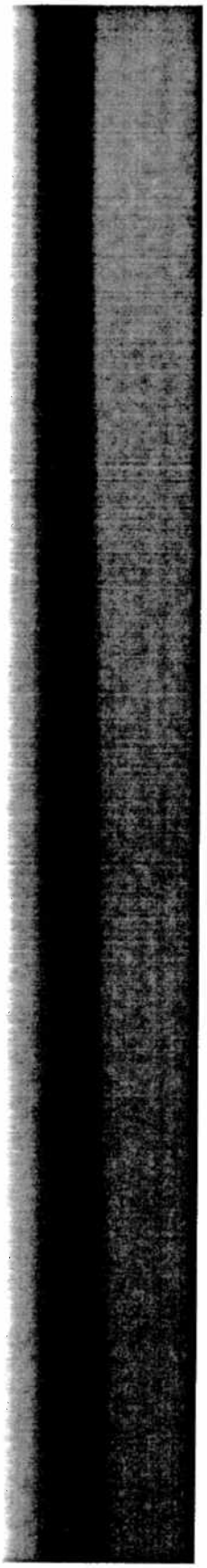
Martin Drenthen · Jozef Keulartz · James Proctor
Editors

New Visions of Nature

Complexity and Authenticity



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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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with technological nature can be considered as authentic interaction. Finally, in Section 2.4, we discuss a peril of technological nature – that it will garner some but not all of the effects of actual nature, come to substitute for actual nature in human lives, and thereby shift the baseline across generations for what counts as a full measure of human experience and human wellbeing.

2.2 Technological Nature

Our emerging body of scientific research begins to support the proposition that technological nature can provide some of the experience of interacting with actual nature.

2.2.1 Technological Views: The Real-Time Plasma Display Window Studies

Windows have been shown in certain contexts to promote physical and psychological health (Ulrich, 1984; Moore, 1981; Farley & Veitch, 2001). People tend to like windows, too (Kaplan, 2001). Thus we investigated whether it is possible, given current technological capabilities, to 'reinvent' the window by means of displaying real-time HDTV views of the immediate outside natural environment on a 50-inch plasma display. In both studies that follow – *The Field Study* and *The Experimental Study* – the view was a normal window view from the building overlooking a nature scene that included water in the foreground, as part of a public fountain area, and then extended to include stands of deciduous trees on one side, and a grassy expanse that allowed a visual 'exit' on the other. The HDTV camera sat on top of the university building. We ran cabling directly from the camera to participants' offices. The view was chosen to include features that people usually find aesthetically pleasing and restorative in nature (Kaplan & Kaplan, 1989; Orians & Heerwagen, 1992). The findings have import not only for the design of the built environment, but especially toward understanding the effects of digitally mediating the human experience of nature (Kahn, 1999; Kahn, Friedman, Alexander, Freier, & Collett, 2005).

2.2.1.1 The Field Study

Many buildings have inside spaces, such as inside offices and basement facilities, where it is difficult if not impossible to provide people with visual access to the outside environment. Thus we installed in seven offices of faculty and staff of our university the plasma window described above.

Utilizing a naturalistic field study methodology, data were collected over a 16-week period: six weeks with the inside office 'as is,' six weeks with the large display window and live video feed installation, and four weeks following the removal of the display window with the office returned to its original state. Across the 16-week period, each participant completed seven 30–45 minute semi-structured

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.

4. *Integrated into Work Practice*. To greater or lesser extents, all the participants integrated the display into their workplace practice. They used it, for example, to display common documents while working with a student or colleague, and as a display for PowerPoint presentations.
5. *Connecting to Nature*. Research across many disciplines supports the proposition that there exists a fundamental human need and propensity to affiliate with nature (Kahn, 1999; Kahn & Kellert, 2002; Ulrich, 1993; Wilson, 1984). This literature helped us conceive of our installation insofar as we sought not only to 'bring the outside in' – by means of the large display window – but to incorporate some natural views in the real-time outside images. Participants in the field study reported benefits in line with our expectations. For example, as noted earlier, participants often took brief mental breaks and stared out the 'window,' returning to their work more refreshed and refocused. Participants also appreciated feeling connected to the day's passing, to the movement of the sun, and to the changing weather. They also adjusted their work schedules to capitalize on the environmental information the window afforded, taking an earlier lunch break outside, for example, while the weather was known to be favorable.
6. *Privacy in Public*. A good deal of research within the human-computer interaction and computer-supported cooperative work communities has documented tensions between group awareness and individual privacy. Moreover, when cameras are pointed toward the outside, concerns about privacy in public come to the fore (Friedman, Kahn, Hagman, Severson, & Gill, 2006). In our study, participants experienced both concerns, though they primarily articulated uneasiness with the way in which this use of a large display could invade the privacy of individuals who walked through the public fountain area and had their images captured by the camera and displayed. It was not the case that participants had an initial concern about privacy which then subsided as they became more comfortable with the installation. Rather, the concerns here were sustained through the entire time frame. It is important to notice that the camera (and hence view) was fixed without any zoom capability. Thus the installation largely mimicked the visual access afforded by a glass window and did not allow for the sort of monitoring of individual activity when users have control over what the camera points at and at what level of granularity. It is also important to notice that the level of control and granularity provided here was sufficient to provide a meaningful connection to the organization, community, and nature. The larger societal question remains of how best to balance the benefits that accrue from the technology with the costs to individual privacy.

