonhuman subjects. Through this exploration of ACI a number of tensions and concerns emerged in the approaches used to understand other species. This formed the starting point to consider different design methods and approaches to propagating interspecies understanding. This work aims to re-emphasise the political nature of ACI and raise questions about the research methods that the discipline gravitates towards.

ACI as a discipline has produced three main interconnected bodies of work: first, those that focus on the design of system and technologies which are created as a place for interspecies communication, where the technology forms a place for humans and animals to interact together; second, those improving animal wellbeing in a landscape shaped around human needs; and, third, those that focus on work which integrates animals into the technological ecology of modern life allowing for increased productivity, tracking, monitoring, and utilisation as a resource (Mancini, “Animal-Computer Interaction (ACI)”).

In this project, the research focuses on the first body of work from ACI which is most concerned with interspecies communication and connection. This body of work situates the nonhuman animal as an important cultural and design stakeholder and is the most connected with approaches to understanding nonhuman animals as subjects. The approach looks to find ways to communicate and understand other, nonhuman, ways of being in the world and how we can use technology as a way to connect and communicate across the species divide. This interspecies communication first needs to explore how the nonhuman animal experiences and understands the world before it can design with and for them. For instance, if we are designing a video game for a cat and a human to play together (like Michelle Westenlaken’s work *Felino* (2014) or Frank Noz and Jinsoo An’s *Cat Cat Revolution* (2011)), we must first understand how the cat sees and experiences the world, how it understands the iPad, how it plays, and how it sees and understands the human player in the situation. ACI is a discipline which “places the animal at the centre of an iterative development process as a legitimate user and design contributor” (Mancini, “Animal-Computer Interaction (ACI)” 2). This approach to “designing with” could be linked to the increased focus in the wider design community on user-centered design and participatory design practice and is at its heart imbued with a politics that fosters interspecies connections and questions the anthropocentric cultural bias that places humans at the centre of culture and the world. These have been described by Eben Kirksey and Stefan Helmreich as “new kinds of relations emerging from nonhierarchical alliances, symbiotic attachments, and the mingling of creative agents” (546). The politics of ACI were core to the original manifesto and underpin its design principles (Mancini, “Animal-Computer Interaction: A Manifesto”). The rhetoric is clear through the process and the artifacts, which are designed with the nonhuman animals as a cultural agent. The design methods for ACI displace the human at the centre of the process and problematise more prevalent anthropocentric design principles.

ACI helps to establish the nonhuman animal as an important subject and user, situating the practice as a political act which recognises the interconnectedness of humans and nonhuman animals and the privilege that human animals bestow upon themselves. It is important that ACI designs for and with the nonhuman animal, and shapes the interface, system and technology around the physiological and psychological needs of the subject. This species-

appropriate design puts an increased importance on understanding the way a nonhuman animal experiences and views the world, resisting anthropomorphising them as design subjects and misframing the design problem.

There is an imperative for the designer to understand the animal as a subject rather than anthropomorphise them and not to project the attributes, behaviours and needs of the human designers onto the animal users (Mancini, “Animal-Computer Interaction (ACI)”, Noz and An; Westerlaken and Gualeni, “Digitally Complemented Zoomorphism”, “Felino”). To design with and for nonhuman animals we need to start to understand the way they experience the world around them. The interactive system, user interface and technology should be designed around the animal subject to cater for their specific bodies, behaviours and motor schemas. In this approach, the animal becomes inscribed into the design and the interactive system becomes species specific.

ACI politics understands and situates the nonhuman animal as an important subject capable of its own unique and species-specific understanding of the world around it. This approach forms an important method for ACI as it relocates design from an adaptive process, which Mancini terms “animal technology” (“Animal-Computer Interaction (ACI)” 2), to one which inscribes the animal into the technological as it creates objects, interfaces and systems which are species specific. The technology, interface or system becomes an extension of the animal as a subject and agent rather than adapting human-centred technology for an animal user. ACI could then sit within a discourse of user-centred design or participatory design processes, where the users of the service, technology or product are predefined and included in design and development, but ACI also suffers from shortcomings in the definition of “ideal users”, normative statements, and the potential to reduce a user to the point of abstraction. These issues in user-centred design can become magnified in ACI as they rely on the designer’s understanding of the nonhuman animal and this understanding is often generated through observation, interspecies ethnography, and bio-metric data monitoring rather than an embodied understanding of the subject. The methods of understanding the subject are then positivist forms of abstracting the subject into data for interpretation by human animals.

