

# Becoming With: Towards the Inclusion of Animals as Participants in Design Processes

**Michelle Westerlaken**  
School of Arts and Communication (K3)  
Malmö University, Sweden  
Nordenskiöldsgatan 1, 211 19 Malmö  
michelle.westerlaken@mah.se

**Stefano Gualeni**  
Institute of Digital Games  
University of Malta  
MSD2080, Msida  
stefano.gualeni@um.edu.mt

## ABSTRACT

In this exploratory paper, we advocate for a way to mitigate the anthropocentrism inherent in interaction-design methodologies. We propose to involve animals that live in anthropic environments as participants in design processes. The current relationships between animals and technology have an inevitable impact on their well-being and raise fundamental ethical questions concerning our design policies. Drawing from the work of Bruno Latour and Donna Haraway, we argue for a situated approach in which we reflect upon concrete design contexts. We explore the notion of *becoming with* as a conceptual framework for the intuitive and bodily understanding that takes place between humans and animals when they encounter one-another in shared contexts. Adopting a research through design approach, we further explore this notion by reflecting upon two different participatory design projects with two dogs. We found these reflections to offer valuable perspectives for designers to analyse and discuss their iterative processes.

## Author Keywords

animal; interaction; design; becoming with; anthropocentrism; play

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

## INTRODUCTION

As human beings, we share environments with other animals, and influence their lives in several ways, some more subtle than others. Starting from the most obvious and deliberate, throughout the last century, animals have been involved in interactions with human technologies in a number of different contexts, such as agriculture, scientific research, the commercial domestic animal industry, military applications, et cetera. Scientific advancements and the development of new technologically-mediated interaction possibilities facilitated a number of research and commercial projects aimed at establishing interactive relationships between animals and computers. Less deliberate and direct ways in which human beings influence and change the life of the animal can be identified in the general anthropization of the environment. We unwittingly (or less so) change entire ecosystems by building human infrastructures such as highways, harbours, and cities, enforcing changes in animal behaviour, favouring the incursion of certain species, and ousting others. We also produce changes in the physical qualities of the various environments with inevitable effects on other living forms.

The recognition of these influences and the ontological unbalance that they presuppose raise fundamental ethical questions about the design policies we adopt in relation to animal welfare. With our work, we wish to explore areas in the design of technological mediation in which the animal is invited to participate in the design process. This objective of ours is a first step towards a larger goal that aspires to promote a design attitude that more invested with all species living on our planet.

In 2011, Animal-Computer Interaction (ACI) was introduced in the larger context of academic disciplines involved in Human-Computer Interaction (HCI) [16]. As a research field, ACI advocates for a user-centred approach informed by the best available knowledge of animals' needs and preferences [16]. A significant amount of existing research is currently situated within the thematic area of HCI and its emerging ACI research community. However, we do not think that the design of technologically mediated interactions for animals should be limited to an HCI-based approach. Other research fields and communities such as animal studies, game studies, posthumanism, philosophy of technology, and interaction-design research are valuable and necessary in relation to this topic. On the basis of the inherent interdisciplinarity in the field of ACI, and openly relying of the body of knowledge already available in those related fields, we firmly believe that the emerging ACI community should also be informed by those disciplines, and open to adopt perspectives and goals that transcend those of traditional HCI methodologies.

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On these premises, this paper has the objective of proposing a more compromissory and less anthropocentric approach to the design of animal-computer interactions. As such, it aims to contribute to the current discussion regarding the ethical dimensions of the relationships between animals and humans (embraced together with their technologies and anthropized environments). Towards these objectives, the first part of the paper articulates a theoretical foundation by reflecting on Donna Haraway's concept of *becoming with* [9] in the context of participatory design. In the second half of the paper we briefly explore the notion of *becoming with* in further practical details. In the fourth section of this paper, *becoming with* is a guiding concept for a participatory design approach that is exemplified and explored in two five-week iterative projects. In both these projects, a designer attempted to devise playful artefacts together with two dogs.

## THEORETICAL FRAMEWORK

What is perhaps the most crucial, and philosophically challenging, question with trying to push interaction design beyond its traditional anthropocentric boundaries is that of our human capability in relation to design for non-human beings. The biological differences with animals when it comes to our perceptual and experiential setups are often vast and beyond our capabilities to intuitively and experientially grasp. This is clearly the case even among beings of the same species, as it is evident in our everyday dealing with the world. The fundamental chasm between humans and other species might raise the question of how, if ever, we could sufficiently understand animals and make appropriate and desirable design choices for them. Posed in that way, the question is in itself anthropocentric, as it presupposes that it is the role and responsibility of the human designer to meaningfully shape the actions and experiences of both the humans and the non-humans that are involved in the interaction. *Hic sunt leones*: the possibilities and limitations involved in attempting to mitigate or somewhat transcend the current anthropocentrism of interaction-design processes, this is where our research 'dragons' are. In the next sections of our paper we discuss several theoretical standpoints that, together, are foundational in our pursuit.

### Technologically Mediated Actors

Bruno Latour's Actor Network Theory (ANT) considers both human and nonhuman elements equally as *actors* that can be mapped within a network. In the context of Latour's work, the term network can be purposefully understood as a system of material and immaterial objects, *actors*, and relationships between human and nonhuman agents [13]. Building on groundwork laid by Heidegger, Latour argues that rather than thinking about the world in terms of subjects opposed to objects, we should aim to move beyond human-centeredness.