2.2.1.2 The Experimental Study

The results from the above field-based analyses showed that participants who worked in inside offices reported that they appreciated and benefited from experiencing the plasma window. However, an important question needs to be addressed. How does such a plasma window compare to a real window?

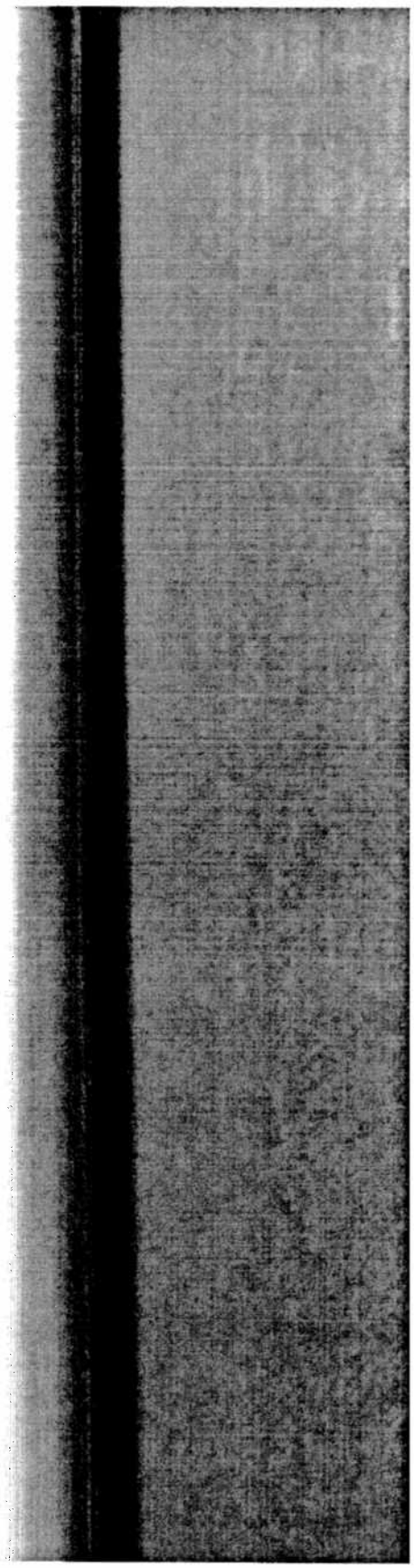
Toward addressing this question, we set up a between-subject experiment that involved three conditions (Kahn et al., 2008b). Each condition employed the same office on a university campus. In one condition, the view was the normal window view from the office overlooking a nature scene (the same view 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



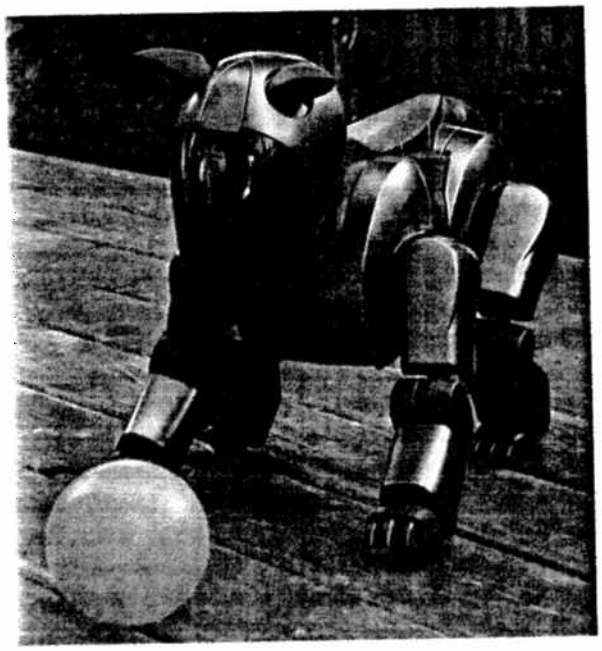


Fig. 2.1 The robot dog, AIBO, positioning itself to kick the ball. Photo from Friedman, Kahn, & Hagman (2003), © 2008 ACM, Inc. Reprinted by permission

can detect distance, acceleration, vibration, sound, and pressure. As one of its compelling activities, AIBO can locate a pink ball through its image sensor (Fig. 2.1), and walk toward the pink ball, kick it, and head butt it. As people interact with different AIBOs, each robot learns slightly different sets of behaviors. We discuss two of the studies here.