ACI relies heavily on positivist approaches to produce design objects and systems which cater for the specificity of the animal physiology. The animal’s behaviours and biometric data is often tracked, logged and processed to help understand its relationship with the computer-mediated experience. These positivist approaches to design research are intended to answer design problems with fixed outcomes, which cleans and simplifies the messiness inherent in multiplicity of design solutions, rather than considering and exploring them (Coulton and Hook). ACI also relies heavily on quantitative analysis of the design which is marred by the problem of intersubjectivity in the design and evaluative process. Michelle Westerlaken and Stefano Gualeni advise that biometric and tracking data should be used to supplement other methods to offer data for quantifiable analysis of the interaction and could help to remove the human interpretation of the animal signals to offer clearer and more useful results (5). This approach can offer insight to help shape the iterative design process but could also disrupt the natural interactions of the animal with the technology as they are observed, measured and tracked. It relies on the human animal’s ability to develop an interspecies intersubjectivity and interpret the data in a species-specific context. This grounded approach to design research offers useful insight into nonanthropocentric design principles, but closes the possibility of other design practices, or design as a place for critique, reflection, introspection or speculation. This form of design, drawing from its origins in human–computer interaction, has a focus on creating useful products which function to serve predefined needs and are

solutions to perceived problems, judged by their ability to work in certain ways and fulfil certain logics.

ACI (proper), as opposed to animal technology or other reductive approaches of designing solutions for animals, respects the species-specific nature of the subject and designs with the nonhuman animal. It has a design rhetoric built on an understanding of all animals as subjects capable of meaningful contributions, that should be designed for and with. Shaun Lawson, Ben Kirman and Conor Linehan suggest we must avoid “project[ing] human characteristics, such as complex cognition and emotionality, onto animals” (Lawson et al. 39). To design with nonhuman animals, we need to foster interspecies empathy and understanding so that we can start to understand the nonhuman animal’s position in the world. We need to frame the problem and develop approaches to help us see how the animal experiences the world. We need to develop ways of understanding the nonhuman animal’s subjectivity and foster ways of exploring other forms of being and seeing the world that we could think of as an intersubjectivity. This intersubjectivity could be considered a kind of tacit knowledge which is hard to communicate through language.

Other forms of design practice and design methods could help to reframe ACI, open up new possibilities to reflect on the animal subject, and challenge anthropocentric design principles through more speculative methods. In an attempt to negotiate the interspecies “intersubjective subjectivity” needed to understand how a nonhuman animal experiences the world and design for these animals, there lies the possibility to investigate a range of interconnected design practices such as critical design, speculative design, design fictions, and design probes. These alternative methods could be used to rethink the design process and focus on the design rhetoric in ACI. Through these methods, design can be used as a process of “engendering debates and changing perspectives about important social issues” (Bardzell et al.).

Speculating on Other Species

Critical and speculative design use design methods and processes to create critical objects, which are often outside of commercial practices and serve an inquisitive or provocative role (Malpass). The objects are usually counter to conventions or question usability, profit or taste (Mazé and Redstörn) and created as a process or product of critical reflection by the designer. Anthony Dunne and Fiona Raby suggest that the practice “rejects how things are now as being the only possibility”, and that “it provides a critique of the prevailing situation through designs that embody alternative social, cultural, technical, or economic values” (*Design Noir* 58). This has been considered alongside contemporary art practices as a method which tries to open spaces for reflection, debate and critique such as showrooms or galleries (Bardzell et al.).

Dunne and Raby pose speculative design as designing for plausible and possible futures, where more traditional commercial design is focused towards predicting probable futures and designing products, services or systems which meet market need (*Speculative Everything*). This process takes the form of the extrapolation of existing systems, technologies or products to create meaningful reflections on the present and the possible futures that could extrude from our current social, political or cultural conditions. James Auger also states that speculative design could provide alternative presents as an exploration of ideologies presented as design proposals. Speculative design can offer a space for reflection, consideration and critique to imagine other possibilities through the consideration of design objects. It provides

an opportunity to focus on the rhetoric and politics distilled into artifacts through the process of design.

