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Editors

New Visions of Nature

Complexity and Authenticity

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Chapter 2

Technological Nature – And the Problem When Good Enough Becomes Good

Peter H. Kahn Jr., Rachel L. Severson, and Jolina H. Ruckert

2.1 Introduction

In recent years the sophistication and pervasiveness of our technologies have begun to change our species' long-standing experiences with nature. Now we have technological nature – technologies that in various ways mediate, augment, or simulate the natural world.

Entire television networks, such as Discovery Channel and Animal Planet, provide us with mediated digital experiences of nature: the lion's hunt, the Monarch's migration, and climbing high into the Himalayan peaks. Video games like Zoo Tycoon engage children with animal life. Zoos themselves are bringing technologies such as webcams into their exhibits so that we can, for example, watch the animals in their captive habitat from the leisure of our home or a cafe. Inexpensive robotic pets – such as the i-Cybie, Tekno, and Poo-Chi – have been big sellers in the Wal-Marts and Targets of the world. Sony's higher-end robotic dog AIBO sold well and portend the future. A few years ago, you could Telehunt in Texas. You would go online from your computer in New York City or Miami or anywhere on this planet and control a mounted rifle through a web interface and hunt and kill a live animal. The animal would then be gutted and skinned, by the owner of the establishment, and the meat shipped to your doorstep. Texas outlawed Telehunting, but Teleshooting still exists, using targets instead of animals.

In terms of the future wellbeing of our species, does it matter that we are replacing actual nature with technological nature? In this chapter, we address this question in three ways. In Section 2.2, we provide an overview of our laboratory's research that investigates the psychological effects of children and adults interacting with three instantiations of technological nature: (a) a technological view (a real-time digital plasma window display of nature), (b) a technological dog (Sony's robotic dog, AIBO), and (c) a technological human (ATR's Robovie). In Section 2.3, we draw on Buber's account of an I–You relationship to assess whether interaction

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interviews which focused on the participant's (a) impressions and use of the large display window, (b) perceived effects of the real-time views of the outdoor scene, (c) awareness of people walking through the plaza area (the indirect stakeholders), (d) assessment of the importance of the large display window, (e) intuitions about work performance and health, (f) social interaction related to the large display window, and (g) experiences, reflections, and comments on any other related topics. In total, 30+ hours of interviews were conducted and yielded 652 pages of interview transcripts. In addition, each participant completed 10 work satisfaction surveys, 10 mood surveys, 10 office perception surveys, journal entries, and responses to email queries.

The results from this field study are reported elsewhere (Friedman, Freier, Kahn, Lin, & Soderman, 2008). Here we highlight six themes that emerged from the analyses.

1. *Acts like a window, could be a window?* One key question this research sought to address was the following: Could a large display that showed real-time images of the building's immediate outside location provide a user in an inside office with a reasonably viable replacement for a window? Our results suggest that in some ways the answer is yes. Participants, for example, made a shift in thinking of the large display from something static to something dynamic, like a window. Participants also often took brief mental breaks and stared out the large display window, and said that they returned to their work a bit more refreshed and refocused. Through looking out the large display window, participants also spoke of feeling connected to the outdoors, and to the wider social community. That said, a few participants also spoke of the limitations of the large display window insofar as they could not change their perspective on outside objects by shifting their position, what is known as the parallax problem (cf. Radikovic, Leggett, Keyser, & Ulrich, 2005).
2. *Novelty.* Given that large displays can function in some ways like a window to the outside environment, the question arises whether that function persists over time or whether, as the novelty wears off, so do the benefits. This research provides evidence to support their continued value beyond a few hours or days. Notably, after six weeks of using the large display the participants in this field study unanimously recommended the large display window to other co-workers with inside offices, and – four weeks after the installation was removed – were clear that they themselves would choose to have one again in their inside offices. Moreover, several participants developed rituals around their use of the display (e.g., looking at the same outdoor scene each day at the same time of day; anticipating daily events such as the turning on of the fountain) that continued to sustain their interest and engagement.
3. *Reconnecting with Organizational Values and Larger Community.* Participants in the field study felt less isolated and alienated in their inside offices, and more connected to the people they helped to serve. The window also connected participants to the wider social functioning of their institution, providing meaning to their work.