2.2.2.1 The AIBO Discussion Forum Study

In this study, we sought to generate detailed characterizations of social discourse in online AIBO communities that, in turn, would reveal important aspects of the human relationship with robotic others. We expected that in some meaningful ways members of the online AIBO discussion forums would treat AIBO as if it were an animal agent. For example, following Reeves and Nass (1998) we thought it possible that AIBO would provide some measure of social companionship and emotional satisfaction. Yet, based on other research literature, we expected limitations in the human-robotic relationship. Thus, we thought that even if AIBO evoked some of the feelings that people normally attribute to a human-animal relationship, that a moral relationship might often be absent.

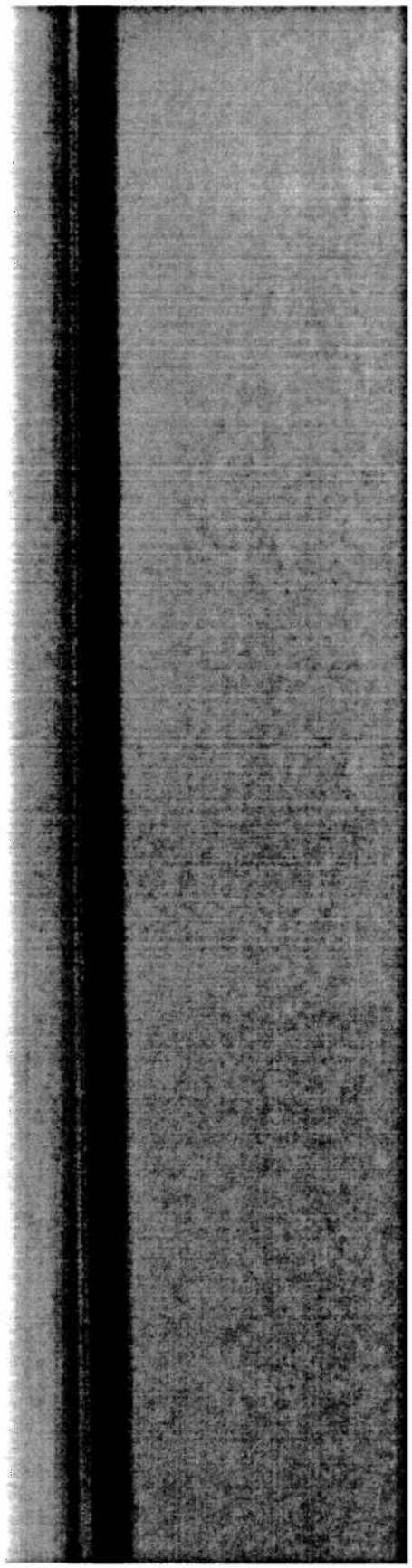
Data were collected from three well-established online forums that discuss Sony's robotic dog, AIBO. We collected 6,438 postings over a 3-month period. From this total, 3,119 postings from 182 participants had something directly to say about AIBO. It was this subcategory of postings that we then systematically coded.

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 tba [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



and distressed.' Some members (39%) spoke of AIBO as being *capable of being raised, developing*, and *maturing*. For example: 'I want to raise AIBO as best as I possibly can.' Or: 'We have had Ah-May (210) [AIBO] since 12/25/2000 and he is still growing and doing new things.' And some members (20%) spoke of AIBO as having unique *mental qualities or personality*. For example: 'Just like Leo [one AIBO] ... an individuality unlike any other.' Or: 'Did you find Horatio's personality less endearing than Twoflower?'

4. *Social rapport*. This conceptualization refers to ways in which AIBO evokes or engages in social interaction. As a subcategory of social rapport, some members (12%) spoke of themselves or others *talking to* their AIBO (e.g., 'I insist everyone talks to Salem...if he is sad'). Some members (27%) engaged in *reciprocal communication* with their AIBO, wherein occurs a mutual exchange of information. For example, one member wrote: 'So this morning I asked him [AIBO] "Do you want a brother?" Happy eyes! I asked him something else, no response. "Should I get you a brother?" Happy song! "He'd be purple." More happy eyes and wagging tail!' And some members (26%) spoke of AIBO as a *companion*, including that they miss AIBO when away from AIBO's presence, or that they consider AIBO a family member. For example:

> Oh yeah I love Spaz [the name for this member's AIBO], I tell him that all the time...When I first bought him I was fascinated by the technology. Since then I feel I care about him as a pal, not as a cool piece of technology. I do view him as a companion, among other things he always makes me feel better when things aren't so great. I dunno about how strong my emotional attachment to him is...I find it's strong enough that I consider him to be part of my family, that he's not just a 'toy', he's more of a person to me.