For instance, the activities of reading a book, being engaged in a conversation, or preparing a meal, should not be understood – for Latour – as relationships where a “subject” directs itself towards a certain “object” or set of objects (a book, some people, the ingredients for a dish). He and the post-phenomenologists would claim, instead, that one always finds oneself in an intricate network of relations with the world, and that – in those relationships – subjects and objects are intertwined with – and give meaning to – one another [7] [23].

As another example, and a more thematically suitable one at that, we can look at when humans and animals (for example dogs) can play together through the mediation of a toy to understand that a certain object functions as a toy in a certain situation, all of the involved parties need to follow specific ways to act that are prescribed by the affordances of the object and by the specific

(playful) context. If a human and a dog are playing together in a forest on a sunny day, one of us might decide to pick up a branch and start playing with it, which prescribes a temporary semiotic label ‘toy’ to that specific object. This is the case until we leave the branch behind, move along, and end the play session. In the tree branch example, we are mediated by the artefact (a toy that suggests certain affordances), the activity we engage in (our mutual play session), and our surroundings (the trees, the grass, and the nice weather). All these elements together form a network that shapes our actions and experiences and connects us with one another. If one of these *actors* changes its temporary state, for example when it starts raining and the branches of the forest are getting wet, our actions and experiences might change, which results in a changing assembly of the network.

Drawing from the work of Latour, Peter-Paul Verbeek argues that people are not passively subjected to technological mediation but users and technological artefacts have the ability to co-shape their mediated role in the course of the interaction [23]. We propose that this is not only valid in interactions with human users, but for animals that take part in the interaction as well. While playing with dogs, it is intuitively evident to both us and the dogs that artefacts (such as toys) have no fixed identity; they are defined in their context of use and are always ‘interpreted’ and ‘appropriated’ by their users [23] [10]. In the context of design, we could say that the originally intended use of a design artefact is hardly the same as actual use, and both immediate and future users will appreciate and appropriate designed artefacts in unforeseen ways [1]. Therefore, as designers, we should aim to equip our design processes with the means to allow our users to appropriate our artefacts in a desirable, morally justifiable, and democratic way [23].

In terms of the objectives of our work, we consider both Latour and Verbeek to provide valuable starting points for the reflection on the design of interactions that involve animals as participants. Even though in his work Verbeek writes about human users and nonhuman objects, and Latour speaks of both human and nonhuman *actors*, both theorists include a distinct focus on the humans as the central figure of the network, a ‘hub’ that eventually appropriates and reshapes the interactions according to its interpretations. Latour maintains that artefacts are not simply and neutrally ‘used’ by humans, but they play an active role in constituting who we are as human beings. Our actions and objectives are the result not only of individual intentions, but of our socio-cultural and material environments [14]. In analogy with what was just observed, Verbeek argues how human intentionality is mediated by technology and shapes a relation between human beings and the world [23].

As observed, in the work of these theorists, nonhuman *actors* are embraced as constitutive components of our world, and consequently of the way in which we analyse and design it. Their theories, however appear to be extending beyond an exclusively anthropocentric position merely to gain a better understanding of how human beings mediate their relationships, are mediated by these relationships, and how this complex network of interaction influences the way we think and act both individually and as a species. So, even though their aim is to shift away from human-centred thinking, their reflections bring the interpretation and design of artefacts and technologies back in the hands of the human.

The consequences of this framework become clear, for example, in the work of Lenskjöld and Jönsson. In her PhD dissertation, Jönsson provides a substantial account of Latour's ANT and aims to propose a non-anthropocentric design approach [11]. In a 2014 paper of theirs, Lenskjöld and Jönsson investigate the possibility of

a pluralisation of perspectives in design by insisting on placing human and animal *actors* as equally capable of action and wish to expand the horizon of how and whom we design with and include into the design process [15]. The authors pursue this goal by means of three different design experiments that explore the relationships between inhabitants of a retirement home and urban birds, such as gulls and magpies. Their design experiments work towards the deployment of speculative prototypes that could materialize new interspecies relations and are structured by methods and tools from co-design [15]. By putting Lenskjold and Jönsson's theory into practice (in the form of material designs), they take the idea of involving animals into the design process to a more holistically encompassing level rather than solely focusing on standardized HCI principles. Even though their work provides a valuable contribution in the context of interaction design in which animals are invited as participants, their approach remains focused on the specific co-design and reflections methods of the human beings that are involved in the interactions (workshops and interviews with the elderly people). The experience of the animal is never structurally reflected upon or taken into account when it comes to decision making with regard to design.

We think that by taking on design challenges that invite animals as participants in the design process, we could extend the approach of Lenskjold and Jönsson and aspire to design technologies that can become more meaningful to all involved beings. This means that instead of trying to avoid the perhaps inevitable anthropomorphism that is inherent to approaching design as human beings making the eventual design decisions, we need to find ways in which we can start reflecting upon the relationships between animals, humans, and the artefacts that we design in a more encompassing way. With methods that are more flexible and more open towards all the stakeholders in terms of their needs and desires. Building upon the work of Latour and Verbeek, we argue that if technologies can be considered mediators that have an active role in shaping our relationship with the world, they need to be considered factors of change in the lives and behaviours of animals as well.

### Thinking Beyond the Human

Throughout time, the design and development of technological artefacts has generally been dominated by human beings. However, humans are not the only species that can use and develop tools [21]. In the practice of participatory design, the animal participant could offer valuable inspiration and perspectives during the design process. For example, through the interaction with prototypes, the animal is able to show preferences, interpretations, and appropriations of artefacts that often were not intended or evident. This could provide the designer with insights leading to more meaningful design iterations. In this participatory set-up, the designers have to translate their understanding of the animal experience into a design intervention or artefact. This means that the design decisions are eventually still taken by humans.