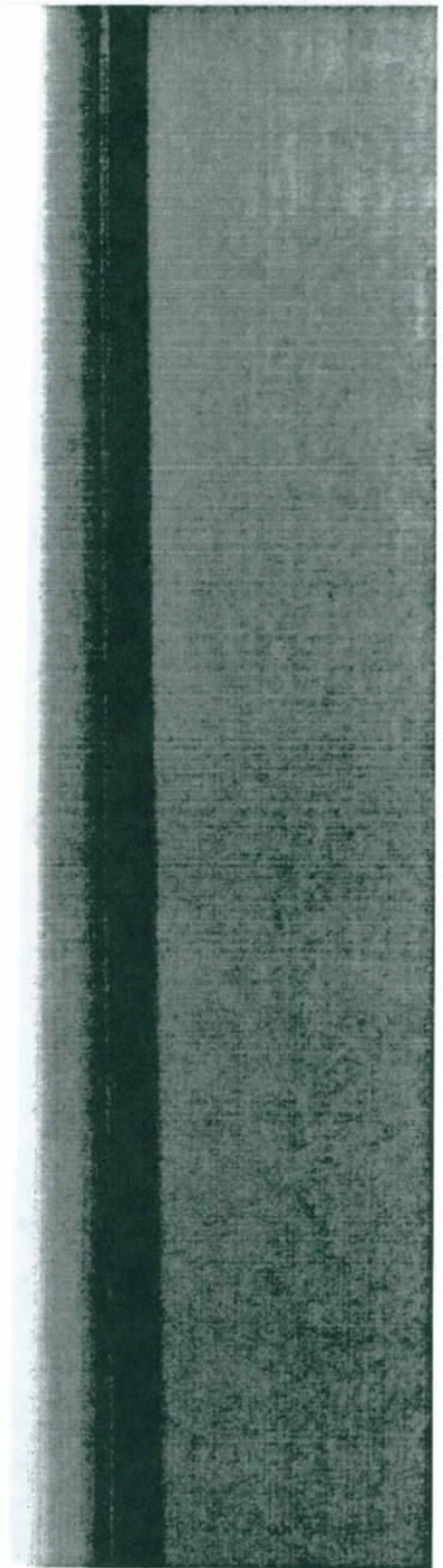
Toward addressing this question, we set up a between-subject experiment that involved three conditions (Kahn et al., 2008b). Each condition employed the same office on a university campus. In one condition, the view was the normal window view from the office overlooking a nature scene (the same view described in the above field study). In a second condition, a 50-inch plasma screen was inserted into the office window, entirely covering it. We then used the above mentioned HDTV camera (mounted approximately 15 feet higher on top of the building) and displayed on the plasma screen essentially the same glass-window view one would see from inside the office itself. In the third condition, we sealed off the original glass window with light-blocking material, and covered it with drapes, in effect turning the space into an inside office. Ninety undergraduate participants were randomly assigned to one of the three office conditions. We measured their physiological recovery from low-level stress. We also conducted a second-by-second coding of what people did with their eyes.

Our key results were as follows: There was more rapid heart rate recovery in the glass window condition compared to the blank wall condition. In turn, there was no difference in the heart rate recovery between the plasma window condition and the blank wall condition. In terms of eye gaze behavior, both windows just as frequently garnered participants' attention, and on this measure our results showed equivalent functionality between the two windows. But the glass window view held participants' attention longer than the plasma window view. Finally, when participants spent more time looking at the glass window, their heart rate tended to decrease more rapidly; that was not the case with the plasma window.