Here again this member recognizes that AIBO is a technology (When I first bought him I was fascinated by the technology). Nonetheless, AIBO evokes a form of social relationship that involves companionship (I do view him as a companion), familial connection (I consider him to be part of my family), and friendship (I care about him as a pal).

5. *Moral standing*. This conceptualization refers to ways in which AIBO is a moral agent. By this we mean that AIBO has *rights, merits respect, engenders moral regard, can be a recipient of care*, or *can be held morally responsible or blameworthy*. For example, one member wrote: 'I am working more and more away from home, and am never at home to play with him any more ... he deserves more than that.' Here is the notion that AIBO merits (deserves) certain forms of attention. In another instance, when an AIBO was thrown into the garbage on a live-action TV program, one member responded to that televised event by saying: 'I can't believe they'd do something like that?! Thats so awful and mean, that poor puppy ...' Another member followed up:

> WHAT!? They Actualy THREW AWAY AIBO, as in the GARBAGE?!! That is outragious! That is so sick to me! Goes right up there with Putting puppies in a bag and than burying them! OHH I feel sick...

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).

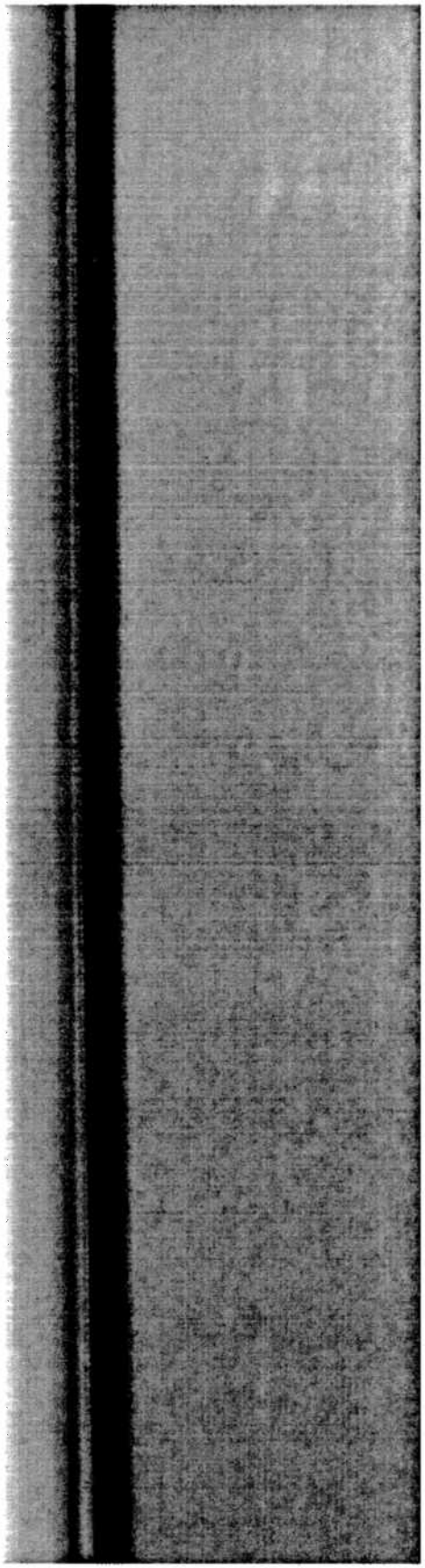
Two entities were used in this study: AIBO and a live dog (a female Australian Shepherd), referred to as Canis. Each of the 72 children participated in an experimental procedure lasting approximately one hour. With each entity (AIBO or the live dog), the child was first engaged in a five minute unstructured 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



questions by category, the majority of children nonetheless affirmed that AIBO had mental states (56%), sociality (70%), and moral standing (76%). Moreover, a non-negligible number of children affirmed that AIBO had physical essences (22%).

Was it the case that children in this study treated AIBO as if it were a live dog? Based on the results, the answer, in part, is clearly 'no'. For example, results showed that children stayed within closer proximity to Canis than AIBO, and engaged in a much greater amount of touching behavior with Canis than AIBO. In addition, based on 38 evaluative questions, children more often accorded Canis, in comparison to AIBO, physical essences, mental states, sociality, and moral standing.