Rather than taking a position that attempts a complete (and completely utopian) abandonment of anthropomorphic thinking, we propose to adopt more encompassing and critical forms of thinking beyond the human. In her 2008 book *When Species Meet*, Haraway upholds that we should focus our attention on the relationships between humans and animals and the ultimately unbridgeable human/nonhuman divide. The interactions we have with animals demand respect and response, rather than an impossible attempt at rising to a sublime and final end that explains the differences between us [9]. She writes that humans and animals are always already entangled simply by being in the world together [9]. This, in turn, means that we have ethical obligations to the animal. In order to become more responsive and respectful towards

our interaction with animals, Haraway argues for actual encounters with animals in practical situated contexts, face to face with the animal. It is only in this way that we can *become with* and recognize, respond, and establish respectful relationships with nonhuman others [9].

Despite the fact that we build our arguments on specific elements of Haraway's work, we also acknowledge some of the critique that has been articulated based on Haraway's writings, especially from the field of Critical Animal Studies. As Zipporah Weisberg illustrates through multiple examples (such as Haraway's defensive arguments regarding dog breeding, animal testing, and animal training), Haraway's texts continue to rely on a humanistic framework in which animal oppression is never fully rejected [24]. Weisberg firmly suggests that the field of Animal Studies should first and foremost rely on the premise that the instrumental domination of animals is politically and ethically unacceptable.

In our work, we do not wish to deny that humans, especially in their role as designers, are placed in an unequal and ethically dominant position compared to the animal as a mere participant. In fact, we hope to emphasise that this unbalanced engagement between (design) researchers and animals is a factor that is usually not specifically reflected upon in existing ACI practices. We also propose that, through the development of new participatory design frameworks, we can start developing a better understanding of animal needs and preferences by inviting them to participate in common activities on their own terms. Philosophers approaching this topic from a less design-oriented standpoint, such as Haraway and Jos De Mul, customarily consider play as a particularly useful common activity to observe.

Throughout her book, Haraway mainly focuses on two ways through which these practical encounters of *becoming with* can take place: touch and play. These forms of pleasurable and voluntary encounters between humans and animals can allow for degrees of freedom and new possibilities: "joy is something we taste, not something we know denotatively or use instrumentally. Play makes an opening. Play proposes. The taste of becoming with in play lures its apprentice stoics of both species back into the open of a vivid sensory present." [9, p. 240]. In the field of interaction/game design, these two elements, play and touch, disclose design spaces for particularly interesting and inspiring respectful encounters between humans and animals. In our previous work we explained how play forms a specifically suitable context in which a mutual understanding between humans and animals is already naturally present due to shared interactions and responses to bodily cues [25, 26]. Taken together with the element of touch discussed by Haraway, we propose that, rather than solely focusing on designing for a formal invitation to play, we could embrace the design of artefacts that invite playfulness in its broad understanding of free, voluntary, and pleasurable encounters between humans and animals that allow us to discover new types of interactions together.

### Becoming with the Animal as Designer

Drawing from the Latour's ANT, and Haraway's notion of *becoming with* animals, we propose that, in order to include the animal as a participant in the design process, we could explore the notion of *becoming with* as a designer through prototyping and experimenting in playful interaction contexts. The knowledge that this generates does not emerge as static scientific constructs. Instead it aligns more with Haraway's concept of *situated knowledges*, meaning conversations from below, departing from partial, critical, and interpretive translations of possible world-views that allow for unexpected openings and negotiations [8]. In other words, the outcomes of these participatory design

experiments are highly contextual, intuitive, and subject to the complex networks of interactions that unfold. In trying to unpack this process further, we found value in exploring the notion of *becoming with* as a framework to get a better understanding of an iterative design process that involves animals.

But what does it mean to *become with* and how can we participate in this as designers? In *When Species Meet*, Haraway describes the notion of *becoming with* as the subject- and object-shaping ‘dance’ that takes place when species are knotted together [9]. In her book, she describes many examples of contexts in which this encounter takes place, such as when she is doing agility sports with her dog and they both respond to one another’s cues and behaviours, or when herding dogs get in the so called ‘contact zone’ and *become with* both the sheep and their human handlers to successfully guide the sheep in the desired direction. Other authors have proposed notions that are similar to *becoming with* but are grounded in different theoretical frameworks. In his work, De Mul proposes perspectives and interpretations on the development of organic life by reflecting upon theories of Dilthey and Plessner [4]. He uses the term *going-along* to describe the mutual understanding between humans and animals by giving the example of himself playing with his dog. What characterizes his experience is that the purpose of the interaction is not ascribed a priori, but unfolds itself in the course of the bodily interaction [4]. He argues that the mutual understanding between humans and animals is depending on the extent to which we can *go-along* in a common embodied praxis such as play [4].

In a different context, authors from the ACI group at the Open University UK have taken an approach that is derived from Peirce’s 1867-1868 theory of semiotics by describing how one of the three kinds of communication signs (symbols, icons, and indices) can be specifically useful for interactions between humans and animals. Where symbols and icons are understood as abstract signs that require linguistic abilities, indices are instead directly and physically grounded in a bodily relationship with the world and other beings and therefore neither preclude nor require shared mental abilities [18]. For example, some dogs have their own conceptual understanding of the meaning when humans use an index finger to point to a specific object and will look directly at the direction in which we are pointing. The other way around, humans can understand the way in which a dog points us to specific objects by continuously switching eye contact or movement between the human and an object (such as a toy or an empty food bowl). On this basis, the authors propose that humans and animals can *co-evolve* by interpreting each other’s semiotic processes on the level of understanding their indexical signs and then connect meaning to them in the context of human-animal interaction [18].