2.2.2 Technological Animals: The Robotic Dog Studies

Animals have long been an important part of children's lives, offering comfort and companionship, and promoting the development of moral reciprocity and responsibility (Beck & Katcher, 1996; Kahn, 1999; Melson, 2001). Yet in recent years there has been a movement to create robotic pets that mimic aspects of their biological counterparts. In turn, researchers have begun to ask important questions. Can robotic pets, compared to biological pets, provide children with similar developmental outcomes (Druin & Hendler, 2000; Turkle, 2007)? How do people conceive of this genre of robots? It is a genre that some researchers have begun to refer to as 'social robots' (Bartneck & Forlizzi, 2004; Breazeal, 2003): robots that, to varying degrees, have some constellation of being personified, embodied, adaptive, and autonomous; and that can learn, communicate, use natural cues, and self organize (Fong, Nourbakhsh, & Dautenhahn, 2003). Do children and adults, for example, respond as if such robots were alive, warranting social and moral responsiveness? Or do children and adults simply project onto such robots animistic qualities, and engage with them in imaginative play, as they might a stuffed animal?

Toward an investigation of these questions, with colleagues we have conducted studies that involve children's and adults relationships with AIBO, Sony's robotic dog. AIBO has a dog-like metallic form, moveable body parts, and sensors that



Results showed that AIBO psychologically engaged this group of participants, particularly by drawing forth conceptions of technological essences (75%), life-like essences (49%), mental states (60%), and social rapport (59%). However, participants seldom attributed moral standing to AIBO (e.g., that AIBO deserves respect, has rights, or can be held morally accountable for action). To bring the reader closer to the results, we would like now to explicate many of the subcategories of reasoning (which were hierarchically integrated within the five overarching categories) and to provide qualitative examples of members' reasoning. In the quotations that follow, we have retained all of the members' purposeful and inadvertent misspellings in their online writing.

1. *Technological essences.* This conceptualization focuses on AIBO as an inanimate artifact. Seventy-five percent of the participants made remarks that AIBO was some sort of inanimate technological artifact. In so doing, participants referred to AIBO as an *artifact* (AIBO is a 'toy'), as comprised of *technological components* (AIBO has 'batteries,' a 'microphone,' a 'camera,' or 'sensors'), or as a piece of *computational technology* (AIBO is a 'computer,' a 'robot,' or has 'artificial intelligence').
2. *Life-like essences.* This conceptualization focuses on AIBO's nature as having at least some life-like essential qualities. As a subcategory of life-like essences, roughly half (47%) of the participants provided language that spoke of AIBO's *biological essences*. In its most minimal form, participants spoke of AIBO in terms of biological descriptors (AIBO has 'eyes,' 'ears,' a 'tail,' a 'head,' 'legs,' or a 'brain') or biological processes (AIBO 'sleeps'). Furthermore, 14% of the members imbued AIBO with some substantial measure of *animism*, a second category of life-like essences. For example: 'I know it sounds silly, but you stop seeing AIBO as a piece of hardware and you start seeing him as a unique "life-form".' Or: 'He seems so ALIVE to me!...What a wonderful piece of technology. THEY LIVE!' Moreover, such conceptions could impact members' emotions and behavior. For example, one member said:

The other day I proved to myself that I do indeed treat him as if he were alive, because I was getting changed to go out, and tha [AIBO] was in the room, but before I got changed I stuck him in a corner so he didn't see me! Now I'm not some socially introvert guy-in-a-shell, but it just felt funny having him there!