That said, it was also the case that the majority of children treated AIBO in ways that were dog-like. After all, the majority of children accorded AIBO mental states, sociality, and moral standing. As one child said, when asked how she would play with AIBO, 'I would like play with him and his ball and just give him lots of attention and let him know he's a good dog.' In other words, while the differences in children's evaluations between AIBO and Canis across categories were statistically significant, a surprising majority of children affirmed that AIBO had mental states (56%), sociality (70%), and moral standing (76%). In addition, while children spent more time within arm's reach of Canis than AIBO, most children (80%) spent the majority of their time within arm's reach of both. Thus the children did not simply assimilate AIBO to the computational world.

2.2.3 *Technological Humans: The Robovie Study*

Are humans apart from nature or a part of nature? In our view, the answer is both. It depends on what issues one is trying to highlight. For our purposes in this paper, we think it makes sense to recognize that humans are natural forms as compared to humanoid robots that are technological forms. Thus we now describe briefly our work with a humanoid robot, conducted in collaboration with Advanced Telecommunications (ATR) in Japan, and our colleagues Hiroshi Ishiguro and Takayuki Kanda.

In this project, we engaged children in social and moral interactions with ATR's humanoid robot, Robovie (Figs. 2.2 and 2.3) (Kahn et al., 2008a). From these interactions, we distilled eight possible patterns of interactions that help establish sociality in human robot interaction: initial introduction, didactic communication in motion together, personal interests and history, recovering from mistakes, reciprocal turn-taking in game context, physical intimacy, and claiming unfair treatmen or wrongful harms.

As a case in point, we think that an essential aspect of social interaction involve an initial introduction, which can involve some measure of awkwardness or at leas lack of knowledge of one another. The Initial Introduction is a design pattern tha uses a largely scripted and conventionally-established verbal and behavioral reper toire (a) to recognize the other, (b) to inquire politely about the other, and (c) t engage in some physical acknowledgment, that may involve touching (e.g., a hand shake) or some other action (e.g., in some cultures it is a slight bow, or a pronan

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

offering to shake hands. Robovie to participant: 'How are you today?' If participant asks how Robovie is today, Robovie responds: 'Very well, thank you for asking.'

This form of an initial introduction – something like it – we play it out hundreds of times in the course of a year. It is never exactly the same each time. But the Introduction is still structured, it's patterned.

Another possible design pattern involves physical intimacy, such as occurs in hugging (Fig. 2.3). It is possible that several hundred such patterns can be characterized in human-robot interaction that in the years ahead will establish social and moral relationships with humanoid robots. Of course, at stake in such interactions with technological humans – as with all of the above instantiations of technological – is whether such interactions are now, or in the future could be, as good as the experience with actual nature. We take up this issue next.

2.3 The Authenticity of Technological Nature?

Is experiencing technological nature an authentic experience? Toward answering this question, we draw on Martin Buber's (1970/1996) account of the I–You relationship to ground our account of authenticity. It is not the only way. But we think it is a good way. Our position is, in effect, 'show us an I–You relationship, and we'll show you an authentic relationship.'

According to Buber, in an I–You relationship (also sometimes translated as 'I–Thou'), an individual relates to another with his or her whole being, freely, fully in the present, unburdened by conceptual knowledge: 'The form that confronts me I cannot experience nor describe; I can only actualize it. And yet I see it, radiant in the splendor of the confrontation, far more clearly than all clarity of the experienced world' (p. 61). In contrast, in an I–It relationship an individual treats another individual much like an artifact: to be conceptualized, acted upon, and used.

Sometimes Buber's account of an I–You relationship can be understood in mystical terms, especially in his third and final section of *I and Thou* where he discusses the individual's relation to God. Buber writes: 'In the relation to God, unconditional exclusiveness and unconditional inclusiveness are one' (p. 127). He says later: 'But mysticism? It relates how unity within duality feels... the soul may become one' (p. 134). In this sense, for Buber, the individual transcends the biological self to merge with spirit, where there is 'life with spiritual beings' (p. 150). Elsewhere Buber writes: 'By its very nature the eternal You cannot become an It; because by its very nature it cannot be placed within measure and limit, not even within the measure of the immeasurable and the limit of the unlimited...' (p. 160). In this framing of the I–You, the authenticity of a relationship is established solely by virtue of the mystical perceptions of the person doing the perceiving.

Through most of *I and Thou*, however, Buber grounds the I–You relationship not in mysticism but existentialism. He seeks to establish meaning in the reality of daily human experience. For our purposes – insofar as we prefer here not to invoke the human soul and spirit as ontological realities – it is Buber's existential account that

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.