Among humans, we often use language for understanding each other and we participate in what philosopher Ludwig Wittgenstein calls *language games*: the communication between individuals that allows us to express and enact experiences beyond words [1]. Wittgenstein explains how participation in *language games* [27] is a kind of rule-following social behaviour in which the rules are not made explicit and formulated a priori, but they are made up and altered as we play along [1]. To follow these rules is to embody

them and to act in a way that other players/participants can understand the game that is played [5]. This happens not only through words, but also through gestures, sounds, body signals, and past experiences.

In design, the notion of shared *language games* between users and designers provides the opening for design in which both designers and users can participate [1]. According to Ehn: “*users and designers do not really have to understand each other in playing language-games of design-by-doing together. Participation in a language-game of design and the use of design artifacts can make constructive but different sense, to users and designers. (...) As long as the language-game of design is not a nonsense activity to any participant, but a shared activity for better understanding and good design, mutual understanding is desired but not really required.*” [5, p. 118].

This aspect is particularly useful in the context of participatory design that we are addressing in this paper. Constructive, shared *language games* in design experiments suggests that the human and the animal can understand each other beyond the use of language. This shared understanding allows us to explore different scenarios, contexts, and prototypes together with the animal, in order to come to new meaningful designs as humans.

Looking at the definitions of these different terms, *becoming with*, *going-along*, *co-evolving*, and shared *language games* it becomes clear that even though they are grounded in different theories, they can all serve a similar purpose: providing a conceptual framework for the intuitive and bodily understanding that takes place between humans and animals when they encounter each other. Within the context of this paper, we will focus on Haraway’s understanding of *becoming with*, because her work takes the most elaborate focus on human-animal relationships.

Following Haraway, we suggest that rather than merely observing the animals and their interaction with artefacts from a distance, we take part in the playful interaction as human beings and explore the possibilities together as a form of co-designing. Where the participatory design tradition already includes the involvement of the human participants with the use of shared *language games* [1], we argue that through the concept of *becoming with* we can effectively include the animal participant in the design process.

To start taking an attempt at *becoming with* as designers and acknowledge the complex network of interactions that unfolds, we can open up a conversation between the material, the animal, and the human by working out design scenarios face-to-face with all the participants involved, using techniques such as *bodystorming*<sup>1</sup> [20] and experimenting with prototypes and iterations in concrete design contexts. While applying these methods, we suggest to adopt a research through design approach and avoid scientific analyses of animal or human behaviour and treating them as users with specific characteristics and generalized user-experiences as is often the case in ACI and HCI practices [6, 17, 19, 22]. Instead we propose to start focussing on what happens between different *actors* in a specific design context, and how relationships are constantly made and remade within the network that unfolds itself through the interaction. These efforts inaugurate an approach to better understand the mediating role of the technology we design and how

in an early stage of development. Rather than the need to explain how the prototype would work as a finished product, the participants act out a spontaneous play session together, and the outcomes of this event form the basis for new design iterations.

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<sup>1</sup> *Bodystorming* is understood here as an embodied and participatory design technique in which new ideas are acted or played out within their specific use-contexts. This process enables the expression and exchange of tacit knowledge at a physical level of experience [20]. An example could involve both a designer and an animal in a play session with a *lo-fi* prototype

different kinds of artefacts can help humans and animals explore ways of *becoming-with* and understanding one another. The next part of this paper provides a first ethnographic account of a conversation between a human designer, two dogs, and the materials that were part of the iterative design process. While being aware of the risky, tentative, and exploratory nature of the content that follows, we argue that this is both a valuable and necessary step in the approach of design with nonhumans and it helps to start investigating less exclusive and more compromissory forms of *critical anthropomorphism*<sup>2</sup> [3] that we should aim to include in design and evaluation processes.

## METHOD

As an extension on our previous research [25, 26], in this explorative study we propose to include both humans and animals in the design process as *actors* in a shared network. In order to further explore these networks in concrete design contexts we advocate for structurally exploring the notion of *becoming with* through shared and voluntary interaction with technological artefacts.

With those objectives in mind, we include two iterative design projects (each spanning over a period of five weeks) in which a designer and her two dogs were involved in two different experimental processes. In the next section of this text we will share an account of this experience and analyse the designer's attempt to *become with* the dogs. Both experimental sessions were pursued with the aim of inviting the animals into the design process and of exploring how certain design decisions were guided or inspired by those shared experiences.

Next to a descriptive (auto-)ethnographic method in which the designer collected notes and images during the process, we made use of video recordings for all the testing sessions of the different prototypes. These recordings allowed us to look back at the play sessions, put some theoretical distance between us and the experience, and reflect upon what happened during these sessions in more detail and with a slower pace. Summaries of these videos can be found online through:

Project 1 - <https://www.youtube.com/watch?v=NAJGvXql-EU>

Project 2 - <https://www.youtube.com/watch?v=0rbbehxwEDw>

Detailed tutorials of the technical aspects of each final design outcome are given on the designer's *Instructables* profile: <http://www.instructables.com/member/Colombinary?show=INSTRICTABLES>

## APPLYING THEORY TO DESIGN

In this section we will reflect upon two different design projects. Both of these projects are characterized by a participatory design context in which the designer and animal participants experimented with multiple prototype iterations in which they could explore the notion of *becoming with*. Both project sections include a summary

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<sup>2</sup> *Critical anthropomorphism* is a term that was first introduced by Gordon Burghardt in 1985 as a perspective on animal behaviour that includes our perceptions, intuitions, feelings, careful behaviour descriptions, identifying with the animal, optimization models, previous studies and so forth in order to generate ideas and hypotheses that may be useful in gaining understanding of nonhuman behaviour [3]. In other words, despite the fact that our human subjectivity will always be in the way of fully understanding animal perceptions and behaviour, we can aim for research methodologies that, rather than strictly avoiding

of the reflective notes of the designer and a discussion regarding the overall process.