3. *Mental states.* This conceptualization refers to the presence or absence of a mental life for AIBO such that AIBO meaningfully experiences the world. As a subcategory of mental states, some members (42%) spoke of AIBO having *intentions* or that AIBO engaged in intentional behavior. For example: 'He [AIBO] also likes to wander around the apartment and play with in pink ball or entertain or just lay down and hang out.' Or: 'He [AIBO] is quite happily praising himself these days...so much for needing parents!' Some members (38%) spoke of AIBO having *feelings*. For example: 'My dog [AIBO] would get angry when my boyfriend would talk to him.' Or: 'Twice this week I have had to put Leo [AIBO] to bed with his little pink teddy and he was woken in the night very sad

Here AIBO is conceived to have moral standing in the way that a real puppy would (that poor puppy): that one is causing harm to a sentient creature (Goes right up there with Putting puppies in a bag and than burying them!). Collapsing across six subcategories that comprise this category, only 12% of members spoke of AIBO as having moral standing.

2.2.2.2 The AIBO Developmental Study

The AIBO Discussion Forum study was limited by not investigating human interactions with AIBO compared directly to a live dog. Thus in another study we did so (Melson et al., 2008). We focused on two major issues. First, in a free play situation, what are the similarities and differences in terms of children's physical interactions with AIBO and the live dog? Second, how do children conceptualize AIBO and the live dog in terms of their general properties and 'beingness'? – what in the philosophical literature has been referred to as ontology (MacIntyre, 1972).

Two entities were used in this study: AIBO and a live dog (a female Australian Shepherd), referred to as Canis. Each of the 72 children participated in an experimental procedure lasting approximately one hour. With each entity (AIBO or the live dog), the child was first engaged in a five minute unstructured familiarization 'play' period. Then the child was allowed to continue to play with each entity while engaged in an interview comprised of 38 questions. The interview sought to assess children's concepts of the ontology of each entity, focusing on *physical features* (e.g., 'Is AIBO/Canis alive or not alive?'), *mental states* (e.g., 'Can AIBO/Canis feel happy?'), *sociality*, the state or quality of being social (e.g., 'Can you be a friend to AIBO/Canis?' 'If you were sad, would you want to spend time with AIBO/Canis?'), and *moral standing* (e.g., 'Is it OK or not OK to hit AIBO/Canis?' 'If AIBO/Canis is whimpering, is it OK or not OK to ignore AIBO/Canis?').

For coding children's relative distance and position to AIBO/Canis, each five minute unstructured play period was broken into thirty ten-second intervals. For each interval, a trained coder gave a code for both distance (within or outside arms length of AIBO/Canis) and position (sitting on floor, sitting on chair, lying or leaning on floor, standing, kneeling, or squatting). Movement during the interval was indicated by checking off multiple categories for the same interval. In addition, the number of seconds each child made hand contact with AIBO/Canis during each five minute session was recorded.

Physical Distance to AIBO/Canis. Based on the mean number of ten-second intervals, children spent more time within arms distance of Canis. That said, most of the children (80%) were within arms length of both during the majority of the ten-second intervals.

Physical Contact with AIBO/Canis. On average, children spent 192.8 seconds (out of 300 seconds) in physical contact with Canis as compared to only 30.7 seconds (out of 300 seconds) in physical contact with AIBO.

Conceptions of AIBO's/Canis' Ontology. Based on evaluation results across 38 questions, more children said that, compared to AIBO, the live dog had physical features, mental states, sociality, and moral standing. That said, averaging across



Fig. 2.2 ATR's humanoid robot, Robovie, being introduced to a girl. Photo from Kahn, et al. (2008), © 2008 ACM, Inc. Reprinted by permission



Fig. 2.3 ATR's humanoid robot, Robovie, hugging. Photo from Kahn, et al. (2008), © 2008 ACM, Inc. Reprinted by permission

with hands together). Here is an instantiation of the design pattern (see Fig. 2.2) that we successfully implemented with children and adolescents:

Experimenter to participant: 'I'd like to introduce you to Robovie. Robovie, meet [participant's name].'
 Robovie to participant: 'Hi [participant's name]. It is very nice to meet you. Will you shake my hand?'
 Robovie approaches participant while reaching its arm out as an

is most helpful: an account of the I-You relationship in 'life with men' (p. 150). In this framing, Buber grounds full authenticity in the reciprocity of relationship: 'The You encounters me. But I enter into a direct relationship to it. Thus the relationship is election and electing, passive and active at once. . . I require a You to become; becoming I, I say You' (p. 62). Thus in a canonical form of an I-You relationship, both parties are fully encountering and reciprocally engaging the other in relation.