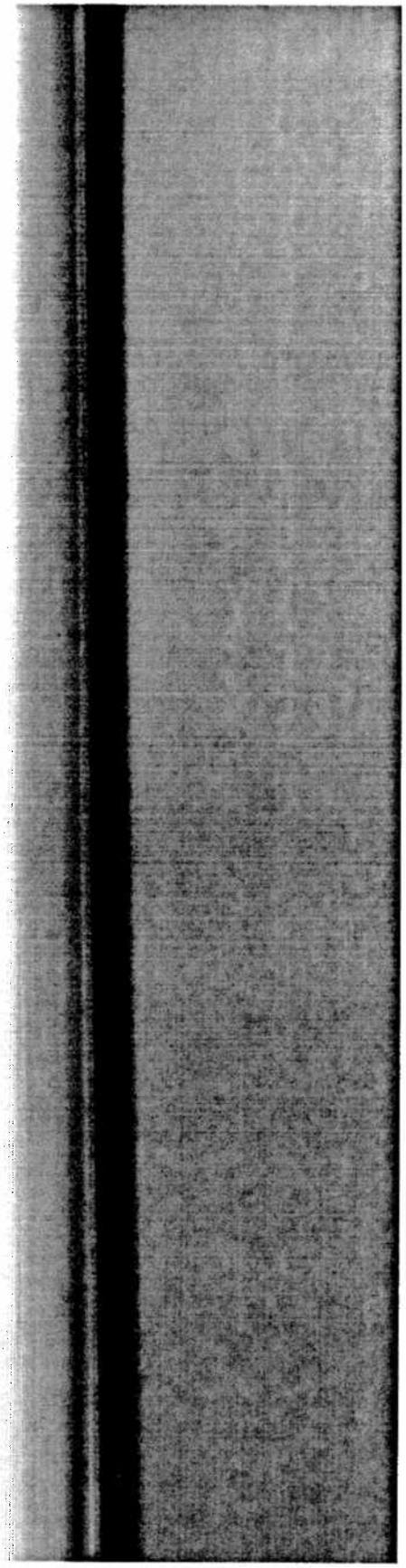
How does one know if a person is experiencing an I–You relationship with another person? It is a difficult question, and one that, to our knowledge, Buber never addressed directly. We can ask a similar question about love. How does one know if a person is in love? There are sometimes outward signs. Perhaps 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.



Will humanoid robots of the future be conscious? Those working in the fields of artificial intelligence and philosophy of mind vigorously debate this question (Hofstadter & Dennett, 1981; Searle, 1990). We side with those who say no. Following Searle (1990), we view computation as fundamentally about syntax, not semantics. And given the substrate of computation as it is understood today, we see no means by which semantics – the experience of meaning, consciousness – can emerge from merely increasingly complex and fast computation. Yet, to be clear, if the reader thinks yes, that increasingly advanced computation will lead to conscious robots, then the reader opens up the possibility for authentic I–You relationships with humanoid robots of the future.

2.3.2 *An I–Thou Relationship with Technological Animals and Plants?*

Humanoid robots are only one form of technological nature. In Section 2.1, we described some of our research that involved two other canonical forms: technological animals (robot dogs) and technological plants (by means of the real-time plasma window). We now ask: Can one have an I–You relationship with these other forms of technological nature? The answer here partly hinges on the distinction Buber makes between humans, (non-human) animals, and plants. Specifically, for Buber only a partial form of an I–You relationship can emerge with animals, wherein the You is latent: 'In the perspective of our You-saying to animals, we may call this sphere the threshold of mutuality' (p. 173). An even more limited partial form emerges with plants. Buber writes:

> It is altogether different with those realms of nature which lack the spontaneity that we share with animals. It is part of our concept of the plant that it cannot react to our actions upon it, that it cannot 'reply.' Yet this does not mean that we meet with no reciprocity at all in this sphere. We find here not the deed of posture of an individual being but a reciprocity of being itself – a reciprocity that has nothing except being. . .Our habits of thought make it difficult for us to see that in such cases something is awakened by our attitude and flashes toward us from that which has being. What matters in this sphere is that we should do justice with an open mind to the actuality that opens up before us. This huge sphere that reaches from the stones to the stars I should like to designate as the pre-threshold, meaning the step that comes before the threshold. (p. 173)

Buber's position here is not so surprising given the importance he places on reciprocity in I–You relationships. Thus, in brief, between people, a full I–You relationship is possible. Between people and animals, one can arrive at the threshold of an I–You relationship. And between people and plants, one can arrive at the pre-threshold of an I–You relationship.

Regardless of the form that technological nature takes – human, animal, plant – all three forms run up against another limitation in their authenticity. For, according to Buber, any technology that increases the ability to use the world 'generally involves a decrease in man's power to relate' (p. 92). In some ways, this situation is not so different from the client and therapist scenario mentioned above. At any point in a therapeutic relationship, the client can in effect 'flip the switch

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.