## Project 1: Experimentation with a Playful Robotic Object

In order to explore a dog's reactions to an interactive robotic object, one of the two on-going design projects features an experiment with a device called *Sphero*, a ball that can be controlled at a distance by a human. *Sphero* can be moved around by a human through an interface on a smartphone that is connected with the ball via *Bluetooth*. Over a period of five weeks, the device was tested with several prototype artefacts and gave rise to different reactions and levels of engagement among the two dog-participants.



Figure 1: the first playful iterations with *Sphero*.

### Designer Notes

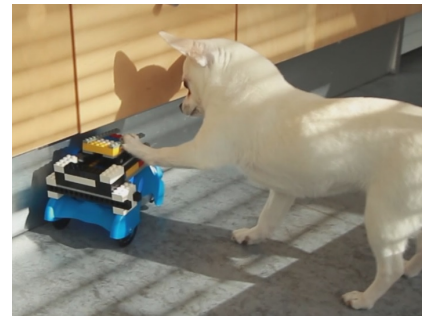
*The first times I tested the device with the dogs I noticed how they would show an interest in the ball, run after it, and occasionally move it around with their paws. However, their interactions immediately made it clear to me that the material of the object itself was not very attractive to them and after a minute or two they would lose interest. The ball was made out of hard plastic and too big for them to pick it up with their mouths as they usually do with their other toys. One of the dogs (A.) occasionally barked at the toy, which she usually does at other objects she intends to play with but are too big (such as a broom or vacuum cleaner) Therefore, the first iterations I carried out consisted of different covers to make it possible for the dogs to grab the ball by putting a soft texture around it (see figure 1). When I put this prototype in my living room for the first time and I started to move it around, both the dogs immediately paid attention to the object. Interestingly, A. moved towards the artefact and started to explore it, while the other dog (B.) took more distance and observed the object from a safe and high position. Apparently A. found it enjoyable and started to play around with the ball for a few minutes, while making eye contact with me multiple times. I tried to facilitate these short moments of contact by participating in the interaction while being closer to them. So I sat on the floor and talked with the dogs, as I would normally do when we play together. After a while A. lost some interest and because of this I tried to change the interaction. Rather than controlling the ball through the phone interface, I would play with the artefact similarly to playing with a regular tennis ball by*

anthropomorphism, adopts more subjective research principles that can eventually bring us closer to the understanding of animals. In our work, we advocate for the extension of such an approach to the field of ACI and design, which means that – rather than relying our design decisions on rigorous scientific analyses of animal behaviour – we recommend the use of methods that more closely align with the synthetic and contextual nature of complex design research [6].

throwing it around and playing fetch, which turned out to be more enjoyable for both A. and me for a few minutes. B., on the other hand, maintained her distance and even seemed a bit scared of the artefact.

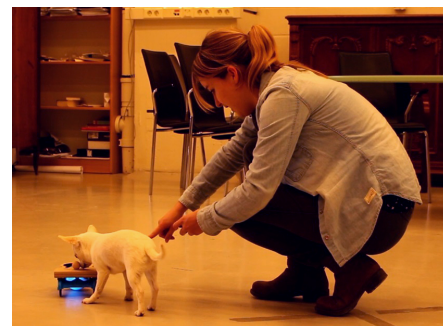
Having lived with these dogs for many years, I know that B. is usually more interested in playful artefacts that contain a reward in the form of food. Therefore, we started exploring the interaction by adding different flavours to the ball such as peanut butter and dog treats inside different covers. This evoked some interest from both of the dogs in the device and it was more fun for me to play around with the ball, trying to make it challenging for the dogs to grab the treats. In return, both of the dogs tried to grab the ball and take it somewhere else so that I would lose control over the ball. In this process, both the dogs and me experimented with the affordances that were proposed by the artefact, which resulted in different compositions of the interactions. During some moments of the interaction, I was in control of the artefact trying to extend the play session by escaping from the dogs. During other moments, one of the dogs was in control by picking up the artefact, sending it in a different direction, or taking out the treat so the play session would finish. The most interesting moments during this stage of the design process occurred when we sought direct contact with each other. For example, when I encouraged the dogs to interact with the artefact by pointing at the ball, talking to the dogs, or when the dogs communicate with me by making eye contact or jumping on my lap. Next to this, the moments in which I filled up the ball with new treats was interesting as well, because this became a clear and mutually understandable moment in which a new play session would be initiated. After a couple of days in which we tried this interaction format, both of the dogs would approach me immediately when I would pick up the ball. I would have liked to try out the possibilities for the dogs to initiate the interaction as well, as they usually do with their regular toys by bringing them to me as an indication of their wish to play with me. However, because of the required charging time of the Sphero and Bluetooth connection with the phone, this was not possible. Nevertheless, their enthusiastic reaction to my initiation to play encouraged me to continue iterating upon this type of interaction through further prototyping.