Speculative design has been criticised for creating objects or proposals which spur debate and raise awareness about projected future scenarios and needs through reflection and imagination, rather than through the creation of useable and experiential objects, systems or artifacts. Within the discipline there has been a range of calls for more tangible and useable forms of speculation, where the audience can experience the use scenarios and the functionality of artifacts. We could consider these as a series of “*counterfactual artifacts*” (Elsden et al. 5387; emphasis in original). The designs must be useable and must be experienced by the audience so that they can meaningfully interact with the design output in order to explore what it might be posing about the possible futures or alternative presents that we might inhabit as opposed to an object in a gallery, or a design proposal, which the audience must *imagine* what it might be like to use or experience. This call is for a more experiential form of artifact that can be picked up, played with and used by the audience.

The outcomes of any ACI design process all say something about how the designers view the status of animals and the world we inhabit with them, through design rhetoric. ACI could create interesting spaces for critical and speculative design to investigate animality and the animal subject through design objects, but these objects should not necessarily be dismissed for not producing the desired usability data, as they open spaces for reflection and consideration on the process of intersubjectivity and anthropocentrism. These speculations, as Robert McGrath poses, can “excite the imagination and challenge our understanding the basic nature of computer mediated interaction” (2529). If these design outputs were more experiential and could be used by human and nonhuman animals, then they could create a more tangible and embodied discursive argument, rather than a rhetoric built on reflection and imagination. This mirrors Elsden et al.’s call for Speculative Enactments through a more engaging and experiential approach, where scenarios are modelled for the participants and the speculation is made tangible by consequentiality: “Speculative Enactments generate consequentiality through both counterfactual materials (e.g. data profiles and the Abacus cards) and demanding social performance (e.g. improv work, dates)” (5391). The audience should be able to experience and play with the design artifact, to use it and consider how it might affect their lives. The audience needs to be put at the centre of the work as a design subject and we need to craft an experience for them which helps them decode the design rhetoric and then open a discursive space for them to interact with and reflect on. This process could be by creating working prototypes that human and nonhuman animals can play with, or by creating work which is released “into the wild”, rather than Elsden et al.’s approach of creating work which is heavily performative. Paul Coulton, Joseph Lindley, Miriam Sturdee and Mike Stead call for adopting a worldbuilding approach which utilises narrative framing to encourage engagement and “tell a world, not a story” (Coulton et al. 172). The design artifacts create entry points into a world for the audience to explore. This approach helps audiences imagine the possible futures in between the artifacts which work as signposts to help imply the future that the designers envisage. Speculative design could help re-emphasise the original political nature of ACI, giving alternative ways of understanding the animal subject, thus challenging important social and cultural issues around anthropocentrism and our relationship to nonhuman animals. Designers such as Anne Galloway and Steve North call for an exploration of speculative design methods within ACI; a wider interdisciplinary mixed methodology, highlighting the anthropocentric bias that could be called into question through these practices. As North writes:

Our current anthropocentric bias denies the reality that human animals are just one species in the family of animals. Interaction environments are rarely limited to just the human species. Nonhuman animals at varying scales (including microbes, mosquitoes, and horses) influence many aspects of our culture, practice, and behaviour. (50)

North's work draws on a range of methods to explore our complex social and cultural relationships with nonhuman animals, most specifically horses, and recognises the complexity of the social and cultural entanglement that we have with other species. We need to understand the nonhuman animal as a subject, situate its experience, understanding its similarities and differences, and we need new methods to explore the situated and subjective experience of nonhuman animals.

Understanding Other Species

This article has already gestured towards an intersubjective subjectivity which explores an understanding and, possibly, a representation of another human or nonhuman animal's position and perception of the world. Thomas Nagel writes clearly about the situated, embodied experience of consciousness and ontology in his essay "What It Is Like to Be a Bat?" This essay explores the impossibility of interspecies understanding of being. Nagel argues that a subject's experience is not that of a consciousness in a vessel but a situated, embodied, interconnected and corporeal experience of the world. He targets the limitations of the abstracting or extruding through an imagining of other species:

If I try to imagine this, I am restricted to the resources of my own mind, and those resources are inadequate to the task. I cannot perform it either by imagining additions to my present experience, or by imagining segments gradually subtracted from it, or by imagining some combination of additions, subtractions, and modification. (439)