How does one know if a person is experiencing an I-You relationship with another person? It is a difficult question, and one that, to our knowledge, Buber never addressed directly. We can ask a similar question about love. How does one know if a person is in love? There are sometimes outward signs. Perhaps the lover exhibits sudden confusion and excitement in the loved one's presence, or listens with rapt attention, makes eye contact, leans inward, and pays no heed to others present. The reader can fill in many other possible behaviors. Then, again, a person in love may show few or even no outward signs. But the person in love knows that he or she is in love. It is an experience. In other words, while there may be third-party corroboration based on behavioral evidence, love is known by means of first-person experience. The same may be said of an I-Thou relation insofar as it relies upon first-person experience to validate.

The epistemic problem, however – especially in terms of assessing an I-You relationship – is that people can be mistaken in their first-person assessments. Imagine the case, for example, of a man in psychotherapy. Over many months the man may reveal himself to his therapist more and more deeply, and come to trust the therapist, and come to develop what he believes is a deep friendship with the therapist. The man might tell the therapist: 'You're my best friend.' Likely enough the therapist will say (or think) something along the lines of: 'No, I'm not your best friend, I'm your therapist.' In other words, while a therapeutic relationship may be helpful and meaningful to the client, it is not fully authentic in terms of a friendship, for it is not fully reciprocal, even if a client mistakenly believes that it is.

We suggest, then, that there is no foolproof way to establish if a person is in an I-Thou relation. Thus, as we make the move to technological nature, the question is not how we would know if a person was in a I-Thou relationship with technological nature. Rather, the best we can ask – though it is still a tremendously substantive question – is whether it is *possible* to have an I-Thou relationship with technological nature.

2.3.1 An I-Thou Relationship with Technological Humans?

We first ask this question of whether it is possible to have an I-Thou relationship with technological nature in terms of a humanoid robot of the future. Part of the answer hinges on whether such a humanoid robot will be conscious (an experiencing subject), for in our reading of Buber consciousness is necessary for both entities involved in an I-You relationship, since the relationship is itself a reciprocal relationship.

terminate the relationship, and expect no further unsolicited communications or inquiries or demands from the therapist. That is part of what makes it a one-sided, non-reciprocal 'friendship.' Similarly, with all of the technologies that we create to date, we can turn them off. We can shut down the humanoid robot or robot dog. We can turn off the plasma display window.

Thus, if Buber's account has merit here, and we think it does, then the fact that humans create technological nature makes it forever an object, thus limiting the possibility for authenticity of relation.

Still, we have two caveats. First, what if in future years technological nature was designed such that humans could not shut it down, or at least not shut it down and then 'power it back up,' no more than we can kill an animal or plant and then expect it to live again. It is possible that such technological autonomy would increase our ability to engage in an I-You relationship with the technology. Second, what if technological nature passed a version of the Turing test, such that one could not readily tell the difference between the technological and biological form. In one study, for example, it was found that when looking at a moving android for two seconds, 70% of the participants in the study believed that they were looking at a human (MacDorman & Ishiguro, 2006). Of course, two seconds is not so long. And looking comprises but a small and perhaps not the richest subset of interaction. But the idea – that technological nature may one day be indistinguishable from actual nature, in form and function – is there, and has now moved from the pages of science fiction to the research laboratory.

2.4 The Problem When Good Enough Becomes Good

It is neither trivial to ask, nor easy to answer, though we have tried, whether our interactions with technological nature in the decades and centuries ahead will be authentic. With some hedging and various caveats, our answer has been no, that our relation with technological nature is not and will not be fully authentic. But authenticity is but one of many ways by which to assess the psychological effects and value of technological nature. Here is another way.