Later, I developed a lo-fi prototype in the form of a dog puzzle that contains dog treats and can be installed on top of the Sphero with the use of LEGO bricks (see figure 2). While the human could manoeuvre the artefact, the dogs could try to move the artefact with their mouth and paws, solve the puzzle, and take out the treat. By this time, B. did not interact with the artefact much; perhaps she was intimidated or scared? Whenever I would present the artefact she showed an interest, but she also approached it very carefully and slowly, often backing away when the artefact moved suddenly. To me this did not feel like a playful interaction anymore. This reaction clearly showed me how A. and B. have different individual characters and preferences and I did not want to push B. any further into participating if she clearly showed that she had her doubts about it. Therefore, I decided to continue the process with a focus on designing together with A. She continued showing interest in this prototype iteration and managed to solve the dog puzzles after we interacted with the artefact for about 10 minutes.



**Figure 2: the lo-fi prototype that was built with LEGO. It consists of a Sphero carriage and a dog treat that can be taken out by opening the top part, as A. is trying out in this image.**

Over the next few days I presented the LEGO prototype a couple of times and each time A. explored the artefact through sniffing and moving it around with her paws. Because of her interest I felt confident enough to continue with the development of a hi-fi prototype with MDF (an engineered wood product) and the use of a laser cutter. During our play sessions I noticed how A. developed an understanding of how the puzzle could be solved. Therefore I wanted to try out different kind of puzzles. I developed a total of four different dog-puzzles that can be installed on top of the Sphero (see figure 3 and 4).



**Figure 3: testing the hi-fi prototype together with A.**



**Figure 4: an overview of the four different wooden puzzles that were developed as a hi-fi prototype.**

#### **Discussion**

This design process was characterised and determined by a core constraint: that of using *Sphero* as a basis for all the design experiments. This self-imposed limitation made it both interesting and challenging to come up with new iterations and experiments that change the way in which the interaction was shaped. The linked videos show that the main functioning and control of the artefact remains indeed very similar throughout the entire design process: the human provided an input to the digital artefact, which sent a signal to the physical artefact and encouraged the animal to interact with it. To a certain extent, this interrupted the shared activity that

the designer and the dogs were engaging in, because the designer was often preoccupied with the interface of the *Sphero* on the mobile device while the dogs were interacting with the ball. It could therefore be questioned if these types of remote-controlled artefacts are generally successful as toys that could enable humans and dogs to play together.

Nonetheless, during the design process, the play sessions facilitated multiple occasions in which the designer was able to understand and respond to the reactions of the dogs towards the prototypes. These responses included things such as changes in the material of the artefact after A. seemed frustrated for not being able to grab the *Sphero* with her mouth. Secondly, the designer and the dogs explored different modes of playful interactions with the *Sphero* by responding to each other's playful behaviour such as playing fetch, running after the ball, or hiding food treats. Third, the different prototypes were also informed by the long-lasting relationship between the designer and the dogs that inspired some of the iterations, such as experimenting with food rewards, or the mutual understanding between the dogs and designer when a new play-session would be initiated. Fourth, the eventual decision of the designer to focus on designing together with A., after B. clearly backed away and signalled that she was intimidated by the interaction. This demonstrated that different traits in each individual dog could lead to different kinds of playful preferences that the designer can cater for. From these observations, we could derive that the final prototype outcome is a result of a process in which *becoming with* between the designer and her dogs played a central role in obtaining an understanding of the dogs' playful behaviour and preferences that could inform design decisions and allow the designer to engage in a design-like *language games* through responses on two different levels: on one level, both the designer and the dogs could respond to the affordances of the artefact and each other's reactions immediately during the play sessions by experimenting with different ways in which the prototype could be used. On a second level, the designer could respond by developing iteration on the artefact that were not only inspired by different events during the play session, but also informed by the longer relationship that exist between the designer and two dogs that have an individual character and playful behaviour.

It should be noted that despite the designer's efforts to invite the dogs to the design process and reflect on design methods that are less anthropocentric and more informed by the animals' responses and behaviour, the designer generally remained in control of the ways in which the design process developed. For example, by choosing a design context, the technical device, initiating the play sessions, and making the eventual design decisions. However, one could argue that design projects with human-only participants are generally structured in this way as well. It is only through experimenting with new participatory design structures and different kind of (nonhuman) participants that we can try and reflect upon these human centred traditions and analyse and discuss our iterative design processes.

## **Project 2: Experimentation with Playful Interaction Including Sound and Smell**

The second on-going design project includes a prototype dog toy that could emit both sounds and smells, which are usually regarded as a dog's most receptive and well-developed senses [2]. The aim of this project was to initiate a participatory design experiment in which the designer would develop a dependency on the dogs in terms of sensory and playful preferences. Unlike the project discussed in the previous section, where the main kinds of playful

interactions were already defined by the functional possibilities of the artefact, in this project the starting point was more open ended, with the aim to try to give the dogs a greater sense of control over the process.