Although Nagel's work was originally a specific and targeted reaction to a trend in philosophy, it offers useful starting points to understand different ways of being in the world and exploring interspecies subjectivity. The essay elevates the situated and embodied experience over the use of the imaginary or other forms of representation to explore different kinds of being. Nagel calls for new methods to reflect on the nature of human subjectivity and new approaches to explore different ways of experiencing the world as a means of understanding different subjects and developing new approaches to intersubjectivity:

At present we are completely unequipped to think about the subjective character of experience without relying on the imagination—without taking up the point of view of the experiential subject. This should be regarded as a challenge to form new concepts and devise a new method—an objective phenomenology not dependent on empathy or the imagination. (449)

This type of speculative work, steeped in a politics of interspecies understanding and targeted towards challenging an anthropocentric bias, could help us to better understand the nonhuman subject and how it experiences the world. Any new approaches need to emphasise nonlinguistic and nonrepresentational methods for exploring the embodied experience of the nonhuman animal, where the knowledge is embodied in things rather than words or other representational means such as film or photography. The research needs to be experiential and explorational, where the user can play with and through the knowledge embodied in the

artifacts. This work needs to be situated in practical, usable and experiential research helping the human to experience some of what it might be like to be a nonhuman animal. Other methods need to be used to open a space for critical reflection and examination of other ways of being, to explore what could be considered as an interspecies intersubjectivity. Stefano Gualeni proposes that we could use digitally mediated situations to explore these different subjectivities:

Digitally mediated simulations do not, in fact, reveal new worlds fictionally, that is to say through forms of mediation which require the complementation of subjective interpretation and imagination, but they effectively and objectively open new experiential, phenomenological horizons. They disclose ways to experience worlds that are alternative and often in contrast with the stable, scientific understanding of time, space, properties, causation, etc. that human beings structured in their everyday relationships with the world labelled as “actual” and operate within such worlds. (189)

These digitally mediated simulations offer a nonlinguistic, exploratory and experiential way to explore tacit knowledge and generate new knowledge using RtD, where the knowledge is embodied in the artifact. The outcomes can offer the audience new ways of experiencing the world and explore new possible and plausible futures (or presents). These simulations can take many forms but can communicate a rhetoric to the audience through experimentation and play, as the audience configure and reconfigure the simulation to explore and experiment with the possibilities the artifact proposes. This offers, not a singular answer to a problem, but a space to frame and explore the problem which is particularly useful to investigate complex social, cultural and political issues where the answer is never fixed. For this to be effective, we need to be able to experience the outcomes and examine their significance, to configure and reconfigure the simulation and the (multiplicity of) meaning that it creates. We need to develop and test new speculative methods to explore the possibilities of an interspecies intersubjectivity. These new speculative methods need to find ways to embrace the embodied and corporeal subjective experience of the world. These methods might not produce what we could recognise as measurable data or “findings”; they are unlikely to produce fixed answers but can generate knowledge in new and more appropriate ways, where a linguistic exploration and framing of the problem would be rendered inadequate or impotent.

Exploring Other Species

There are a number of existing speculative design and art projects which explore this terrain in different ways to examine nonhuman embodiment. These projects often consist of a range of artifacts that are worn by the designer or artist to present a narrative of interspecies understanding (to varying degrees). The work of Thomas Thwaites in his *Goat Man* project (2016) is a good starting point to draw lines around these types of practices. Thwaites created an exoskeleton that allows him to move on four limbs as well as carry out other extrahuman activities. He frames this as a holiday away from being human. This project is accompanied by his design narrative or reflective portfolio in the book *Goatman: How I Took a Holiday from Being Human*. The design artifacts which help the designer experience this, and the performance of trying to cross the Alps wearing the equipment, create a goat-like experience for the designer, and a humorous and reflective account for the audience. Thwaites’s research is extensive and he iterates a number of objects to help him experience what we will term “goatness”. The analogue artifacts (a frame, a helmet, a stomach) all help to transform elements of his body schema to mimic a goat and help him explore the similarities and differences

between the body schemas, but the project does not simulate goat vision. To understand the way that the goat experiences the world, vision of a goat is important because it helps, as a core human animal sense, to explore, experience and navigate the world. Humans are optocentric and use vision as a primary sense to understand the world around them, whereas other species do not use sight as a primary sense.