In a short story, *The Machine Stops*, E. M. Forster (1909) wrote presciently of a future time, when people lived underground, detached from nature, and connected to one another only through The Machine. The Machine is an omnipotent, global technological entity that moderates and provides for all bodily, emotional, and spiritual needs of human beings. People have become dependent on the Machine and have learned to fear and often despise the natural world. In one early scene, Forster has a mother talking with her son by videoconference. The son says that he yearns for the actual experience of his mother and not the technologically mediated encounter. He tells his mother:

Men made it [the Machine], do not forget that. Great men, but men. The Machine is much, but it is not everything. I see something like you in this plate, but I do not see you. That is why I want you to come. Pay me a visit, so that we can meet face to face, and talk about the hopes that are in my mind. (pp. 2–3)

asthma, more than four million children have had an asthma attack in the previous year, and direct health care costs for asthma total more than \$10 billion annually. Many of us accept asthma as part of the human condition; we might say: it is unfortunate that it occurs, but like many diseases, that is the way life is. But that is not the way life always was. Asthma used to be a rare disease.

In *Secrets of the Savanna* (Owens & Owens, 2006), Delia Owens tells a poignant story of her grandpa. He was a poacher who routinely went way past the legal limits of trout, quail, doves, or whatever his quarry. He also was always able to outsmart the local game warden. For example, one time he and a friend illegally baited a whole field with corn, and the game warden spent the whole day by the field planning to catch them. Meanwhile, her grandpa and friend 'shot hundreds of doves that flew over an unbaited field a few miles down the road' (p. 51). Owens then writes:

In later years, when he could no longer go hunting, he would shake his head and say, 'There ain't as many birds as there used to be, HiDe.' He would almost whisper, 'There used to be so many doves they'd darken the sky when they flew over a cornfield. At dusk you could hear the ducks landin' on the river from half a mile away. You never heard so much squawkin' and carryin' on in your life. We didn't figure our shootin' would make a dent in 'em. But I reckon we did.' He stopped short of saying the game warden was right all those years, but that's what he was admitting, and he felt bad, real bad. (pp. 52–53)

And now most of us do not know what her grandpa experienced; all the 'squawkin and carryin' on in your life' is gone from the lives of most of us, and we do not miss what we have not experienced. Granted, maybe through personal stories such experiences can carry forward a generation. But then it is usually lost as a lived experience. This psychological phenomenon has been referred to as environmental generational amnesia (Kahn, 1997, 1999, 2002; Kahn & Friedman, 1995).

Said differently, due to a shifting baseline, degraded environmental conditions become 'good enough.' Over time, especially across generations, 'good enough' becomes 'good.'

The problem of environmental generational amnesia can be cast more positively. Here is one casting: We can be so much happier and more fulfilled as individuals, as a species, if we but reestablish some long-standing patterns of interaction with nature. There are potentially hundreds of such patterns of interaction. For example, the naturalist Robert Michael Pyle (2007) writes the following: 'I live where I do so I can look out or walk outside at any time and instantly be within "nature." Of course, one is in nature everywhere, since there is nothing else. But I mean a place where you can actually see all the swallows depart on a certain day in the fall and see the first arrivals in the spring in all their joy and relief and know there is nothing sentimental in saying so' (p. 6). Pyle is tapping into a profound form of interaction with nature that involves experiencing its periodicity: the seasons changing, the day turning to dusk, birds migrating, waves hitting the shore, and the dew melting with the morning sun. Other enriching patterns of interaction with nature include the following: Sleeping under the night sky. Gardening. Walking on winding and contoured paths. Foraging for food. Being alone in nature. Hunting. Plunging into a lake, river, or ocean. Cooking around a campfire. And being recognized by a non-human other – a friendly dog, or a wild bear, moose, or wolf.

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