### **Designer Notes**

*This project started with the collection of different types of objects that were infused by specific smells. I noticed that one of the main activities my dogs engage in when we go outside is exploring objects by smelling them and following smell trails that are unnoticeable for me. Next to this, I discovered that they had a big interest in certain items that were connected to other places, such as clothing items of family members that live in other countries, branches from a local forest, towels that were in the dog-bed of a familiar dog, etc. I noticed how they would spend their time sniffing these objects and it seemed like an enjoyable activity to them (see figure 5). I became fascinated with the possibility that, perhaps, these smells could trigger certain memories for them, like familiar smells can do for humans.*



**Figure 5: both of the dogs in the activity of smelling a particular object (in this case a towel that belongs to a family member living abroad) that formed an inspiration for this project.**

*This activity inspired me to experiment with artefacts capable of producing distinct smells. I developed a lo-fi prototype that includes a soft toy inside of which a phone could be hidden that can play pre-recorded sound files of 20/30 seconds that could be recognizable for the dogs (such as a talking family member, soundscapes from a local forest, and a familiar barking dog). Another compartment of the toy contained objects that had specific smells that the dogs could be familiar with (such as a branch from the forest that they played with, a t-shirt of a family member and a blanket of a familiar dog, who both live in other countries). I wanted to create an open-ended toy and leave further ideas about its development up to the way in which the interaction would be played out during the testing sessions. By testing the toy-prototype with my dogs I wanted to explore their responses and their general interest in this type of interface.*

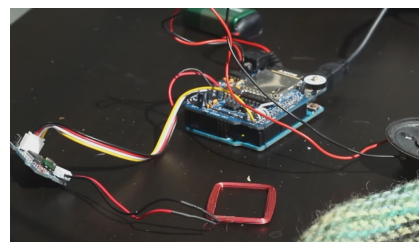
*When the prototype was first introduced, both of the dogs were immediately interested and approached the artefact (see figure 6). It was an unfamiliar object and I tried to presented it in a playful way, allowing the dogs to sniff it, bite it, and take it anywhere they wanted. I sat on the floor next to the toy and I noticed that they were specifically interested in sniffing the toy from all sides, but especially the compartment that contained the smelly objects. I engaged in this interaction by providing affection such as talking to the dogs and petting them. They responded to this by making eye contact, approaching me, and walking back and forth with the toy in their mouth. The sounds, however, gave different reactions for each dog: when the phone played low-volume sounds, the dogs did not seem to react to it in a very clear way, but when the sounds were louder, A. tilted her face while looking at the toy multiple times, signalling her trying to identify what is going on. B. on the other*

hand, backed away from the toy when it would produce louder sounds. I tried to get a better understanding of their responses on the sound files, but because the dogs did not show a specific behaviour related to the sound files that was understandable to me, I felt unable to cater this play session towards further exploring the possibilities of the sound files. Instead, I responded by separating the sounds and smells, and reveal the smell-items that were hidden inside the toy. I took the objects out of the prototype and presented them to the dogs; they were interested in the smell of the object and investigated the items together for a couple of minutes. To me it seemed that they were enjoying this activity and curiously exploring the items in a calm setting. This encouraged me to develop this interaction further.



**Figure 6: the lo-fi prototype that consists of a soft cover and two inside compartments: one containing the smell-object and the other one includes a smartphone that played sounds activated by the human from distance.**

As a response to the limitations in understanding the dogs' reactions towards the sound files, I wanted to provide the dogs with a sense of control over when the sounds would be activated. Up until this point I would activate the sounds when the dog was interacting with the toy. However, with the smartphone inside the toy I had to manually activate each sound and this distracted me from the playful interaction we were sharing. In order to further iterate on this concept, I developed a hi-fi prototype including a stuffed animal with an Arduino Uno, an Audio Wave Shield, a speaker, and a Radio-frequency identification (RFID) reader/antenna (see figure 7). Additionally, I added RFID tags to the collars of the dogs. With this prototype, the sounds were automatically activated whenever the dogs would come close to the toy (with a 7cm reading range of the RFID antenna). This allowed me to focus on the playful interaction itself, rather than being preoccupied with the technical components. For each dog five different sounds were recorded and selected based on my personal understanding of what they would prefer: during the first experiments, I noticed how B. seemed to dislike loud noises so in this iteration I made sure that B. could only activate low-volume sounds through her RFID tag. A. on the other hand, seems to be generally more playful and curious, so the RFID tag of A. was programmed to activate louder and more active sound files.



**Figure 7: the technical components of the hi-fi prototype including an Arduino Uno, an Audio MP3 Shield, an RFID reader, an antenna, and a speaker.**

Both of the dogs were interested in this prototype when I presented it to them and we played together for about 30 minutes. During this time, we tried out different modes of playful interaction including playing fetch, pulling the toy from each side, exploring the smells, and listening to the sounds. The dogs managed to start different sound files by themselves during the experiment and extensively smelled the parts of the toy that contained the added smells (see figure 8). Interestingly, the dogs remained strikingly careful in their interaction with this prototype compared to the rough ways in which they treat their other toys. This could be caused by the smells and sounds that were emitted from the artefact, or, perhaps more likely, it was their response to my own careful behaviour. Even though I tried to avoid treating this toy differently than other dog toys, the artefact contained electronics that, although safe and robust, could break quite easily if the dogs would start chewing on them. Here I started to perceive how I did not only respond to the interactions of the dogs with the prototypes, but the dogs were also responding to my behaviour in return.



**Figure 8: testing the hi-fi prototype with A. Her collar contains a small RFID tag that activates the sound files.**

While interacting with the prototype together, I noticed how the dogs' playful behaviour (biting, pulling, and running after the artefact) was alternated with other types of behaviour such as sitting next to the artefact, sniffing it calmly, or seeking contact with me. Therefore, after the play session I iterated upon this by presenting the prototype as a starting point for exchanging affection and to experiment with sound files that are specifically created as calming music for dogs [12]. In this set-up, the RFID tag of the dogs activated different types of calming music whenever they approach the toy. Especially A. seemed to appreciate these sounds and she approached me and the prototype. When I started to pet her she sat down next to me and, after extensively sniffing the prototype for a minute, eventually fell asleep on top of the prototype.