The design artifacts are also worn by the designer, and documentary evidence and written reflective diaries, help explain the progress and the journey to the audience but fall short of allowing the reader or audience to experience the “goatness of goats”. The audience cannot experience this first hand and the project does not help us understand how the goat orientates itself with large bulging eyes on the side of its head. The project does not simulate its focus, field of view or explore how it might orientate itself using sight. It simulates the goat’s body, but not its perception.

Another project which uses more digitally mediated and simulated experiences for the users is *Birdly* by Somniacs (2015). The project simulates the experience of a bird flying through a digitally simulated cityscape. The user lies flat on their front on a specifically designed controller platform, puts on a commercial VR headset and uses their arms to flap the panels attached to the sides of the platform to control the simulated bird’s wings. The user can use their arms to soar through the city, and as they glide lower the platform tilts forward and a fan blows air in the user’s face to help make the simulation all the more “real”, in an attempt to blur the lines between the simulated world and the world outside the simulation. This project provides the user with a very sophisticated simulation of a bird-like bodily experience where the human animal can flap their arms and fly, creating an intersubjective space for the user to explore. The view through the goggles, or bird’s eyes, is however a human’s perception of the cityscape. To explore the rhetoric of *Birdly*’s design, the artifact argues that the body is the locus of birdness or humanness as the platform creates a bird-like, and nonhuman animal, experience, but we view this experience with human-animal eyes and human modes of perception. Our body and how we traverse the digitally simulated landscape is bird-like in the bodily movements and performance of bird, but the user’s vision is still human. This simulates a hybrid animal with a bird’s body and a human head, brain and eyes. This experience then might be close to Kafka’s famous exploration of animality in *Metamorphosis* where Gregor inhabits a peculiar nonhuman animal body, alien to him, but is very aware of his humanity. Gregor sees the world as a human but from inside a beetle’s body.

Birdly and other interactive projects that open a space for interspecies embodied intersubjectivity, such as Anne Cleary and Denis Connolly’s *Meta-Perceptual Helmets* (2014), Marshmallow Laser Feast’s *In the Eyes of Animals* (2015), and Chris Woebken and Kenichi Okada’s *Animal Superpowers* (2007) all allow the users to play with the design artifact and experience the simulated and mediated experiences of the nonhuman animal first hand. This playfulness is important to help the users configure and reconfigure the simulated experience and the knowledge generated by the research. Play is key to helping the user explore the possibilities and limitations of the simulated interspecies intersubjectivity. Miguel Sicart offers play as a way of “being in the world”, pushing us to be more open to the possibilities of new knowledge and help us explore the meaning (through design rhetoric) constructed in the research (3). Sicart builds on the work of scholars such as Klaus Meier, who states that the openness of play “offers obvious opportunities to explore alternative modes of awareness, to develop insights into and knowledge of new modes of being, and to explore radically different possibilities perhaps not readily available elsewhere” (194).

To create new speculative methods, we need to create counterfactual artifacts which can help promote us to play with simulations of nonhuman animal embodied experiences to help us propagate an interspecies intersubjective subjectivity. These artifacts need to be in a dialogue with how the nonhuman animal experiences the world and offer an embodied and mediated simulation of the nonhuman animal. The creation of these simulations and virtual worlds at different scales of mediation could, as Gualeni suggests, create new ways of thinking which would be difficult to encourage using linguistic modes of new knowledge production. These new ways of thinking and experiencing the world could engender what Nagel defines as “an objective phenomenology not dependent on empathy or the imagination” (449). This would require an immediacy which could be offered by more experimental, experiential, speculative modes of research.

By creating these experiences which open up a playful, embodied and interactive experience of the interspecies intersubjective subjectivities, we could create new ways of thinking about nonhuman animals and new modes of designing for and with them which are not preoccupied with positivist research methods but instead encourage a more speculative and open research methodology. These new methods could help designers engage with some of the core politics and ideology within ACI and explore new ways of generating and situating knowledge about nonhuman animals. Interactivity and play are key to helping audiences remain open to new ways of thinking and “being” in exploring our relationship with nonhuman animals. We need to be conscious of how animals perceive and experience the world and we need to find new tools or, to emphasise the importance of play, new toys to help us experience these different ways of experiencing the world. RtD can allow researchers to explore alternative modes of knowledge production, which does not limit the knowledge to linguistic modes of exploration, communication and interpretation. It allows researchers to create new approaches to designing for and with animals and consider interactive and playful new knowledge which would be impossible to explore through more traditional scholarly practices. Using speculative design can help the researchers examine counterfactual artifacts for alternative futures (and presents), inscribing a politics into the artifacts and objects to express the ideas that they are exploring and allowing for the complex issues to be framed rather than solved, but these cannot rely on the imaginary or reflective engagement, they must be experiential, playful and interactive.