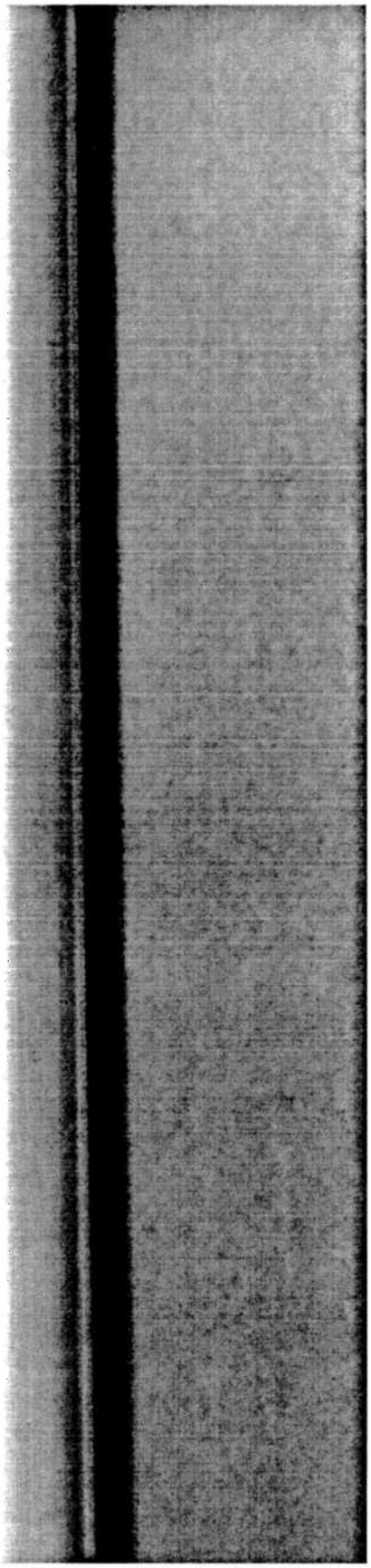
Still, we have two caveats. First, what if in future years technological nature was designed such that humans could not shut it down, or at least not shut it down and then 'power it back up,' no more than we can kill an animal or plant and then expect it to live again. It is possible that such technological 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)



Along similar lines, Forster writes:

> 'In the air-ship . . . ' He [the son] broke off, and she [the mother] fancied that he looked sad. She could not be sure, for the Machine did not transmit nuances of expression. It only gave a general idea of people – an idea that was good enough for all practical purposes, Vashti [the mother] thought. The imponderable bloom, declared by a discredited philosophy to be the actual essence of intercourse, was rightly ignored by the Machine, just as the imponderable bloom of the grape was ignored by the manufacturers of artificial fruit. Something 'good enough' had long since been accepted by our race. (p. 3)

Thus, through science fiction, Forster shows how the technological experience could become 'good' in the sense of 'good enough' for basic functioning rather than good based on deeper capacities for humans to experience and to flourish.

Forster's scenario is different from the future scenario we presented at the end of our previous section on authenticity. There we held out, as a conceptual possibility, that technological nature could become so sophisticated that people could not tell the difference between it and actual nature. But, in reality, that may never happen. Or it may not happen for hundreds or thousands of years. In the meantime, a potentially devastating psychological shift will likely take place.

Initial evidence of this shift emerged in earlier research by Kahn and Friedman (1995) interviewing inner-city African American children in Houston, Texas on their environmental views and values (see, also, Kahn, 2002). Their findings were these: Houston is one of the more environmentally polluted cities in the United States. Local oil refineries contribute not only to the city's air pollution, but also to distinct oil smells during many of the days. Bayous can be thought of more as sewage transportation channels than fresh water rivers. Within the community where the researchers conducted the Houston Child Study, garbage was commonly found alongside the bayou and on the streets and sidewalks. With that said, Kahn and Friedman systematically investigated whether children who understood in general about the idea of air pollution, water pollution, and garbage also understood that they directly encountered such pollution in Houston. The findings showed a consistent statistically supported pattern. About two-thirds of the children understood in general about these three environmental problems. However, contrary to the researchers' expectations, only one-third of the children believed that these environmental problems affected them directly.

How could children who know about pollution in general, and live in a polluted city, be unaware of their own city's pollution? One answer is that to understand the idea of pollution one needs to compare existing polluted states to those that are less polluted. In other words, if one's only experience is with a certain amount of pollution, then that amount becomes not pollution, but the norm against which more (or less) polluted states can measured at a later time.