#### Discussion

This on-going design process included an experiment with a toy using an interface that focused on sound and smell. The videos that were made during the play sessions demonstrate different ways in



which the prototype can be used. The activity of smelling familiar objects, which the designer observed as something that the dogs enjoy, formed the main inspiration for this design project and can be identified as a response to an understanding of a behaviour they perform voluntarily, on their own terms. Even though the decision making process was still controlled by the human designer, the open-endedness of the artefact facilitated more moments during the design process in which the designer could engage in *becoming with* the dogs and respond to their interactions.

Similarly to the first project, this happened on two different levels: first and foremost on an immediate level, both the dogs and designer responded to each other's interaction with the artefact through playful behaviour such as throwing, pulling, sniffing, taking out different items, sharing affection, and generally exploring the artefact together. The second level at which reaching a mutual understanding with another species was facilitated by the presence of an artefact can be observed as the designer gained inspiration from these play sessions. In this case, *becoming with* emerged in the process of interaction design in the form of further development of the electronic components of the artefact, selecting specific sound files for each dog based on individual characteristics, and in the design of additional types of interactions inspired by the shared activity such as sharing affection and the use of calming music files. In return, the dogs were then able to respond to these iterations and complete the interactions in their own individual ways.

The way in which the interactions were shaped between the designer and the dogs in this project exemplifies how the designer and dog can *become with* through exploring the artefact and its affordances together on their own terms and reacting to each other's signals and behaviour both immediately during the play sessions as well as at a later stage in a response to new iterations and interactions. This process was valuable in exploring the different use scenarios and possibilities of the prototype together with the animal. During this design process it became clear that this prototype could facilitate interaction in different ways that we did not intend upfront.

In general, this on-going design project was characterised by very personal ways in which the experiments could encourage the human and the dogs to *becoming with*. Therefore, regarding further design iterations, it could be interesting to allow other people to engage in design experiments with domesticated animals using a similar prototype. In this case, people could collect different smelling objects and sounds clips that their dogs might be able to relate to in order to discover new types of interactions and scenarios that fit with different individual characters of both humans and dogs.

## CONCLUSIONS

In this work we first outlined a theoretical framework in which we advocated for the adoption of a less exclusive and more compromissory form of critical anthropomorphism that we can use for the design of interactions in which animals are invited as participants in the design process. The animals that live in our society are, to one extent, bound to their own needs and behaviour while, on the other hand, humans have created artificial living environments and technological artefacts for them. These mutually influential factors between animals and technology have an impact on their well-being and raise fundamental ethical questions about the design policies we should adopt in relation to animal welfare. We wish to introduce new perspectives in the design of technological mediation, aspiring to establish a design attitude that is less anthropocentric and more invested with all species living on

our planet. Drawing from the work of Latour and Haraway, we proposed to further explore the notion of *becoming with* through playful interaction design in order to engage in respectful relationships with animals in situated design contexts. With this approach we aim to generate knowledge that leads to new design methods that intend to include the animal as a participant in the design process.

With our exploratory design work, consisting of two iterative design processes, we attempted to start actualising the notion of *becoming with* by inviting two dogs to join the human in common, playful interaction with an artefact as part of the iterative design process of the latter. We reflected upon these two design experiments through (auto-)ethnographic methods such as taking notes and using image- and video- recordings of the prototype testing (play)sessions. We hope that these reflections illustrate how we aimed to invite the animal as a valuable participant in the design process without the need to assess animal behaviour in rigorous analytical ways, as is common praxis in HCI studies. Instead, we gained insights into meaningful design in situated contexts by letting the animal and designer explore the different prototype iterations freely, on their own terms, and together.

Similar to design contexts that follow participatory structures with humans, these projects also showed how the human designer remains largely in control of the process, for example by choosing the design context, the available materials, and making the eventual design decisions. In design with animals, this exemplifies a – perhaps – unavoidable degree of human control and anthropocentrism that are not often specifically reflected upon by researchers that include animals as users in their designs or methods.

With this paper, we aim to contribute to the current discussion regarding the direct and indirect influence of technology on animals and the ethical dimensions of the relationships between animals and technology. However, this work only addresses a small part in answering much larger questions that can help us to design and evaluate technologically mediated human-animal interaction and is currently limited to the few humans and the two dogs that could be included in this project. This resulted in a generally personal project with small-scale design ideas, and the individual characters, size, and willingness to contribute of only two animals that are already involved in long lasting relationships with the designer. This largely shaped the outcomes of our work and the extent to which the designer was already experienced in *becoming with* these two dogs in particular. However, we do not wish to exclude the possibility of exploring the use of similar methods and theories with other animals in the future. These limitations introduce interesting dimensions within the notion of *becoming with* that are relevant to explore further, but outside of the current aim of this paper. These include questions such as the required time-scale that is necessary to accomplish a state of *becoming with* an unknown animal, the specific animal species that could be involved, the thoroughness by which this is supposed to happen, and the satisfaction of this process for both humans and animals. Further research could therefore extend and critique the framework and method that we introduced in this work by exploring and reflecting upon the notion of *becoming with* animals in different settings, including the possibilities to *become with* different kinds of animals, and focusing on the types of relationships we have with them. For example, how could *becoming with* be facilitated between human designers and agricultural animals, shelter animals, or animals that we usually do not relate to, such as insects or amphibians? And could this be a desired practice from both a critical and ethical perspective? With this, we wish to contribute to the wider ethical

and cultural value of the field of inter-species design with new knowledge both at the level of theory and more concretely through an exploratory design projects. Our ultimate goal is moving towards a wider, less anthropocentric, and more democratic understanding of inter-species design.

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