The freedom of a toy to encourage directed but not structured play as a form of interaction is important to adopt for methods such as speculative design, so that audiences can play with artifacts and think through the similarities and differences the alternative presents. The openness of informal, noncompetitive play allows the audience a freedom of interpretation and meaning making, which is more discursive and links more closely with speculative and critical design practice. By crafting playful objects designers can engage audiences in new ways. This could, as Meier suggests, allow for new approaches to knowledge and knowing which may not be opened in other (more linguistic) ways of research production such as writing.

Exploring Other Species Through Making

Building on previous explorations of the nonhuman animal, this project creates an embodied, playful and explorative prototype for a speculative research method which simulates how a horse sees the world. By simulating horse sight, a headset helps the human user reflect on how a horse perceives the world and orientates itself in space. The research project builds

on previous experiments but focuses on sight as a human animal's locus for understanding the world around us. There are obvious tensions in focusing down and operationalising one sense which is a human animal's primary sense, but the project aims to help human animals better understand a horse's spatial experience. In the simulation of horse vision, the human user can explore the similarities and differences between their experience and the horse's perception, in an attempt to challenge the anthropomorphising of horses and help designers design for and with horses.

The horse has a long cultural history which is both linked to play and leisure and also labour and work in the West. When developing the project, it was important to develop work which accurately simulated the different vision of a nonhuman animal, taking into account the field of view (FoV), the colour ranges, the depth of focus and embodied experience of sight to help navigate some of the previous issues in the tensions between body and vision, and the accuracy of simulation highlighted previously. It was important to select an animal which had a close relationship to human animals and also has a vision which is removed and alien to the human body.



Figure 1: Demonstration of *Equine Eyes* Prototype at “If You Weren’t: Playing with Realities in ARG, AR and VR” Symposium, Stanford University, 23 May 2017. Photo: Greg Niemeyer.

In the early prototypes of the work, two low-resolution web cameras were fed into a computer and then rendered onto an Oculus Rift DK1 virtual reality headset (Figure 1). The prototype mimicked the position of the eyes of a horse, facing to the left and right like many prey animals, but lacked true fidelity because they were too low resolution. They also lacked

the FoV as they had only narrow lenses and did not factor in how the nonhuman animal eye experiences colour. The headset was often tested with users with a cardboard cut-out of a horse's head, flat between the two cameras. Users during testing reflected that the horse shape helped them “feel more transformed” and helped them “think of it as horse vision”.

In further prototypes of the work the original cameras were replaced with high-definition cameras which have a 180-degree FoV replicating horse vision. The low-definition cameras used as the first prototype gave a pixelated vision which one user described as “computery”. This pixilation meant that the users were very conscious of the mediation of the sight, rather than the simulation of the vision. In some cases, due to travel constraints the headset needed to be stripped back so it only consisted of a headset and cameras (Figure 2). Although this makes the work easier to transport and test, users felt that the project lacked some of the necessary horse-like qualities.



Figure 2: *Equine Eyes* prototype demoed at the “Playful Encounters” Symposium, Ningbo, China, 28–29 September 2018.

Through testing with conference and symposium audiences it was important that the headset resembled a horse to help the users feel as if they were being transformed into another animal. Future prototypes are being developed to help focus on the horse-like headset at different scales. This approach is most effective when the head is “wearable” so that the audience can put on the horse’s head and see through its eyes.



Figure 3: Prototype with 180-degree FoV cameras to create a 350-degree FoV with dichromatic colour range. Photo: Vincent O’Callaghan.