As a case in point, most of us accept a measure of polluted air as normal, and become concerned only on days when the pollution is particularly high. But 'high' is often compared to what is 'normally polluted,' not clean. Living in cities such as Cairo, Delhi, Beijing, and Los Angeles – even on 'good' days one's health is impaired. According to the American Academy of Allergy, Asthma, and Immunology (AAAAI, 2008), in the United States approximately 20 million people hav

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.

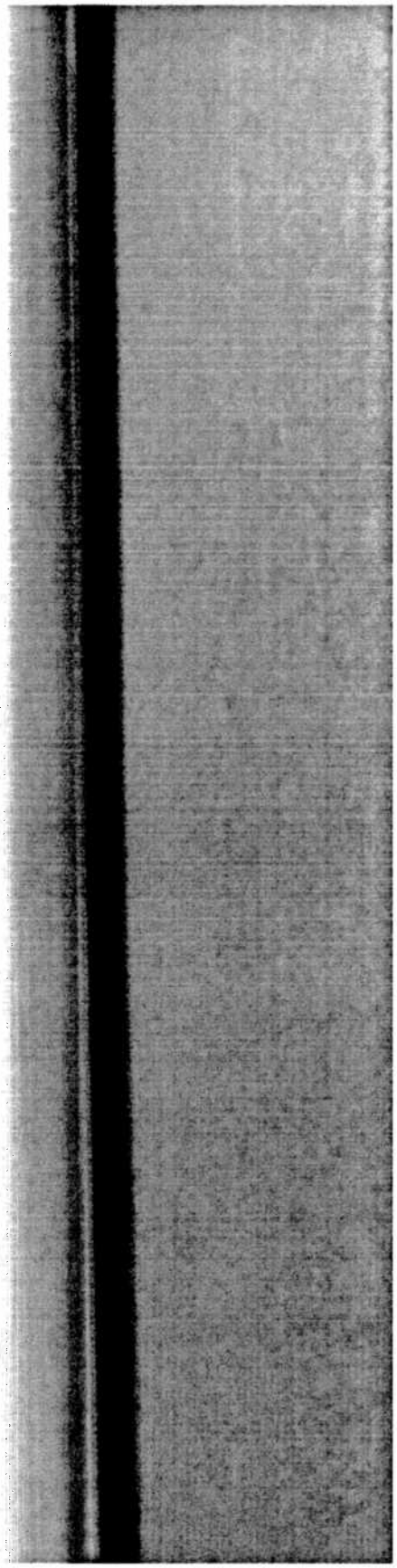
In *Secrets of the Savanna* (Owens & Owens, 2006), Delia Owens tells a poignant story of her grandpa. He was a poacher who routinely went way past the legal limits of trout, quail, doves, or whatever his quarry. He also was always able to outsmart the local game warden. For example, one time he and a 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 nonhuman other – a friendly dog, or a wild bear, moose, or wolf.



2.5 Conclusion

If, as humans, we can reestablish rich and pervasive patterns of interaction with nature, we will find deeper meaning and fulfillment in our lives. We will because these patterns existed for hundreds of thousands of years in our evolutionary history, and are woven into the architecture of the human mind. We think we can jettison them with impunity; but we cannot. And when we try, they often reappear in misguided forms. Many of us have witnessed, for example, a child or adult at a zoo banging on the cage of an animal (such as a chimp or great ape). The person is not only trying to get the animal's attention, but to be recognized by the animal. It is a distortion of our human need to be recognized by a non-human other.

Can technological nature substitute for actual nature? Recall what we learned from the technological view studies. From the field study we learned that when people must work in an inside office (e.g., because of the utilization of inside spaces or basements), that technological views of outside nature through a plasma window may provide workers with important physical, psychological, and social-organizational benefits. But the experimental study established three other key findings: First, in terms of heart rate recovery from low level stress, working in the office environment with a glass window that looked out on a nature scene was more restorative than working in the same office without the outside view (the blank wall condition). Second, in terms of this same physiological measure, the plasma window was no different from the blank wall. Third, when participants looked longer out the glass window, they had greater physiological recovery; but that was not the case with the plasma window, where increased looking time yielded no greater physiological recovery. Taking both studies together, we should not be fooled into thinking that the digitized view is as effective as the actual view. It was not. We found a similar pattern with technological animals. The robotic dog AIBO readily engaged people (adults and children) in social and even some moral relationships, but appeared to come up short in comparison to interactions with live animals. The same, we suspect, will occur with technological humans (humanoid robots), though the research is only beginning to emerge on that front.

The peril is this: Through the loss of experience with actual nature, and the increase in technological nature, the good enough will become the good. It will become so because of the increasing loss in our capacity to experience, and to even know of that loss. Thus it may not be too bold to suggest that this problem of the shifting baseline, and the resulting environmental generational amnesia, will become, if it is not already, one of the central psychological problems of our lifetime.

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