The current prototype has a headset with two cameras mounted on the sides, facing outwards from the sides of the headset, which feed two 180-degree FoV cameras into a computer for processing. The two camera feeds are angled at eighty degrees to the user’s eyes, so that their 180-degree FoV overlap at the front of the headset. This creates a connected 350-degree FoV with a ten degree overlap of stereopsis or overlapping FoV at the front of the headset (which is good for depth perception), and a blind spot at the rear of the headset. The FoV simulates a horse’s perception and allows the user to see both sides of their human animal body. At the point of publication, the project is a “tethered” headset which takes the form of a large (to scale) horse’s head made of lightweight plastic which is then tethered to a laptop with cables. The two cameras are fed into the laptop through a USB. These live feeds are rendered onto two texture surfaces for each human eye. The two camera feeds are imported into the Unity game engine where they are postprocessed using Look Up Tables (LUTs). These LUTs are used to map the colour range that a horse experiences. Horses can only experience a dichromatic colour range, meaning they are unable to see red. Instead, their eyes see between tones of blue and yellow (Carroll et al.; Neitz et al.). The cameras are then rendered through the engine and mapped onto the VR headset so that the user can see through the cameras. Users during testing have described the experience as like “taking your eyes out and sticking them on the sides of your head”. The research is presented in an annotated portfolio which documents the iterative prototyping process and knowledge generated at different stages of the making process (Hook).

The prototype mediates between the human’s front facing binocular vision experienced by most predatory species, and the horse’s side facing binocular vision experienced by most prey species. The simulation of the horse vision allows users to explore how the horse sees the world and creates a playful and interactive experience for users. The work opens a space for

users to experience and reflect on how a horse perceives the world. The headset takes the form of a mask which helps the user prepare for a transformation into a horse and frames the experience for the user, drawing on a long cultural history of play, masks and transformation. The toy allows users to explore the similarities and differences between the human and nonhuman subjects' perception of the world.

When presented at conferences for feedback to help in the iterative process, I have offered a twenty-minute presentation which frames the project and introduces the core concepts for audiences. This outlines the methods and frames the work, positioning it in a history and trajectory of ACI and speculative design, and then gives audiences core facts about how the horse sees the world. The audience is then invited to test the headset individually and provide feedback (which usually compares what individuals expected the experience to be like to what they experienced in the test). There is a comparison by most users between their understanding at three key touchpoints: before the talk, after the description, and then after the experience. This reflective process is important to the project to help in the design and iteration of the project.

The project has obvious limitations in that it instrumentalises and operationalises sight, giving primacy to the experience of perception over the cognitive, corporeal and bodily entanglement that seeing the world has to consider. The project cannot help the user "be" a horse but can let them explore a different perceptual schema which allows them to experiment and play with how a horse may see the world. The headset can be used as a toy to help designers explore how horses experience the world and allow users to think about their relationship with horses and other nonhuman animals. The project explores the (im)possibilities of understanding different nonhuman animals' experience of the world and offers new ways of exploring the nonhuman subject.

Conclusion

Through this research, "making" in a variety of different contexts as a form of knowledge generation has been central to the arguments about understanding other species. The research draws on a wide body of existing projects which, to varying scales and degrees, try to help users understand different species' experience of the world. By experiencing different modes of perception and other species' experiences of the world, we can open a space for reflection and speculation on other species and our relationship to them. The project poses a counternarrative to the positivist, observation-based, and data-driven methods of designing for other species which form much of the methodological grounding for ACI. The project instead encourages embodiment and play as an approach to interspecies empathy and understanding. The focus of the work presented in *Equine Eyes* is to accurately simulate the horse's vision and create a mediating process between the horse vision and the human vision so that the human can "see through the eyes of a horse", as it was described during testing. The project is designed to help open a space for interspecies, intersubjective subjectivity and help the user understand how a horse perceives the world, without anthropomorphising them.

In producing research, it is important to consider the most appropriate ways to explore a topic and generate new knowledge. This study argues that situating the knowledge in design artifacts that can be played with and experienced by users is the most appropriate way to explore the embodied experience of other animals. This knowledge could be considered as tacit knowledge which is difficult to explore through linguistic forms of communication and

research. Alternative modes of research can open new avenues to explore complex social, cultural and political issues such as anthropocentrism, our cultural biases towards anthropomorphising other species and our relationship to nonhuman animals. This project uses designing, prototyping, iterating and making as a mode of exploring, generating and situating new knowledge about our relationships with animals and how we might design for and with them. The prototypes work as a counternarrative to more positivist approaches to the generation of new knowledge about nonhuman animals. This project draws on a number of research disciplines to create hybrid strategies which prioritise experience over language and offer potential models for other researchers in disciplines such as HCI tools (or toys) to promote new engagements with design practice and interspecies intersubjectivities.

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